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ABSTRACT

Effect of Immigration on Depression among Older Natives in Western Europe*

To our knowledge, no study has examined the effect of immigration on the health of older natives. We use the Study of Health, Ageing and Retirement in Europe (SHARE) to investigate whether immigration affects depression among natives 65-80 years old. Immigration may increase the supply and lower the price of personal and household services, a term that refers to care services and non-care services such as cleaning, meal preparation, and domestic chores. Higher consumption of personal and household services by older natives may help maintain health through a variety of pathways including reduced loneliness, greater participation in meaningful social activities, and improved physical functioning. Using a shift-share IV, we find a beneficial effect of immigration on reducing the number of depression symptoms and the probability of clinically significant depression among older natives. We also find some evidence for the hypothesized mechanisms, although our ability to come to definitive conclusions about mechanisms is limited in our data.

JEL Classification: I12, I14, J61
Keywords: health, immigration, aging, social determinants

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1. Background and objectives

Concerns about the effects of immigration on the well-being of natives, which have been the subject of discussion and research for decades, have only grown in recent years as a result of rising immigration rates and the increasing diversity of immigrants' countries of origin. In many Western countries, including the United States and various European countries, immigration has become a burning political issue and an important factor in elections. In this context, comprehensive and objective information on the costs and benefits of immigration becomes increasingly important.

Numerous studies have addressed the effects of immigration on natives' wages and employment (Borjas, 1995; Card, 1990, 2001; Dustmann et al., 2005; Glitz, 2012; Ottaviano & Peri, 2012). A recent review concludes that immigration has a very small effect on the average wages of native workers, including less educated workers Peri (2014). Moreover, there is evidence that firms have absorbed immigrants by adopting appropriate technologies, expanding production, and moving native workers into more communication-intensive jobs. Other studies have assessed the effects of immigration on natives' educational outcomes and found mixed results (Brunello & Rocco, 2013; Hardoy & Schøne, 2013; Ohinata & Van Ours, 2013). Additional research has addressed the fiscal costs and benefits of immigration (Dustmann & Frattini, 2014; Dustmann et al., 2010).

By contrast, research on the effects of immigration on dimensions of natives' lives unrelated to labor market or educational outcomes is just starting. For example, a recent study by Akay et al. (2014), focusing on persons aged 16-64 in Germany, found that immigration has a positive effect on natives' subjective well-being.

More pertinent to our work, Giuntella & Mazzonna (2015), have recently published the only study examining the effects of immigration on the health of natives. This study, which focused on natives aged 25-59 in Germany, found that immigration reduced the probability that natives reported a doctor-assessed disability exceeding 30 percent. The effects were concentrated among workers without a college degree and blue-collar workers. The researchers also found evidence that the mechanism underlying these beneficial health effects has to do with the impact of immigrants on improving the working conditions of natives. Specifically, since immigrants self-select into physically demanding jobs that may be strenuous and risky, but do not require highly developed communication skills (e.g., Giuntella, 2012; Orrenius & Zavodny, 2009), job-related tasks are reallocated such that native workers, especially low-skilled workers, increasingly specialize in communication-intensive tasks that are less physically strenuous and have fewer harmful effects on health (e.g., Fletcher et al., 2011). Giuntella et al. (2018) considered also another possible pathway through which immigrants may affect natives' health. Immigrants may crowd out natives in the access to publicly provided healthcare services, especially emergency services and pediatrics, by lengthening waiting lists or by reducing the time and the resources available to natives. In fact, Giuntella et al. show that in the UK waiting lists to access NHS are not correlated with the immigrant share, even in emergency departments.

To date, however, no study has examined the effect of immigration on the health of natives aged 65 or older. At first blush it might seem reasonable to assume that immigrants cannot influence the health of natives in this age group, since labor market-related mechanisms are unlikely to be in play. However, immigrants could affect the health of older natives through other mechanisms. First,

immigration boosts the supply of personal and household services and, by making them more affordable, it contributes to ease the burden of domestic tasks, supports seniors' mobility and sociability and reduces seniors' loneliness. Second, the presence of immigrants in a community could encourage older natives to seek out volunteering opportunities or engage with groups or organizations involved with immigrants or immigration policy, such as religious or political organizations. Third, on the negative side, a high density of immigrants could also scare the most senior and frail natives, keeping them barricaded in their homes, withdrawing from the neighborhood social life.

This study examines the effects of immigration on depression among natives aged 65-80 years in five Western European countries: Belgium, France, Germany, Italy, and Spain. We focus on depression because it is the condition more immediately related with people degree of socility. Moreover, late life depression is associated with lower quality of life, increased risk of morbidity, increased risk of suicide, decreased physical, cognitive, and social functioning, and greater self-neglect, all of which are in turn associated with increased mortality (Blazer, 2003).

We use a rich panel dataset to estimate models where depression is a function of the immigrant share in the natives' region of residence, we take advantage of the panel nature of the data and use instrumental variable (IV) estimation to identify causal effects of the immigrant share. We consider mechanisms for effects on depression among natives that go beyond the narrative of improved working conditions.

The rest of the paper proceeds as follows. Section 2 provides some background information on depression and the role of immigrants in personal and household services. Section 3 describes the data and Section 4 discusses the empirical model and the identification strategy. Section 5 presents our results. Section 6 assesses potential threats to the validity of our findings, including selective migration of natives and the validity of our IV. Section 7 explores potential mechanisms for an immigration effect on depression. Section 8 summarizes the results and concludes.

2. Background.

2.1. Depression in older adults and its risk factors.

Depression among older adults results in a great deal of suffering. Clinically significant depressive symptoms are present in 15 percent of community-dwelling older persons and are more common in women than in men (Blazer, 2003). Several factors and protective factors for depression in late life have been identified through epidemiologic and clinical research.

Important physical risk factors for depression among older adults include poor self-perceived health, the onset of new medical conditions, and functional limitations or disability that results in reduced capacity to engage in desirable activities (Fiske et al., 2009; Cole et al., 2003). Cardiovascular and neurological conditions—for example, strokes—feature prominently among the medical conditions, likely because they often result in functional limitations. Salient social risk factors for depression include social isolation, defined as the objective lack of social integration and paucity of social contacts; loneliness, regarded as the subjective experience that results from the absence of desired relationships and social ties; and the lack of strong social supports (Fiske et al., 2009; Cacioppo et al., 2006).

Additionally, several studies suggest that persons who need to care for sick or frail family members are more likely to report symptoms of depression and psychological distress than non-caregivers (e.g., Pinquart & Sörensen, 2003; Vitaliano et al., 2003). As people live longer, growing numbers of persons in their 60s and 70s have living parents or parents-in-law who require high levels of care, and some persons in this age group may have to care for a sick or disabled spouse or partner. Conversely, the most frequently cited protective factor is meaningful engagement in social activities, volunteer work, or religion (Fiske et al., 2009).

Perhaps not surprisingly, risk factors and protective factors for decline in physical health are similar to those for depression. Prospective studies conducted as long as four decades ago in the United States and Europe found that one of the most important factors promoting health in adults, including people over age 65, is social integration, that is, the development and maintenance of strong social ties, institutional connections, and community participation. These studies found that persons who had more ties with friends and relatives and belonged to more groups had lower mortality and better physical functioning (e.g., Berkman & Syme, 1979; House et al., 1982; Seeman, 1996; Barth et al., 2010). The beneficial effects of social ties are consistent across age, sex, initial health status, and follow-up period (Holt-Lunstad et al., 2010). Interestingly, volunteering may have a particularly beneficial effect on the health of older people (Piliavin & Siegl, 2007).

On the flip side, loneliness and social isolation are associated with worse self-rated health, the onset of functional decline and disability, and increased mortality (Holt-Lunstad et al., 2015; Ong et al., 2016; Steptoe et al., 2013), and studies suggest that persons who care for sick or disabled relatives have worse physical health and higher mortality than non-caregivers (e.g., Pinquart & Sörensen, 2003; Vitaliano et al., 2003). Caregivers who are able to maintain high levels of social integration may be protected against the harmful effects of caregiving (Rozario et al., 2004).

2.2. Immigrants and the market for personal and household services

The term personal and household services covers a broad range of activities that contribute to the well-being at home of families and individuals. They include care services such as child care and care for the elderly and for persons with disabilities as well as non-care services such as cleaning, cooking and meal preparation, and gardening and other domestic chores (Farvaque et al., 2013). In recent decades, the role of immigrants in the market for personal and household services has grown rapidly in many European countries. The fraction of foreign-born domestic workers exceeded one-fourth in Belgium in 2011, having doubled in five years (Michielsen et al., 2013); surpassed three-fifths in Spain in 2009, where the number of foreign-born domestic workers grew from 15,000 to 320,000 between 1996 and 2009 while the number of native domestic workers plateaued (Leon, 2010); [1] and reached nearly four-fifths in Italy in 2008 (Peri et al., 2014), where foreign-born domestic workers grew from about 50,000 to more than 700,000 between 1994 and 2011 while the number of native domestic workers rose slightly (Castagnone et al., 2013). As increasing supply has lowered the prices of these services, more households are consuming them with important economic consequences. A

[1] A different source also documents the rapid rise in foreign-born domestic workers in Spain, but pegs the fraction of foreign-born workers at 55 percent in 2012 (Dominguez-Mujica et al., 2013).

higher local share of immigrants who can provide childcare increases the labor supply of women in their child-bearing years (e.g., Barone & Mocetti, 2011; Cortés & Tessada, 2011). Similarly, a higher local share of immigrants who can provide elder care increases the labor supply of women in late middle-age and delays their retirement (Peri et al., 2015).

Consumption of personal and household services increases after retirement age. For example, more than one-fifth of persons aged 65-74 in France hire workers to help them with domestic chores, and this fraction rises to more than two-fifths for persons aged 75 or older. Perhaps not surprisingly, older persons living alone resort more than average to hiring workers to do domestic chores, shop, and prepare or deliver meals. About one-fifth of persons aged 65 or older in France hire workers to assist with the care of a dependent person (Farvaque et al., 2013). In Germany, about one-fifth of households employ workers for domestic chores (Farvaque et al., 2013). In Italy, nearly one-third of families with a relative over 65 hire some form of help and 14 percent of these families employ a personal assistant (ISTAT, 2010).

3. Data and methods

Our main data sources are the Survey of Health, Ageing and Retirement in Europe (SHARE) and the European Union Labor Force Survey (EU LFS). SHARE is a multi-disciplinary and cross-national panel database of micro-data on the health, socioeconomic status (SES), and social and family networks of individuals aged 50 or older. Data collection began in 2004-2005 with Wave 1 and subsequent waves have been conducted approximately every two years; Wave 6 was collected in 2015. The sample is systematically refreshed to address attrition. Eleven Western European countries participated in Wave 1 and participation has grown over time. SHARE currently covers 27 European countries and Israel.

To enhance homogeneity in labor markets and political and economic institutions, and for econometric reasons (explained later), our main analyses focus on natives residing in five Western European countries, including Belgium, France, Germany, Italy, and Spain, that meet four criteria. First, the country participated in at least two waves of SHARE. Second, the country is included in both SHARE and the EU LFS. Third, the region of the country where each subject resided at the time he or she first entered the study is reported in the data. Region is reported at the NUTS1 level for Germany and Austria and at the NUTS2 level for the other countries.[2] Fourth, the country has at least 10 regions (together the five study countries account for 81 regions).[3] In the study, we use data from Waves 1, 2, 4, 5 and 6. Wave 3, also called SHARELIFE, focused on subjects' life histories and did not collect most of the health measures we need (see below). As in previous related research (Akay et al., 2014; Giuntella & Mazzonna, 2015), the definition of natives in this study is based on citizenship.

The EU LFS is a large household sample survey that provides quarterly information, including sociodemographic and economic characteristics, on individuals aged 15 or older living in private

[2] Region was reported at the NUTS2 level for most of Spain, but region ES5 (Este) was reported at the NUTS1 level.
[3] We use an additional five Western European countries, including Austria, Denmark, Portugal, Sweden, and Switzerland, in robustness checks. These countries meet the first three criteria but have fewer than 10 regions.

households in European Union member countries. The surveys are conducted by the national statistical institutes across Europe and are centrally processed by Eurostat, which harmonizes the data across countries. We use the EU LFS to obtain the annual share of immigrants in each study country and region during the period of the study as well as the number of immigrants at the country level, in each year and disaggregated by source nation.

Additional data sources for our study include the 2001 censuses of European countries, which we use to obtain the "baseline" share of immigrants in 2001, by source nation, in each study country and region. However, Belgium and Germany do not make their 2001 census data publicly available. Therefore, we obtain the "baseline" immigrant share for regions in Belgium, by source nation, by pooling the 1998-2001 data from the EU LFS. Similarly, we obtain the "baseline" immigrant shares for regions in Germany, by source nation, by pooling the 1997-2001 data from the German Socio-Economic Panel (SOEP), a longitudinal survey of private households that includes sociodemographic information. As described later, we use the "baseline" immigrant shares to construct the IV needed to identify the effects of immigrants of the health of natives.

Finally, we use harmonized data from Eurostat on the unemployment rate and on gross domestic product (GDP) in each study country and region (http://ec.europa.eu/eurostat/data/database). [4]

The study sample consists of SHARE subjects in each study country who are native citizens, report complete data for the variables needed in each analysis (see below), and have at least two usable observations. For each subject we use only those observations in which the age of the subject is 65-80 and in which the subject resides at the same address as the first time he or she was surveyed. [5]

The outcome variables in our main analyses are measures of depression reported by SHARE respondents. SHARE assesses depression symptoms and depression using the EURO-D scale, a 12-item scale that elicits whether subjects have symptoms related to affective suffering (e.g., depression, tearfulness, and wishing to die) and to motivation (e.g., loss of interest, poor concentration, and lack of enjoyment) (Prince, et al., 1999a; Prince, et al., 1999b). For analysis, we construct a variable indicating the number of symptoms reported and a binary variable indicating that the subject reports four or more symptoms (versus three or fewer). The cut-point of four or more symptoms is considered to indicate clinically significant depression (Castro-Costa et al., 2007; Prince et al., 1999a).

The main explanatory variable in the econometric analyses is the share of immigrants in a subject's region of residence, defined as the percentage of the population in the region who are not citizens of the country and whose country of origin is not in the EU-15. [6]

The set of controls include individuals variables (age, gender, living with a partner, number of children, and number of grandchildren), derived from SHARE and regional variables (the

[4] Since Eurostat does not report GDP for Switzerland by region, for the robustness checks we supplement the Eurostat data with economic data and reports from the Swiss Federal Statistical Office.

[5] SHARE provides information on whether each subject changed residential address from one wave to the next, but for subjects who move there is no information on the new location. Therefore, we could not follow subjects wherever they moved.

[6] The EU-15 were the member countries of the European Union prior to 2004: Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands, Portugal, Spain, Sweden, and United Kingdom.

unemployment rate for people aged 20-64 years and GDP per capita, expressed in purchasing power standards).[7]

Table 1 reports summary statistics for the study sample.[8] Figure 1 shows a map of the study countries, divided into regions, with shading used to indicate the annual percentage point increase in the immigrant share between 2004 and 2015, the period of the study. Regions with the largest percentage point increases are present in Spain and Italy, and regions with the next largest percentage point increases are seen in France. Regions with smaller increases are scattered throughout the five study countries, whereas regions with a declining immigrant share are present in France, Belgium, and Germany. Figure 2 shows a map of the study countries, where shading is used to indicate the immigrant share in 2015, the final year of the study period.

4 The model

We estimate the effect of the immigrant share on depression among natives residing in a region using the following econometric model:

$$D^*_{irctw} = \beta S_{r(t-k)} + X'_{it}\gamma + Z'_{rt}\rho + \alpha_i + \theta_{cw} + \varepsilon_{irctw} \qquad \text{(eq. 1)}$$

where D^*_{irctw} is a depression measure for subject *i* residing in region *r* in country *c*, measured in calendar year *t* and wave *w* (of SHARE). Since depression is a latent variable, we don't observe it directly. Instead, we observe two indicators based on the number of depression symptoms, as described in Section 3.

In this specification, $S_{r(t-k)}$ is the immigrant share in region *r* in year *t-k*;[9] X_{it} is a vector of time-varying individual characteristics including age and marital status; and Z_{rt} is a vector of time-varying regional characteristics including the unemployment rate and GDP per capita. To capture the effects of age on health we use a separate linear time trend for each birth-year cohort (1924 to 1950), which allows for different rates of change in health as a function of starting age. Additionally, α_i is a time-invariant individual fixed effect (which also account for the region of residence fixed effects as in our sample subjects do not move), θ_{cw} are country-specific wave fixed effects,[10] and ε_{irctw} is an error term.

[7] The PPS is an artificial currency unit. Theoretically, one PPS can buy the same amount of goods and services in each country. However, price differences across borders mean that different amounts of national currency units are needed for the same goods and services depending on the country. PPS is the technical term used by Eurostat for the common currency in which national accounts aggregates are expressed when adjusted for price level differences using purchasing power parities.

[8] The physical health outcomes and "mechanistic" variables are described below in Sections 5 and 6, respectively.

[9] Thus the immigrant share is lagged by *k* years relative to the health measures. As we explain in Section 4, we use $k = 2$ in our main analyses.

[10] We use country-specific wave fixed effects, rather than country-specific year fixed effects, because many country-year combinations had very few observations and the fieldwork of SHARE is contained in a single year in waves 5 and 6. In all waves and countries the fieldwork extended at most over (portions of) two adjacent calendar years and never lasted more than 12 months.

We estimate all models as linear models. Thus we treat the number of depression symptoms as a continuous, interval-scaled variable, and we estimate a linear probability model for clinically significant depression. All analyses are stratified by gender and standard errors are robust to clustering at the regional level.

There are two main threats to the ability of this model to identify the causal effects of immigration on the health of natives. First, natives may respond to growing shares of immigrants in the regions of residence by moving to other regions. As we show in Section 6, we find no evidence that the propensity of natives to move differs by immigrant share.

Second, the rate of growth in the immigrant share across regions may be influenced by changes over time in regional economic or non-economic factors that are also correlated with depression status. For example, faster economic growth and the resulting favorable labor market conditions may attract more immigrants to a region, but economic conditions are also correlated with depression. We adopt several strategies to assess this concern.

To begin, our model includes country-specific wave fixed effects. Although country-specific wave fixed effects cannot control for differences in the trajectories of relevant economic and non-economic factors across regions within the same country, they capture differences in these trajectories across countries, which may represent a sizable component of overall cross-region differences.

Additionally, our model also includes the unemployment rate and GDP per capita in each region over time. By controlling for these time-varying regional variables, we attempt to capture the role of unobserved regional factors that can influence the immigrant share and health.

Finally, we use IV estimation to address any remaining correlation between the immigrant share and the error term in our models. Following Card (2001) and Giuntella & Mazzonna (2015), we use an IV that allocates the number of immigrants in a host country in each year from a particular source nation to regions in the host country based on the regional distribution of immigrants from that source nation in a "baseline" year preceding the study period. This IV, often called a "shift-share" IV, takes advantage of the tendency of new immigrants to locate in enclaves established by immigrants from the same source nation (Card, 2001). At the same time, by allocating new immigrants to regions based on their distribution in a prior year, the IV aims to eliminate any correlation between the actual flows of immigrants to regions in each year and time-varying regional factors that might both influence immigration and be associated with the health of natives.

Specifically, let M_{nct} be the total number of immigrants from source nation *n* residing in host country *c* in year *t* and let $f_{nr(c),baseline}$ be the fraction of that population living in region *r* (of country *c*) in the baseline year. Then $\widehat{M}_{nrt}$, the imputed number of immigrants from source nation *n* in region *r* in year *t* is given by:

$$\widehat{M}_{nrt} = M_{nct} \times f_{nr(c),baseline}$$

To construct the IV, we impute the immigrant share in region *r* in year *t*. This involves summing the imputed numbers of immigrants in region *r* across source nations to obtain an imputed total number of immigrants in region *r* and dividing the sum by a suitable population. Following Giuntella & Mazzonna (2015), we construct the IV as follows:

$$\hat{S}_{rt} = \frac{\sum_n \widehat{M}_{nrt}}{P_{r,baseline}}$$

where $P_{r,baseline}$ is the total population of region *r* in the baseline year (2001 in this study). By fixing the denominator at its value in the baseline year, we ensure that the variation in $\hat{S}_{rt}$ is driven only by changes in the imputed immigrant population.[11]

The shift-share IV described above is country-based in the sense that its value for a region depends on the initial distribution of immigrants across regions in the country and the total number of immigrants coming into the country in each year. This specification accommodates well the evidence that immigration follows country-specific trends as shown in Figure 3. But this runs the risk that the value of the IV will be correlated with unobservables for large regions that account for a sizable share of the population in a country. This is because the total number of immigrants coming into a country is mechanically influenced by the number coming into large regions, which, in turn, depends on conditions in the region. We attempt to minimize this concern about large regions by limiting our main analyses to countries that have at least 10 regions.

A second concern about the country-based shift-share IV is that it is conceptually most appropriate if immigrants are restricted in moving from one country to another. In fact, immigration rules vary across Western European countries, and the ability to move from one country to another depends on the type of visa or residence permit an immigrant has and possibly on additional factors, especially if the person wants to work. Nonetheless, movement across countries is possible.

To address these concerns, we developed a Western Europe-based IV in which the value for a region depends on the initial distribution of immigrants across regions in all of Western Europe and the total number of immigrants coming into Western Europe each year. We use this alternative IV to check the results using the country-based IV.

The identifying assumption underpinning use of the shift-share IV is that, conditional on the explanatory variables in the model, including the various fixed effects, the IV is uncorrelated with any unobservable time-varying regional economic factors that influence the flow of immigrants to a region and may be associated with depression among natives in the region. In Section 6, we conduct a series of indirect tests of this exclusion restriction and also assess whether small violations of the exclusion restriction would affect our main results regarding depression. We find support for the validity of our IV and that small violations of the exclusion restriction would not overturn our main results.

5. Main results: Effects of immigration on depression among natives

5.1. Main results

[11] The data sources we use to construct the IV, the 2001 census and EU LFS, do not report detailed nation of origin for immigrants. Instead, these data sources aggregate country of origin into macroregions such as European Free Trade Association, other European countries, Middle East, North Africa, East Asia, and so on. To develop the IV, we use 12 macroregions common to the census and EU LFS.

Table 2 presents OLS and two IV estimates of the effect of the immigrant share on depression among natives 65-80 years old. One IV estimate uses the country-based IV and the other uses the Western Europe-based IV. We use a two-year lag between the immigrant share and depression status. After testing other lags (see below), we settled on a two-year lag. On the one hand, it would take some time for new immigrants to make their way into the market for personal and household services and for their presence in this market to begin to influence the health of older natives, including their mental health. On the other hand, the first stage R2 (and hence the partial R2 of the instrument) is maximized with the two-year lag specification.

The OLS and both IV estimates indicate that a higher immigrant share reduces the number of depression symptoms among older men and women. Point estimates also suggest a beneficial effect of the immigrant share on the probability of clinically significant depression, although for women this effect only reaches statistical significance when we use the Western Europe-based IV.

Given that IV estimates are larger than OLS in absolute value, OLS bias is positive and attenuates the negative effect of immigration on depression. A positive bias implies that the rate of growth in the immigrant share is positively correlated with shocks at the regional level which increase depression and which are not captured by the controls in *X* and *Z*. A further indication that OLS bias is positive results from the application to equation (1) of the method developed by Oster (2019). The latter establishes bounds on the true value of the effect of the immigrant share on the outcome under two alternatives. In the first alternative, we assume there are no unobservables and equation (1) is correctly specified, so the effect of the immigrant share is given by the OLS coefficient. In the second alternative, we assume there are unobservables, but the observables and unobservables are equally related to the treatment. In this case the effect of the immigrant share is given by the bias-adjusted coefficient, β^*, which is corrected for the bias due to the unobservables.[12] As shown in Table 2, the bias-adjusted coefficients are larger than the OLS (but in one case where the difference with the OLS estimate is indeed very small).

With regard to the IV estimates, the first-stage partial F statistics for the IV shown in Table 2 exceed the rule-of-thumb value of 10 suggested by Staiger & Stock, (1997) to protect against weak instruments. Stock & Yogo (2005) show that in the case of one endogenous variable and one IV the rule-of-thumb works well, so our IV estimates are not expected to be biased due to weak instruments.

5.2. Robustness checks

We conduct a series of robustness checks using IV estimation. (We used the country-based IV in the robustness checks.) In the first set of robustness checks, we vary the lag between the measurement of the immigrant share and the depression measures. Table A.1 (Appendix) shows that the effects of the immigrant share on the number of depression symptoms and the probability of clinically significant depression among men are similar irrespective of the lag. For women, by contrast, the effect of the

[12] The method is formally developed and described in Oster (2019). Calculating β^* requires the researcher to choose two parameters: δ and R^2_{max}. The assumption that the observables and unobservables are equally related to the treatment corresponds to $\delta=1$, and in applying the method we employ $R^2_{max}=1.3R^2$, where R^2 is obtained from the OLS regression, as suggested by Oster. This exercise is performed conditioning on individual fixed effects and country-specific wave effects. Hence the only remaining unobservables ought to vary by individual and time or region and time.

immigrant share on the probability of clinically significant depression diminishes as the lag is reduced. However, estimates are much less precise when there is no lag and turn to be larger in absolute value. We would have liked to estimate models with lags longer than two years but could not do so because the baseline year for constructing the IV was 2001 and the first SHARE wave was in 2004.[13]

In the second set of robustness checks, we estimate equation (1) using different samples, including limiting the sample to observations in which the subject was 65-75 years old; expanding the sample to all observations in which the subject was 65 years old or older; limiting the sample to observations for survivors, defined as subjects who did not die during the study period; and expanding the sample to subjects in 10 Western European countries (see Section 3 and footnote 3). As shown in Table A.2, the findings are generally consistent with an effect of the immigrant share in reducing depression. However, the findings for the samples defined by age are of particular interest. Specifically, the larger coefficients (in absolute value) for men 65-75 years old and smaller coefficients for men 65+ suggest that the effects of the immigrant share among male natives may be most pronounced for the younger subset of older men. Conversely, the pattern of coefficients for women suggests that the effects of the immigrant share among female natives may be most prominent for the oldest subset of women.

6. Validity of our identification strategy

Our study relies on regional variation in changes over time in the immigrant share to identify the causal effect of immigration on depression among older natives. As mentioned earlier, there are two main threats to the validity of our identification strategy. First, natives may respond to immigration by moving to a different region. Second, immigrants choose where to locate in part based on the characteristics of local labor markets. If these characteristics affect – or are correlated with factors that affect – depression, and if they are not fully controlled for in the analyses, the resulting regression estimates could be biased. In this section, we describe our efforts to assess these threats to validity.

6.1. Migration of natives

We assess the first concern by examining whether the immigrant share affects the probability that a subject moves to a new address. Thus we estimate the following model:

[13] In a model with heterogeneous effects, where the role played by immigration in explaining depression varies across regions, the IV effects are LATE (local average treatment effects). Roughly, IV estimate the average effect of depression in those regions (compliers) where a change in the instrumental variable causes a change in the share of immigrants in the same direction. It is difficult to tell which regions are in the set compliers, also because both the instrument and the endogenous variable are continuous. To get an intuition, we dichotomize both variables, by defining two dummies which take 1 for values above the median and 0 otherwise. We thus distinguish between regions with high and low predicted share or actual share of immigrants respectively. In this setting, compliers are those regions which turn to be high-immigration if the instrument switches from low- to high-immigration and viceversa. The first stage estimate corresponds to the proportion of compliers in the sample. Such proportion is as large as 64 percent of the sample when variables are twice-lagged, about halves with variables once-lagged and halves again when variables are taken at their current value. On these grounds the twice-lagged specification is the one which produces LATEs based on the amplest set of regions. This evidence is consistent with the finding that first stage fit is much better with the two-lag specification.

$$M_{ir(w+1)} = \beta S_{rt} + X'_{it}\gamma + Z'_{rt}\rho + \alpha_i + \varphi_t + \theta_{cw} + \varepsilon_{irctw}$$

where $M_{i(w+1)}$ is an indicator for whether subject *i*, who resided in region *r* in country *c* during wave *w*, reported a new address in wave *w*+1.[14] In the model, S_{rt} is the immigrant share in region *r* in year *t* (and wave *w*) and the other variables are as in equation (1). We estimate the model using IV estimation as in the previous analyses.

Table A.3 shows that the immigrant share has no effect on the probability that either older men or women move to a new address. These findings suggest that migration of natives does not bias our findings regarding the impact of immigration on depression.

6.2. Selection in immigrants' location decisions

We address the second concern by including individual fixed effects, country-specific wave fixed effects, and time-varying regional macroeconomic variables in the econometric models and by using IV estimation. Therefore, the question becomes whether our IV satisfies the identification assumption discussed earlier: no correlation with any unobservable time-varying regional factors that influence the flow of immigrants to a region and may be associated with depression among natives in the region.

In a recent review of the use of shift-share IVs in labor economics, Jaeger et al. (2018) note that the identification assumption might be violated if, for example, region-specific economic shocks persist over time. Persistent local shocks might induce a correlation between the immigrant shares in the baseline year used to construct the IV and subsequent economic conditions. One way to eliminate the potential correlation due to persistent local shocks is to allow enough years between the baseline year and the study period. We cannot do this because our baseline year is 2001 and the first SHARE wave was in 2004. (The 1991 European census does not include the variables needed to serve as the baseline year.) Therefore, we rely on country-specific time effects and regional macroeconomic variables to capture economic conditions,[15] and we conduct indirect tests to assess whether there is evidence for a residual correlation and whether small violations of the identifying assumption would overturn our findings.

6.2.1. Excluding regional economic controls

Although we cannot test the identification assumption directly, we conduct analyses to assess whether excluding the regional economic controls (the unemployment rate and GDP per capita) from equation (1) changes our findings for depression. If the findings are unchanged when we exclude these variables, which are known to influence immigrants' location decisions, it suggests that the individual fixed

[14] Ideally, we would model subjects moving to a different region. As discussed in footnote 6, however, SHARE ascertains whether subjects changed residential address from one wave to the next, but for subjects who move there is no information on the new location. Consequently, we settle for modeling whether subjects reported a new address.

[15] A similar approach has been used by other researchers when data availability constrains the lag between the study period and the information on immigrant shares used to construct the shift-share IV (e.g., Bell et al., 2013; Ottaviano et al., 2015; Giuntella & Mazzona, 2015, Del Carpio et al., 2015; Machin & Murphy, 2017).

effects, year fixed effects, country-specific wave fixed effects included in the model do a good job of capturing the characteristics of local labor markets that affect immigrants' location choices. Indeed, comparing Table A.4 with Table 2 shows that the estimated effects on the immigrants share on depression are similar irrespective of whether we include the regional economic controls in the model.

6.2.2. Applying the Oster method to the first stage and reduced form models

As noted above, our identification strategy could fail if the shift-share IV is correlated with unobservables. We investigate this possibility by applying the Oster (2019) method, discussed in Section 4, to both the first stage and reduced form models corresponding to equation (1). The method establishes bounds to the true value of the coefficient of the shift-share IV in the first stage and reduced form models under two alternatives: (1) there are no unobservables, and (2) there are unobservables but the observables and unobservables are equally related to the outcome variable (immigrants share and depression, respectively). If the bounds exclude zero, accounting for unobservables would not change the direction of our IV estimates of the effect of the immigrant share on depression. [16]

As shown in Table A.5, the bounds exclude zero for the first stage and reduced form models, men and women, and the number of depression symptoms and clinically significant depression. This implies that accounting for unobservables does not change the direction of our IV estimates of the effect of the immigrant share on depression. Accounting for unobservables increases the magnitude of all the first stage coefficients, however, indicating that the IV estimate of the effect of immigration on depression would fall compared with the coefficients shown in Table 2.

6.2.3. Allowing for small violations of the exclusion restriction

Following the approach proposed by Conley et al., 2012, we test the robustness of our findings to small deviations from the excludability condition of the instrument. Suppose that $\hat{S}_{rt}$ has a direct effect on depression which is not mediated by S_{rt} , and denote it by γ. We check how our baseline estimates for clinical depression (resp. depression symptoms) change for values of γ in the interval [-1,1] (resp. [-2,2]). In general, the sign of γ can be either positive or negative, given that it results from the correlation with omitted variables that are not captured by the controls included in the model and that are difficult to figure out. As regards clinical depression, which is significantly related to the share of immigrants only among males in our baseline results, estimates turn to be statistically insignificant when the direct effect of $\hat{S}_{rt}$ is negative and smaller than -0.2, i.e. about one fifth of its reduced form effect (which sums the indirect effect that passes through S_{rt} and the possible direct effect) (see Figure 4A and Table A.5). As for depression symptoms, estimates turn insignificant for γ<-0.8 among males and γ<-1.3 among females (see figures 4C and 4D), which correspond respectively to about 19 and 24 percent of the corresponding reduced form effect (see Table A5). We conclude that our findings are robust to small deviations from the excludability assumption.

[16] The IV estimate of the effect of the immigrant share in equation (1) is the ratio of the coefficient of the shift-share IV in the reduced form and the coefficient of the shift-share IV in the first stage.

6.3. Additional considerations: short-run versus long-run

Jaeger et al. (2018) show that a potential problem with the shift-share IV is that it may conflate the short and long-run effects of immigration. In particular, in studies of the impact of immigration on natives' wages, it may conflate an initial negative effect with long-run adjustments in firms' stock of capital that lead to wage growth. They posit that this combination of short and long-run effects may explain why the results of studies of the impact of immigration on natives' labor market outcomes are mixed and generally seem biased towards zero.

While we cannot rule out the possibility that we are capturing in part long-run effects of immigration on depression, in our context the mechanism of adjustment suggested by Jaeger et al. (2018) is less compelling, because the production function for domestic and personal care services uses few inputs other than labor. One possible general equilibrium adjustment is that native domestic workers exit the market in the long run in response to the inflow of immigrants. Were this the case, in the long run the price of personal and household services could return to its original level after an initial fall, and the increased affordability of these services would be short-lived.

However, this story does not square well with the (admittedly limited) available data. As noted earlier, in Italy the number of foreign-born domestic workers rose from just above 50,000 to more than 700,000 between 1994 and 2011 and was not accompanied by an outflow of natives from the market (Castagnone et al., 2013). Similarly, in Spain the number of foreign-born domestic workers increased from 15,000 to 320,000 between 1996 and 2009 while simultaneously the number of native domestic workers held steady (Leon, 2010).

7. Exploring the mechanisms

The background provided in Section 2 suggests potential mechanisms for a beneficial effect of immigration on depression among older natives. First, a higher immigrant share may increase the number of older natives who receive "professional" help at home and in turn decrease those who receive "informal" help from the relatives. For frail older natives and those who live alone, instrumental assistance with cooking and preparation of regular and balanced meals, regular medication taking, and personal and home hygiene are likely to support healthy aging.

Second, a higher immigrant share may reduce loneliness and affect social integration among older natives. Immigrants who provide both care and non-care services to older natives could encourage their social integration by identifying opportunities for participation, offering emotional support, and providing transportation and assistance with mobility. Although for most older persons lack of time is not a barrier to social participation (Krantz-Kent & Stewart, 2007), it may be for some who spend long hours on domestic chores. For these persons, immigrants who provide personal and household services could enhance social integration by freeing up time. Immigrants could reduce loneliness and social isolation among older natives, especially those who live alone, by providing companionship. Immigrant care providers could reduce rates of depression among older natives who bear the responsibility of providing high-intensity care to a sick or disabled parent, parent in law, or

spouse by assuming a portion of that responsibility. This would reduce the stress of caregiving and provide time for social participation to the older native.

Third, support with cooking and preparation of meals and regular medication taking may improve physical functioning among older natives and in turn reduce depression sympthoms.
In this section, we test whether these hypotheses are supported by the data.

7.1. Effect of immigration on receipt of informal and professional help by older natives

SHARE asks subjects to report whether they have received help in the last 12 months, inside or outside the household, from a relative, a friend or neighbor, and a professional, including a priest, a therapist, a housekeeper, or a personal service provider. We assess the effect of the immigrant share on receiving informal and professional help by estimating models similar to equation (1) but with the following binary variables as the outcomes: whether received help from a relative; whether received help from a friend or neighbour; whether received help from any professional; and whether received help from a "badante,"[17] defined as a housekeeper or personal service provider.

Table 3 reports the effects of the immigrant share on receiving help from different sources. As expected if "professional" help substitutes for "informal" help from relatives, a higher immigrant share reduces the probability of receiving help from a relative. By contrast, we find no evidence of substitution for help from friends or neighbors. In this context, it's worth noting that the probability of receiving help from a relative is several times higher than the probability of receiving help from a friend or neighbor, and that the latter is actually very low (Table 1).

Contrary to expectations, we find no effect of a higher immigrant share on the probability of receiving help from a professional or a "badante." However, estimates are largely imprecise and given the associated standard error we cannot reject our prior of positive effects. We suspect that these findings depend on a substantial measurement error or misclassification in the data. The descriptive data shown in Table 1 indicate that only 1-2% of older natives reported receiving help from a professional, but these figures are an order of magnitude lower than figures from other sources, several of which are summarized in Section 2. While we know of no published report that receiving help from a professional is underreported in SHARE, our data make it extremely likely that this is the case and we conjecture that many respondents, especially the most senior and especially in southern Europe, may feel ashamed of reporting that they need continuous help from someone outside their family.

As with the analyses of depression, the first-stage partial F statistics for the IV shown in Table 3 all exceed the rule-of-thumb value of 10 suggested by Staiger & Stock (1997).

In partial support to the hypothesis that immigrants reduce the price of household and personal services and make them more affordable especially for the poor, we remark that the negative effect of the immigrant share on the probability of receiving help from relatives is large and significant among seniors with lower secondary education or less, while it is not statistically significant and small among those with at least upper secondary education (we consider education as a proxy for permanent income – see Table A6).[18]

[17] "Badante" is a commonly used Italian word meaning caretaker or personal assistant.
[18] Help from non relatives remains uncorrelated with immigrant share for both genders and both levels of education.

We have also experimented specifications of model (1) where we replace S_{rt} by the share of female immigrants, because females are over-represented in the sector of personal and household services, or the share of immigrants whose reported occupation was ISCO 911 (Domestic, hotel and office cleaners and helpers). In both cases the alternative immigrant shares were almost perfectly correlated with S_{rt} (correlation above 99 percent) so that estimates' interpretation was dubious.

7.2. Effect of immigration on loneliness and social integration among older natives

We assess the effect of the immigrant share on loneliness and social integration by estimating models similar to equation (1), but with the following outcomes.

SHARE asks subjects to report how often they feel left out of things. To assess loneliness, we construct a binary variable indicating that the subject reported feeling left out of things often (versus sometimes, rarely, or never)[19] (Hughes et al., 2004).

SHARE also asks subjects to report whether and how often they have done any of the following four activities in the last 12 months: done voluntary or charity work; attended an educational or training course; gone to a sport, social, or other kind of club; and taken part in a political or community-related organization.[20] To assess social integration, we construct binary variables indicating whether the subject did voluntary or charity work almost every week or more often, a binary variable indicating whether the subject did at least one of the four activities almost every week or more often, and a variable indicating the number of activities that the subject did almost every week or more often.

Table 4 reports the effects of the immigrant share on natives' loneliness and social integration. Among men a higher immigrant share reduces the probability of reporting feeling left out of things often, our measure of loneliness, but there is no effect on social integration activities. Among women a higher immigrant share increases the probability of doing at least one of the four social integration activities almost every week or more often and as well as the number of social integration activities, but there is no effect on loneliness.

7.3. Effect of immigration on physical functioning among older natives

We assess the effect of the immigrant share on physical functioning by estimating models similar to equation (1) but with a small number of physical health outcomes that reflect physical functioning and physical limitations among older adults: self-rated health, ability to carry out activities of daily living, and ability to carry out everyday activities related to physical performance.

Self-rated health, categorized as excellent, very good, good, fair, or poor, is considered the best single measure of health status obtainable through surveys. It is a strong predictor of mortality in all

[19] This question was only asked in Waves 2, 4, 5, in 6. It is one of the items in the 3-item UCLA Loneliness Scale (Hughes et al., 2004). The other two items in the scale – how often do you feel you lack companionship and how often do you feel isolated from others – are not elicited in SHARE.

[20] Additional activities (e.g., taken part in activities of a religious organization) are asked in different SHARE waves, but these four activities are the only ones elicited in every wave.

populations studied and its predictive validity has increased over time (e.g., Idler & Benyamini, 1997; Schnittker & Bacak, 2014). For analysis, we dichotomize the responses as excellent or very good versus good, fair, or poor.

SHARE also asks subjects to report whether they have difficulty with any of 13 activities reflecting basic activities of daily living (ADLs) and instrumental activities of daily living (IADLs) because of a physical, mental, emotional, or memory problem. For analysis, we construct a binary variable indicating difficulty on at least one activity (versus none) and a variable indicating the number of activities on which the subject has difficulty[21] (Buz & Cortes-Rodriguez, 2016; Chan et al., 2012; LaPlante, 2010; Spector & Fleishman, 1998).

Lastly, SHARE asks subjects to report whether they have difficulty performing any of 10 everyday activities related to physical performance because of a health or physical problem (Nagi, 1976). For analysis, we construct a binary variable indicating difficulty on at least one activity (versus none) and a variable indicating the number of activities on which the subject has difficulty.

As shown in Table 5, a higher immigrant share has beneficial effects on the physical health of older men and women. Specifically, for men a higher immigrant share increases the probability of reporting very good or better health, reduces the probability of having difficulty with at least one ADL or IADL, and reduces the number of ADLs and IADLs on which the subject has difficulty. For women a higher immigrant share increases the probability of reporting very good or better health, reduces the number of ADLs and IADLs on which the subject has difficulty, and reduces the number of everyday activities related to physical performance on which the subject has difficulty.

7.4. Summary

We find evidence that a higher immigrant share reduces the probability of receiving help from a relative, but we don't find the expected positive effect on the probability of receiving help from a professional. We noted above our reasons for strongly doubting the validity of the latter finding.

We also find that a higher immigrant share improves self-rated general health and physical functioning among older natives, an important potential pathway for beneficial effects on depression. Finally, a higher immigrant share reduces loneliness, measured as the probability of feeling left out of things, among men, but does not affect men's social integration. Conversely, a higher immigrant share increases participation in social integration activities, but does not affect loneliness, among women.

We also underscore that the causal chains inherent in our analysis of mechanisms—immigration leads to higher consumption of personal and household services by older natives; which results in less loneliness and greater social integration; which preserves physical functioning and directly reduces the risk of depression, while preserved physical functioning as well contributes to reducing depression—is only one possibility. It is just as plausible that immigration improves

[21] This approach is consistent with recent psychometric research indicating that ADLs and IADLs comprise a single dimension (Spector and Fleishman, 1998; LaPlante, 2010; Buz and Cortes-Rodriguez, 2016). Some studies additionally suggest that adding up the items on which subjects have difficulty provides a good measure of functional disability (Spector and Fleishman, 1998). Combining ADLs and IADLs into a single scale also minimizes the age- and gender-related biases in measuring disability that occur with either alone (LaPlante, 2010; Chan et al., 2012).

depression and physical functioning through other mechanisms and that better mental and physical health, in turn, encourage natives to increase their participation in social integration activities. Our data do not enable us to distinguish between these two alternative causal chains.

8. Summary and conclusions

This study is the first to examine the effects of immigration on depression among natives aged 65 or older. We find that immigration improves reduces depression in this age group. The beneficial effects of immigration appear to be roughly similar for native men and women.

Our exploration of the mechanisms underlying these beneficial health effects finds evidence that immigration improves self-rated general health and physical functioning among both native men and women, reduces loneliness among men, and promotes social integration among women. Loneliness is known to be detrimental to the health of older persons, so relief from loneliness is likely to benefit health. Social integration has been demonstrated to improve physical and mental health as people get older and is considered an essential element in successful aging.

Overall, our findings regarding mechanisms are weaker than those regarding depression and physical health. Although the SHARE data are excellent for studying mental and physical health transitions among older Europeans, they are less ideal for testing the mechanisms we posited. The list of social integration activities elicited uniformly across all waves of SHARE is rather brief and lacks, for instance, information about socializing with friends and relatives. The use of a single item about being left out of things to assess loneliness is limiting as well. Items addressing dimensions of loneliness such as lacking companionship and feeling isolated from others would have provided more insight into subjects' degree of social integration. We also reiterate our previous warning that our analyses of mechanisms cannot establish the order of causation among improved physical functioning, reduced loneliness and increased social integration, and lower risk of depression. Despite these shortcomings, our exploration of mechanisms offers some innovative insights into how immigration may come to have a positive influence on the mental health of older natives.

In this paper, we have followed the identification strategy commonly used in the literature on immigration and have conducted tests that support its validity in our application. We encourage other researchers to attempt to replicate our findings using other data sets and other identification strategies. In addition, qualitative studies to assess how the lives and activities of older natives are affected by the presence of immigrants in their communities are likely to be helpful in understanding what is surely a complex set of phenomena.

References

Akay, A., Constant, A., & Giulietti, C. (2014). The impact of immigration on the well-being of natives. *J Econ Behav Organ, 103*, 72-92. doi:https://doi.org/10.1016/j.jebo.2014.03.024

Anderson, N. D., Damianakis, T., Kroger, E., Wagner, L. M., Dawson, D. R., Binns, M. A., . . . Cook, S. L. (2014). The benefits associated with volunteering among seniors: a critical review and recommendations for future research. *Psychol Bull, 140*(6), 1505-1533. doi:10.1037/a0037610

Barone, G., & Mocetti, S. (2011). With a little help from abroad: The effect of low-skilled immigration on the female labour supply. *Labour Econ, 18*(5), 664-675. doi:https://doi.org/10.1016/j.labeco.2011.01.010

Barth, J., Schneider, S., & von Kanel, R. (2010). Lack of social support in the etiology and the prognosis of coronary heart disease: a systematic review and meta-analysis. *Psychosom Med, 72*(3), 229-238. doi:10.1097/PSY.0b013e3181d01611

Beach, S. R., & Schulz, R. (2017). Family Caregiver Factors Associated with Unmet Needs for Care of Older Adults. *J Am Geriatr Soc, 65*(3), 560-566. doi:10.1111/jgs.14547

Bell, B., Fasani, F., & Machin, S. (2013) Crime and immigration: evidence from large immigrant waves. *The Review of Economics and Statistics*, 95 (4),1278-1290. doi: 10.1162/REST_a_00337

Berkman, L. F., & Syme, S. L. (1979). Social networks, host resistance, and mortality: a nine-year follow-up study of Alameda County residents. *American journal of Epidemiology, 109*(2), 186-204.

Blazer DG. (2003). Depression in late life: Review and commentary. *J. Gerontol. A Biol. Sci. Med. Sci* 58, 249–65.

Borjas, G. J. (1995). The Economic Benefits from Immigration. *The Journal of Economic Perspectives, 9*(2), 3-22.

Brunello, G., & Rocco, L. (2013). The effect of immigration on the school performance of natives: Cross country evidence using PISA test scores. *Economics of Education Review, 32*, 234-246.

Buz, J., & Cortes-Rodriguez, M. (2016). Measurement of the severity of disability in community-dwelling adults and older adults: interval-level measures for accurate comparisons in large survey data sets. *BMJ Open, 6*(9), e011842. doi:10.1136/bmjopen-2016-011842

Cacioppo, J.T., Hughes, M.E., Waite, L.J., Hawkley, L.C., & Thisted, R.A. (2006). Loneliness as a Specific Risk Factor for Depressive Symptoms: Cross-Sectional and Longitudinal Analyses. *Psychology and Aging 21 (1),* 140 –151.

Cangiano, A., & Shutes, I. (2010). Ageing, Demand for Care and the Role of Migrant Care Workers in the UK *Journal of Population Ageing* (14 December 2010 ed., Vol. 3, pp. 39-57): Springer Netherlands.

Card, D. (1990). The Impact of the Mariel Boatlift on the Miami Labor Market. *ILR Review, 43*(2), 245-257. doi:doi:10.1177/001979399004300205

Card, D. (2001). Immigrant Inflows, Native Outflows, and the Local Labor Market Impacts of Higher Immigration. *Journal of Labor Economics, 19*(1), 22-64. doi:10.1086/209979

Castagnone, E., Salis, E., Premazzi, V. (2013). Promoting integration for migrant domestic workers in Italy / International Labour Office, International Migration Programme, International and European Forum of Research on Immigration (FIERI). Geneva: ILO. International migration paper, No.115, ISSN 1020-2668; 1564-4839 (web pdf).

Castro-Costa, E., Dewey, M., Stewart, R., Banerjee, S., Huppert, F., Mendonca-Lima, C., . . . Prince, M. (2007). Prevalence of depressive symptoms and syndromes in later life in ten European countries: the SHARE study. *Br J Psychiatry, 191*, 393-401. doi:10.1192/bjp.bp.107.036772

Chan, K. S., Kasper, J. D., Brandt, J., & Pezzin, L. E. (2012). Measurement equivalence in ADL and IADL difficulty across international surveys of aging: findings from the HRS, SHARE, and ELSA. *J Gerontol B Psychol Sci Soc Sci, 67*(1), 121-132. doi:10.1093/geronb/gbr133

Cole, M.G., & Dendukuri, N. (2003). Risk Factors for Depression Among Elderly Community Subjects: A Systematic Review and Meta-Analysis. *Am J Psychiatry 160,* 1147–1156.

Conley, T.G., Hansen, C.B., & Rossi, P.E. (2012). Plausibly Exogenous. *Review of Economics and Statistics 94(1),* 260-272.

Cortés, P., & Tessada, J. (2011). Low-Skilled Immigration and the Labor Supply of Highly Skilled Women. *American Economic Journal: Applied Economics, 3*(3), 88-123. doi:doi: 10.1257/app.3.3.88

Del Carpio, X., Özden, C., Testaverde, M., & and Wagner M. (2015). Local Labor Supply Responses to Immigration. *Scandinavian Journal of Economics*, 117(2), 493-521.

Dickens, A. P., Richards, S. H., Greaves, C. J., & Campbell, J. L. (2011). Interventions targeting social isolation in older people: a systematic review. *BMC Public Health, 11*(1), 647. doi:10.1186/1471-2458-11-647

Domínguez-Mujica, J., Hernández, R., & Parreño-Castellano, J. (2013). *Gender, migration and household services in Spain*.

Dustmann, C., Fabbri, F., & Preston, I. (2005). The Impact of Immigration on the British Labour Market. *The Economic Journal, 115*(507), F324-F341. doi:10.1111/j.1468-0297.2005.01038.x

Dustmann, C., & Frattini, T. (2014). The fiscal effects of immigration to the UK. *The Economic Journal, 124*(580).

Dustmann, C., Frattini, T., & Halls, C. (2010). Assessing the Fiscal Costs and Benefits of A8 Migration to the UK *FISC STUD, 31*(1), 41.

Farvaque, N. (2015). *Thematic review on personal and household services*: European Employment Policy Observatory (EEPO).

Farvaque, N., Broughton, A., Ledermaier, S., Kelemen, M., Voss, E., & Wagner, M. (2013). *Developing personal and household services in the EU: A focus on housework activities*: European Commission.

Fiske, A., Loebach Wetherell, J., & Gatz, M. (2009). Depression in older adults. *Annu Rev Clin Psychol 5,* 363–389.

Fletcher, J. M., Sindelar, J. L., & Yamaguchi, S. (2011). Cumulative Effects of Job Characteristics on Health. *Health economics, 20*(5), 553-570. doi:10.1002/hec.1616

Folland, S., & Rocco, L. (2014). *The Economics of Social Capital and Health: A Conceptual and Empirical Roadmap*. Washington, DC; World Scientific.

Fried, L. P., Carlson, M. C., Freedman, M., Frick, K. D., Glass, T. A., Hill, J., . . . Zeger, S. (2004). A social model for health promotion for an aging population: initial evidence on the Experience Corps model. *J Urban Health, 81*(1), 64-78. doi:10.1093/jurban/jth094

Fried, L. P., Carlson, M. C., McGill, S., Seeman, T., Xue, Q. L., Frick, K., . . . Rebok, G. W. (2013). Experience Corps: a dual trial to promote the health of older adults and children's academic success. *Contemp Clin Trials, 36*(1), 1-13. doi:10.1016/j.cct.2013.05.003

Giuntella, O. (2012). Do immigrants squeeze natives out of bad schedules? Evidence from Italy. *IZA Journal of Migration, 1*(1), 7. doi:10.1186/2193-9039-1-7

Giuntella, O., & Mazzonna, F. (2015). Do immigrants improve the health of natives? *Journal of Health Economics, 43*, 140-153. doi:http://dx.doi.org/10.1016/j.jhealeco.2015.06.006

Glitz, A. (2012). The Labor Market Impact of Immigration: A Quasi-Experiment Exploiting Immigrant Location Rules in Germany. *Journal of Labor Economics, 30*(1), 175-213.

Goll, J. C., Charlesworth, G., Scior, K., & Stott, J. (2015). Barriers to Social Participation among Lonely Older Adults: The Influence of Social Fears and Identity. *PLoS One, 10*(2), e0116664. doi:10.1371/journal.pone.0116664

Hardoy, I., & Schøne, P. (2013). Does the Clustering of Immigrant Peers Affect the School Performance of Natives? *Journal of Human Capital, 7*(1), 1-25.

Holt-Lunstad, J., Smith, T. B., Baker, M., Harris, T., & Stephenson, D. (2015). Loneliness and social isolation as risk factors for mortality: a meta-analytic review. *Perspect Psychol Sci, 10*(2), 227-237. doi:10.1177/1745691614568352

Holt-Lunstad, J., Smith, T. B., & Layton, J. B. (2010). Social relationships and mortality risk: a meta-analytic review. *PLoS medicine, 7*(7), e1000316.

House, J. S., Robbins, C., & Metzner, H. L. (1982). The association of social relationships and activities with mortality: prospective evidence from the Tecumseh Community Health Study. *American journal of Epidemiology, 116*(1), 123-140.

Hughes, M. E., Waite, L. J., Hawkley, L. C., & Cacioppo, J. T. (2004). A Short Scale for Measuring Loneliness in Large Surveys: Results From Two Population-Based Studies. *Res Aging, 26*(6), 655-672. doi:10.1177/0164027504268574

Idler, E. L., & Benyamini, Y. (1997). Self-rated health and mortality: a review of twenty-seven community studies. *J Health Soc Behav, 38*(1), 21-37.

ISTAT. (2010). *Rapporto Annuale*.

Jaeger, D.A., Ruist, J., & Stuhler, J. (2018). Shift-share instruments and the impact of immigration. IZA Institute of Labor Economics, Discussion Paper 11307, January.

Krantz-Kent, R., & Stewart, J. (2007). How do older Americans spend their time? *Monthly Labor Review*, 130, 8–26.

LaPlante, M. P. (2010). The classic measure of disability in activities of daily living is biased by age but an expanded IADL/ADL measure is not. *J Gerontol B Psychol Sci Soc Sci, 65*(6), 720-732. doi:10.1093/geronb/gbp129

Leon, M. (2010). Migration and care work in Spain: the domestic sector revisited. *Social Policy and Society* 9(3), 409-418.

Lund, R., Nilsson, C. J., & Avlund, K. (2010). Can the higher risk of disability onset among older people who live alone be alleviated by strong social relations? A longitudinal study of non-disabled men and women. *Age Ageing, 39*(3), 319-326. doi:10.1093/ageing/afq020

Machin, S. & Murphy, R. (2017). Paying out and crowding out? The globalization of higher education. *Journal of Economic Geography*, 17(5), 1075–1110.

Miller, B., & Montgomery, A. (1990). Family Caregivers and Limitations in Social Activities. *Res Aging, 12*(1), 72-93. doi:10.1177/0164027590121004

Nagi, S. Z. (1976). An epidemiology of disability among adults in the United States. *Milbank Mem Fund Q Health Soc, 54*(4), 439-467.

Nilsson, C. J., Avlund, K., & Lund, R. (2011). Onset of mobility limitations in old age: the combined effect of socioeconomic position and social relations. *Age Ageing, 40*(5), 607-614. doi:10.1093/ageing/afr073

Ohinata, A., & Van Ours, J. C. (2013). How immigrant children affect the academic achievement of native Dutch children. *The Economic Journal, 123*(570).

Ong, A. D., Uchino, B. N., & Wethington, E. (2016). Loneliness and Health in Older Adults: A Mini-Review and Synthesis. *Gerontology, 62*(4), 443-449.

Orrenius, P. M., & Zavodny, M. (2009). Do Immigrants Work In Riskier Jobs? *Demography, 46*(3), 535-551.

Orth-Gomer, K., & Johnson, J. V. (1987). Social network interaction and mortality: a six year follow-up study of a random sample of the Swedish population. *Journal of Chronic Diseases, 40*(10), 949-957.

Oster, E. (2016). Unobservable Selection and Coefficient Stability: Theory and Evidence. *Journal of Business & Economic Statistics*. 10.1080/07350015.2016.1227711.

Ottaviano, G. I. P., & Peri, G. (2012). Rethinking the effect of immigration on wages. *Journal of the European Economic Association, 10*(1), 152-197. doi:10.1111/j.1542-4774.2011.01052.x

Ottaviano, G., Peri, G., & Wright, G.C. (2015). Immigration, trade and productivity in services: evidence from U.K. firms. NBER Working Paper 21200 (May). http://www.nber.org/papers/w21200

Penning, M. J., & Wu, Z. (2016). Caregiver Stress and Mental Health: Impact of Caregiving Relationship and Gender. *Gerontologist, 56*(6), 1102-1113. doi:10.1093/geront/gnv038

Peri, G. (2014). Do Immigrant workers depress the wages of native workers? *IZA World of Labor, 42*. doi:10.15185

Peri, G., Romiti, A., & Rossi, M. (2015). Immigrants, domestic labor and women's retirement decisions. *Labour Economics, 36*, 18-34. doi:https://doi.org/10.1016/j.labeco.2015.07.004

Piliavin, J. A., & Siegl, E. (2007). Health benefits of volunteering in the Wisconsin longitudinal study. *J Health Soc Behav, 48*(4), 450-464. doi:10.1177/002214650704800408

Pinquart, M., & Sörensen, S. (2003). Differences between caregivers and noncaregivers in psychological health and physical health: a meta-analysis. *Psychol Aging, 18*(2), 250-267.

Pinquart, M., & Sörensen, S. (2011). Spouses, adult children, and children-in-law as caregivers of older adults: a meta-analytic comparison. *Psychol Aging, 26*(1), 1-14. doi:10.1037/a0021863

Prince, M. J., Beekman, A. T., Deeg, D. J., Fuhrer, R., Kivela, S. L., Lawlor, B. A., . . . Copeland, J. R. (1999). Depression symptoms in late life assessed using the EURO-D scale. Effect of age, gender and marital status in 14 European centres. *Br J Psychiatry, 174*, 339-345.

Prince, M. J., Reischies, F., Beekman, A. T., Fuhrer, R., Jonker, C., Kivela, S. L., . . . Copeland, J. R. (1999). Development of the EURO-D scale--a European, Union initiative to compare symptoms of depression in 14 European centres. *Br J Psychiatry, 174*, 330-338.

Roth, D. L., Fredman, L., & Haley, W. E. (2015). Informal caregiving and its impact on health: a reappraisal from population-based studies. *Gerontologist, 55*(2), 309-319. doi:10.1093/geront/gnu177

Roth, D. L., Haley, W. E., Hovater, M., Perkins, M., Wadley, V. G., & Judd, S. (2013). Family caregiving and all-cause mortality: findings from a population-based propensity-matched analysis. *Am J Epidemiol, 178*(10), 1571-1578. doi:10.1093/aje/kwt225

Rozario, P. A., Morrow-Howell, N., & Hinterlong, J. E. (2004). Role Enhancement or Role Strain. *Res Aging, 26*(4), 413-428. doi:doi:10.1177/0164027504264437

Schnittker, J., & Bacak, V. (2014). The increasing predictive validity of self-rated health. *PLoS One, 9*(1), e84933. doi:10.1371/journal.pone.0084933

Schulz, R., & Beach, S. R. (1999). Caregiving as a risk factor for mortality: the Caregiver Health Effects Study. *Jama, 282*(23), 2215-2219.

Schulz, R., Beach, S. R., Hebert, R. S., Martire, L. M., Monin, J. K., Tompkins, C. A., & Albert, S. M. (2009). Spousal suffering and partner's depression and cardiovascular disease: the Cardiovascular Health Study. *Am J Geriatr Psychiatry, 17*(3), 246-254. doi:10.1097/JGP.0b013e318198775b

Seeman, T. E. (1996). Social ties and health: The benefits of social integration. *Annals of epidemiology, 6*(5), 442-451.

Spector, W. D., & Fleishman, J. A. (1998). Combining activities of daily living with instrumental activities of daily living to measure functional disability. *J Gerontol B Psychol Sci Soc Sci, 53*(1), S46-57.

Staiger, D., & Stock, J. H. (1997). Instrumental Variables Regression with Weak Instruments. *Econometrica, 65*(3), 557-586. doi:10.2307/2171753

Steptoe, A., Shankar, A., Demakakos, P., & Wardle, J. (2013). Social isolation, loneliness, and all-cause mortality in older men and women. *Proceedings of the National Academy of Sciences, 110*(15), 5797-5801.

Stock, J., & Yogo, M. (2005). Testing for Weak Instruments in Linear IV Regression. In W. K. A. Donald (Ed.), *Identification and Inference for Econometric Models* (pp. 80-108). New York: Cambridge University Press.

Thoits, P. A., & Hewitt, L. N. (2001). Volunteer work and well-being. *J Health Soc Behav, 42*(2), 115-131.

Uchino, B. N. (2006). Social support and health: a review of physiological processes potentially underlying links to disease outcomes. *J Behav Med, 29*(4), 377-387. doi:10.1007/s10865-006-9056-5

Unger, J. B., McAvay, G., Bruce, M. L., Berkman, L., & Seeman, T. (1999). Variation in the impact of social network characteristics on physical functioning in elderly persons: MacArthur Studies of Successful Aging. *J Gerontol B Psychol Sci Soc Sci, 54*(5), S245-251.

Vitaliano, P. P., Zhang, J., & Scanlan, J. M. (2003). Is caregiving hazardous to one's physical health? A meta-analysis. *Psychol Bull, 129*(6), 946-972. doi:10.1037/0033-2909.129.6.946

Tables

Table 1. Characteristics of study sample, stratified by gender.

	Men		Women	
	Mean	Std. Dev	Mean	Std. Dev.
Depression outcomes				
No. depression symptoms	2.029	2.040	3.108	2.463
Clinical depression	0.200	0.400	0.379	0.485
Physical health outcomes				
Good or better self-rated health	0.192	0.394	0.145	0.352
Any ADL/IADL limitation	0.181	0.385	0.268	0.443
No. ADL/IADL limitations	0.548	1.786	0.791	2.017
Any physical limitation	0.468	0.499	0.660	0.474
No. Physical limitations	1.360	2.087	2.334	2.539
Individual characteristics				
Age (yrs)	71.675	4.507	71.767	4.583
Lives with spouse or partner	0.847	0.360	0.638	0.480
No. children	2.213	1.447	2.306	1.544
No. grandchildren	3.014	3.003	3.506	3.336
Regional characteristics				
Unemployment rate (%)	10.992	6.998	11.242	7.083
GDP per capita (PPS)	27.070	7.336	26.978	7.590
Mechanistic variables				
Received help from relatives	0.094	0.292	0.133	0.340
Received help from friends or neighbors	0.013	0.114	0.023	0.150
Received help from professionals	0.014	0.116	0.020	0.139
Received help from "badanti"	0.006	0.076	0.010	0.101
Often feels left out	0.054	0.225	0.075	0.264
Volunteer or charity work	0.123	0.328	0.103	0.304
Any social integration activity	0.270	0.444	0.237	0.425
No. social integration activities	0.349	0.640	0.301	0.597

Note: Age is in years, the unemployment rate is a percentage, and GDP per capita is in purchasing power standards.

Table 2. Effects of immigration on depression among natives 65-80 years old in five countries (immigrant share lagged by 2 years).

	OLS estimates		IV estimates (country-based instrument)		IV estimates (Western Europe-based instrument)	
	No. depression symptoms	Clinical depression	No. depression symptoms	Clinical depression	No. depression symptoms	Clinical depression
Men						
Immigrant share	-7.604***	-0.999*	-9.553**	-2.171**	-9.617*	-2.078**
	(2.721)	(0.557)	(4.557)	(0.926)	(4.936)	(0.988)
No. subjects	4,197	4,197	4,197	4,197	4,197	4,197
No. observations	10,958	10,958	10,958	10,958	10,958	10,958
First-stage F	—	—	27.27	27.27	45.89	45.89
Oster □*	-7.632	-0.988	—	—	—	—
Women						
Immigrant share	-9.776***	-0.786	-11.962**	-1.562	-12.297**	-2.352**
	(2.883)	(0.647)	(5.495)	(0.953)	(5.658)	(0.956)
No. subjects	4,785	4,785	4,785	4,785	4,785	4,785
No. observations	12,591	12,591	12,591	12,591	12,591	12,591
First-stage F	—	—	26.61	26.61	60.96	60.96
Oster β*	-10.19	-0.922	—	—	—	—

*p<.10 **p<.05 ***p<.01

Note 1: Standard errors are in parentheses, robust to clustering by region. Oster β* is the bias-adjusted coefficient of the immigrant share (see text).

Note 2: Models control for time-varying individual and regional characteristics, individual fixed effects, age-cohort specific time trends, calendar year fixed effects, and country-specific wave fixed effects. Details are provided in Section 4.

Table 3. Effects of immigration on receiving help from relatives, friends, professionals, and "badanti" among natives 65-80 years old (immigrant share lagged by 2 years).

	Received help from a relative	Received help from a friend or neighbor	Received help from a professional	Received help from a "badante"
Men				
Immigrant share	-2.396***	0.090	-0.312	-0.234
	(0.782)	(0.214)	(0.469)	(0.491)
No. subjects	3,635	3,635	3,635	3,635
No. observations	9,231	9,231	9,231	9,231
First-stage F	27.82	27.82	27.82	27.82
Women				
Immigrant share	-1.674**	0.289	-0.122	-0.022
	(0.804)	(0.389)	(0.295)	(0.319)
No. subjects	4,427	4,427	4,427	4,427
No. observations	11,464	11,464	11,464	11,464
First-stage F	30.18	30.18	30.18	30.18

*p<.10 **p<.05 ***p<.01

Note 1: All estimates are IV. Standard errors are in parentheses, robust to clustering by region.
Note 2: Models control for time-varying individual and regional characteristics, individual fixed effects, age-cohort specific time trends, calendar year fixed effects, and country-specific wave fixed effects. Details are provided in Section 4.

Table 5. Effects of immigration on feeling left out and social integration activities among natives 65-80 years old (immigrant share lagged by 2 years).

	Often feels left out	Volunteer or charity work	Any social integration activity	No. social integration activities
Men				
Immigrant share	-1.527**	0.580	0.465	0.756
	(0.640)	(0.449)	(1.026)	(1.108)
No. subjects	3,666	4,242	4,242	4,242
No. observations	9,301	11,078	11,078	11,078
First-stage F	49.06	27.92	27.92	27.92
Women				
Immigrant share	-0.478	0.386	1.238**	1.565**
	(1.024)	(0.338)	(0.531)	(0.746)
No. subjects	4,157	4,800	4,800	4,800
No. observations	10,622	12,668	12,668	12,668
First-stage F	52.91	27.41	27.41	27.41

*p<.10 **p<.05 ***p<.01

Note 1: All estimates are IV. Standard errors are in parentheses, robust to clustering by region.
Note 2: Models control for time-varying individual and regional characteristics, individual fixed effects, age-cohort specific time trends, calendar year fixed effects, and country-specific wave fixed effects. Details are provided in Section 4.

Table 5. Effects of immigration on physical health outcomes among natives 65-80 years old in five countries (immigrant share lagged by 2 years).

	Good or better self-rated health	Any ADL/IADL limitation	No. ADL/IADL limitations	Any physical limitation	No. physical limitations
Men					
Immigrant share	2.232**	-2.565*	-12.276***	-0.564	-4.944
	(1.036)	(1.541)	(4.368)	(1.601)	(5.352)
No. subjects	4,356	4,355	4,355	4,354	4,354
No. observations	11,388	11,386	11,386	11,385	11,385
First-stage F	28.12	28.05	28.05	28.05	28.05
Women					
Immigrant share	1.127*	-2.742	-11.546*	0.076	-9.224*
	(0.678)	(1.870)	(6.076)	(1.158)	(4.988)
No. subjects	4,937	4,935	4,935	4,935	4,935
No. observations	13,032	13,027	13,027	13,027	13,027
First-stage F	26.36	26.42	26.42	26.42	26.42

*p<.10 **p<.05 ***p<.01

Note 1: All estimates are IV. Standard errors are in parentheses, robust to clustering by region.
Note 2: Models control for time-varying individual and regional characteristics, individual fixed effects, age-cohort specific time trends, calendar year fixed effects, and country-specific wave fixed effects. Details are provided in Section 4.

Table A.1. Robustness checks: Effects of immigration on depression among natives 65-80 years old in five countries, with varying lags for immigrant share.

	No lag		**1-year lag**		**Mean of 1-year and 2-year lags**	
	No. depression symptoms	Clinical depression	No. depression symptoms	Clinical depression	No. depression symptoms	Clinical depression
Men						
Immigrant share	-14.303*	-2.467	-9.830*	-2.202*	-10.560**	-2.453**
	(7.832)	(1.653)	(5.452)	(1.154)	(5.382)	(1.110)
No. subjects	4,202	4,202	4,202	4,202	4,197	4,197
No. observations	10,976	10,976	10,976	10,976	10,958	10,958
First-stage F	20.95	20.95	45.80	45.80	31.26	31.26
Women						
Immigrant share	-13.547	-0.288	-10.777	-0.633	-12.379*	-1.292
	(8.887)	(1.523)	(6.831)	(1.169)	(6.579)	(1.121)
No. subjects	4,792	4,792	4,792	4,792	4,785	4,785
No. observations	12,616	12,616	12,616	12,616	12,591	12,591
First-stage F	51.35	51.35	34.98	34.98	27.61	27.61

*p<.10 **p<.05 ***p<.01

Note 1: All estimates are IV. Standard errors are in parentheses, robust to clustering by region.

Note 2: Models control for time-varying individual and regional characteristics, individual fixed effects, age-cohort specific time trends, calendar year fixed effects, and country-specific wave fixed effects. Details are provided in Section 4.

Table A.2. Robustness checks: Effects of immigration on depression among natives 65-80 years old, with varying samples (immigrant share lagged by 2 years).

	65-75 years old		65+ years old		Survivors		Ten countries, all regions	
	No. depression symptoms	Clinical depression	No. depression symptoms	Clinical depression	No. depression symptoms	Clinical depression	No. depression symptoms	Clinical depression
Men								
Immigrant share	-17.797***	-2.668**	-6.174	-1.453	-9.019*	-2.296***	-10.786**	-2.501***
	(5.075)	(1.114)	(5.069)	(0.930)	(4.618)	(0.837)	(4.436)	(0.917)
No. subjects	3,178	3,178	5,095	5,095	4,018	4,018	6,655	6,655
No. observations	7,840	7,840	13,831	13,831	10,520	10,520	17,094	17,094
First-stage F	35.76	35.76	27.39	27.39	28.34	28.34	32.57	32.57
Women								
Immigrant share	-1.224	-0.886	-9.547**	-1.294*	-13.293**	-1.963*	-12.264**	-1.516
	(7.757)	(1.227)	(4.820)	(0.720)	(5.676)	(1.113)	(5.341)	(0.956)
No. subjects	3,564	3,564	6,115	6,115	4,632	4,632	7,625	7,625
No. observations	8,863	8,863	16,811	16,811	12,225	12,225	19,743	19,743
First-stage F	39.23	39.23	24.10	24.10	26.53	26.53	31.23	31.23

*p<.10 **p<.05 ***p<.01

Note 1: Details on the samples are provided in Section 3. All estimates are IV. Standard errors are in parentheses, robust to clustering by region.

Note 2: Models control for time-varying individual and regional characteristics, individual fixed effects, age-cohort specific time trends, calendar year fixed effects, and country-specific wave fixed effects. Details are provided in Section 4 and 5.

Note 3: In the right-most columns, we use an additional five Western European countries, (Austria, Denmark, Portugal, Sweden, and Switzerland). These countries meet our first three criteria of inclusion, but have fewer than 10 regions.

Table A.3. Effects of immigration on moving to a new address for natives 65-80 years old (immigrant share lagged by one wave).

	Men	**Women**
Immigrant share	0.147	-0.629
	(0.632)	(0.592)
No. subjects	4,443	5,113
No. observations	11,691	13,591

*p<.10 **p<.05 ***p<.01

Note 1: All estimates are IV. Standard errors are in parentheses, robust to clustering by region.

Note 2: Models control for time-varying individual and regional characteristics, individual fixed effects, age-cohort specific time trends, calendar year fixed effects, and country-specific wave fixed effects. Details are provided in Section 4 and 6.

Table A.4. Effects of immigration on depression among natives 65-80 years old, with alternative specification that excludes regional economic controls (immigrant share lagged by 2 years).

	No regional economic controls	
	No. depression symptoms	Clinical depression
Men		
Immigrant share	-11.154**	-2.354**
	(4.923)	(0.920)
No. subjects	4,197	4,197
No. observations	10,958	10,958
First-stage F	23.45	23.45
Women		
Immigrant share	-11.983**	-1.562
	(5.325)	(0.957)
No. subjects	4,785	4,785
No. observations	12,591	12,591
First-stage F	23.64	23.64

*p<.10 **p<.05 ***p<.01

Note 1: All estimates are IV. Standard errors are in parentheses, robust to clustering by region.

Note 2: Models control for time-varying individual characteristics, individual fixed effects, age-cohort specific time trends, calendar year fixed effects, and country-specific wave fixed effects. Details are provided in Sections 4 and 6.

Table A.5. Oster method applied to the first stage and reduced form models corresponding to equation (1) in the main analyses of depression.

	No. depression symptoms		Clinical depression	
	First stage	Reduced form	First stage	Reduced form
Men				
Shift-share IV	0.445***	-4.255*	0.445***	-0.965**
	(0.085)	(2.205)	(0.085)	(0.460)
Oster β*	0.936	-3.401	0.936	-0.867
Women				
Shift-share IV	0.454***	-5.445**	0.454***	-0.716*
	(0.088)	(2.571)	(0.088)	(0.399)
Oster β*	0.953	-5.190	0.953	-0.692

*p<.10 **p<.05 ***p<.01

Note 1: Standard errors are in parentheses, robust to clustering by region. Oster β* is the bias-adjusted coefficient of the shift-share IV (see text).

Note 2: Models control for time-varying individual and regional characteristics, individual fixed effects, age-cohort specific time trends, calendar year fixed effects, and country-specific wave fixed effects. Details are provided in Sections 4 and 6.

Table A.6. Effect of immigration on receiving help from relatives, and non-relatives, among natives 65-80 years old (immigrant share lagged by 2 years)

	Low education (ISCED 0,1,2)		**High education (ISCED 3,4,5+)**	
	Received help from a relative	Received help from a non relative	Received help from a relative	Received help from a non-relative
Men				
Immigrant share	-2.672***	-0.120	-1.006	-0.241
	(0.862)	(0.333)	(1.152)	(1.391)
No. subjects	1,887	1,887	1,746	1,746
No. observations	4,807	4,807	4,419	4,419
First-stage F	23.11	23.11	25.66	25.66
Women				
Immigrant share	-2.842***	0.065	1.264	-0.411
	(1.088)	(0.363)	(0.973)	(1.053)
No. subjects	2,883	2,883	1,544	1,544
No. observations	7,453	7,453	4,005	4,005
First-stage F	25.01	25.01	54.66	54.66

*p<.10 **p<.05 ***p<.01

Note 1: All estimates are IV. Standard errors are in parentheses, robust to clustering by region.

Note 2: Models control for time-varying individual and regional characteristics, individual fixed effecs, age-cohort specific time trends, calendar year fixed effects, and country-specific wave fixed effects. Details are provided in Section 4.

Note 3: Non-relatives include neighbors, friends, professionals, and "badanti".

Figures

Figure 1. Average annual variation in Extra-EU immigrant share between 2004 and 2015, in percentage points. By region.

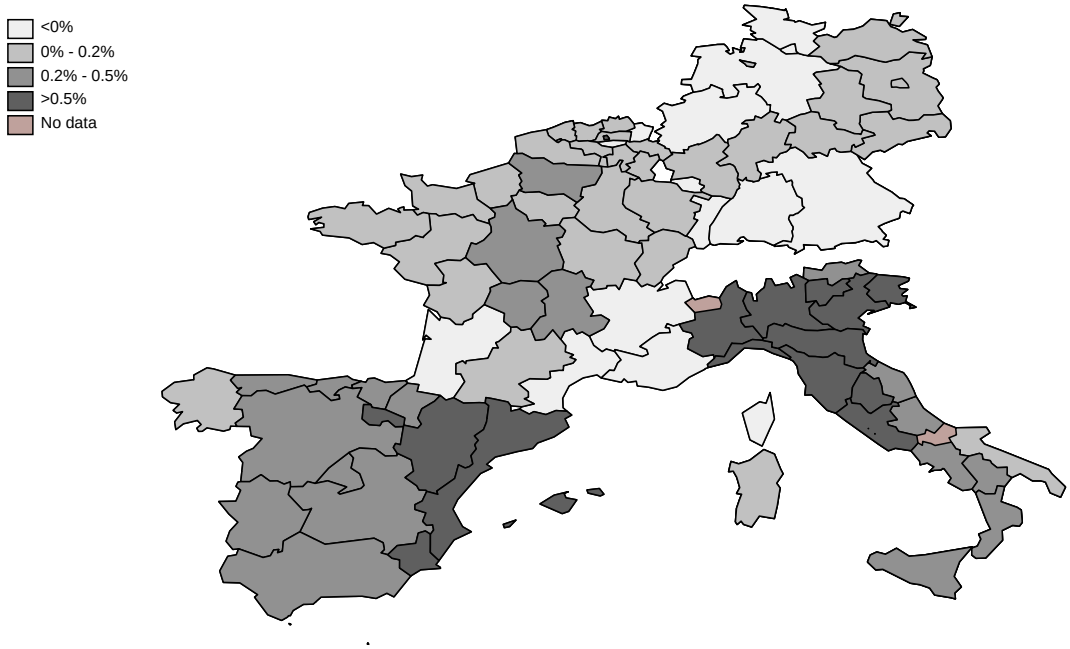


Figure 2. Extra-EU immigrant share in 2015. By region

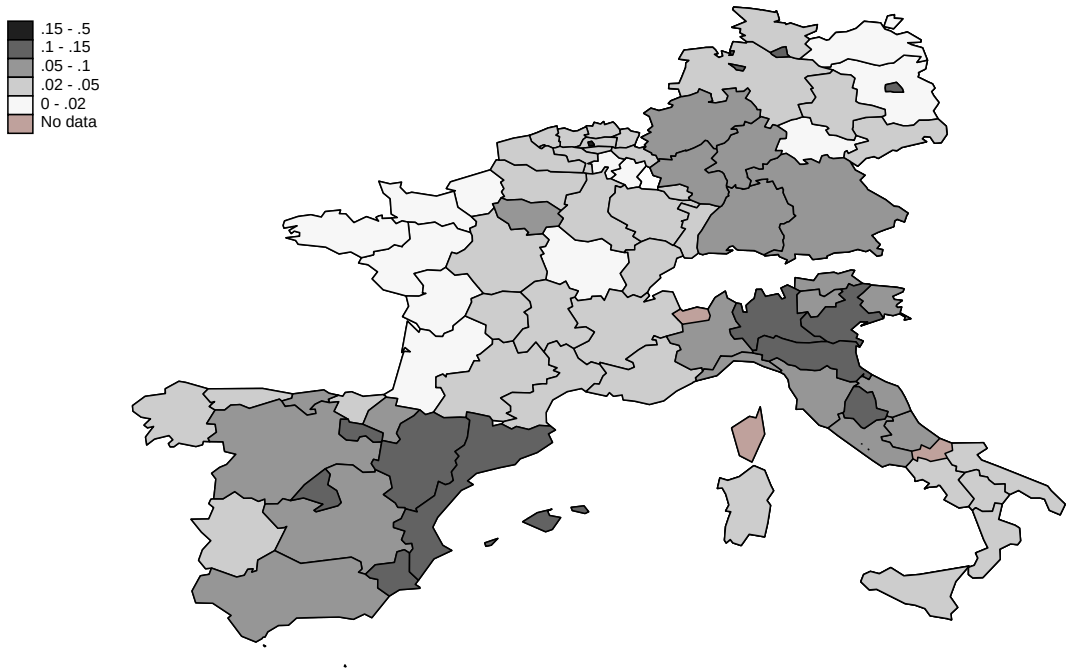


Figure 3. Extra-EU immigrant share, between 2004 and 2015. By country.

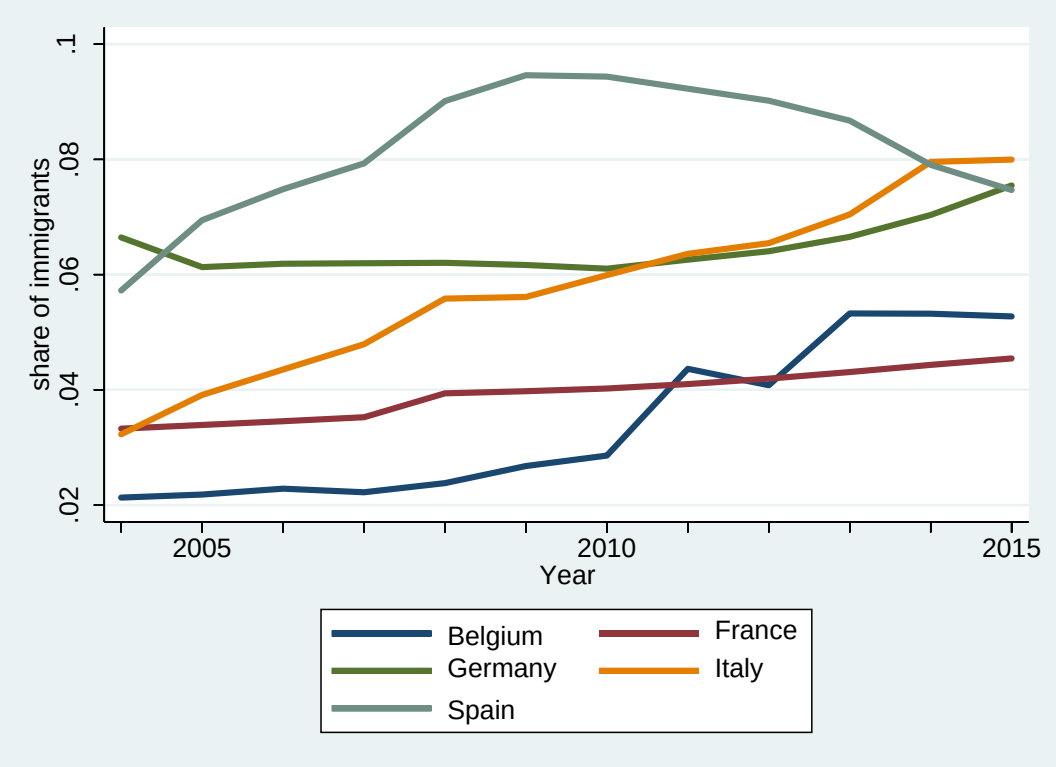
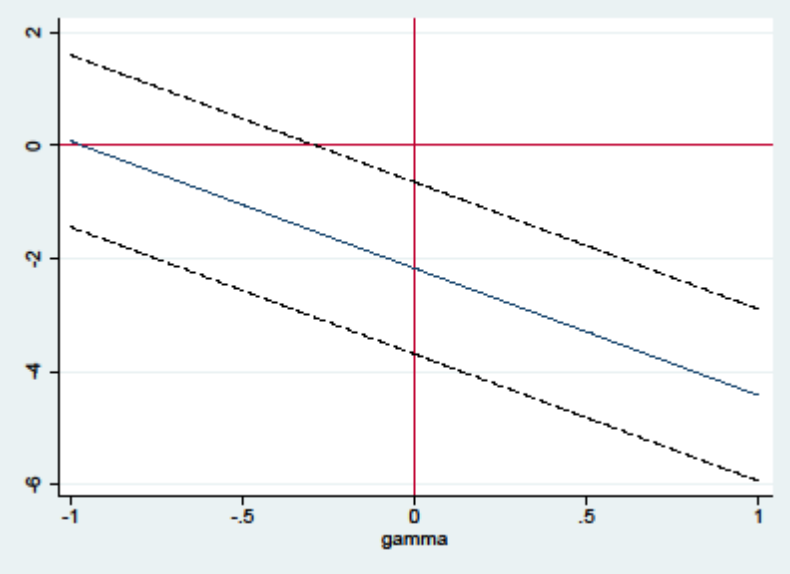
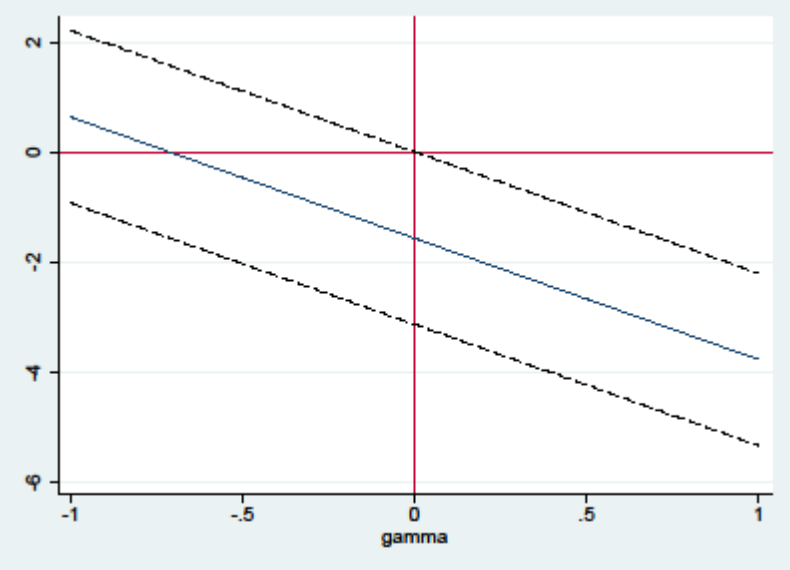


Figure 4A Conley Test. Corrected IV estimate of the effect of immigrant share on clinical depression. Males



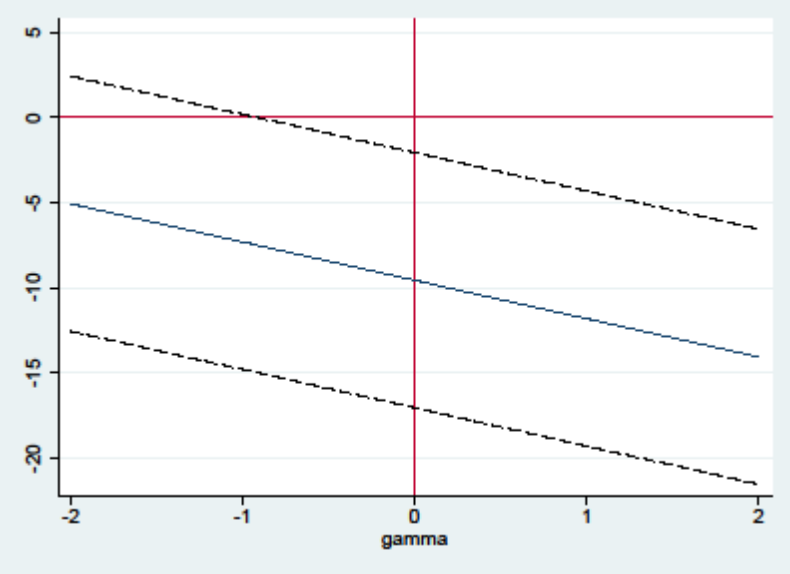
Note: γ is the supposed direct effect of the instrument.

Figure 4B. Conley Test. Corrected IV estimate of the effect of immigrant share on clinical depression. Females.



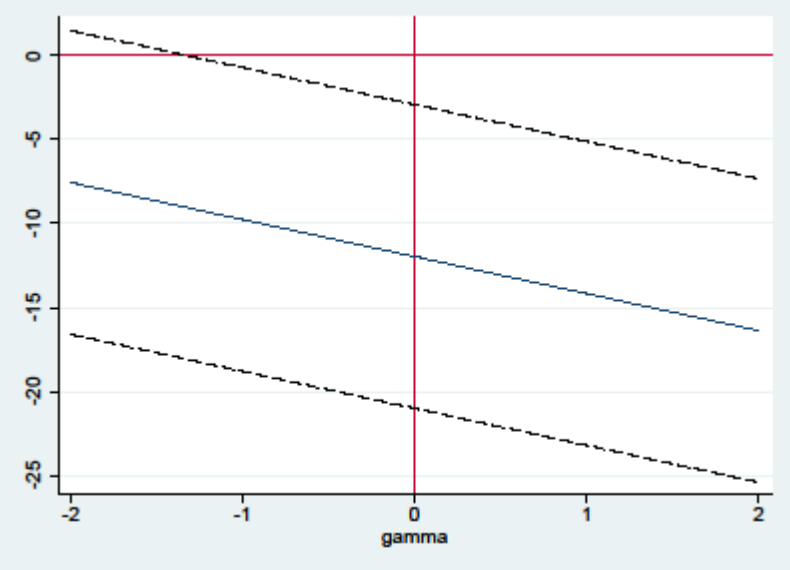
Note: γ is the supposed direct effect of the instrument.

Figure 4C Conley Test. Corrected IV estimate of the effect of immigrant share on the number of depression symptoms. Males.



Note: γ is the supposed direct effect of the instrument.

Figure 4C Conley Test. Corrected IV estimate of the effect of immigrant share on the number of depression symptoms. Females



Note: γ is the supposed direct effect of the instrument.