Health spending in Italy: the impact of immigrants*

VERY PRELIMINARY, PLEASE DO NOT QUOTE

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Abstract

This paper studies the impact of legal immigrants on public health expenditure across Italian regions during the period 2003-2015. Identification strategy is based on the shift–share instruments, which are robust to pull factors that might attract immigrants in Italy and to internal migration of natives. We find a persistent negative relationship between the variables of interest. A 1 percentage point increase in immigrants over total population leads to a decrease in public health expenditure per capita by about 3.9% (i.e. around 70 euro per capita). This relationship is confirmed for specific entry groups such as immigrants from countries with strong migration pressure. Looking at possible channels, we do not find support for any crowding out effects from public to private health services due to increasing immigration. Likewise, no significant evidence emerges on the role of entry barriers. The main driver of our results is the immigrants' demographic structure: the negative effect is basically due to the male component and the working age group.

Keywords: immigrants, health expenditure, demographic structure

JEL Classification: F22, H51, H41, I10, J61

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1 Introduction

Immigration is an increasing phenomenon in Europe, especially in countries at the external borders of the European Union (EU). As recently argued by Kerr and Kerr (2011), "looking forward, the heterogeneity in recent European experiences and policy environments provides an excellent laboratory for identifying immigration's effects in a new setting". There is an ongoing debate (Boeri, 2010; Edo *et al.*, 2018) on the socio-economic effects of immigration (e.g., on the labour market, education outcomes, health system) which goes hand-in-hand with a growing public perception that immigrants are a fiscal burden in Europe and abuse generous welfare states (Alesina *et al.*, 2018).

Actually, the related empirical evidence is mixed. Some works are not supportive of negative net effects of legal immigration on public finances (Preston, 2014) or find that immigrants are net contributors to fiscal systems (Dustmann *et al.*, 2010; Dustmann and Frattini, 2014). Other studies show that, on the one hand, immigrants are more likely to receive welfare benefits than the native population in the United States (Borjas and Hilton, 1996; Borjas, 2011); on the other hand, a substantial dispersion in immigrants' participation in the welfare state is observed in the EU countries (Boeri *et al.*, 2002; Boeri, 2010).

The welfare impact of immigration in the host country also deals with the consumption of certain social goods including education, social assistance and healthcare. These expenditures should increase with each individual immigrant. Compared to natives, immigrants may cause additional education expenditures, for example through language training programs.[1] However, recent empirical evidence on EU-15 countries by Speciale (2012) shows that an increase in foreign population had a negative effect on public education expenditure in years 1987–1999.[2] In a similar fashion, Razin *et al.* (2002) find that a higher share of (low-educated) migrants led to less generous social transfers rather than more redistribution in European countries in years 1974–1992, while Jofre-Monseny *et al.* (2016) document that social spending increases less in Spanish municipalities that recorded the largest increases in immigrant density over the period 1998–2006.

An increasingly explored, although complex, issue is the impact of immigrants on the health-care system of host countries. Expenses attributable to immigrants are generally not directly available and per capita public health expenditure is difficult to assess as it varies widely by age and other characteristics. As a matter of fact, only few OECD countries have estimates in this respect (OECD, 2013). Ultimately, the impacts of immigrants on health expenditure depends upon the size and composition of their population, wherein age and gender issues, country of origin and reasons for migration play a crucial role [3]

Previuos studies have mostly dealt with immigrants' access to health services (Norredam and Krasnik, 2011; Rechel *et al.*, 2013; Devillanova and Frattini, 2016) and their utilization

[1] Some studies examine the impact of immigrant concentration on the long-term educational outcomes of native students, finding an adverse effect of the former on the latter (Gould *et al.*, 2009).

[2] The intuition is that in more heterogeneous and ethnic diverse societies, the levels of public good provision and redistribution will be lower in line with Alesina *et al.* (1999).

[3] More generally, as pointed out by Ekberg (1999) the immigrants' age structure and labour market situation are major determinants for their net contribution to the public sector.

(Devillanova, 2008; Solé-Auró *et al.*, 2012) or on the impact of immigrants on the national health service efficiency (Giuntella *et al.*, 2018). Such analyses are based on either administrative records or *ad hoc* surveys and health expenditure estimated from the health status of the respondents.

In this paper, we analyse how legal migrants affect public health spending during the period 2003–2015 in Italian regions based on the demand factors for healthcare services. Italy is an interesting laboratory case for several reasons. At the national level, the share of legal migrants over total population passed from about 2% at the beginning of 2000s to more than 8% in 2015 (i.e. over 5 million people). More than 90% come from countries with strong migration pressure (e.g., Central and Eastern Europe, North Africa, East Asia), which suffer from a large economic divide and offer lower social protection to their citizens.

Health spending represents about three quarters of the budget for Italian regions and it is for the most part an undisputed regional government responsibility in Italy (Costa-Font and Turati, 2017). Apart from a small number of policy tasks left to the central government[4], responsibility of healthcare functions ultimately falls on regions. Hence, each region is basically autonomous in setting health spending and organizing services; this leads to significant differences across Italian regions.[5]

Our identification strategy takes endogeneity concerns into account. First, according to the "welfare magnet" hypothesis (Borjas, 1999; Razin and Wahba, 2015), immigrants normally locate into areas where welfare benefits – including health – are higher; reverse causality could therefore bias the estimated effect of immigrants on public health expenditure. Second, neglected, possibly unobserved pull factors might cause a spurious correlation between the two.

We adopt an instrumental variable approach that is based on shift–share instruments a la Card (2001), which take into account the role of "migration networks" (Munshi, 2003; McKenzie and Rapoport, 2010) in determining the geographical distribution of migrants in destination areas. In particular, we follow the recent approach by Bianchi *et al.* (2012) to improve the quality of instruments by removing all pull factors linked to the attractiveness of Italian regions, and focusing only on push factors related to the countries of origin. In addition, we refine the instruments following Bratti and Conti (2018) to guarantee instruments' exogeneity with respect to internal migration.

We find a persistent negative relationship between the share of immigrants over total population and public health expenditure in our sample. Such result holds across different specifications and identification strategies. In terms of magnitude, a 1 percentage point increase in the migrant population over total population leads to a decrease in public health expenditure per capita by about 3.9% (i.e. about 70 euro per capita). The negative relationship is confirmed also when:

[4]The central government takes care of drug price setting, international health as well as the definition of the essential healthcare levels being guaranteed in all regions.

[5]Since the constitutional reform in 2001, reforms towards decentralization in Italy also involved the health management sector (Caroppo and Turati, 2007; Ferrario and Zanardi, 2011). In this context, regions have been assigned more responsibilities and are allowed to define some characteristics of the health system (e.g., the structure of the hospital network, the share of private providers, etc.). This translates into twenty different health systems – one for each different Italian region –, with Emilia-Romagna and Lombardia often quoted as extreme cases (Bordignon and Turati, 2009).

i) we focus on specific groups such as migrants from countries with strong migration pressure; *ii)* we check for any bias due to the presence of refugees and asylum seekers in recent years that is not directly captured by our immigration variable; *iii)* we take into account the occurance of economic crisis and related austerity measures that caused a reduction in public spending, including the health sector.

In light of these findings, we investigate the mechanisms that might drive the relationship between immigration and public health spending. We first rule out any possible crowding out effect from public to private health services by showing that immigrants do not affect private health expenditure. Then, we analyse whether immigrants' demographic structure does matter, since gender and age determine different needs for healthcare services and, hence, heterogeneous impacts on public health expenditure. We find that the negative effect of immigrants on public health spending is driven by the male component and the working age group. Both results suggest a positive selection mechanism recently pointed out also by Constant (2017) and Edo *et al.* (2018).

Additionally, the existence of entry barriers (e.g., language, cultural habits) might limit the access of immigrants to public healthcare and drive the negative effect on health spending in our sample. To explore this channel, we exploit hetereogeneity across Italian regions in terms of the use of cultural mediators. However, no significant evidence emerges on the role of those entry barriers in determining our main findings. Finally, as immigration might also affect the health sector supply (Giuntella *et al.*, 2018), we investigate whether immigrants induce a shift in the size of healthcare personnel. Results are consistent with those on health spending (i.e. negative relationship) when considering general practitioners over population as dependent variable. On the other hand, a positive association emerges when focusing on general practitioners with more than 1,500 patients, the medical on-call services and the emergency doctors. This evidence is in line with previous studies showing that, compared to natives, immigrants rely mostly on emergency services and less on basic health care and preventive practice, thus seeking for medical advice only in serious conditions (Norredam *et al.*, 2004; Antón and Muñoz de Bustillo, 2010; De Luca *et al.*, 2013; Devillanova and Frattini, 2016).

The remainder of the paper is organized as follows. Section 2 provides some background information on immigrants across Italian regions. Section 3 presents the identification strategy and describes the data. Section 4 reports the baseline results and Section 5 provides some robustness checks. Section 6 discusses the mechanisms behind the negative relationship between immigrants and health public spending in Italy. Section 7 briefly concludes.

2 Immigrants in Italy

Immigrants can be defined on the basis of either their country of origin/birth (i.e. foreign-born) or their citizenship/nationality (i.e. foreign nationals). The country of birth criterion would be more appropriate in international comparisons as a person's nationality can change over time, and the conditions under which nationality is granted vary widely across destination countries(OECD, 2013). However, there are also cross–country analyses that look at foreign

nationals rather than the foreign-born such as Boeri (2010).

We follow the definition of immigrants provided by the Italian National Institute of Statistics (hereafter Istat) as "legally resident foreign population" on the basis of the citizenship/nationality criterion. Thus, we exclude foreign-born individuals that already got Italian citizenship, while we include foreigners born in Italy (i.e. second generations without Italian citizenship). It is worth noticing that in Italy most immigrants keep their own citizenship for a long time due to a complex procedure for naturalization (OECD, 2011). Data collected and made available by Istat can therefore be considered a good proxy for the stock of legal migrant population.

As other Southern European countries, Italy experienced the transition from an emigration to an immigration country quite recently. At the beginning of the 2000s, immigrants accounted for less than 3% of total population (2.7% in 2003) in Italy, while representing on average about 9.5% of the population in OECD countries (OECD, 2017).

From that moment on, a steep upward trend has been observed; in 2015, immigrants were 8.3% of total population, thus increasing almost three times over a decade In absolute terms, the number of foreigners increased from about 1.5 million in 2003 to more than 5 million in 2015.

Despite such a general trend, the distribution of foreign residents and their recent growth are highly heterogeneous across Italian regions as reported in Figure **??**. The share of immigrants over the total population is much larger in the North, as a consequence of the economic divide between Northern and Southern regions in Italy. In 2003, the incidence was lower than 2% in all Southern regions, while being almost three times larger in Lombardy and Emilia Romagna. In 2015, they accounted for at least 7% of total resident population in Northern and Central regions, while the average share in the South was still less than 4%.

More than 90% of foreign residents come from "countries with strong migration pressure". With such a definition, Istat labelled countries of origin in Central and Eastern Europe (including recent EU Member States such as Romania), Africa, Latin America and Asia (with the esclusion of Israel and Japan). Eastern Europe is the area of origin of nearly half of the immigrants (see Figure 1). Romanians and Albanians are the two major immigrant communities in Italy since mid 2000s, followed by Moroccans and Chinese.

On average, females accounted for more than 52% of immigrants in 2015, while representing 51% of the Italian population. Striking differences emerge when comparing the age structure of immigrants with respect to natives as shown in Figure 2.

On average, the foreign population is younger with the working–age group being widely over–represented compared to the native population. The highest share among immigrants is recorded around 35 years, both among males and females (2.5-2.61% of the total population). For the native population, instead, the highest share corresponds to 50 years, both among females and among males (1.6%-1.7%). The bottom of the pyramid is wider due to higher fertility rates compared to Italian women, and their dependency ratio is half than the natives' one (29.2% and 59.6%, respectively).

Figure 1: Immigrants by area of origin,2015

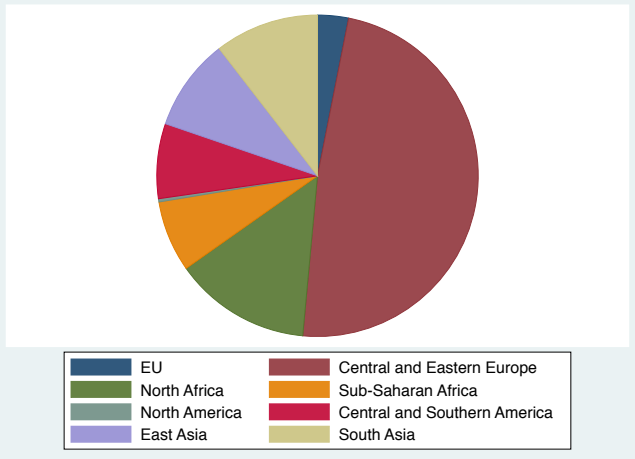
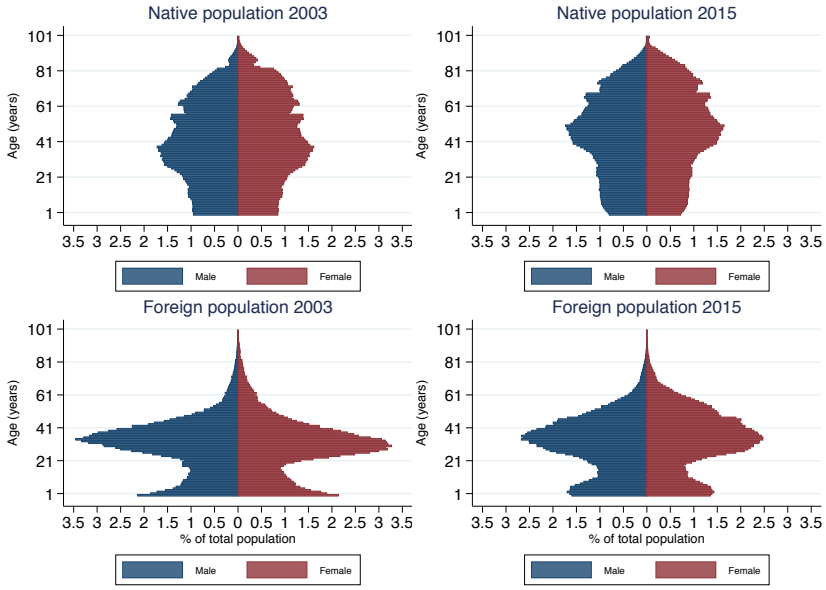


Figure 2: Gender and age structure of immigrant and native population, 2015



3 The empirical analysis

3.1 Model and variables

The baseline model we estimated is the following:

$$HEXP_{i,t} = \alpha + \beta IMMIG_{i,t} + \gamma \mathbf{X_{i,t}} + \mu_i + \tau_t + \epsilon_{i,t} \quad (1)$$

$HEXP_{i,t}$ is public health expenditure per capita in region i in year t. $IMMIG_{i,t}$ is our variable of interest and represents legally resident immigrants in region i as a share of total resident population at the beginning of year t. $\mathbf{X_{i,t}}$ is a set of control variables discussed below. Finally, μ_i and τ_t capture region and time fixed effects, respectively; $\epsilon_{i,t}$ is the error term. The period of analysis is 2003–2015.

Our dependent variable $HEXP_{i,t}$ is the logarithm of public health expenditure per capita. In Italy, most expenditure in healthcare is mediated and provided by the public sector.[6] The public healthcare system in Italy allows for patients' mobility: costs are covered independently of the region that is actually providing the service. This means that health spending in each region also reflects how many patients it might attract from other parts of the country, including migrants.[7] Accordingly, the presence of immigrants might translate into an increased demand – and possible overcrowding – of health assistance in some regions, which in turn might induce natives' mobility towards more efficient services. In order to address this issue, our dependent variable is adjusted for inter-regional mobility of patients and refers to health expenditure attributable to residents only.[8] Actually, we run estimations using also the unadjusted measure for public health spending – i.e. addressed to resident and non-resident patients – and results are confirmed.

Looking at aggregate data, public health expenditure per capita in Italy increased, on average, from 1,471 euro in 2003 to 1,874 euro in 2015, showing the highest values in 2010. In recent years some reductions in public spending have been undertaken through the implementation of austerity measures, also affecting the healthcare sector (Vicarelli and Pavolini, 2015; Carney, 2017). Comparing to regional data, it emerges that higher levels of spending remain in some Central and Northern regions over the whole period.

The set of control variables in $\mathbf{X_{i,t}}$ refers to regional characteristics following the empirical literature on the standard determinants of health spending in Italy (Giannoni and Hitiris, 2002; Franzini and Giannoni, 2010; Francese and Romanelli, 2011) and in other advanced economies (Gerdtham *et al.*, 2000; Herwartz and Theilen, 2003; Baltagi and Moscone, 2010; Martin *et al.*, 2011; Prieto and Lago-Peñas, 2012; Herrero-Alcalde and Tránchez-Martín, 2017). It basically includes socio-economic and demographic variables capturing the demand factors for healthcare services, including the labour market conditions and the education level. In detail, we add: the logarithm of GDP per capita, as a measure for regional development ($GDPpc$); the logarithm of

[6] This definition includes services provided directly, other expenses, pharmaceutical assistance, general medical assistance, medical-specialist assistance, nursing homes, rehabilitative, integrative assistance and other services.

[7] In general, we observe movements of patients resident in the South to the Centre and North for medical care.

[8] The correction is applied by the Istat through a matrix of correction coefficients, calculated on the basis of the expenditure flows of inter-regional mobility recorded by the Ministry of Health.

resident population (Pop)[9] to capture the demand size the dependency ratio, calculated as the share of population below 15 and above 65 years over the working age population ($Depratio$); the percentage of population with tertiary education ($Educ$); the female life (expressed in years) expectancy ($Life\_exp$), as a proxy for the health status of the population; the female employment rate ($Empl\_rate$). We also control for the revenues collected through regional taxes as a share of regional GDP ($Taxes$) and include a dummy equal to 1 if the region runs budget deficits in the health sector in that year, then requiring the central government's intervention restore regional public finances ($Deficit$). The latter controls help to capture specific characteristics of the Italian health system concerning the financing mechanism.[10].

Another element possibly affecting decentralized health expenditure are government's preferences for public spending. Indeed, left political parties are normally more prone to redistributive and welfare spending programs – including health, education, and social assistance – than the right ones. Hence, one could expect a different impact of the incumbent regional government's ideology on health services provision (Potrafke, 2010). We do not include this control in Equation 1 as it is almost time–invariant within each region over the whole period and thus already captured by regional fixed–effects.[11]

A detailed definition of variables, with data sources and summary statistics, is provided in Table 1.

3.2 Identification issues

Our aim is to identify the causal impact of immigrants on public health expenditure, that is getting an unbiased estimation of the β coefficient in Equation 1. However, endogeneity concerns are likely to arise in such a context. Omitted unobservable factors might drive both immigrants distribution across Italian regions and differences in public health expenditure. Moreover, the generosity of the welfare state might have a key role in attracting larger flows of international immigrants (Razin and Wahba, 2015), thus generating a reverse causality bias. A FE estimator is able to control for unobserved heterogeneity across regions that is fixed over time. However, we address the reverse causality problem by relying on an instrumental variable approach based on different sets of instruments.

The common ground of our strategy is the role of migration networks in explaining that newcomers tend to locate where previuos immigrants from the same country or area of origin already live (Munshi, 2003; McKenzie and Rapoport, 2010). We first consider the second and

[9] Actually, we use the native population in the baseline specifications. Alternatively, we also considered the logarithm of total resident population, with no appreciable differences in estimation results. The pairwise correlation between the two variables is very high (about 0.90) and statistically significant at 1% level.

[10] Indeed, taxes such as the regional income tax surcharge and the regional tax on productive activities, which are extremely important in the regional budget, are strictly linked to the National Health Service (NHS) since most of their revenues are used to finance health spending locally provided (Lagravinese *et al.*, 2017). Moreover, the central government can define automatic procedures for the appointment of special administrators and impose the maximum tax rate for both those taxes in any region in the case of health deficits as occured, for instance, in Lazio, Liguria, Campania, Abruzzi and Molise in various years. Finally, we run regressions also using other indirect taxes and social contributions collected at the regional level and results are confirmed.

[11] For instance, in Marche, Tuscany and Emilia-Romagna, among others, there are left-wing parties from 2003 to 2015, while in Lombardy and Veneto right-wing ones.

third lag of $IMMIG_{i,t}$ as instruments. $IMMIG_{i,t-2}$ and $IMMIG_{i,t-3}$ are likely to be good predictors of $IMMIG_{i,t}$ as proved by Piopiunik and Ruhose (2017), but at the same time they should not exert any additional independent effect on public health expenditure at time t.

More appropriately, we follow the approach that was pioneered by Card (2001) and has become rather popular in the migration literature by building a shift–share instrument on the basis of the past composition of the immigrant population by nationality across Italian regions.[12]

Our instrument for region i at time t is computed as

$$\widehat{IMMIG}_{i,t} = (\sum_j \omega^j_{i,1994} IMMIG^j_t)/\widehat{POP_{i,t}}; \qquad \omega^j_{i,1994} = \frac{IMMIG^j_{i,1994}}{IMMIG^j_{1994}} \tag{2}$$

where $IMMIG^j_t$ represents the overall stock of immigrants from country j in year t and $\omega^j_{i,1994}$ is the share of immigrants from country j living in region i in 1994, that is a decade before the beginning of our sample period allowing to avoid potential correlation between the instrument and the error term (Goldsmith-Pinkham *et al.*, 2018). $\widehat{POP_{i,t}}$ is the predicted native population in year t computed as the share of region i population over national population according to the 1994 distribution (Bratti and Conti, 2018). As it does not include the stock of immigrants, it avoids the denominator of the instrument being endogenous. Moreover, it is not affected by the internal migration of natives possibly due to the arrival of immigrants.

Starting from the shift–share approach, we also follow Bianchi *et al.* (2012), who refined this IV strategy by removing all local pull factors related to the attractiveness of Italian regions (e.g., welfare benefits, low crime, development, quality of life, etc.) and consider only immigration to destination countries other than Italy. This allows to focus on migration push factors only, which are related to the countries of origin. Thus, the third alternative instrument we implemented is the following:

$$\widehat{IMMIG}_{i,t} = (\sum_j \omega^j_{i,1994} IMMIG^{j,EU15_{(-IT)}}_t)/\widehat{POP_{i,t}} \tag{3}$$

where $\omega^j_{i,1994}$ is defined as in Equation 2 while $IMMIG^j_t$ is replaced by $IMMIG^{j,EU15_{(-IT)}}_t$, that is the yearly stock of migrants from country j residing in all EU–15 countries other than Italy using data from the OECD International Migration database.[13]. The EU–15 is the most reasonable area to capture immigrants' composition and strong network effects (Speciale, 2012) suitable also for the Italian case. In fact, our results remain stable if we consider other OECD countries beyond EU–15 to build the instrument in Equation 3.

In both the shift–share strategies adopted here, the composition by nationality of the migrant population in 1994 is used to build a prediction of actual immigrant stocks at the regional level, which can be reasonably thought as exogenous with respect to public health expenditure:

[12] A similar approach is also adopted by Bell *et al.* (2013) who employ an instrumental variable strategy based on the past settlement of immigrants for the large inflow of workers from EU accession countries that occurred from 2004 onward. More recently, Sá (2015) and Giuntella *et al.* (2018) use the same shift–share instrument approach to impute the supply-driven increase in immigrants in each local authority.

[13] We follow the nationality criterion. Alternatively, OECD collects also the stock of foreign–born population by country of birth. Results remain substantially unchanged by adopting this alternative criterion in building our instrument.

immigrant stocks in 1994 have no direct effect on current regional health expenditure, apart from their influence on current migration inflows.

In the 1990s, the size of the foreign population in Italy was much lower compared to our sample period. According to 1994 data immigrants were less than 700 thousands but figures sharply rose afterwards, up to 1.5 million by 2003, our first sampling year. In 2015, more than 5 million immigrant were legally resident in the country. It is unlikely that their initial distribution in 1994, which predates this substantial increase, could have any impact on the dynamics of health spending ten years later.

A further element to be taken into account is the fact that each nationality has its own geographical distribution across Italian districts and clustering patterns are therefore highly heterogeneous over the countries' of origin spectrum. In this sense, regions with a similar share of immigrants over total resident population might display very different values for our instrument due to the different mix of immigrants' nationalities.

Finally, the spectrum of origin countries changed substantially in the last decades (Bratti and Conti, 2018), due to factors that are mostly related to push factors (Bianchi *et al.*, 2012) and therefore not correlated with economic conditions and other pull factors at the Italian regional level, such as health public spending. Immigrants from Eastern Europe were less than 20% of the total migrant population in 1994, and accounted for 47% of it in 2015 while the incidence of immigrants from Northern Africa and the Middle East decreased from 22% to 13% over the same period. In terms of nationalities, apart from Morocco the ranking of the five most represented nationalities changed entirely between 1995 (Morocco, US, Jugoslavia (Serbia and Montenegro), Philippines and Tunisia) and 2015 (Romania, Albania, Morocco, China, Ukraine).

Some recent empirical research disputes the validity of shift–share instruments (Jaeger *et al.*, 2018). The main idea is that such instruments are vulnerable to identification issues in the presence of dynamic adjustments to immigration supply shocks in the labor market, whose outcomes have been extensively analysed in the literature (Borjas, 2014; Card and Peri, 2016). This is especially true when the mix of immigrants' countries of origin is highly persistent over time, such as for the United States over the last decades(Jaeger *et al.*, 2018).[14] In such a context, the estimates of immigrants' impact on natives' wages could be biased.

In our case, those shorthcomings are less relevant. Our aim is to analyse the effect of immigration on health spending and labour market adjustments may not be a relevant source of bias in such context.[15] Most importantly, unlike the US scenario, migration inflows to Europe, and Italy, have been unstable and heterogeneous over time.

Since 1990 Europe experienced an increase in immigration that can be attributed partly to migration from Northern Africa partly to intra–European migration, following the collapse of communist regimes and the opening of Eastern European countries. East–West European migration was pushed further by the 1990s Balkan wars and by the 2004/2007 EU Enlargement.

[14] In terms of dynamic adjustments to immigration supply shocks Monras *et al.* (2015) for example find a rapid response of the US labor market to low-skilled immigrants from Mexico after the 1995 peso crisis.

[15] As explained in Section 3.1, we do control for annual female employment rate in our baseline specification. Alternatively, we also tried to include the total (female plus male) employment rate without any appreciable difference in our results.

The Arab Sping in 2011 was followed by an upswing in the number of migrants that crossed the Mediterranean to enter the EU, not only due to the Syrian civil war but also to other conflicts, climate change consequences and extreme poverty in African countries. As discussed above, the increase in foreign residents in Italy was substantial in the last decades and the countries of origin changed over time as well as the reason for migrating to Italy (work purposes in the 1990s, family reunification afterwards).

In short, the high degree of concentration and persistence in immigrants' countries of origin and locations, which could undermine shift–share instruments' validity in the US case (Jaeger *et al.*, 2018), does not appear as a serious concern in our case.[16]

4 Baseline results

Table 2 shows results from the baseline specification reported in Equation 1. We use different strategies, starting from the FE estimator in columns (1)-(2). Then, we move to more reliable estimates using different instrumental variable approaches (columns (3)-(8)) following, respectively, Piopiunik and Ruhose (2017), Card (2001) and Bianchi *et al.* (2012). For each strategy, we present both the parsimonious model with the variable $IMMIG$ only (together with region and time fixed-effects) and the most comprehensive specification, which includes also all the control variables, **beyond** region and time fixed-effects.

We find a persistent and robust effect of $IMMIG$ on $HEXP$. The coefficients on $IMMIG$ is negative and statistically significant across specifications and identification strategies.

The soundness of the IV estimates is confirmed by the first–stage regressions. Indeed, the F-statistic, which is normally used to test the hypothesis that the coefficient of the excluded instrument is equal to zero in the first–stage, is always above the threshold of 10 (see the bottom of Table 2) as suggested by the literature on weak instruments (Staiger and Stock, 1997; Stock and Yogo, 2002; Stock *et al.*, 2002). Hence, we reject the hypothesis of weak instruments for our IV estimates. Moreover, looking at the Kleibergen-Paap rk LM statistic we can also reject the null hypothesis of underidentification at the 1% level of significance.[17]

In terms of magnitude, the IV coefficients suggest that a 1 percentage point increase in migrants over total population leads to a decrease in public health expenditure per capita between 1.2% (column (3)) and 3.9% (column (8)). This corresponds, on average, to a decrease of about 22 and 70 euro per capita.

Different concurrent factors are likely to contribute to this result. First of all, the immigrant population may differ substantially from the native one in terms of gender composition and age

[16] For the sake of completeness, we also implemented the methodology proposed by Jaeger *et al.* (2018), including a lagged endogenous regressor instrumented with a lagged shift–share instrument to address possibile identification problems. However, it is worth noticing that our time span could be inadequate to get unbiased results when adopting this approach, compared to the estimates in Jaeger *et al.* (2018) that have been run for on ten–years data from the 1970s to the 2000s. Our main results (not reported in the paper but available upon requests) are basically confirmed.

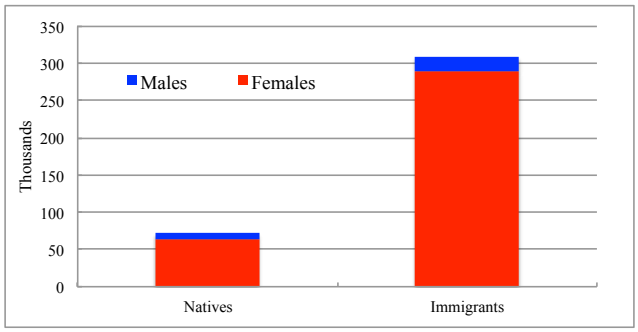
[17] We do not report the Hansen J statistic of overidentification test of all instruments for columns (5)–(8) as in those regressions the number of instruments equals the number of endogenous variable, so the equation is exactly identified. As argued by Murray (2006), having at least as many instruments as troublesome variables is only a necessary condition for identification but, in most applications, the condition proves sufficient.

structure (see Section 6) thus determining a lower demand for healthcare services. At the same time, recent empirical literature provided evidence of a "healthy immigrant effect" (Chiswick *et al.*, 2008; Jasso *et al.*, 2004; Kennedy *et al.*, 2006) according to which migrants are, on average, healthier compared to the native–born population at the moment of arrival. This effect is not country-specific, but common to many destinations and is related to either a positive self–selection of immigrants or the "Salmon bias" hypothesis, according to which the less healthy migrants usually return to their origin country (Constant *et al.*, 2018). However, immigrants' health status is likely to deteriorate quickly over time (Dustmann *et al.*, 2015; Giuntella and Stella, 2017) due to a "negative acculturation" process encompassing the adoption of risky behaviours (alcohol consumption, smoking, sedentary life) and the worsening of dietary styles, but also to to poor working and living conditions and the lack of protective factors, such as close family and religion.

Second, immigrants often make a limited use of healthcare service compared to natives, by relying mostly on emergency services and less on screening and preventive practices(De Luca *et al.*, 2013; Devillanova and Frattini, 2016). This happens either because of language barriers that might prevent communication with health practitioners, or because of the lack of knowledge about the host country's healthcare system, or because of cultural differences in approaching health services (e.g. the use of emergency care only instead of preventive care).

Finally, a negative impact of immigration on health spending may be also partly ascribed to the role of female migrants in the elderly care sector, which largely substitute for publicly provided healthcare services in Southern European countries (King and Zontini, 2000). According to administrative data (INPS – Osservatorio sul lavoro domestico), in 2015 out of the 380 thousands workers employed as caregivers by Italian households, almost 76% were female migrants (Figure 3). We try to better explore those channels in Section 6, conditional on data availability.

Figure 3: Caregivers in Italy by nationality and gender, 2015



Turning attention to the control variables, some regularities emerge across specifications. *Ceteris paribus*, health expenditure per capita decreases as *Pop* increases. The positive and statistically significant coefficients on *Depratio* confirms the importance of the age structure for the demand of healthcare, which is normally higher for younger and older age cohorts (Meier and

Werding, 2010).[18] Likewise, public health expenditure per capita is positively correlated with female life expectancy ($Life\_exp$). On the other hand, the female employment rate, $Empl\_rate$, turns out to have no significant effects suggesting that the demand for healthcare is not affected by more intense female labour force participation and, implicitly, lower provision of informal care inside the household. This result sounds quite consistent with findings by Franzini and Giannoni (2010) on individual determinants of self-rated health in Italy according to which individuals who are working, either men or women, reported better health than those who are not working and might therefore have lower needs of healthcare services.

The coefficient on GDP per capita, $GDPpc$, is statistically significant and negative, indicating that public health expenditure per capita decreases with regional economic development: richer regions are more efficient in providing health services. Similarly, Crivelli *et al.* (2006) find a negative income elasticity of demand for healthcare services in Swiss cantons over years 1996–2002 probably due to the high degree of territorial decentralization of healthcare in Switzerland. Along the same line, Herrero-Alcalde and Tránchez-Martín (2017) show that the growth of social spending is slower than the growth rate of regional economic activity in Spain, reflecting that some regions could be close to the so-called "saturation point" of social protection.

The dummy $Deficit$ has a negative and significant coefficient across specifications as expected. Indeed, if the regional government is running a deficit in the health sector, automatic procedures and repayment plans defined by the central government are implemented to reduce health spending and consolidate the regional budgets. The negative sign on $Taxes$ is consistent with the fiscal federalism literature, according to which when using revenue from own local taxes the size of local spending is lower than when financing it with intergovernmental transfers (Liberati and Sacchi, 2013). Concerning the health sector, regions might have the incentive to set their own taxes at the minimum level if they believe that the central government will cover the remaining costs – via intergovernmental grants – in order to guarantee the provision of essential healthcare services (Francese and Romanelli, 2011). Moreover, given the economic and demographic differences across Italian regions, local taxes might not be sufficient to finance the health system (Lagravinese *et al.*, 2018) and equalization funds (based on VAT revenue-sharing) are required to compensate for different regional fiscal capacities (Cavalieri and Ferrante, 2016).

5 Robustness checks

5.1 Irregular migrants, refugees and asylum seekers

A first concern about the estimated relationship is the increased presence of irregular immigrants, who are not captured by our variable of interest and might have an impact on public health expenditure. We try to take into account the possible effect of such illegal foreing population by adding among the controls in Equation 1 a proxy for the illegal employment rate in each region

[18] In addition, results are confirmed if we consider *Depratio* based on native population only instead of the index computed for the total resident population. The pairwise correlation between the two variables is more than 0.90 and statistically significant at 1% level.

measured by the share of illegal work units on total work units. Results are confirmed:[19] this additional regressor is barely statistically significant and, more importantly, its inclusion does not affect the magnitude and statistical significance of our coefficient of interest.[20]

The presence of refugees and asylum seekers became higher in recent years due to a dramatic increase in sea arrivals via the Mediterranean central route since 2014. As documented by Edo *et al.* (2018), in 2015 over 1.3 million asylum claims were registered in the EU, with the vast majority of refugees coming from the Middle East. Mediterranean countries like Greece and Italy were heavily affected by the influx of refugees. In the first phase of such emergency, asylum seekers were mainly hosted either in the First Aid and Reception Centres (CPSA) or governmental centres for accommodation of asylum seekers (CARA/CDA) in Southern Italy. Thanks to the SPRAR project (Protection System for Refugees and Asylum Seekers), asylum seekers were subsequently redistributed across Italian regions.

To check for the existence of any (omitted variable) bias related to the presence of asylum seekers not captured by our migration variable, we provide Table 3 where we re-estimate Equation 1 by excluding, one at a time: *i)* only year 2015 (panel A); *ii)* both years 2014 and 2015 (panel B); *iii)* Sicily, Puglia, Calabria (panel C). In all cases, the $IMMIG$ variable has negative and significant coefficients which are very similar in size to those reported in Table 2.

5.2 Immigrants from countries with strong migration pressure

To test the robustness of our baseline results, we provide additional estimates by adopting a different definition of the key explanatory variable. In Italy, more than 90% of immigrants come from countries with strong migration pressure, which is a category used by Istat that include Eastern European and less developed countries (see Section 2). According to the "welfare magnet" hypothesis (Borjas, 1999; Razin and Wahba, 2015), immigrants coming from such countries might choose Italy as their destination due to the welfare benefits provided to its resident population, such as universal access to healthcare services, and this might ultimately translate into an increasing burden for public spending.

We substitute $IMMIG$ with $IMMIG\_SMP$, that includes legally resident immigrants from Central and Eastern Europe, Africa, Latin America and Asia (excluding Israel and Japan) as a share of total population in each region. Results are reported in Table 4. The coefficient on $IMMIG\_SMP$ remains negative and significant across all specifications. Moreover, the coefficients are very similar to Table 2 also in terms of magnitude.[21] Hence, the negative relationship between foreing population and public health expenditure holds even when focusing on immigrants from developing countries, which suffer from a larger economic divide with respect to Italy and offer lower welfare protection to their citizens.

[19] We do not show this estimation exercise in the paper but results are available upon request.

[20] It is worth noting that even in the case of a significant coefficient on irregular immigrants, we could not conclude that the effect is driven by illegal migrants as the illegal work units considered in the index include both the native and the foreign population and refer also to occasional activities carried out by people who declare themselves officially unemployed as students, housewives or pensioners.

[21] As a matter of fact, the pairwise correlation between $IMMIG$ and $IMMIG\_SMP$ is about 0.95 and statistically significant at 1% level.

5.3 Economic crisis and austerity period

One potential concern is that our results may be driven by the period of adverse economic conditions after the Great Recession started in 2008 and the subsequent austerity programme consisting of sustained reductions in public spending and budget deficit by the Italian government. In this framework, the NHS spending decreased in 2013 (Carney, 2017) and all regions, being responsible of health budgetary aspects, subsequently cut their health spending following such adjustment (Vicarelli and Pavolini, 2015) as documented in Section 3. Given this, our negative relationship between immigrants and public health expenditure could be affected by such events.

To deal with this issue, we re-run estimations in Equation 1 by adding a dummy variable equal to 1 for years between 2009 and 2013 (both included) as a proxy for the economic crisis among the controls. In a similar fashion, we replicate estimations in Equation 1 focusing only on the period before the austerity package dsigned during the Monti's government in 2011 by restricting the sample to the year 2010 (included). In both cases, the main results (available upon request) remain unchanged and the negative relationship between $IMMIG$ and $HEXP$ is confirmed across specifications.

5.4 Public health expenditure over GDP

As a further robustness check, we re-estimated Equation 1 considering public health expenditure over GDP as dependent variable ($HEXP\_GDP$) rather than expenditure per capita. Results are reported in Table 5 and are consistent with those in Table 2. In detail, the coefficient on $IMMIG$ is negative and statistically significant across specifications, confirming that an increase in the share of immigrants over total population decreases the share of public health expenditure over GDP. In terms of magnitude, our estimates suggest that an increase of migrants over total population by 1% causes a reduction in public health expenditures between 0.227% (column (3)) and 0.443% of GDP (column (8)), everything else equal. Therefore the effect estimated employing health spending as a percentage of GDP can be considered quantitatively consistent with the effect obtained by using public health expenditure per capita.

6 What are the mechanisms behind?

This section aims to investigate the possible mechanisms, partially anticipated in Section 4, behind the relationship of interest.

6.1 Crowding–out towards private healthcare

We start by checking whether the negative effect of $IMMIG$ on $HEXP$ might be due to a crowding out from public to private health services (Giuntella *et al.*, 2018). To this purpose, we re-estimated Equation 1 considering private health expenditure per capita as dependent variable. Results (availabe upon requests) indicate that the increase in the share of foreign population in Italy did not raise households' private health expenditure and exclude therefore that regional

spending on the health function decreases due to a crowding out effect on the use of public healthcare services.

6.2 Demographic structure of immigrant population

The negative impact may be related to the specific composition of the immigrant population. Empirical studies usually show that women use more healthcare services than men. At the same time, population ageing have proved to be a major determinant of healthcare expenditure (Storesletten, 2003; Martin *et al.*, 2011).

In our case, as documented in Section 2, the age structure of foreign residents is different with respect to natives, with a larger share of young individuals. Female immigrants may have stronger needs of healthcare assistance compared to their male counterparts due to child birth and induce abortion and because of higher fertility rates their use of healthcare services may also be larger compared to native women.

In other words, the issue at stake is whether the overall negative impact of immigrants on health spending would become heterogeneous once we specifically account for their demographic structure. To explore this channel, we focus on immigrants' composition: *i)* by gender; *ii)* by age, taking into account child, young and old migrants. In both case, we re-estimated Equation 1 by adding among regressors, one at a time, the share of male migrants over total migrant population ($MALE\_share$) and the share of working–age migrants (i.e. 15–64 years old) over total migrant population ($WORKAGE\_share$).

The IV strategy is the same presented in Section 3.2. With an additional (possibly) endogenous variable, we defined a second instrument according to the different approach followed in each column. In columns (3)–(4), we used the second and third lag of $MALE\_share$ and $WORKAGE\_share$, respectively. In columns (5)–(6), the second instrument was built by applying Equation 2 to either male immigrants or to the working age population only. The strategy put forward in columns (7)–(8) was implemented only to instrument the gender composition since no detailed information on the stock of migrants by age and country of origin in the EU–15 was available for the whole period.

Results are reported in Table 6 and 7, where we observe a negative and significant coefficient on, respectively, $MALE\_share$ and $WORKAGE\_share$, which is also robust across specifications. Overall, the negative effect of immigrants on public health spending is driven by the male component and the working age group.

In Italy, the share of immigrants belonging to the working–age group is about 80% over total immigrants, confirming the prevalence of active population over the dependent counterpart. Hence, immigrants are usually underrepresented among the elderly, where health expenditures tend to be highest (Hagist *et al.*, 2009). In addition, the average length of stay of the migrant population is supposed to be lower compared to other countries with a longer tradition as destination countries. This implies that the so called "healthy migrant effect" might still be at work and the process of convergence to the natives' health status not yet evident. Evidence provided on the heterogeneity of such effect across European countries showed that indeed in Italy immigrants reported a better health status compared to natives, after controlling for their

socio–economic characteristics (Moullan and Jusot, 2014). The opposite happened in Belgium, France and Spain where migrants' health status is poorer than natives'.

6.3 Entry barriers

A further question arising from our baseline results is whether different cultural habits and, mostly, entry barriers (e.g., language) might limit immigrants' access to healthcare services and, hence, determine the negative effect on health spending in our sample.[22] In order to explore this channel, we tried to exploit hetereogeneity across Italian regions in terms of the existence and availability of cultural mediators to favour social and economic integration. Based on regional legislation, we build a dummy variable equals to 1 if a region allows for the presence of cultural mediators to be used for specific public functions such as social assistance and health. Accordingly, we split the whole sample into two sub-samples: the former includes regions that employ this figure in public services, while the latter regions without this professional figure. If the mechanism is at work, one might expect the negative coefficient of $IMMIG$ either to decrease in absolute value or to lose significance in the sub-sample of regions that are not employing cultural mediators. On the other hand, in regions where cultural mediator are employed in public services, the effect of $IMMIG$ on $HEXP$ might become either positive or null.

When re-running regression of Equation 1, we find that the coefficients on $IMMIG$ are significant and negative in both sub-samples, and very similar in magnitude. the presence of entry barriers.

6.4 Shifts in the health sector supply

Thus far, we focused on the effects of immigration on the demand side of health spending finding a negative impact. Such lower level of health expenditure based on demand factors might also be related to a lower supply of healthcare services due to increasing migration. Put differently, immigration might also induce a shift in supply, affecting the number of healthcare personnel, such as doctors and nurses, and this might translate into a direct effect on the efficiency of the healthcare sector (Giuntella *et al.*, 2018).

To explore this channel, we start by analyzing how immigrants affect the supply of health services by focusing on the proportion of general practitioners in the population as a dependent variable[23] and using the most parsimonious model (i.e. without controls) as in Giuntella *et al.* (2018).[24] Results are reported in Table 8.[25] Consistently with previous outcomes, we find a significant and negative relationship between immigrants ($IMMIG$) and the share of general practitioners over population in columns (1) and (2).

[22] Evidence has been provided on the difficulties by female and undocumented migrants in accessing specific health services, such as preventive care (McCormack *et al.*, 2008; Wolff *et al.*, 2008; Rechel *et al.*, 2013).

[23] According to the Italian national legislation, a full-time general practitioner should attend to a maximum number of 1,500 patients.

[24] Indeed, our baseline model refers to the standard determinants of health spending based on the demand factors and could be inappropriate to explain the supply of health services.

[25] We replicated regressions using different techniques but, for the sake of space, we report only the IV approach based on Card (2001) and Bianchi *et al.* (2012) strategies.

However, if we consider the share of general practitioners with more than 1,500 patients (columns (3)-(4)) and the medical on-call services and the emergency doctors (columns (5)-(6)) as proxies for health services' supply, the picture becomes slightly different. Indeed, the $IMMIG$ variable has positive and statistically significant coefficients across specifications. Intuitively, this result is not so surprising and it is consistent with evidence provided in the first two columns. Immigrants do not usually consult general practitioners and make a limited use of ordinary medical examinations, prevention screenings and early detection programs, as discussed in Section 4[26]. They are likely to call for medical assistance only in the case of serious conditions and diseases. This attitude might explain the positive sign on $IMMIG$ when health supply is proxied by emergency services such as medical on-call services and emergency doctors. Likewise, recently arrived immigrants, that register for the NHS for the first time, might have a direct (positive) impact on the share of general practitioners exceeding the 1,500 patients threshold as proved by our results.

7 Concluding remarks

"Much of the developed world is now increasingly composed of nations of immigrants" Borjas (2014). Starting from this stylized fact, one of the major concerns put forward by public opinion is that immigrants could steal natives' jobs, reduce their wages and negatively contribute to public finances. In this context, it becomes crucial to study the economic effects of immigration in host countries in order to debunk false myths whenever necessary and promote an evidence–based objective approach.

Compared to the huge literature on the labour market impact of immigration, studies looking at the relationship between immigration and welfare systems are more recent – basically due to the lack of reliable data –, especially for European countries where this topic goes hand-in-hand with the challenges posed by demographic ageing more than in the US (Storesletten, 2000; Boeri *et al.*, 2002; Fehr *et al.*, 2004; Carone *et al.*, 2005; Chojnicki and Ragot, 2016).

Based on our evidence, we can assert that no detrimental effects of immigration on public health spending emerge across Italian regions over the last decade. These findings are mainly explained by the fact that immigrants are younger than natives and mostly belong to the working–age population. For this reason, they could effectively alleviate the fiscal burden induced by population ageing in most advanced economies (Edo *et al.*, 2018).

Although immigrants are often healthier compared with the native population at their arrival in the host country, available data suggest that they tend to be more vulnerable to certain sickness (Rechel *et al.*, 2013). Hence, given their non–negligible economic contribution in advanced economies (Borjas, 1995; Battisti *et al.*, 2018), specific migrant–related health policies should be required (e.g., training health workers, adapting organizational culture, improving data collection, providing information to migrants on health problems and services), reflecting recognition of the need for health systems to adapt to increasingly diverse populations, especially

[26]Due to different cultural backgrounds and to the absence of universal health coverage in several countries of origin, immigrants are likely to resort to traditional remedies such as herbal treatments even in case of sickness.

in European countries (Mladovsky *et al.*, 2012).[27]

Since our study focuses on a relatively short time period, future research could be devoted to analyze the long–run effects of immigration on the demand for health services. Indeed, as the health status of immigrants converges to that of natives over time (Dustmann *et al.*, 2015), their need of healthcare assistance may increase with possibly different outcomes in terms of public spending.

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[27] Mladovsky (2011) observes that, in a sample of 25 European countries – almost within the EU –, only 11 were shown to have adopted targeted policies for immigrants' healthcare at the national level.

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Tables

Table 1: Variables: definition, sources and summary statistics

Variable	Definition	Source	Mean	St. Dev.	Min	Max
$HEXP$	Log of public health expenditure per capita by region	Istat	7.49	0.11	7.17	7.76
$HEXP\_GDP$	Public health expenditure over regional GDP (%)	Istat	7.74	2.02	4.36	12.54
$IMMIG$	Foreign population over resident population by region (%)	Istat	5.41	3.17	0.60	12.06
$IMMIG\_SMP$	Foreign population from countries with strong migration pressure over resident population by region (%)	Istat	5.04	3.01	0.54	11.72
$MALE\_share$	Foreign males over total foreign population by region (%)	Istat	47.62	2.98	41.49	55.12
$WORKAGE\_share$	Foreign individuals between 15 and 64 years over total foreign population by region (%)	Istat	79.49	2.39	75.59	86.38
$Depratio$	Sum of population 0-14y and population over 65y on 15-64y population by region (%)	Istat	53.16	3.92	42.89	65.58
$GDPpc$	Log of regional Gross Domestic Product per capita	Istat	10.08	0.27	9.59	10.54
Pop	Log of regional native population	Istat	14.42	1.06	11.68	16.00
$Empl\_rate$	Employed female over 15y population on population over 15y by region (%)	Istat	34.59	7.98	18.95	47.02
$Life\_exp$	Number of years of female life expectancy at age 0 by region	Istat	84.22	0.83	81.37	85.83
$Educ$	Share of population with university degree over total population (%) by region	Istat	10.41	2.31	5.02	18.17
$Taxes$	Regional direct taxes over regional GDP (%)	Istat	14.83	2.10	9.66	20.97
$Deficit$	Dummy equal to 1 in year with regional budget deficit due to health spending	Istat	0.18	0.39	0.00	1.00
$Generalpractitioners$	Number of general practitioners per 10,000 inhabitants by region	Istat	7.97	0.66	6.17	9.37
$Generalpractitioners > 1,500$	Number of general practitioners with more than 1,500 patients by region (%)	Istat	18.87	9.60	4.50	49.77
$Emergencydoctors$	Log of on-call services and emergency doctors by region	Istat	4.66	0.93	2.08	6.24

Table 2: Baseline results

Dep Var: Log Health Exp pc	(1) OLS	(2) OLS	(3) IV (lag)	(4) IV (lag)	(5) IV (Card, 2001)	(6) IV (Card, 2001)	(7) IV (Bianchi *et al.*, 2012)	(8) IV (Bianchi *et al.*, 2012)
IMMIG	-0.014*	-0.024***	-0.012***	-0.025***	-0.021***	-0.029***	-0.024***	-0.039***
	[0.007]	[0.005]	[0.003]	[0.003]	[0.005]	[0.005]	[0.005]	[0.008]
Pop		-1.075***		-1.070***		-1.057***		-1.012***
		[0.363]		[0.180]		[0.180]		[0.184]
Depratio		0.008**		0.008***		0.009***		0.012***
		[0.003]		[0.002]		[0.002]		[0.002]
Life_exp		0.026***		0.026***		0.025***		0.024**
		[0.008]		[0.009]		[0.009]		[0.010]
Educ		0.004		0.005		0.007		0.011**
		[0.004]		[0.004]		[0.004]		[0.005]
Empl_rate		0.002		0.002		0.001		0.000
		[0.004]		[0.003]		[0.003]		[0.003]
GDPpc		-0.219**		-0.220***		-0.224***		-0.234***
		[0.100]		[0.071]		[0.071]		[0.073]
Taxes		-0.008***		-0.008***		-0.009***		-0.011***
		[0.002]		[0.003]		[0.003]		[0.003]
Deficit		-0.022**		-0.022***		-0.024***		-0.028***
		[0.009]		[0.006]		[0.007]		[0.007]
Time FE	yes	yes	yes	yes	yes	yes	yes	yes
Region FE	yes	yes	yes	yes	yes	yes	yes	yes
Observations	260	260	260	260	260	260	260	260
Number of regions	20	20	20	20	20	20	20	20
F test (first stage)			392.7	167.7	91.92	50.47	47.98	22.28
Kleibergen-Paap LM statistic (p-value)			0.00	0.00	0.00	0.00	0.00	0.00
Hansen J statistic (p-value)			0.12	0.20				

Robust standard errors in brackets. *** p<0.01, ** p<0.05, * p<0.1. Constant included but not reported in the table.
Columns (3)-(4): IV strategy based on the use of the second and the third lag of the *IMMIG* variable (Piopiunik and Ruhose, 2017). Columns (5)-(6): IV strategy based on Card (2001).
Columns (7)-(8): IV strategy based on Bianchi *et al.* (2012).

Table 3: Robustness: irregular immigrants, refugees and asylum seekers

Panel A								
Dep Var:	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Log Health Exp pc	OLS	OLS	IV (lag)	IV (lag)	IV (Card, 2001)	IV (Card, 2001)	IV (Bianchi *et al.*, 2012)	IV (Bianchi *et al.*, 2012)
IMMIG	-0.015*	-0.024***	-0.013***	-0.025***	-0.022***	-0.028***	-0.023***	-0.035***
	[0.007]	[0.005]	[0.003]	[0.003]	[0.005]	[0.005]	[0.005]	[0.007]
Controls	yes	yes	yes	yes	yes	yes	yes	yes
Time FE	yes	yes	yes	yes	yes	yes	yes	yes
Region FE	yes	yes	yes	yes	yes	yes	yes	yes
Observations	240	240	240	240	240	240	240	240
Number of regions	20	20	20	20	20	20	20	20
F test (first stage)			351.9	160.4	68.27	36.72	43.51	22.99
Panel B								
Dep Var:	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Log Health Exp pc	OLS	OLS	IV (lag)	IV (lag)	IV (Card, 2001)	IV (Card, 2001)	IV (Bianchi *et al.*, 2012)	IV (Bianchi *et al.*, 2012)
IMMIG	-0.015**	-0.025***	-0.014***	-0.026***	-0.023***	-0.028***	-0.024***	-0.032***
	[0.007]	[0.004]	[0.004]	[0.003]	[0.005]	[0.006]	[0.005]	[0.006]
Controls	yes	yes	yes	yes	yes	yes	yes	yes
Time FE	yes	yes	yes	yes	yes	yes	yes	yes
Region FE	yes	yes	yes	yes	yes	yes	yes	yes
Observations	220	220	220	220	220	220	220	220
Number of regions	20	20	20	20	20	20	20	20
F test (first stage)			308.5	130.5	46.66	24.83	40.25	25.29
Panel C								
Dep Var:	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Log Health Exp pc	OLS	OLS	IV (lag)	IV (lag)	IV (Card, 2001)	IV (Card, 2001)	IV (Bianchi *et al.*, 2012)	IV (Bianchi *et al.*, 2012)
IMMIG	-0.012	-0.023***	-0.010**	-0.024***	-0.019***	-0.031***	-0.021***	-0.037***
	[0.009]	[0.006]	[0.004]	[0.004]	[0.006]	[0.006]	[0.007]	[0.009]
Controls	yes	yes	yes	yes	yes	yes	yes	yes
Time FE	yes	yes	yes	yes	yes	yes	yes	yes
Region FE	yes	yes	yes	yes	yes	yes	yes	yes
Observations	221	221	221	221	221	221	221	221
Number of regions	17	17	17	17	17	17	17	17
F test (first stage)			222.4	137.5	61.30	32.62	29.89	14.75

Robust standard errors in brackets. *** p<0.01, ** p<0.05, * p<0.1. Constant included but not reported in the table.
Columns (3)-(4): IV strategy based on the use of the second and the third lag of the *IMMIG* variable (Piopiunik and Ruhose, 2017). Columns (5)-(6): IV strategy based on Card (2001). Columns (7)-(8): IV strategy based on Bianchi *et al.* (2012).

Table 4: Robustness: Immigrants from countries with strong migration pressure (SMP)

Dep Var: Log Health Exp pc	(1) OLS	(2) OLS	(3) IV (lag)	(4) IV (lag)	(5) IV (Card, 2001)	(6) IV (Card, 2001)	(7) IV (Bianchi *et al.*, 2012)	(8) IV (Bianchi *et al.*, 2012)
IMMIG_SMP	-0.014*	-0.023***	-0.012***	-0.025***	-0.023***	-0.031***	-0.026***	-0.043***
	[0.007]	[0.005]	[0.003]	[0.003]	[0.005]	[0.006]	[0.006]	[0.010]
Pop		-1.093***		-1.084***		-1.066***		-1.023***
		[0.350]		[0.179]		[0.179]		[0.189]
Depratio		0.007**		0.008***		0.009***		0.012***
		[0.003]		[0.002]		[0.002]		[0.002]
Life_exp		0.025***		0.024***		0.023***		0.022**
		[0.008]		[0.009]		[0.009]		[0.010]
Educ		0.004		0.005		0.008*		0.013**
		[0.004]		[0.004]		[0.005]		[0.006]
Empl_rate		0.002		0.002		0.001		-0.000
		[0.004]		[0.003]		[0.003]		[0.003]
GDPpc		-0.225**		-0.228***		-0.237***		-0.252***
		[0.093]		[0.072]		[0.073]		[0.078]
Taxes		-0.008***		-0.009***		-0.010***		-0.013***
		[0.002]		[0.003]		[0.003]		[0.004]
Deficit		-0.020**		-0.021***		-0.023***		-0.027***
		[0.009]		[0.006]		[0.007]		[0.007]
Time FE	yes	yes	yes	yes	yes	yes	yes	yes
Region FE	yes	yes	yes	yes	yes	yes	yes	yes
Observations	260	260	260	260	260	260	260	260
Number of regions	20	20	20	20	20	20	20	20
F test (first stage)			375	165.7	80.75	33.60	45.48	18.48
Kleibergen-Paap LM (p-value)			0.00	0.00	0.00	0.00	0.00	0.00
Hansen J (p-value)			0.11	0.20				

Robust standard errors in brackets. *** p<0.01, ** p<0.05, * p<0.1. Constant included but not reported.
Columns (3)-(4): IV strategy based on the use of the second and the third lag of the *IMMIG_SMP* variable (Piopiunik and Ruhose, 2017).
Columns (5)-(6): IV strategy based on Card (2001). Columns (7)-(8): IV strategy based on Bianchi *et al.* (2012).

Table 5: Robustness: Public health expenditure as a share of GDP

Dep Var:	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Health Exp/GDP	OLS	OLS	IV (lag)	IV (lag)	IV (Card, 2001)	IV (Card, 2001)	IV (Bianchi *et al.*, 2012)	IV (Bianchi *et al.*, 2012)
IMMIG	-0.236**	-0.297***	-0.227***	-0.287***	-0.328***	-0.292***	-0.308***	-0.443***
	[0.083]	[0.055]	[0.039]	[0.035]	[0.049]	[0.043]	[0.055]	[0.077]
Pop		-8.216**		-8.253***		-8.238***		-7.634***
		[3.375]		[1.626]		[1.649]		[1.738]
Depratio		0.053		0.051***		0.052***		0.087***
		[0.033]		[0.018]		[0.019]		[0.023]
Life_exp		0.259***		0.260***		0.260***		0.246**
		[0.070]		[0.090]		[0.090]		[0.098]
Educ		0.069*		0.065**		0.067*		0.133***
		[0.035]		[0.033]		[0.037]		[0.048]
Empl_rate		0.027		0.028		0.028		0.012
		[0.038]		[0.026]		[0.025]		[0.032]
GDPpc		-9.306***		-9.296***		-9.301***		-9.450***
		[0.930]		[0.631]		[0.629]		[0.666]
Taxes		-0.067**		-0.065***		-0.066**		-0.095***
		[0.029]		[0.025]		[0.026]		[0.031]
Deficit		-0.169		-0.165***		-0.167**		-0.224***
		[0.102]		[0.064]		[0.067]		[0.072]
Time FE	yes	yes	yes	yes	yes	yes	yes	yes
Region FE	yes	yes	yes	yes	yes	yes	yes	yes
Observations	260	260	260	260	260	260	260	260
Number of regions	20	20	20	20	20	20	20	20
F test (first stage)			392.7	167.7	91.92	50.47	47.98	22.28
Kleibergen-Paap LM (p-value)			0.00	0.00	0.00	0.00	0.00	0.00
Hansen J (p-value)			0.51	0.29				

Robust standard errors in brackets. *** p<0.01, ** p<0.05, * p<0.1. Constant included but not reported in the table.
Columns (3)-(4): IV strategy based on the use of the second and the third lag of the *IMMIG* variable (Piopiunik and Ruhose, 2017). Columns (5)-(6): IV strategy based on Card (2001).
Columns (7)-(8): IV strategy based on Bianchi *et al.* (2012).

Table 6: Immigrants' composition: gender

Dep Var: Log Health Exp pc	(1) OLS	(2) OLS	(3) IV (lag)	(4) IV (lag)	(5) IV (Card, 2001)	(6) IV (Card, 2001)	(7) IV (Bianchi *et al.*, 2012)	(8) IV (Bianchi *et al.*, 2012)
IMMIG	-0.010*	-0.017***	-0.011***	-0.021***	-0.004	-0.019**	0.000	-0.008
	[0.005]	[0.005]	[0.003]	[0.003]	[0.005]	[0.010]	[0.005]	[0.012]
MALE_share	-0.010***	-0.007***	-0.011***	-0.008***	-0.015***	-0.003	-0.018***	-0.010**
	[0.002]	[0.002]	[0.002]	[0.002]	[0.004]	[0.004]	[0.004]	[0.004]
Pop		-0.981***		-0.940***		-1.033***		-0.950***
		[0.241]		[0.159]		[0.176]		[0.157]
Depratio		0.005*		0.006***		0.006*		0.003
		[0.003]		[0.002]		[0.003]		[0.004]
Life_exp		0.024**		0.023**		0.025***		0.023**
		[0.009]		[0.009]		[0.009]		[0.009]
Educ		0.002		0.004		0.003		-0.002
		[0.005]		[0.004]		[0.005]		[0.006]
Empl_rate		0.003		0.002		0.002		0.004
		[0.004]		[0.003]		[0.002]		[0.003]
GDPpc		-0.188**		-0.187***		-0.202***		-0.166**
		[0.073]		[0.068]		[0.077]		[0.076]
Taxes		-0.007***		-0.008***		-0.007**		-0.005
		[0.002]		[0.003]		[0.003]		[0.004]
Deficit		-0.018**		-0.020***		-0.020***		-0.015*
		[0.009]		[0.006]		[0.007]		[0.008]
Time FE	yes	yes	yes	yes	yes	yes	yes	yes
Region FE	yes	yes	yes	yes	yes	yes	yes	yes
Observations	260	260	260	260	260	260	260	260
Number of regions	20	20	20	20	20	20	20	20
F test *IMMIG*			214.54	108.02	54.22	22.03	31.26	9.76
F test *MALE_share*			30.01	39.04	80.99	52.72	25.77	48.53
Kleibergen-Paap LM (p-value)			0.00	0.00	0.01	0.01	0.00	0.00

Robust standard errors in brackets. *** p<0.01, ** p<0.05, * p<0.1. Constant included but not reported in the table.
Columns (3)-(4): IV strategy based on the use of the second and the third lag of the *IMMIG* and *MALE_share* variables (Piopiunik and Ruhose, 2017).
Columns (5)-(6): IV strategy based on Card (2001). Columns (7)-(8): IV strategy based on Bianchi *et al.* (2012).

Table 7: Immigrants' composition: age

Dep Var: Log Health Exp pc	(1) OLS	(2) OLS	(3) IV (lag)	(4) IV (lag)	(5) IV (Card, 2001)	(6) IV (Card, 2001)
$IMMIG$	-0.018**	-0.021***	-0.040**	-0.050**	-0.025***	-0.023***
	[0.008]	[0.006]	[0.018]	[0.025]	[0.004]	[0.005]
$WORKAGE\_share$	-0.013*	-0.007	-0.075**	-0.075	-0.039***	-0.022**
	[0.006]	[0.005]	[0.038]	[0.048]	[0.010]	[0.011]
$GDPpc$		-0.311**		-0.496***		-0.304***
		[0.115]		[0.155]		[0.077]
Pop		-0.896**		0.390		-0.703***
		[0.335]		[0.753]		[0.232]
$Life\_exp$		0.026***		0.013		0.020**
		[0.008]		[0.020]		[0.009]
$Educ$		0.003		0.004		0.002
		[0.004]		[0.005]		[0.004]
$Empl\_rate$		0.004		0.014		0.005*
		[0.004]		[0.008]		[0.003]
$Taxes$		-0.011***		-0.011***		-0.009***
		[0.003]		[0.004]		[0.003]
$Deficit$		-0.026**		-0.038***		-0.025***
		[0.011]		[0.015]		[0.007]
Observations	260	260	220	220	260	260
Number of regions	20	20	20	20	20	20
F test $IMMIG$			242.14	121.79	184.24	169.48
F test $WORKAGE\_share$			14.06	16.85	19.95	16.29
Kleibergen-Paap LM (p-value)			0.00	0.02	0.00	0.00

Robust standard errors in brackets. *** p<0.01, ** p<0.05, * p<0.1. Constant included but not reported in the table. Columns (3)-(4): IV strategy based on the use of second and third lag of the $IMMIG$ and $WORKAGE\_share$ variables (Piopiunik and Ruhose, 2017). Columns (5)-(6): IV strategy based on Card (2001).

Table 8: Immigrants and the health sector supply

Dep Var:	General practitioners per 10,000 inhabit.		General practitioners > 1,500 patients		Emergency doctors	
	(1)	(2)	(3)	(4)	(5)	(6)
$IMMIG$	-0.130***	-0.108***	2.595***	2.230***	0.033**	0.037***
	[0.031]	[0.028]	[0.441]	[0.418]	[0.014]	[0.014]
Time FE	yes	yes	yes	yes	yes	yes
Region FE	yes	yes	yes	yes	yes	yes
Observations	220	220	220	220	220	220
Number of regions	20	20	20	20	20	20
F test	46.66	40.25	46.66	40.25	46.66	40.25
Kl.-Paap LM statistic (p-val)	0.00	0.00	0.00	0.00	0.00	0.00

Robust standard errors in brackets. *** p<0.01, ** p<0.05, * p<0.1. Constant included but not reported in the table. Dependent variables are available only for the period 2003–2013 . Columns (1),(3),(5): IV strategy based on Card (2001). Columns (2),(4),(6): IV strategy based on Bianchi *et al.* (2012).