STOCKHOLM SCHOOL OF ECONOMICS
Department of Economics
5350 Master's thesis in economics
Academic year 2018–2019

Migration and Health Care Utilization:
An Empirical Analysis of the Impact of Migrants on Hospital Congestion in Italy.

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Abstract: The effect of migrants on public health care in the host country is an important component of the economic and political discourse about immigration. Lack of familiarity with the healthcare system and systematically different health status may drive patients of foreign origins to crowd medical facilities, affecting the quality of service provision. Using a Difference-in-Differences fixed effect model, this paper investigates whether province-level migration in Italy creates congestion in the treatment delivery, measured by the number of visits to emergency rooms, hospitalizations and utilization of hospital beds. To alleviate the concerns of omitted variable bias, the paper further adopts an IV strategy based on a spatial allocation model of migrants' penetration. After assessing the robustness of the results, the paper concludes that, *ceteris paribus*, migration has a negligible impact on overcrowding in health care. No effect on emergency departments and beds' utilization is detected, while a slight increase in hospitalizations cannot be excluded. Based on the empirical evidence, policies aimed to strengthen migrants' knowledge of the healthcare system, while possibly enhancing the wellbeing of this category of users, would have limited impact on overall resource utilization.

Keywords: Government Policy, Regulation, Public Health, Health Behaviour, International Migration

JEL: I180 I120 F22 O15

Supervisor: Abhijeet Singh
Date submitted: 13th May 2019
Date examined: 24th May 2019
Discussant: Rowan Kurtz
Examiner: Mark Sanctuary

Acknowledgements

I wish to thank my supervisor, Professor Abhijeet Singh, Stockholm School of Economics, who consistently encouraged me to work independently on this project, while providing precious feedback and relevant comments to steer me in the right direction.

I am grateful to all the contributors of this paper, notably to Professor Martina Björkman Nyqvist, Stockholm School of Economics, Professor Milo Bianchi, Toulouse School of Economics, Professor Paolo Buonanno, University of Bergamo, and Professor Paolo Pinotti, Bocconi University and Banca d'Italia, for sharing precious comments and data sources. In addition, I thank Dr. Alessio Menonna, Researcher at ISMU Foundation, and to Professor Giancarlo Blangiardo, University of Milan Bicocca, for providing estimates on irregular migrants.

I would also like to acknowledge Mr. Rowan Kurtz as the second reader of this thesis, and I am gratefully indebted to him for his very valuable comments on this thesis. In addition, I wish to thank him for the time spent together in these last two years.
Finally, I must express my very profound gratitude to my parents, for providing me with unfailing support throughout my graduate studies. This achievement would not have been possible without them.

Original data, dataset aggregation code, and empirical analysis are available at `https://sites.google.com/view/jacopolunghi`. All errors are the author's responsibility.

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List of Abbreviations

AC	Acute Treatment (*Degenza per acuti*)
AGENAS	Italian National Agency for Regional Healthcare Services (*Agenzia Nazionale per i servizi sanitari Regionali*)
AIOP	Italian Association for Private Hospital Activities (*Associazione Italiana Ospedalità Privata*)
ASL	Health Management Association (*Azienda Sanitaria Locale*)
Censis	Research Centre for Social Investments (*Centro Studi Investimenti Sociali*)
CUP	Central Reservation System (*Centro Unico di Prenotazione*)
DID	Difference-in-Differences
D.l.	Decree-Law (*Decreto Legge*)
DPCM	Prime Ministerial Decree (*Decreto del Presidente del Consiglio dei Ministri*)
DST	Statistics Denmark (*Danmarks Statistik*)
EHIC	European Health Insurance Card
ER	Emergency Room
EU	European Union
GP	General Practitioner
HFA	Health For All
IRPEF	Personal Income Tax (*Imposta sul Reddito delle Persone Fisiche*)
ISMU	Initiatives and Studies on Multiethnicity (*Iniziative e Studi sulla Multietnicità*)
ISTAT	Italian National Institute of Statistics (*Istituto Nazionale di Statistica*)
ITU	Instensive Treatment Units (*Reparti di Terapia Intensiva*)
IV	Instrumental Variable
LDC	Least Developed Country
LTC	Long Term Care (*Lungodegenza*)
NHS	National Healthcare System (*Sistema Sanitario Nazionale*)
OLS	Ordinary Least Squares
OSF	Official Statistics Finland
SCB	Statistics Sweden (*Statistiska centralbyrån*)
UNHCR	United Nations Higher Commissioner for Refugees
WHO	World Health Organization
2SLS	Two-stage Least Squares

1 Introduction

The implications of immigration for the host country are an increasingly controversial topic in Europe. Among the numerous factors that enter the political and economic discussion, the effect of migrants on the healthcare system deserves special attention. Migratory flows may impose considerable challenges to the sustainability and efficient organization of treatment delivery. Firstly, the booming number of users could create bottlenecks in service utilization and imply a negative fiscal impact for natives. Secondly, migrants are often considered a vulnerable group with regards to medical provision (European Parliament, 2010), as their access to health care may be restrained by limited language proficiency or immigration status (Derose et al., 2007). Unfamiliarity with the country's patient pathway (i.e. the route followed by a patient from the first contact through the completion of treatment) could also drive heterogeneity in utilization: foreign residents may heavily (and sometimes improperly) recur to only some specific medical facilities, creating inefficiencies and impinging the quality of service provision.

While the correct approach to manage migration in a sustainable fashion is subjected to tense discussion all over Europe, the case of Italy offers a striking example of the importance of this topic in a political and economic perspective. Immigration to the country has been increasing steadily during the last decades. The number of current residence permits at the beginning of each year has mounted from roughly 750,000 in 1992 to almost 4 million in 2014[1]. Migratory influxes originated from a variety of countries, as multiple economic and geopolitical factors, including the collapse of Soviet Union and ex-Yugoslavia, the political turmoil in North and West Africa, and the economic growth of densely populated Asian countries, contributed to enhance the attractiveness of Italy in the eyes of migrants (Colombo & Sciortino, 2004). In most recent years, instability in Africa and the Middle East has sparked massive displacement across the Mediterranean. Due to its strategic geographical location, Italy – together with Spain and Greece – has become a crossroads of new migratory routes: in 2016, more than 180,000 between asylum seekers and refugees have approached the Italian borders[2]. Unprecedented migratory flows, in turn, have helped to broaden the electoral consensus around parties supporting anti-immigration sentiment, such as Northern League (*Lega Nord*) (Van Spanje, 2010; Albertazzi et al., 2018).

In close connection to the economic and political debate in the country, this paper analyzes whether immigration in the last decade has had an appreciable impact on the Italian healthcare system. I approach this complex question by focusing on separate aspects of migrants' demand of health care. Firstly, I empirically investigate the relationship between migration and the number of visits to emergency rooms (henceforth ERs). As foreign residents might face distortions in access to medical consultation, they may turn to emergency departments as a source of routine sick care, increasing waiting time and potentially implying additional costs of treatment. Secondly, I estimate the effect of immigration on hospitalizations and the usage rate of hospital beds. Positive evidence in this direction may entail that the Italian healthcare system is not adequately responding to the pressure imposed by new arrivals. As such, this paper addresses the question of whether immigration leads to hospital congestion in health care in Italy.

To shed light on this controversial issue, I construct a panel dataset of 103 Italian provinces between 2004 and 2014, using the number of valid residence permits at the beginning of each year as a measure of immigration. The baseline specification comprises of a Difference-in-Differences (henceforth DID) fixed-effects panel data regression analysis. Moreover, to remove the concern of residual bias generated by unobserved determinants of migratory inflows that could also influence ER visits and hospitalizations, I propose a spatial allocation model that draws from the work of Bianchi et al. (2012). I use foreign resident population in 2003 to predict settlements of incoming migrants in the following years, and conduct a 2SLS regression, instrumenting actual residence permits with their model-recomputed value. I show the robustness of the results to an alternative IV specification, which relaxes the assumption of independence between province-specific characteristic and migration to the entire country, as well as to the exclusion of Southern provinces.

After addressing causality concerns, I find no impact of immigration on ER visits and a positive, despite contained and non-uniform, effect on hospitalizations. The relationship between migratory flows

[1] Source: ISTAT (author's elaboration).
[2] Source: UNHCR - Italy Sea Arrivals Dashboard.

and the rate of beds utilization is similarly somewhat positive, but highly unstable and economically small throughout the specifications. To complement these results and provide further insights for policy evaluation, I assess whether the effect is heterogeneous across migrants' countries of origin, and I show positive but scattered evidence that migration leads to a higher probability that ER visits result in hospital admission, despite the magnitude of this effect is again limited. Finally, I find no variation in utilization of hospital beds across medical facilities and departments of different kind. Overall, these results suggest a negligible impact of migration on congestion in health care, and nuance the claim that migrants are a primary concern for health authorities in Italy. Additionally, without denying that policies tailored to strengthen familiarity of foreign-born patients with the healthcare system may enhance their health and satisfaction, the findings hint that the overall impact on utilization and efficiency is rather limited.

The paper relates to the literature on the healthcare usage among immigrants (Antón & De Bustillo, 2010; Solé-Auró et al., 2012), with particular reference to the different propensity of migrants and natives to visit the ER (Halfon et al., 1996; Mahmoud & Hou, 2012; Tarraf et al., 2014). In addition, the paper connects to the research on the effects of immigrants on various characteristics of the host country and society, such as labor market and wage competition (Altonji & Card, 1991; Card, 2001; Borjas, 2005), fiscal policy (Auerbach & Oreopoulos, 1999; Storesletten, 2000; Rowthorn, 2008), and criminality (Reid et al., 2005; Bianchi et al., 2012; Nunziata, 2015). With regards to the Italian case, previous studies have investigated the patterns in utilization of healthcare services by migrants in Italy. Using survey data from 2004/2005, De Luca et al. (2013) show that immigrants have a higher probability of visiting ERs, whereas Baglio et al. (2010) find that discrepancies in utilization are mainly driven by injuries for males and abortion or childbirth acute for females. By asking whether migratory inflows and heterogeneity in treatment demand determine overcrowding in medical facilities in the country, this paper contributes to the literature in two ways. Primarily, it adds to the economic and political discussion concerning the real effects of migration on the Italian economy. Furthermore, the paper explores whether the presence of migrants, together with their peculiar utilization of hospital facilities relative to the natives, can induce congestion in health care and, if any, which treatment areas are mostly affected. In doing so, the paper provides relevant considerations for future policy interventions in the healthcare system.

The remainder of this paper is organized as follows: after briefly describing the Italian migration policy and healthcare system, Section 2 reviews the existing literature on the differences in healthcare utilization between migrants and natives. Section 3 describes the data and shows the trends in immigration and healthcare utilization in the country. Section 4 illustrates the baseline DID fixed-effects specification and presents the estimation results. As unobserved factors may bias the coefficients of interest, Section 5 explains and shows the results of the IV strategy based on a spatial allocation model of migrants' penetration. Section 6 explores the robustness of the findings, while Section 7 adds useful insights for policy purposes. The implications for the Italian healthcare system are thoroughly discussed in Section 8, and some caveats and limitations to the analysis are listed in Section 9. Finally, Section 10 concludes.

2 Country Background and Literature Review

2.1 The Italian migration policy

Migration policy in Italy is rooted on the residence permit, a document that certifies the right of foreigners to stay in the country. Non-EU nationals that intend to settle in Italy need to request a certificate within 8 days from arrival, providing justification for their application [3]. This requirement is waived for EU citizens, which can reside in Italy without a valid residence permit for a period up to 90 days. Moreover, the document has usually a validity between three months and two years, after which it requires renewal. Alternatively, conditional on the compliance with relevant criteria[4], a residence permit can be converted into a permanent residence certificate. At this stage, foreigners become part of the Italian resident population and stop counting as migrants[5].

[3] Residence permits are currently issued for working, studying and family reunification reasons.

[4] For specific reference, see D.Lgs 286/1998 and Law D.L. 93/2013.

[5] Foreign-born migrants obtaining a permanent residence certificate are still counted as foreign population residing steadily in the country.

2.2 The National Healthcare System

Health care constitutes a major component of the Italian welfare state; health expenditure in 2012 accounted for roughly 9.2% of GDP (Ferré et al., 2014). The National Health Service (henceforth NHS) provides universal coverage to citizens, while being largely publicly funded. Around 70% is financed through taxation, with only a minor share of private and insurance companies disbursement (France & Taroni, 2005)[6]. Being mostly tax-based, public health care is primarily free of charge at the point of service. Occasionally, treatment is conditional on the payment of a prescription charge, but the price usually incorporates governmental subsidies.

Medical assistance is delivered through a network of population-based Health Management Organizations (*Azienda Sanitaria Locale*, ASL), as well as through accredited public and private hospitals. The latter can levy a premium price for the provision of luxury services (private rooms, television etc.), but medical treatment is subjected to identical charge as in public facilities. In 2013, the NHS counted 1,135 accredited structures, evenly distributed between public (49.43%) and private (50.57%) [7]. Alternatively, health care is supplied by non-accredited hospitals that operate outside the NHS and can freely determine the price of treatment. Their relative weight in the Italian healthcare system is rather limited: inferring from the list of member hospitals of the Italian Association for Private Hospital Activities (*Associazioni Italiana Ospedalità Privata*, AIOP), they account for around 3% of the overall capacity, measured in availability of hospital beds (AIOP, 2016).

While the objectives and principles of the NHS are defined at national level, the system has experienced progressive decentralization in favor of the 20 regional health departments, which are responsible for service delivery in the respective area (Cappellaro et al., 2009). The reforms towards regionalization of health care aimed to improve efficiency by optimizing the allocation of resources, as these have become progressively scarcer in recent years. Indeed, after the adoption of spending review programs, financing public health care in Italy has been increasingly troublesome: despite the historically high position of the Italian NHS in international rankings (WHO, 2000), more than a decade of economic stagnation and a large stock of public debt have put significant pressure on welfare provision (Ferré et al., 2014). In 2011, household survey data retrieved from De Belvis et al. (2012) shows that 21% of families were forced to decrease health-related purchases in response to the negative income shock triggered by the financial crisis, while 10% had to postpone surgical treatments.

Focusing on the functioning of the NHS, all registered individuals are assigned to a General Practitioner (*Medico di Medicina Generale*, henceforth GP)[8]. GPs serve as gatekeepers, providing either prescriptions for minor medical conditions or necessary referral to access healthcare specialists in case of specific symptoms. To minimize waiting lists, visits are managed through a central reservation system (*Centro Unico di Prenotazione*, CUP). Only after consultation with a specialist practitioner, patients in need can be hospitalized in a facility of their choice. However, hospital admission can also occur through emergency departments, when the subject visiting the ER is found in severe conditions, that require prolonged monitoring. In this case, the patient is temporarily allocated in Intensive and Sub-intensive Treatment Units (*Reparti di terapia intensiva*, ITU), and redirected to the competent department in a second stage. As such, ERs can constitute an alternative access path to non-urgent hospital treatment and can serve to bypass the conventional pathway. However, between 2004 and 2014, only around 16% of visits led to hospitalization[9]. Most patients received instead instant treatment, or have been redirected to a specialist after the visit.

To prioritize patients in need of urgent care, emergency departments classify visits using a 4-tones colour scale, from red (maximum priority) to white (non-urgent). Following the budget law of 2007[10], code-white ER visits are subject to a compensation in most regions, in the attempt to disincentive improper use of the facilities. However, as the fee is levied by regional governments, significant heterogeneity persists across regions, with regards both to the price charged and the categories of users exempted from

[6] For a complete analysis of the progression of healthcare system in recent years, see Donatini et al. (2001).
[7] Source: Ministry of Health.
[8] A detailed description of Italy's patient pathway is found in Ferré et al. (2014).
[9] Source: Health For All Italia (author's elaboration).
[10] See Law 296/2006.

payment (e.g. minors, individuals with no income etc.)[11].

Finally, considering the role of migration for the Italian NHS, it is worth noticing that, in accordance with the principles of equity and universalism in access, legal immigrants with regular inscription to the NHS receive full healthcare coverage and have the same rights of Italian citizens[12]. In addition, a limited range of services, including treatment for pregnant women and minors, as well as international prophylaxis and prevention of infectious diseases, are also available for illegal residents[13]. Registration to the NHS is compulsory for Italian citizens and documented migrants who are regularly employed in the country. Immigrants free of legal obligations can still apply for inscription, conditional on the payment of an annual fee[14].

After providing the necessary background to understand the analysis conducted in this paper, the next section reviews the literature about the perceived threats to healthcare provision implied by migration, as well as the channels through which immigrants may have an impact on the healthcare system of the host country.

2.3 Impact of migrants on health care: a multifaceted question

The existence of a contradiction between the closed nature of the welfare state and the inevitable thinning of countries' borders has been long debated in the literature (Freeman, 1986; Mau & Burkhardt, 2009). The perceived impact on the welfare system is often recognized as one of the most common factors driving hostility towards migrants by the extensive research examining the roots of anti-immigration sentiment (e.g. Mayda, 2006; Semyonov et al., 2006; Hainmueller & Hiscox, 2010). With specific regards to health care, aside from the strongly politically-loaded content that is advanced to justify strict border controls (Rechel et al., 2013), newcomers may be thought to affect medical services especially if they diverge significantly from the native population. For instance, comparatively low-educated immigrants with high fertility rates can constitute a net cost for the healthcare system, by causing the demand for treatment to grow while generating limited public revenues (Lee & Miller, 2000). Also, fast-growing inflows of migrants, who might also tend to concentrate in small geographic areas (Evans, 1987), may outpace the speed of adjustment in the capacity of medical facilities, creating serious bottlenecks.

While these could appear as immediate and possibly unsophisticated concerns, hospital congestion could arise from migratory flows because of heterogeneity in healthcare utilization between migrants and natives. In other words, even under the assumption of no effect of migration on the extensive margin of treatment delivery (i.e. a simply higher number of users for unaltered resources), immigrants may still have an impact on the intensive margin, that is, by disproportionately recurring to a limited range of medical services. As such, the research exploring the patterns of healthcare usage by the immigrant population in Western countries offers an essential background to the analysis conducted in this paper. Notwithstanding the complexities involved in examining an individual's health sphere (treatment need and physical perception are notably two subjective measures), this topic has been widely analysed in the literature. At least two major reflections have led the discussion on why, and to what extent, natives and migrants may constitute two different categories of patients.

Firstly, foreign residents may seek medical consultation outside the correct procedure traced by the patient pathway, due to misinterpretation or lack of familiarity with it. More specifically, previous research illustrates the tendency of migrants to visit ERs more frequently than natives (Norredam et al., 2009). Such trend has been identified across different settings and several countries in Europe. The studies diverge when trying to associate this phenomenon with specific economic and social characteristics of immigrants: Norredam et al. (2004) find that higher usage rate of ERs in Denmark is associated with foreigners from Somalia, Turkey and ex-Yugoslavia, while research on the Spanish healthcare system finds positive evidence associated to immigrants from either low-income (Rué et al., 2008) or high-income countries (Cots et al., 2007). With specific reference to Italy, using data from the Italian Health Conditions Survey, De Luca et al. (2013) estimate a higher probability of first- and second-generation

[11] The amount and the conditionalities of the fee levied in each region are monitored by the Italian National Agency for Regional Healthcare Services (AGENAS).

[12] EU nationals in Italy for a period of no more than 90 days holding an European Health Insurance Card (EHIC) can receive free-of-charge treatment without NHS inscription.

[13] See DPCM of 12.01.2017.

[14] Source: Ministry of the Interior.

migrants to visit ERs. Despite positive evidence, the result is not universally validated: Hargreaves et al. (2006) find no difference in the mode of access to hospital services in UK, notwithstanding lower probability of non-natives to have GP registration.

Disproportionate usage of ERs is often explained by access barriers to other forms of treatment, either at provider or at patient level. In other words, limited acquaintance with the country's healthcare system (Leduc & Proulx, 2004; Cots et al., 2007), in addition to sociocultural and language diversity (Dyhr et al., 2007) are mostly invoked to justify the propensity to seek medical consultation at emergency departments rather than through GPs and specialists. A main concern associating with this phenomenon is that non-compliance with the correct procedures dictated by the patient pathway could imply considerable distortions in service provision. For example, scarce communication with GPs may increase the frequency of unnecessary code-white visits, as immigrants refer to ERs as sources of routine sick care. Indeed, individuals of foreign origins have been associated with non-urgent use of emergency departments, (Halfon et al., 1996; Lang et al., 1996; Ballotari et al., 2013) but the evidence is not conclusive (David et al., 2006). Notwithstanding minor discrepancies, code-white visits are often classified as inappropriate utilization (O'Brien et al., 1996; Sempere-Selva et al., 2001) and, in turn, are expected to negatively affect quality and efficiency of treatment delivery (Mygind et al., 2008).

Peculiarly, limited understanding of the healthcare system may increase ER visits for completely opposite reasons. By failing to receive adequate preventive healthcare from GPs and specialists, migrants may neglect early signals of illness, and visit ERs in highly severe conditions (Farchi et al., 2005; Ballotari et al., 2013). Even this scenario would impose efficiency constraints: observance of the correct patient pathway could allow to better plan hospitalizations and improve patients' allocation.

A second source of heterogeneity between migrants and natives emerging in the literature is that these two groups may not be comparable in terms of overall health status; the former could be systematically sicker or healthier than the latter and, in turn, may need hospital care more or less frequently. However, evidence of different utilization patterns of hospital departments other than ERs is rather mixed. Research has suggested that immigrants may have a relatively lower treatment demand, according to what is known as the "healthy immigrant effect" (McDonald & Kennedy, 2004; Newbold, 2005). The argument goes as follows: under the assumption of existing fixed costs of immigration, following a process of self-selection, newcomers are expected to be in good physical conditions and financially wealthy. Moreover, outside maternity and pediatric wards, migrants may have lower needs of hospitalization, being on average younger than the native population. Evidence of the "healthy immigrant effect" has been previously documented in Canada (Chen et al., 1996), the United States (Stephen et al., 1994), and Europe (Constant et al., 2018). Other studies, however, have argued that the effect may vary depending on the host country. Moullan and Jusot (2014) show that individuals of foreign origin have better health status than natives in Italy, but worse in France, Belgium and Spain. Comparatively better health of immigrants may logically translate into fewer hospitalization admissions. Indeed, a paper by Cacciani et al. (2006) finds lower hospitalization rates of immigrants from LDCs in the Italian region of Lazio, despite the trend is reversed in case of infectious diseases or deliveries and induced abortions.

The existence of an "healthy immigrant effect" is not widely accepted in the literature. Contradictory evidence of migrants suffering from worse health conditions has been observed in different settings (Solé-Auró et al., 2012; Constant et al., 2018). Particularly, considering the case of immigration from LDCs and developing economies to Europe, the disease environment in the home country may contribute to explain systematic sickness among foreign-born patients. For instance, research has progressively examined the link between migration and infectious disease spreading, recognizing higher incidence of contagion among adult and young foreign residents, especially originating from West and Sub-Saharan Africa (Huerga & Lopez-Velez, 2002; Venters & Gany, 2011) and Latin America (Monge-Maillo et al., 2009). Accordingly, the immigrant population has been sometimes associated with higher rates of hospitalization (Carrasco-Garrido et al., 2007).

As it appears in this section, a variety of mechanisms may underlie either over- or underutilization of the healthcare system by immigrants in Italy. Understanding which of these forces dominate over the others, and under which conditions, goes beyond the scope of this research. Indeed, this paper neither denies nor confirms the presence of the aforementioned dynamics at individual level, but rather tries to assess the effect of these conjoint forces on the utilization of medical facilities at country level. By studying the effect of migration on the number of ER visits, hospitalizations and usage rate of hospital beds, the paper aims to investigate the existence of bottlenecks in Italian hospitals that could be primarily imputable to migrants. This, in turn, allows to give a more solid empirical foundation to the discussion about the potential threats of migration, and to explore the impact of policy interventions in the NHS.

With these objectives in mind, the next section describes the sources and the characteristics of the data employed, and depicts the main trends in the variables of interest.

3 Data and Model Specification

In this paper, I assembled data on immigration, ER visits and hospitalizations for a panel of Italian provinces in the period from 2004 to 2014. The Italian administrative system is organized into regions, which are further disaggregated into provinces. These last geographical entities are comparable to TS3 geographical units as defined by the OECD[15].

Starting from a value 103 in 2004, the number of provinces in the dataset rises to 110 by the end of the panel, following two reorganizations of provincial administrative boundaries. As this may affect comparability in some of the measures (e.g. in the number of residence permits issued in each province), I restore balance in the panel by recomputing the value of all variables for the original set of 103 provinces. I explain the methodology behind the calculation in Appendix (Section A.I)[16].

The statistics on immigration are retrieved from the Italian National Institute of Statistics (ISTAT). I use valid residence permits on 1st January each year as a measure of yearly immigration in the country[17]; the series is produced drawing from the national repository of the Ministry of the Interior, and it presents two main complexities. Firstly, the procedure to collect statistics on residence permits in Italy has undergone important modifications throughout the panel period, following the adoption of new European regulation in 2007. Under specific conditions, heterogeneity in the dataset could add noise to the estimates. Section A.I in Appendix describes in detail the novelties implied by the regulation, while arguing that both the consistency of the effect across different specifications and the peculiar nature of the changes help to alleviate the concern of erratic results. Secondly, this approach inevitably neglects the presence of migrants that reside in Italy without valid documentation. As correlation between illegal immigrants and healthcare utilization could bias the estimated impact of immigration on hospital congestion, I argue about undocumented migration in Section 6.

With regards to the measures of congestion and utilization of healthcare services, I access the WHO's *Health for All* (henceforth HFA) database, which reports health-related statistics and essential indicators for all WHO European Region member states. The individual dataset for Italy[18] is assembled by the Ministry of Health through the aggregation of hospital discharge forms (*Scheda di dimissione ospedaliera*). A publicly available version is again provided by ISTAT. In addition to data about the number of visits to the ER, hospitalizations and utilization of hospital beds at province level, the HFA dataset contains information on several characteristics of the population, as well as health conditions, mortality, disease environment and healthcare resource management.

At this stage, it is important to clarify that all measures of hospital congestion are computed over the full population, hence including both native- and foreign-born residents. This approach partially differs from the existing research on the topic which, focusing primarily on the individual experience at medical facilities, has tried to pinpoint a large number of patient's characteristics (including nationality), in order to explain utilization behaviour. Indeed, this methodology does not allow to study how native Italians reacted to migratory inflows[19], but rather contributes to render a comprehensive picture of the situation in the country, and to clarify whether or not migration is a pivotal concern to be addressed by authorities in the healthcare sector.

[15] Source: The OECD Regional database.

[16] To alleviate the concerns that this transformation may affect the results, I repeat the estimations excluding all the provinces that are affected by the administrative reorganizations. The results are reported in Appendix, and only minor changes are depicted (Section A.I and Section A.V, Table A.V.1).

[17] This approach does not consider any difference in immigration status other than that existing between permanently foreign resident and immigrant population.

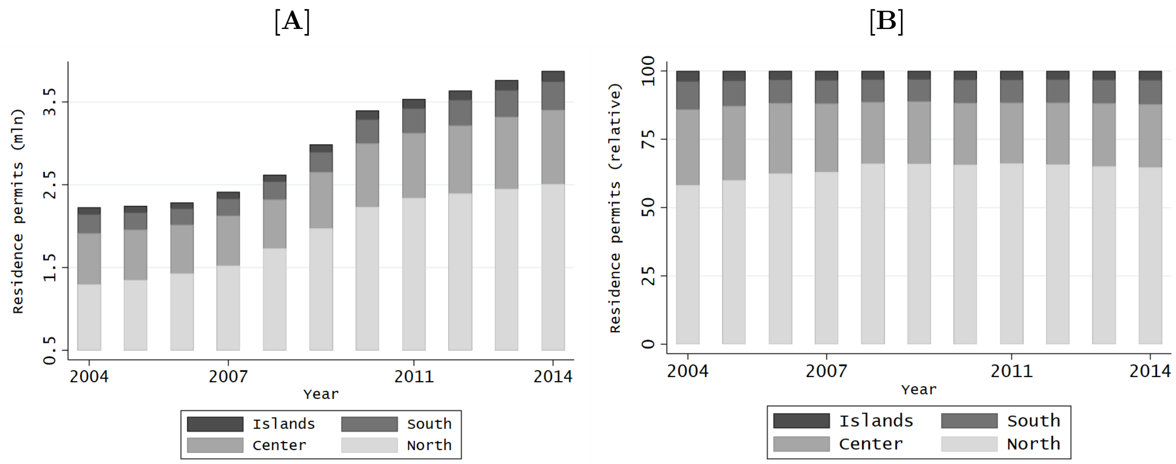
[18] Health For All – Italia.

[19] More about the caveats and limitations to the analysis is argued in Section 9.

3.1 Migratory flows in Italy

The number of residence permits with validity on 1st January is increasing steadily from 2004 (Figure 1, Panel [A]), reaching a peak slightly below 4 million units in 2014 (roughly 6.5% of the resident population). Panel [B] reports instead the distribution of residence permits in the four major Italian macro-regions[20]. It clearly emerges that, despite Northern and Central regions absorb the highest share of migrants (between 80% and 90%), the geographic dissemination of residence permits remains relatively stable throughout the panel, with only a partial redistribution from the Centre to the North.

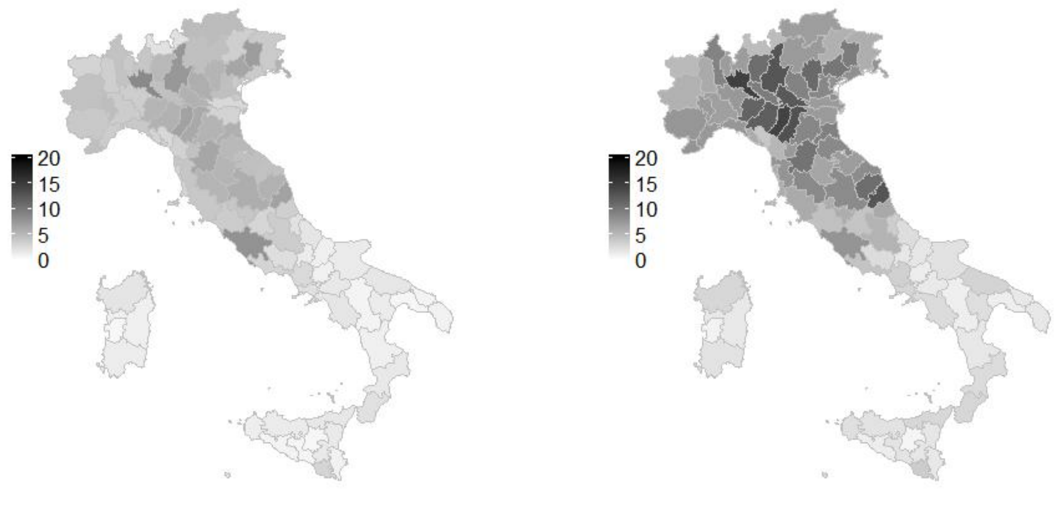
Figure 1: Valid residence permits in Italy, 2004-2014



Notes: Panel [A] depicts the number of valid residence permits (in million of units) issued in Italy throughout the panel year, by areas. Panel [B] shows the relative distribution of valid residence permits across areas. The single provinces included in each area are reported in Appendix (Section A.II, Table A.II.1).
Source: author's rendering on ISTAT data.

The attractiveness of North Italy for migrants is confirmed by looking at the number of residence permits per 100 inhabitants in each province (Figure 2).

Figure 2: Residence permits distribution across Italian provinces, 2004-2014



(a) 2004 **(b)** 2014

Notes: The figure reports the number of valid residence permits per 100 inhabitants across provinces, at the beginning (a) and at the end of the panel (b).
Source: author's rendering on ISTAT data.

[20]Geographic clustering of Italian provinces is described in Appendix (Section A.II, Table A.II.1).

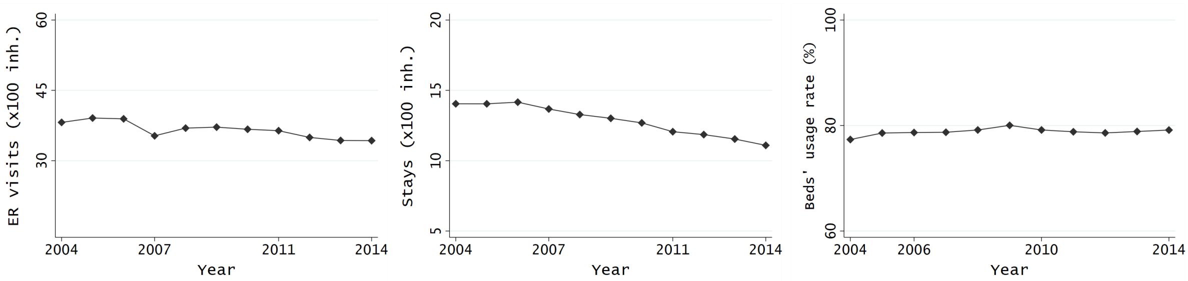
Migration is concentrated particularly in the Lombardy and Emilia-Romagna regions, being these the wealthiest and most industrialized, which can offer better placement in the labour market (Ambrosini, 2013). The North-South cleavage appears even more clearly towards the end of the panel period.

3.2 Indicators of healthcare utilization

Emergency departments constitute a remarkable source of treatment for patients in Italy: in 2004, the average number of visits per 100 inhabitants $\left(\frac{Visits}{P} * 100\right)$ across provinces is around 38.16, declining slightly to roughly 34.3 in 2014 (Figure 3). It is important to notice that this figure does not reflect exactly the share of the population who visited the ER in each period, as one patient could turn to emergency services multiple times in a year.

After being relatively stable around 14 during the first years, also the average number of hospitalizations per 100 inhabitants across provinces $\left(\frac{Hospitalizations}{P} * 100\right)$ decreases steadily, hitting a bottom value slightly above 10 in 2014 (Panel (b)). The falling trend hardly reflects any improvement in the wellbeing of the entire population. Most likely, it can be explained by the reduced capacity of Italian hospitals imposed by progressive spending reviews[21]. This dynamic contributes to justify the inclusion of the third regressand: hospitalizations may not respond to immigration simply because hospitals do not have enough capacity to admit further patients. However, this should reflect in the usage rate of hospital beds. The indicator is defined as the percent ratio between the actual and potential days of hospitalization in aggregate terms $\left(\frac{Days}{Days_{potential}} * 100\right)$. This latter measure is obtained by multiplying the number of available beds in each department by the days in which that department has been active in the year (365 or 366 for an uninterrupted yearly service). As such, the index is an approximation for the capacity at which hospitals are functioning at province level. Looking at Panel (c), despite the contraction in hospital admissions, beds' usage sets around 80% along the entire period. The only slight peak occurs between 2007 and 2009, which could reveal a temporary shortage of resources following the climax of the financial crisis.

Figure 3: Trends in the main outcome variables, 2004-2014



(a) Visits to the ER **(b)** Hospital stays **(c)** Beds' usage rate

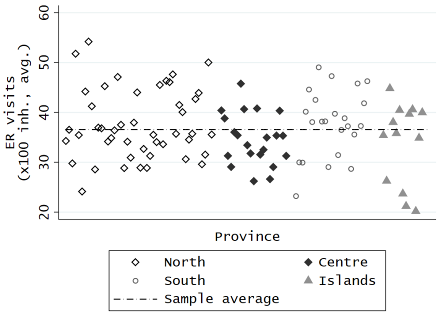
Notes: The figure reports the trend in the average number of ER visits per 100 inhabitants (a), hospitalizations per 100 inhabitants (b) and utilization rate of hospital beds (c) in Italy throughout the panel years.
Source: author's rendering on HFA Italy data.

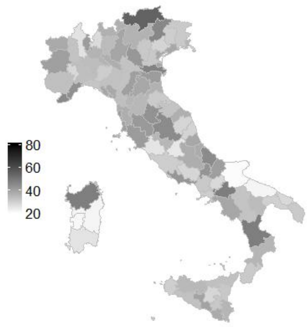
Conversely, the situation across provinces hardly shows any obvious pattern (Figure 4). Panel (a) plots the variation of the 2004-2014 average of the aforementioned variables. The graph shows substantial volatility in the number of ER visits and hospitalizations. In addition, very few provinces display an average utilization of hospital beds above 85%, which reassures on the indicator's capability to hypothetically respond to migratory influxes[22]. Turning to Panel (b), the North-South division does not emerge clearly anymore: the picture is rather heterogeneous for all the three measures, with extreme values associated to isolated provinces, rather than to more extended areas.

[21]See D.L. 95/2012.
[22]In a situation close to full utilization of hospital beds, thresholds in capacity could negatively affect the results, as they would prevent the index from reacting to swings in migration.

Figure 4: Across-province variation and cross-country distribution (2014) of main outcome variables

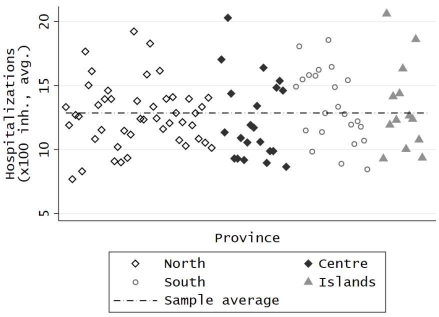
I) ER visits

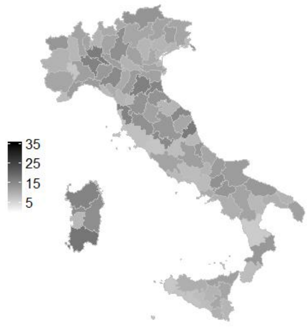




I.a) Province-level variation **I.b)** Geographic distribution (2014)

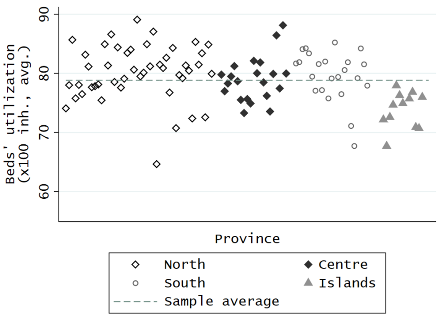
II) Hospitalizations

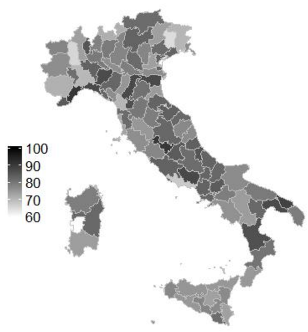




II.a) Province-level variation **II.b)** Geographic distribution (2014)

III) Beds' utilization





III.a) Province-level variation **III.b)** Geographic distribution (2014)

Notes: Panel (a) reports the variation across provinces in the number ER visits per 100 inhabitants (I), hospitalizations per 100 inhabitants (II) and utilization rate of hospital beds (III), calculated as the average between 2004 and 2014. Provinces are further differently identified by area (Section A.II, Table A.II.1). A dashed line represents the overall sample mean for each measure. Panel (b) shows instead the the situation across the country, at the end of the panel period (2014). Provinces displaying missing values are colour-coded in white.
Source: author's rendering on HFA Italy data.

Importantly, at a first glance, there is no evident link between residence permits and the selected measures of hospital congestion. Correlation to migration is negative and proximate to zero for either ER visits (-0.02) or hospitalizations (-0.01), while being mildly positive for the utilization rate of hospital beds (0.18). However, this outcome might be imputable to underlying unobservables affecting both migration and healthcare-related measures. For instance, poorly managed facilities may negatively influence migration, while causing the number of ER visits to drop due to the bad perceived quality of the treatment received. The multivariate regression analysis described in the next section aims to isolate confounding evidence and obtain a more reliable indication of the effect of migrants on hospital congestion.

4 Baseline Specification: Difference-In-Differences Fixed-Effects Estimation

In this section, I present the baseline specification, which comprises of a fixed-effect DID panel data model summarized by the following equation:

$$y_{irt} = \nu_0 + \nu_1 migr_{irt} + \mu_i + \varphi_t + \eta_{rt} + \mathbf{\Theta} S_{irt} + \mathbf{\Omega} L_{irt} + \varepsilon_{irt} \tag{1}$$

where the dependent variable y_{irt} includes the number ER visits (*ER visits*) and hospitalizations (*Stays*) per 100 inhabitants, in addition to the usage rate of hospital beds (*Beds utz*) in province i, region r, and year t. The independent variable $migr_{irt}$ is the number of valid residence permits on 1st January per 100 inhabitants, the chosen proxy for migration in the country.

μ_i and φ_t represent respectively province and time fixed effects, while η_{rt} captures *Region X Year* fixed effects. The term comprises of a matrix of k regional dummies interacted with the panel years $\left(\eta_{rt} = \sum_r^k reg_t^k * year_t\right)$ and helps to control for region-specific trends[23]. Furthermore, S_{irt} and L_{irt} are two matrices of controls (respectively *Short* and *Long*), including a set of observables that could influence the outcome variable while being correlated with migration dynamics. Finally, ε_{irt} is a stochastic error term[24].

The selection of covariates changes slightly between specifications[25]. The reason for separating them in two groups is to isolate those with higher probability of being an outcome, rather than a driver, of immigration. Their inclusion carries the concern of “bad controlling”, and may induce what is defined as "collider bias" in the coefficients of interest (Angrist & Pischke, 2008). At the same time, excluding them *a priori* may leave systematic unobserved heterogeneity and, in turn, induce omitted variable bias. Memory of this statistical trade-off should govern interpretation of the estimates whenever *Long* controls are included in the regression.

With regards to ER visits, I consider factors that have been associated in the literature with appropriate and inappropriate recourse to emergency services[26] and, at the same, can attract to or deter migrants from the province. I include socio-economic and demographic indicators, as well as hospital quality measures.

Firstly, I focus on covariates that are assumed to be independent from the inflow of immigrants in the province (*Short*). To control for the demographic distribution in each unit, I initially construct an "age-utilization" index, calculated as the share of male population with Italian origins aging either 0 to 5 or more than 75 over the entire native population (*Age Index (M)*). Indeed, age appears to strongly influence the number visits to the ER in Italy: a multiscope survey conducted yearly at country level ("Aspects of daily life", *Aspetti della vita quotidiana*) indicates that infants and old people have a higher

[23] Despite the term more precisely identifies region- and year-specific estimated intercept terms, in the remainder of the paper, *Region X Year* FEs will be referred as region-specific trends, to ease the separation between the former and time and year FEs.

[24] In the remaining of this paper, standard errors are clustered at province level. Cluster-robust standard errors are common practice in panel data methods (Bertrand et al., 2004; Kezdi, 2004; Cameron et al., 2010). In addition, data collection is conducted by provincial bodies at ASL organizations level (See: Minitery of the Interior, *Annuario Statistico del Servizio Sanitario Nazionale*), which increases the likelihood of within-cluster (province) error correlation.

[25] A detailed description of all variables is reported in Appendix (Section A.III).

[26] Studies on the characteristics of ER users are provided by Carret et al. (2007) and Hunt et al. (2006).

probability to have visited ERs in the three months preceding the interview[27]. In addition, the survey suggests greater utilization of male patients, although the pattern is reversed for individuals between 25 and 34 (most likely capturing higher demand for treatment due to pregnancies and childbirth). Moreover, I control for proxies of quality and capacity of healthcare facilities by including the percentage of hospitals with a functioning emergency department (*% ER endowed*). While influencing the number of visits, offering ER services might affect immigration, thinking that newcomers could tend to settle in provinces with better and larger hospitals.

Secondly, I include a set of variables that might have a two-way causal link with migration (*Long*). I control for unemployment rate (*Unemployment*) and average income per capita in the province; the measure is calculated from taxable income data and expressed in thousands of euros (*Income*). Moreover, I include a measure of educational attainment, calculated as the share of population completing compulsory education, noting that this is only provided by ISTAT at regional level. Given the relatively high risk of work-related injuries in both the agriculture (Hard et al., 2002) and the construction sectors (Dong & Platner, 2004; Waehrer et al., 2007), combined with positive evidence on the propensity of migrants to work in riskier jobs (Orrenius & Zavodny, 2009), I further control for the share of workers in the building (*% Construction*) and agrofood industry (*% Agriculture*). Employment of migrants in these sectors has been remarkably high in Italy, either through formal or informal arrangements (Quassoli, 1999). Finally, as visits to emergency departments could reasonably depend on acts of violence (Rand & Strom, 1997) and road accidents (Jones & Bentham, 1995), I control for a measure of criminality (*Crime*), calculated as the sum of violent crimes per 100 inhabitants reported to the police, and the number of road traffic injuries per 100 inhabitants (*Accidents*). In addition to exacerbating ER utilization, higher criminality may correlate with migration by discouraging newcomers from settling in relatively unsafe areas. Conversely, road accidents may positively relate to migratory inflows in case migrants tend to move to congested cities, where road traffic causalities are more frequent. In this case, the belief that migrants are not a primary source of either violent crime or road traffic injuries is backed by previous research on the link between immigration and crime (Bianchi et al., 2012; Bell et al., 2013), as well as on the inclination of migrants to rely on public transportation rather than individual means of transport (Heisz & Schellenberg, 2004; Tal & Handy, 2010).

When studying the effect on hospitalizations and usage rate of hospital beds, I slightly modify only the pool of quality indicators in the *Small* set of covariates, leaving *Long* controls unaltered. In this way, I try to include measures that more closely relate to hospital stays. In addition to the number of hospital beds per 100 inhabitants (*Beds*), which both account for hospital's size and capacity, I add an index of hospital immigration ($Migr_H$), calculated as the percentage of patients hospitalized outside their province of residence. Inter-hospital migration is a remarkable phenomenon in Italy, mostly flowing from South to North (Cartabellotta et al., 2018). The rationale behind the inclusion of this variable is that higher hospital immigration may signal better quality of facilities and treatment in the province. Furthermore, I control for the average length of stay (*Stay length*). The measure may capture two different aspects: hospitals may specialize in treatments that require longer recovery and monitoring which, in turn, would imply that hospital beds are generally more intensively occupied by in-patients. Alternatively, longer stays may signal lower quality in the facility, as they may capture the higher risk of medical complications (Thomas et al., 1997; Borghans et al., 2008). Finally, as survey data shows again higher likelihood of hospitalization among male new-borns and old cohorts (See Appendix, Section A.IV), I add the ageing index calculated on the male population.

Alongside observables, the inclusion of fixed effects allows to control for time-invariant characteristics of each province (geographical location, level of corruption etc.), as well as unobservables that change over time but are constant across provinces (such as changes in national law). Furthermore, as health care is mostly managed at regional level in Italy, the inclusion of region-specific interaction terms allows to control for deferring trends across regions throughout the panel years.

Table 1 presents across-province summary statistics of the included variables at the beginning and at the end of the panel period. While Panel a) summarizes the aforementioned trends in the dependent and independent variables, Panels b) and c) reveal the economic fatigue suffered by Italy since 2004. Firstly, an increasing average of the "age-utilization" index is explained by the progressive ageing of Italian population. Moreover, similarly to hospital admissions, hospital beds per 100 inhabitants and the

[27] Survey statistics are plotted in Appendix, Section A.IV, Figure A.IV.1.

percentage of hospitals equipped with an emergency department is decreasing through time, under the pressure of the recent spending cuts. Possibly correlating to the reduced capacity in terms of beds, the average rate of hospital immigration has increased since 2004. The average length of hospital stays is also higher in 2014, most likely reflecting the larger presence of old patients in medical facilities.

Turning to socio-economic variables, following the financial and sovereign debt crises, unemployment increases sharply to roughly 13% in 2014, while income per capita increases, but stagnates towards the end of the panel. Educational attainment shows an increasing pattern, while crime rate and the number of road accidents seem to be on a descending trend. Particularly, the measure of crime shows a clear drop, caused by a change in the classification of allegations after 2009 [28]. As the discontinuity is only in the computation technique, the inclusion of time fixed effects will help to get rid of the artificially induced variation. Conversely, the share of constructions and agriculture in the Italian production base appears rather stable.

Table 1: Summary statistics

a) Main	2004	2014	**b) Short**	2004	2014	**c) Long**	2004	2014
ER visits	38.17	34.28	Age Index (M)	0.12	0.14	Unempl	8.00	13.13
	(8.36)	(6.86)		(0.01)	(0.01)		(5.06)	(5.91)
Stays	14.05	11.09				Income	11.19	13.03
	(3.38)	(2.56)					(2.68)	(2.98)
Beds utz	77.35	79.14	ER dept. (%)	53.92	51.94	Educ (%)	43.17	52.19
	(8.42)	(5.94)		(24.04)	(21.55)		(4.43)	(5.26)
Migration	3.51	6.06				Accidents	0.41	0.29
	(1.97)	(3.78)					(0.19)	(0.11)
			Beds	0.40	0.31	Crime	0.31	0.16
				(0.12)	(0.08)		(0.09)	(0.03)
			Migr_H	18.71	21.81	Constr (%)	9.03	7.61
				(8.02)	(8.95)		(2.99)	(2.83)
			Stay length	7.69	8.03	Agric (%)	5.92	5.29
				(1.67)	(1.22)		(4.42)	(4.18)

Notes: The table reports the mean across provinces of the included variables in 2004 and 2014. Standard deviations are reported in parentheses. Panel a) contains dependent and independent variables. Panels b) and c) list respectively *Short* and *Long* controls. *Short* controls include *Aging (M)* and *ER dept. (%)* when the independent variable is *ER visits*, and *Aging (M)*, *Beds*, *Migr*$_H$, and *Stay length* when the regressands are *Stays* and *Beds utz.* A detailed description of the variables employed is found in Appendix (Section A.III).

Overall, summary statistics suggest that the reduced budget of public healthcare providers in Italy may have had repercussions on the performance and capacity of health facilities. Nonetheless, migration may have an impact on the NHS *per se*. This possibility is explored while evaluating the results of the baseline DID fixed-effects model.

4.1 Baseline DID model results

The estimated effect of migration on hospital congestion is reported in Table 2. The dataset is strongly balanced, containing yearly observations for 103 provinces in almost every year between 2004 and 2014. Region-specific trends and the two sets of controls are added at different stages, allowing to observe the

[28] See Appendix (Section A.III).

reaction in the main coefficient of interest. To enhance visualization, the coefficients of the covariates are omitted, and can be retrieved in Appendix[29].

Panel (I) considers the effect of migration on ER visits. Regressing this variable (expressed per 100 inhabitants) on the number of residence permits with only province and year fixed effects generates significant results. Following a one-unit increase in migration, ER visits rise by 0.8 units (Column 1). However, the effect dissipates with the inclusion of region-specific trends: the coefficient switches sign, while losing in magnitude and significance (Column 2). Columns 3 and 4 temporarily neglect regional trends and focus on the response of the estimates to the inclusion of the specified covariates. Adding only *Short* controls (Column 3) to the regression returns again a positive effect, with mild statistical significance. Conversely, *Long* controls marginally affect the result already obtained in Column 1. Finally, Column 5 reports the full-length regression: no effect of migration on the number of ER visits is detected, with the coefficient being slightly negative and strongly non-significant.

Turning to the number of hospitalizations in Panel (II), the positive impact of migration appears to be rather stable across the specifications. After the inclusion of region-specific trends and controls, the coefficient oscillates between 0.356 and 0.08, remaining partially significant. To give a measure of the economic relevance of this effect, the change in the predicted value of the number of hospitalizations is around 2 in the most conservative specifications when residence permits in each province move from their minimum (roughly 0.44 in the sample) to their maximum value (around 20.8) This is close to 17% of the average number of hospitalizations across provinces and over time (*Mean of* y).

While hospitalizations seem to respond positively to migratory inflows, the effect on the utilization rate of hospital beds is blurred (Panel (III)). Starting from a negative value in the simple fixed-effects regression, the coefficient switches sign once region-specific trends are considered. However, even after adding *Short* and *Long* controls, it remains mostly non-significant. Only Column 5 displays a partial effect: it seems that, in this case, *Long* controls are responsible for subtracting part of the significance and magnitude.

The estimates of the baseline DID fixed-effects model provide an unclear picture of the role of migrants in creating bottlenecks in healthcare facilities. Larger migratory inflows do not seem to have any impact on the visits to ERs, while larger migration positively relates to the number of hospitalizations. However, more hospital admissions do not systematically translate in a more intense utilization of hospital beds. Albeit this evidence may suggest limited impact of immigration on hospital congestion, causality concerns are in place. The presence of time-varying unobservables could mask part of the effect by inducing bias in the coefficients. Furthermore, residence permits may be an inadequate proxy for actual immigration phenomenon. The remainder of this paper progressively addresses these issues, trying to strengthen the reliability of the estimates. In the next section, I start by repeating the estimations using an instrumental variable approach, employing a spatial allocation model of migrants' penetration based on previous settlements of foreign residents in Italy.

[29] Section A.V, Table A.V.2.

Table 2: Baseline estimates

	(1)	(2)	(3)	(4)	(5)
[I]			**ER visits**		
Migration	0.790***	-0.320	0.509*	0.647**	-0.217
	(0.266)	(0.364)	(0.300)	(0.287)	(0.345)
Observations	1,123	1,123	1,123	1,121	1,121
R^2	0.172	0.347	0.197	0.212	0.359
Mean of y	36.56	36.56	36.56	36.56	36.56
[II]			**Stays**		
Migration	0.356***	0.111**	0.127**	0.311***	0.0813*
	(0.070)	(0.054)	(0.049)	(0.049)	(0.043)
Observations	1,127	1,127	1,127	1,125	1,125
R^2	0.520	0.664	0.709	0.537	0.756
Mean of y	12.86	12.86	12.86	12.86	12.86
[III]			**Beds utz**		
Migration	-0.490**	0.268	0.226	-0.137	0.387*
	(0.218)	(0.220)	(0.219)	(0.230)	(0.210)
Observations	1,127	1,127	1,127	1,125	1,125
R^2	0.028	0.151	0.298	0.074	0.388
Mean of y	78.83	78.83	78.83	78.83	78.83
N. of provinces	103	103	103	103	103
Province FE	✓	✓	✓	✓	✓
Year FE	✓	✓	✓	✓	✓
Region X Year FE		✓	-	-	✓
Controls Short		-	✓	-	✓
Controls Long		-	-	✓	✓

Notes: The table reports OLS fixed-effects estimates of the effect of migration on ER visits per 100 inhabitants (Panel [I]), hospitalizations (Panel [II]) and the utilization rate of hospital beds (Panel [III]). Column 1 includes only time and province fixed-effects. Region-specific trends are added in Column 2. *Short* and *Long* controls are respectively added in Columns 3 and 4. Column 5 reports the estimates of the full model. A description of all the variables included can be found in Appendix (Section A.III), together with the estimated coefficients of the controls (Section A.V, Table A.V.2). Standard errors clustered at province level. *** p<0.01, ** p<0.05, * p<0.1.

5 IV Strategy

5.1 A Spatial Allocation Model of migrants' penetration

Notwithstanding the inclusion of control variables and fixed effects, variation in the unobservables influencing both migratory inflows and congestion in healthcare services may bias the results. For instance, public health authorities in Italy are required to achieve a balanced budget[30], but regional institutions hold the legislative and administrative right to manage the healthcare provision in the area. As a more conservative regional government takes office, it may enforce tighter spending cuts, resizing emergency departments and decreasing hospitals' capacity. New access barriers, in turn, may have a negative effect on visits and utilization that would not be captured by the included covariates. In addition, a conservative government may take a hard line on foreign policy, conveying anti-immigration ideas and imposing, *de facto*, barriers to migratory inflows. Under this hypothesis, the DID regression would overestimate the coefficients of interest. Upward bias may also arise if, for example, regulation on workplace safety rules is relaxed only in some provinces, increasing the number of work-related accidents while attracting migrants in seek of employment.

To alleviate these concerns, I refine the previous estimates through an instrumental variable approach. I employ a spatial allocation model of migrants' penetration, which recalculates immigration in each province using earlier settlements as predictors of later arrivals. This approach draws from a class of models, widely analysed in the literature, that recognize the tendency of migrants to settle in areas that host previously established communities from the same country of origin (Card, 2009; D'Amuri et al., 2010; Bianchi et al., 2012). As a measure of earlier settlements, I use the distribution of foreign resident population from country j in each province in year 2003, calculated using census data[31]. I compute a two-dimensional matrix of weights $\mathbf{\Phi}$:

$$\mathbf{\Phi} = \begin{bmatrix} \phi^1_{1,t_0} & \phi^2_{1,t_0} & \cdots & \phi^j_{1,t_0} & \cdots & \phi^n_{1,t_0} \\ \phi^1_{2,t_0} & \phi^2_{2,t_0} & \cdots & \phi^j_{2,t_0} & \cdots & \phi^n_{2,t_0} \\ \vdots & \vdots & & \vdots & & \vdots \\ \phi^1_{i,t_0} & \phi^2_{i,t_0} & \cdots & \phi^j_{i,t_0} & \cdots & \phi^n_{k,t_0} \end{bmatrix} \tag{2}$$

with ϕ^j_{i,t_0} defined by the following equation:

$$\phi^j_{i,t_0} = \frac{R^j_{i,t_0}}{\sum_i R^j_{i,t_0}} \tag{3}$$

where R^j_{i,t_0} and $\sum_i R^j_{i,t_0}$ indicate the number of foreign residents from country j, respectively in province i and the entire country. Note that resident population considers only those individuals with usual residence in the province[32]. This measure allows to identify well-entrenched communities of foreigners and, as such, to minimize the risk of capturing a temporary redistribution of immigrants in Italy. As reported in Appendix (Section A.I), after 2007, ISTAT produces statistics on valid residence permits issued to non-EU citizens by nationality. As such, the model now focuses exclusively on non-EU nationals. Isolating migration from outside the EU allows to restore homogeneity between the panel years before and after the adoption of the new European guidelines[33], while being consistent with the premises of the analysis. Indeed, the presumption that migrants may have different patterns of healthcare utilization due to lack of familiarity with the NHS or to discrepancies in health status compared to the natives is less applicable to other EU-nationals, given the proximity in economic and social conditions and a similar organization of the healthcare system.

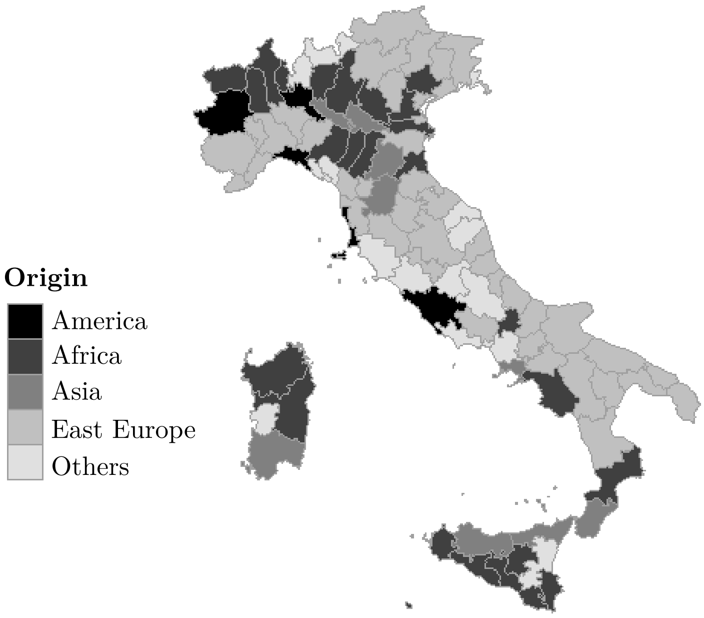
In the dataset, values for the top 20 countries that supply the largest number of migrants to Italy

[30] See D.lgs 118/11.
[31] Source: ISTAT, *Popolazione straniera residente all'1 gennaio, anno 2003.*
[32] See ISTAT, *Glossario Statistico.*
[33] This claim is further justified in Appendix (Section A.I); see the discussion on series discontinuity and measurement concerns.

each year are distinctively reported[34], whereas immigration from all other locations is aggregated into an additional category (*Other Countries*). While this structure may decrease the predictive power of the allocation mechanism, migration from independently-classified countries accounts for around 80% to 83% of the total migratory inflow, helping to minimize the concern[35].

Figure 5 depicts the tendency of migrants of different nationalities to settle in specific areas. For ease of interpretation, foreigners are clustered into macro-regions of origin[36].

Figure 5: Foreign communities across Italy



Notes: the figure describes the likelihood of migrants from different source countries to settle in specific areas. Provinces are assigned to the nationality associated with the highest relative share, according to Equation 3. The countries of origin included in each macro-region are reported in Appendix (Section A.II).
Source: author's elaboration and computation on ISTAT data.

Each province is colour-coded with the pitch of the macro-region that is associated with the highest relative weight according to Equation 3. As such, the map does not necessarily imply that migrants from the source countries are prevalent in the province; it rather signals that, while considering the overall presence in the country, foreigners of the assigned macro-region are comparatively more likely to settle in the province than other migrants.

Possibly in reason of geographical proximity with the Western Balkans, foreigners from East Europe tend to favour the Adriatic Cost. Conversely, both Northern and Southern regions seem to be prominent destination of African and Asian nationals. Importantly, considerable cross-country variation emerges, reassuring on the instrument's ability to capture the dynamics in migratory intakes.

Under these premises, the model predicts the inflow of later migrants, in each province and year, according to the following equation:

$$\widehat{migr}_{irt} = \sum_{j}^{n} \left[\mathbf{\Phi}^{j}_{ir,t_0} * migr^{j}_{t} \right] \tag{4}$$

[34]The list of countries, classified by geographical areas, is provided in Appendix (Section A.II, Table A.II.2).
[35]Individually identified countries and their respective weight in entire migratory inflow to the country are graphed in Appendix (Section A.IV, Figure A.IV.2).
[36]A list of the most targeted provinces by country of origin is reported in Appendix (Section A.II, Table A.II.3).

where Φ^{j}_{i,t_0} represents the two-dimensional matrix including weights for n =21 nationalities in 103 provinces. The effect of residence permits on ER visits, hospital admissions and utilization rate of hospital beds is estimated using a 2SLS regression analysis, which takes model-recomputed residence permits as an instrument for actual migration. The new identification strategy is summarized by the following reduced-form equation:

$$y_{irt} = \nu_0 + \nu_1 \widehat{migr_{irt}} + \mu_i + \varphi_t + \eta_{rt} + \mathbf{\Theta} S_{irt} + \mathbf{\Omega} L_{irt} + \varepsilon_{it} \tag{5}$$

with all terms other than $\widehat{migr_{irt}}$ defined as in Equation 1.

Considering initially the relevance of the instrument, the capacity of existing communities to drive settlement decisions of migrants of the same nationality seems strongly confirmed in the data. High correlation between the resident foreigners in each province in 2003 and the number of valid residence permits in 2014 is found for almost all source countries[37]. Nonetheless two major assumptions are essential for the validity of this approach.

Firstly, the earlier settlements of migrants in 2003 must be uncorrelated with the aforementioned time-varying unobservables. Drawing from the previous example, migrants' locational decisions before 2004 must be uncorrelated with the likelihood of a single province to divert from a left-wing to a more conservative government, again under the hypothesis that rightist political forces may have a simultaneous effect on both healthcare provision and migratory inflows. Secondly, as argued by Card (2009), the predicted inflow of migrants will be exogenous as long as migratory inflows from each country of origin are uncorrelated with the unobservable characteristics of a specific province. In the example, the estimation of unbiased results requires that the change in the province's government will not spur overall migration from any source country to Italy: this latter assumption will be further discussed and weakened in Section 6. Before that, I report the new estimates obtained using the spatial allocation model.

5.2 IV estimation results

The results of the IV specification are presented in Table 3. Preliminarily looking at the first-stage regression, the high predictive power of the spatial allocation model is confirmed. The coefficients are highly significant, and the SW F-statistics for excluded instruments always allows to reject the weak identification hypothesis. Looking instead at the second-stage, the estimates reveal only minor differences from the baseline OLS specification.

[37] See Appendix (Section A.IV, Figure A.IV.6).

Table 3: IV estimates - Spatial allocation model

	[I] ER visits				**[II] Stays**				**[III] Beds utz**			
	(I.1)	(I.2)	(I.3)	(I.4)	(II.1)	(II.2)	(II.3)	(II.4)	(III.1)	(III.2)	(III.3)	(III.4)
[A] Second stage												
Migration	-0.638	0.546	0.588*	-0.691	0.239***	0.180**	0.454***	0.130*	0.0658	0.232	-0.354	0.673
	(0.576)	(0.377)	(0.328)	(0.563)	(0.0901)	(0.0715)	(0.101)	(0.0778)	(0.372)	(0.321)	(0.298)	(0.420)
[B] First stage												
$\widehat{Migration}$	0.70***	0.82***	0.86***	0.69***	0.71***	0.83***	0.86***	0.71***	0.71***	0.83***	0.86***	0.71***
	(0.11)	(0.06)	(0.06)	(0.12)	(0.11)	(0.06)	(0.06)	(0.12)	(0.11)	(0.06)	(0.06)	(0.12)
F-stat. (excl.)	43.85	168.3	185.1	36.05	44.32	162.7	185.9	34.96	44.32	162.7	185.9	34.96
R^2-uncent.	0.345	0.197	0.211	0.356	0.662	0.708	0.532	0.756	0.150	0.298	0.0723	0.387
Mean of y	36.56	36.56	36.56	36.56	12.86	12.86	12.86	12.86	78.83	78.83	78.83	78.83
Observations	1,123	1,123	1,121	1,121	1,127	1,127	1,125	1,125	1,127	1,127	1,125	1,125
N. of provinces	103	103	103	103	103	103	103	103	103	103	103	103
Prov. FE	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Year FE	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Region X Year FE	✓	-	-	✓	✓	-	-	✓	✓	-	-	✓
Controls Short	-	✓	✓	✓	-	✓	✓	✓	-	✓	✓	✓
Controls Long	-	-	✓	✓	-	-	✓	✓	-	-	✓	✓

Notes: The table reports IV estimates of the effect of migration on ER visits per 100 inhabitants ([I]), hospitalizations ([II]), and utilization rate of hospital beds ([III]). Recomputed residence permits, weighted using the distribution of foreign resident population by country or origin in each province, are used as an IV for actual migration. Migration from 20 individually identified source countries is considered. Migrants of other nationalities are clustered into an additional category (*Other countries*).
Column 1 of each panel includes time and province fixed-effects, in addition to Region-specific trends. *Short* and *Long* controls are progressively added in Columns 2 and 3. The fully specified model is found in Column 4. Both first-stage ([A]) and second-stage coefficients ([B]) are reported. A description of all the variables included can be found in Appendix (Section A.III), together with the estimated coefficients of the controls (Section A.V, Table A.V.2). Standard errors clustered at province level. *** p<0.01, ** p<0.05, * p<0.1.

No effect of migrants on the number of ER visits per 100 inhabitants is detected: the coefficient again oscillates between positive and negative values, and somewhat increases in magnitude, despite remaining strongly non-significant. Migratory inflows still seem to positively associate with a higher number of hospitalizations, with the effect still decreasing throughout the specifications. Importantly, migrants appear again to have no impact on the utilization of hospital beds. The coefficient shows no significance, despite steadily increasing from Column 1 to 4.

The results of the reduced form regression are reported in Table 4. To ease visualization, I only focus on two specifications that always include region-specific trends and *Short* controls, adding *Long* controls at alternate stages. It is important to recall that, as first-stage coefficients oscillate between 0.7 and 0.8, the direct effect described by the reduced-form coefficients in the casual model should be considered between 25% and 40% higher. By adding *Long* controls only at a later stage, it is partially confirmed the belief that these are responsible for subtracting significance in the coefficient of usage rate of hospital beds. As argued in Section 4, the reader should exert extra caution while interpreting these coefficients.

Table 4: IV estimates - Spatial allocation model (Reduced form regression)

	[I] ER visits		**[II] Stays**		**[III] Beds utz**	
	(I.1)	(I.2)	(II.1)	(II.2)	(III.1)	(III.2)
$\widehat{Migration}$	-0.447	-0.480	0.113**	0.0921*	0.522**	0.477*
	(0.362)	(0.341)	(0.0480)	(0.0521)	(0.243)	(0.275)
R^2	0.350	0.361	0.753	0.756	0.384	0.389
Mean of y	36.56	36.56	12.86	12.86	78.83	78.83
Observations	1,123	1,121	1,127	1,125	1,127	1,125
N. of provinces	103	103	103	103	103	103
Prov. FE	✓	✓	✓	✓	✓	✓
Year FE	✓	✓	✓	✓	✓	✓
Region X Year FE	✓	✓	✓	✓	✓	✓
Controls Short	✓	✓	✓	✓	✓	✓
Controls Long	-	✓	-	✓	-	✓

Notes: The table reports the Reduced Form IV estimates of the effect of migration on ER visits per 100 inhabitants ([I]), hospitalizations ([II]) and beds utilization rate ([III]). Column 1 includes region-specific trends and *Short* controls. *Long* controls are added in Column 2. A description of all the variables included can be found in Appendix (Section A.III). Standard errors clustered at province level. *** p<0.01, ** p<0.05, * p<0.1.

Looking at the second-stage and reduced-form regressions, the IV strategy based on the spatial allocation model of migrants' penetration roughly confirms the findings retrieved at the baseline. No indication of bottlenecks created by migrants in emergency departments is detected, while the effect on hospitalizations persists, notwithstanding partial noise induced by the inclusion of *Long* controls. Interestingly, the effect on the beds' utilization index appears to be reinforced but, as OLS estimates were suggesting, partially shaded when *Long* controls are added. An estimated coefficient of roughly 0.5 implies that the predicted utilization of hospital beds increases by around 10 percentage points when residence permits span from minimum to maximum (roughly 13% of the overall mean).

Before thoroughly discussing the implications of these findings for the Italian NHS in Section 8, the remaining of this paper extends these results and tests their robustness, in order to strengthen the belief of a modest impact of migration on hospital congestion.

6 Robustness of the Results

To assess the stability of the findings just retrieved, I adopt a two-fold approach aimed to relax some of the assumptions behind the identification strategy. Firstly, regardless the plausibility of the restrictions underlying the validity of the IV strategy, I explore the presence of residual bias in the coefficients. Drawing from the an idea of Bianchi et al. (2012), I refine the instrument to account for potential endogeneity in the total inflow of nationals from each country of origin to Italy. Secondly, I argue on the possibility that valid residence permits might represent an inadequate proxy for migration, due to the presence of undocumented migrants.

6.1 Country-specific drivers of outflows: migration to the Nordics

The spatial allocation model in the previous section relies on the absence of correlation between immigration from each country of origin to Italy and the time-varying unobservable characteristics of each province. However, this assumption could be invalidated if particularly striking reforms in some provinces (e.g. policies that favor immigration while expanding government budget in healthcare) could influence the attractiveness of Italy overall. In other words, migrants may form expectations about the host country based on province-specific conditions: these, in turn, would drive immigration everywhere in the country, even outside the reformed area.

To address this concern, I modify the IV specification and use migration to the Nordic countries as a predictor of migratory inflows to Italy. To maintain consistency, I focus on the set of selected countries of origin previously included in the matrix $\mathbf{\Phi}$. As long as migration to the Nordics can be considered uncorrelated to the specific conditions of an Italian province, this approach would allow to restore exogeneity in the number of residence permits computed using the spatial allocation model. Hence, the regressor is now predicted according to the following equation:

$$\widehat{migr_{irt}}^{Nor} = \sum_{j}^{n} \left[\mathbf{\Phi}_{ir,t_0}^{j} * \overline{migr}_t^j \right] \tag{6}$$

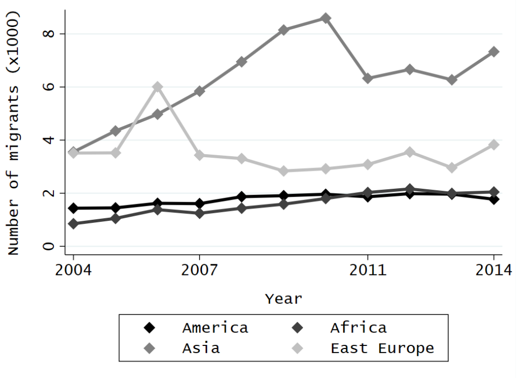
where $\overline{migr}_t^j$ represents total migration to m Nordic countries, such that $\overline{migr}_t^j = \sum_1^m migr_{m,t}^j$. The reduced form still obeys to Equation 4, and only replaces $\widehat{migr_{irt}}^{Nor}$ as main independent variable.

By focusing the attention on migration to other countries, as argued by Bianchi et al. (2012), the model will more precisely isolate the share of migration spurred by country-specific factors, which push migrants to leave their motherland and settle elsewhere. Furthermore, the reason for focusing specifically on Northern Europe can be explained by the *proximity trade-off* implied by this new IV strategy. First, these countries are enough close to Italy, both geographically and politically, to experience similar immigration dynamics, which is fundamental for the instrument's relevance. Secondly, notwithstanding similarities, different welfare provision (Brochmann & Hagelund, 2012) and labor market conditions (Barth et al., 2014), in addition to a clear cultural separation, contribute to create a sharp distinction between the Nordics and Italy in the eyes of a potential migrant. Accordingly, migrants shall not see an Italian province as a good indicator of the expected living conditions in Northern Europe.

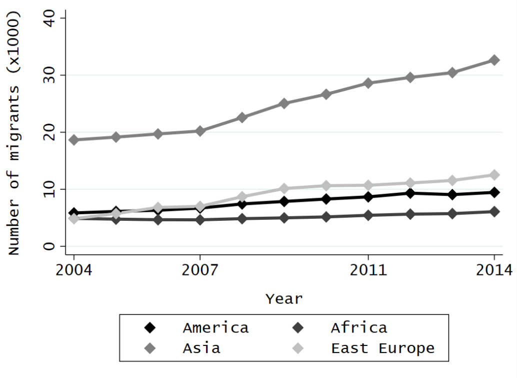
In the model, I include migration to Sweden, Denmark and Finland, as the production of statistics in these countries obeys to the same Communitarian regulation applying to Italy, endorsing comparability between the series. Data are publicly available from the respective national statistical institutes [38]. Figure 6 shows the trends in immigration to the Nordics from the 20 individually identified nationalities reported in the matrix $\mathbf{\Phi}$, combined by macro-region. I exclude the other countries in order to enhance affinity with the series produced by ISTAT.

[38] *Statistiska centralbyrån* for Sweden (SCB), *Official Statistics of Finland* for Finland (OSF) and *Danmarks Statistik* for Denmark (DST). A detailed description of the measures is found in Appendix (Section A.III).

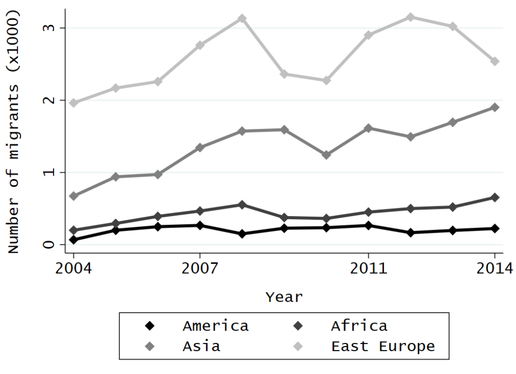
Figure 6: Immigration from 20 countries of origin to the Nordics, by macro-region



I.a) Sweden



I.b) Denmark



I.c) Finland

Notes: The figure reports the trends in immigration in Sweden (a), Denmark (b), and Finlands (c), by macro-region. The countries of origin included in each macro-region are reported in Appendix (Section A.II).
Source: author's rendering on DST, OSF and SCB data.

Despite the heterogeneity in the composition and size of flows across the three Nordic countries, migratory influxes seem to be on a steadily increasing path, as previously observed for Italy. Immigration from the chosen Asian countries is prevailing in Sweden (Panel (a)) and Denmark (Panel (b)), while East Europeans (Panel (c)) are comparatively more present in Finland. The steadily highest values displayed by Denmark do not necessarily reflect higher overall migration to the country, but rather more intense intakes from the subset of countries selected. Importantly, the trends depicted in Figure 6 suggest the existence of a correlation with the Italian case and, in turn, provide a solid foundation to conduct this modified 2SLS regression analysis.

The estimates are reported in Table 5. Initially focusing on Panel [B], first-stage coefficients show steadily high significance, while the SW F-statistics, despite importantly decreased compared to Section 5, still reduces concerns of a weak instrument bias. Turning to Panel [A], second-stage coefficients show very little variation from previous estimates. No impact of migrants on ER visits per 100 inhabitants emerges (Panel [I]), while the positive effect on hospitalizations persists across most of the specifications, ultimately losing significance in Column 4 (Panel [II]). Higher number of hospitalizations does not appear to translate into more intense utilization of hospital beds, as the coefficient remains, this time, consistently non-significant (Panel [III]).

Table 5: IV estimates - Migration to the Nordic countries

	[I] ER visits				[II] Stays				[III] Beds utz			
	(I.1)	(I.2)	(I.3)	(I.4)	(II.1)	(II.2)	(II.3)	(II.4)	(III.1)	(III.2)	(III.3)	(III.4)
[A] Second stage												
Migration	-0.543	0.567	0.732*	-0.532	0.238*	0.144**	0.393***	0.120	-0.711	0.0625	-0.494	0.117
	(0.578)	(0.379)	(0.365)	(0.564)	(0.0900)	(0.0715)	(0.0757)	(0.0778)	(0.374)	(0.321)	(0.368)	(0.421)
[B] First stage												
$\widehat{Migration}^{Nordics}$	29.16***	43.87***	43.12***	27.63***	29.87***	43.60***	43.19***	28.05***	29.87***	43.60***	43.19***	28.05***
	(0.11)	(0.06)	(0.07)	(0.12)	(0.11)	(0.07)	(0.07)	(0.12)	(0.11)	(0.07)	(0.07)	(0.12)
F-stat. (excl.)	19.57	51.88	78.51	21.06	20.57	60.84	86.23	21.58	20.57	60.84	86.23	21.58
R^2-uncent.	0.346	0.197	0.211	0.358	0.662	0.709	0.535	0.756	0.136	0.297	0.0698	0.387
Mean of y	36.56	36.56	36.56	36.56	12.86	12.86	12.86	12.86	78.83	78.83	78.83	78.83
Observations	1,123	1,123	1,121	1,121	1,127	1,127	1,125	1,125	1,127	1,127	1,125	1,125
N. of provinces	103	103	103	103	103	103	103	103	103	103	103	103
Prov. FE	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Year FE	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Region X Year FE	✓	-	-	✓	✓	-	-	✓	✓	-	-	✓
Controls Short	-	✓	-	✓	-	✓	-	✓	-	✓	-	✓
Controls Long	-	-	✓	✓	-	-	✓	✓	-	-	✓	✓

Notes: The table reports IV estimates of the effect of migration on ER visits per 100 inhabitants ([I]), hospitalizations ([II]), and utilization rate of hospital beds ([III]). Residence permits to the Nordic countries are used as an IV for valid residence permits in Italy, which are further recomputed using weights from the 2003 distribution of foreign resident population in each province by source country. Migration from 20 individually identified source countries is considered. Migrants of other nationalities are not included in the model.
Column 1 of each panel includes time and province fixed-effects, as well as region-specific trends. *Short* and *Long* controls are progressively added in Columns 2 and 3. The fully specified model is found in Column 4. Both first-stage ([A]) and second-stage coefficients ([B]) are reported. A description of all the variables included can be found in Appendix (Section A.III), together with the estimated coefficients of the controls (Section A.V, Table A.V.2). Standard errors clustered at province level. *** p<0.01, ** p<0.05, * p<0.1.

Table 6 reports the reduced form regression, with *Short* controls added to region-specific trends, while *Long* covariates are included in a separate stage. Translating the magnitude of the coefficients in the casual model (note that first-stage coefficients are now between 27.6 and 43.9), very little has changed. Only a residual impact on the number of hospitalizations is detected, but the effect is not stable to the inclusion of *Long* controls. In view of this evidence, the assumption that province-level characteristics can be considered exogenous to migratory inflows in the entire country finds further justification.

Table 6: IV estimates - Migration to the Nordics (Reduced form regression)

	[I] ER visits		**[II] Stays**		**[III] Beds utz**	
	(I.1)	(I.2)	(II.1)	(II.2)	(III.1)	(III.2)
$\widehat{Migration}^{Nordics}$	-14.52	-14.70	3.959*	3.353	5.738	3.276
	(16.00)	(16.11)	(2.347)	(2.530)	(13.90)	(15.31)
R^2	0.348	0.359	0.752	0.755	0.381	0.386
Mean of y	36.56	36.56	12.86	12.86	78.83	78.83
Observations	1,123	1,121	1,127	1,125	1,127	1,125
N. of provinces	103	103	103	103	103	103
Prov. FE	✓	✓	✓	✓	✓	✓
Year FE	✓	✓	✓	✓	✓	✓
Region X Year FE	✓	✓	✓	✓	✓	✓
Controls Short	✓	✓	✓	✓	✓	✓
Controls Long	-	✓	-	✓	-	✓

Notes: the table reports the Reduced Form IV estimates of the effect of migration on ER visits per 100 inhabitants ([I]), hospitalizations ([II]) and utilization rate of hospital beds ([III]). The measures of interest are directly regressed on residence permits to the Nordic countries, recomputed using weights from the 2003 distribution of foreign resident population in Italy. Migration from 20 individually identified countries of origin is considered. Migrants of other nationalities are not included in the model.
Column 1 includes region-specific trends and *Short* controls. *Long* controls are added in Column 2. A description of all the variables included can be found in Appendix (Section A.III). Standard errors clustered at province level. *** p<0.01, ** p<0.05, * p<0.1.

6.2 Irregular migrants

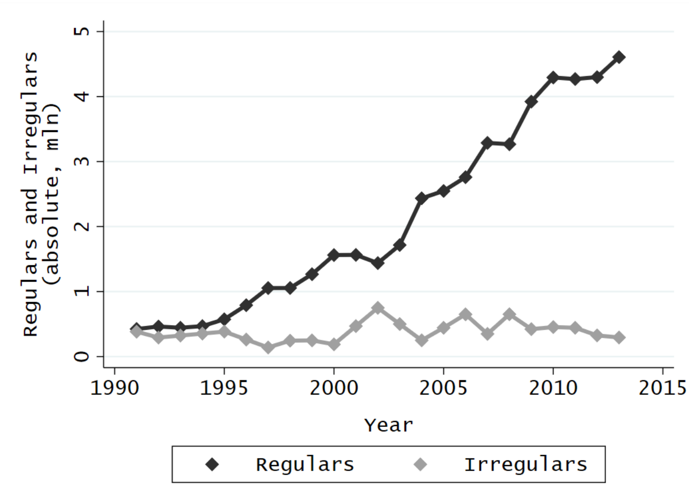
Using valid residence permits as main proxy of migration inevitably neglects the presence of irregular migrants in the country. As argued in Section 2, notwithstanding restricted access to the healthcare system, undocumented migrants have the right to receive medical treatment in case of urgency, as well as in all the circumstances that endanger the health of a minor[39]. Under specific conditions, the presence of irregulars may bias the estimates, shading the conclusions of the paper. However, as illegal migration is, by definition, an unmeasured phenomenon, including it in the analysis is prone to clear limitations. Based on the limited evidence available, this section argues on the likelihood and magnitude of potential bias due to those residing in Italy outside the official records.

Firstly, thanks to multiple waves of regularization starting in the early 90s[40], undocumented migrants represent a progressively decreasing share of total migration throughout the panel years. Figure 7 reports estimates of irregulars in the country computed by the ISMU foundation[41]. A widening cleavage in

[39]See DPCM of 12.01.2017.
[40]E.g. D.l. 489/1995, D.l. 195/2002, Law 102/2009.
[41]Initiatives and Studies on Multiethnicity (*Fondazione ISMU: Iniziative e Studi sulla Multietnicità*).

the trends followed by the number of legals and illegals is depicted, with the latter accounting for only around 6% of the overall migration in 2014.

Figure 7: Regular and irregular migrants in Italy, 1990-2014



Notes: the figure shows the trend in the number of regular and irregular foreign residents in the period 1990-2014. Estimates on irregular migrants are compiled by the ISMU foundation.
Source: author's rendering on ISMU data.

In addition to the effort of Italian authorities to fight illegal migration, undocumented migrants would constitute a threat to the estimates only to the extent that their settlements are negatively correlated with those of official immigrants. Indeed, if irregulars tend to settle in provinces where also more valid residence permits per 100 inhabitants are generally issued, their presence would be approximated by the main independent variable, and the effect would be to a large extent incorporated in the coefficients. Albeit the limited amount of disposable data, this tendency is partially confirmed in Northern Italy: estimates provided by the ISMU Foundation in the Lombardy region show very strong and positive correlation between the number of regulars and irregulars per 100 inhabitants in a panel of 11 provinces[42] between 2004 and 2014 (roughly 80%)[43].

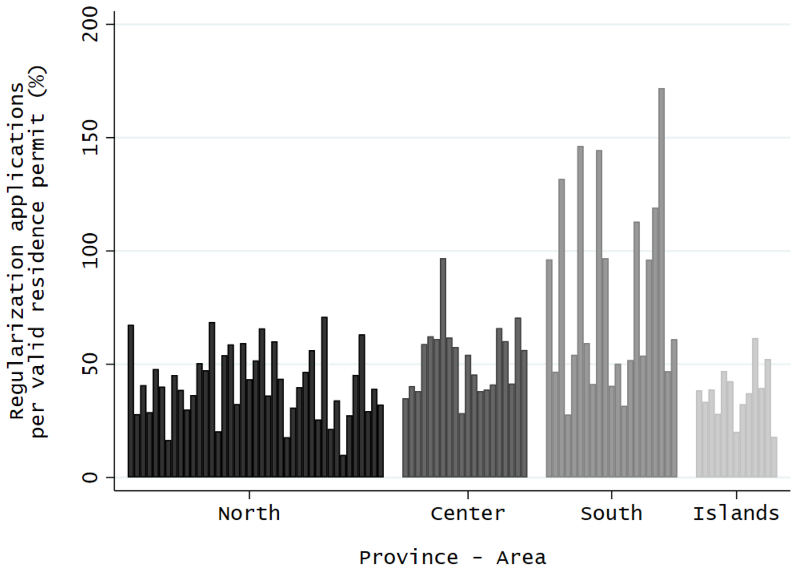
Greater concerns would arise if undocumented migrants concentrated in provinces where official migration is low. In this case, the number of residence permits would constitute a weaker proxy for actual immigration, and the reliability of the estimates would be put into question. For instance, assuming a positive causal relationship, the main coefficients may not capture the real effect of migratory inflows as these are kept artificially low by undocumented migrants in those provinces with numerous ER visits and hospitalizations. The scenario could be reversed if migrants are thought to have a negative impact on the outcome variables.

In this regard, particularly Southern provinces might constitute a source of noise. In South Italy, the unemployment rate is comparatively higher[44] and unofficial employment is more common than in the rest of the peninsula. Furthermore, undocumented migrants in the area find more easily occupation in shadow economy, especially in the primary sector (Reyneri, 1998; Quassoli, 1999). Better opportunities in the underground market, at the expenses of formal employment, could attract unofficial migration while discouraging those holding a valid residence permit. Data retrieved from the 2002 regularization on the number of applications from irregular migrants supports this hypothesis[45]. As shown in Figure 8,

[42] A 12th province, *Monza e della Brianza*, is created in 2009. See Appendix for details (Section A.I).
[43] A graphical representation is provided in Appendix (Section A.IV, Figure A.IV.4).
[44] In the panel period, the unemployment rate averages around 13% in the South, compared to around 7.4% in the Center and 5.6% in the North. Source: ISTAT, author's elaboration.
[45] Data are retrieved from Bianchi et al. (2012).

applications for regularization as a share of existing valid permits tend to fluctuate around 50%, but South Italy partially deviates from the trend, with multiple provinces showing a ratio of 100% or more.

Figure 8: 2002 regularization applications, by province and area



Notes: the figure shows the number of applications in the 2002 regularization wave, as a percentage of valid residence permits in each province. Data are retrieved from Bianchi et al. (2012). Provinces are clustered into four geographic areas (see the composition of clusters in Appendix, Section A.II).
Source: author's rendering on data from Bianchi et al. (2012).

Thus, given that the presence of irregulars may affect the estimates especially in Southern provinces, I repeat the analysis presented in the previous section while excluding them from the sample. This approach cannot entirely eliminate all the concerns regarding a potential bias: South Italy may differ from the rest of the country in dimensions other than undocumented migrants, and its exclusion could influence the results through multiple channels.

Nonetheless, small variation in the coefficients would help to strengthen the belief that irregular migration does not constitute a major threat for the conclusions of this paper. For conciseness, the results are reported in Appendix (Section A.V, Table A.V.3). The picture is roughly unchanged, with no effect on ER visits, and scattered evidence of a positive impact on hospital admissions and utilization of hospital beds.

7 Additional Evidence for Policy Evaluation

The empirical analysis conducted so far has shown robust evidence of scarce to no impact of immigration on the selected indicators of congestion in the NHS. However, policy actions targeting migrants in the healthcare system cannot be claimed superfluous uniquely on the base of this result. Recognizing peculiar patterns in service utilization by foreign patients may still offer the opportunity to strengthen efficiency and enhance quality of treatment delivery. As such, this section elaborates further on the main findings of the paper, aiming to identify areas of potential intervention. Firstly, I examine the existence of an heterogeneous effect on health care overcrowding across migrants from different nationalities. Secondly, I ask whether migration can be associated with a higher incidence of ER visits resulting in hospital admission. Finally, I delve into the usage rate of hospital beds, looking separately at the index calculated for accredited private and public hospitals, as well as for different typologies of departments.
All the results of the regression analysis conducted in this section are reported in Appendix (Section A.V).

7.1 Heterogeneous effects by source country

Differences in health care usage may not only exist between migrants and natives, but also across nationals of separate source countries. Exploring the presence of heterogeneous effects across migrants' nationalities allows to clarify whether the negligible impact of migration on hospital congestion could be explained by the coexistence of two opposite dynamics. Indeed, while migrants from certain areas could, for instance, visit ERs more frequently than natives, nationals of some other countries may have a relatively lower propensity to use emergency services, and the two effects may offset each other. While this scenario would not be in contrast with the general conclusions of the analysis, it might imply different policy recommendations. Despite no sign of overcrowding in health care caused by immigration, raising the awareness of specific groups of migrants about the correct patient's pathway might still have considerably positive repercussions on the NHS.

To this end, despite the number of valid residence permits by country of origin is not provided by ISTAT at province level, this value can be predicted using the spatial allocation model. Recalling the specification illustrated in Section 5, the figure can be computed by reducing the cohort of source countries that enter the calculation. That is, province-specific residence permits can be recomputed according to the following equation:

$$\widehat{migr_{irt}}^{Sel} = \sum_{j}^{n^*<n} \left[\mathbf{\Phi}^{j}_{ir,t_0} * migr^{j}_{t} \right] \tag{7}$$

where n^* is a selected subgroup of countries of origin. As such, I repeat the estimations using Equation 4 and substituting $\widehat{migr_{irt}}^{Sel}$ as main regressor. I progressively remove some of the 20 original source countries to observe the fluctuations on the coefficients. I base the exclusions on geopolitical and cultural proximity to Italy, as well as considerations about the precision of the measures available for immigration. Before proceeding, it must be clarified that, despite the interpretation of the main coefficients of interest in this section is roughly unchanged, any positive evidence emerging from this approach would have to consider which share of overall migration to Italy is accounted for by the selected subgroup. Indeed, any signal of hospital congestion associated with some nationalities could be compatible with a negligible overall impact, also in view of the limited presence of migrants from those countries in Italy.

Firstly, I test whether nationals of other non-Communitarian European countries clearly differ from other migrants in terms of healthcare utilization. Multiple explanations could drive this belief. For example, relative geographical proximity and cultural affinity may decrease the barriers faced by migrants in identifying the correct procedure to request health assistance. Furthermore, thinking of a possible association between income and health status (Shibuya et al., 2002; Mackenbach et al., 2004), relative economic wealth of East Europe compared to Asian and African developing countries may justify healthier migration from these regions[46]. Hence, I exclude the individually identified Non-EU Eastern European countries from the computation[47]. The estimates are reported in Appendix (Table A.V.4, Panel [I]). While the model can still predict actual migration, given significant first-stage coefficients and reassuring F-statistics, the results are essentially unaltered. No effect on the number of ER visits and the utilization rate of hospital beds is found, while the number of hospitalizations shows only partial significance.

Another concern involves again considerations about irregular migration. For some specific source countries, residence permits may approximate actual migration with increasingly lower precision. Especially towards the end of the panel, political turmoil following the "Arab Springs" in North Africa (Morehouse & Blomfield, 2011), in addition to increased human smuggling and trafficking activities in Western African countries (e.g. Carling, 2006), have modified the composition of irregular migration to Italy. Estimates calculated by the ISMU foundation on the 11 provinces of the Lombardy region show that, while the relative weight of undocumented migration is shrinking over time in response to the waves of regularization, the share of irregulars over the total number of African migrants has remained relatively stable between 8% and 10%[48]. To test whether the decreased precision of the proxy for migration could

[46] The average GDP per capita in East Europe between 2003 and 2014 was $10,785 (PPP, current $US), compared to $5,484 in Asia, $7,993 in North Africa and $3,345 in West Africa. Source: World Bank.

[47] The geographic clustering of countries of origin into macro-areas is reported in Appendix (Section A.II).

[48] See Appendix, Section A.IV, Figure A.IV.3.

imply heterogeneous effects across nationalities, I further exclude individually identified North and West African countries, which leaves a total of 11 source inputs entering the matrix Φ (Table A.V.4, Panel [II]). Similarly to what observed before, while the instrument maintains relevance, the main results of the analysis are largely unaffected.

As a final test, I iteratively run the estimates using only one country of origin. Even though this cherry-picking approach does not rely on any theoretical background, no clear jumps in the significance and magnitude of the coefficients associated with single-country regressions shall further strengthen the conclusions of this section. The results are plotted and described in Appendix (Section A.IV, Figure A.IV.7). Reducing the matrix Φ_{ir,t_0} to a column vector has clear drawbacks: in several cases, residence permits calculated using the spatial allocation model tend to not sufficiently correlate with actual migration in the province (in this case, the country is colour-coded in grey). However, as expected, no clear deviation from the main findings is recorded, ultimately reinforcing the absence of heterogeneous effects across different nationalities. The implications of this evidence for the conclusions of the paper are further discussed in Section 8.

7.2 Hospitalizations through emergency departments

The paper has also shown that the number of visits to the ER at province level is not susceptible to migration. Despite this outcome is *per se* indicative of the negligible impact of migrants on treatment provision in emergency departments, it cannot inform on the appropriateness of ER utilization by foreign patients. Indeed, while bottlenecks in health facilities may be avoided by adjusting capacity to the varying pool of potential patients, improper use of ERs may still constitute an undesired outcome. Interestingly, failure to seek regular medical advice through GPs and specialists may have different implications for emergency services. As argued in Section 2, it might increase non-urgent visits, which have been associated with excessive costs of treatment (Baker & Baker, 1994) and lower patient's satisfaction, mainly as individuals perceive that their presence at the hospital is unjustified (Hall & Press, 1996; Olsson & Hansagi, 2001). Conversely, if migrants that do not comply with the right patient pathway also do not seek routine sick care at ERs, they might simply not receive preventive medical consultation. In this scenario, they may recur to emergency services only in case of serious acute conditions which, in turn, could increase the probability that ER visits lead to hospitalization (Falik et al., 2001; Oster & Bindman, 2003)

To further explore whether migration has an effect on the urgency of casualties at emergency departments, I reconduct the analysis using the share of visits resulting in hospital admission as main dependent variable (*% Hosp (ER)*, defined as $\frac{Visits_{HOSP}}{Visits} * 100$). While this proxy cannot entirely capture the appropriateness of ER visits (i.e. code-yellow and code-red visits may not always require hospitalization), it can still indicate whether, *ceteris paribus*, migration is associated with more severe conditions of patients approaching emergency departments. Peculiarly, either strongly negative or positive evidence emerging from this approach would support interventions that aim to strengthen the acquaintance of migrants with the NHS. In addition to enhancing the quality of medical support received, these actions would spur a more appropriate usage of resources, with predictable efficiency gains.

The effect is estimated using the baseline DID model, as well as both IV strategies based on the spatial allocation model and migration to the Nordic countries. I include the same set of *Short* and *Long* covariates employed to study the number of ER visits per 100 inhabitants. The results are reported in Appendix (Section A.V, Table A.V.5).

The main coefficient of interest shows only partial significance throughout the different specifications. Region-specific trends seem to capture most of the effect both at the baseline and in the first IV estimates. However, when Italian migratory inflows are instrumented using migration to the Nordics, the coefficient regains significance. In this case, a one-unit increase in the number of residence permits per 100 inhabitants raises the share of ER visits leading to hospital admission by 0.6% to 0.78%, roughly a 4 percentage points deviation from the average across the panel (16.67).

Despite the evidence is far from conclusive, a tendency of migration to associate with more hospital admissions through the ER cannot be entirely excluded. This, in turn, could partially explain the positive (although similarly unstable) effect on the number of hospitalizations per 100 inhabitants. Before providing conclusive comments on this new evidence, I lastly investigate whether the negligible effect on the utilization rate of hospital beds is stable across public and private facilities, as well as Acute Care and Long Term Care departments.

7.3 Utilization of hospital beds across departments and facilities

Throughout the paper, the evidence of a positive effect of migration on the usage rate of hospital beds has been fragmented, and rather insufficient to conclude that migrants associate with sensibly higher beds' utilization. While this conclusion is drawn looking at the NHS in its entirety, the picture could be mixed when focusing on specific areas and facilities that compose the healthcare system. Aiming to shed further light on whether health authorities in Italy should respond to migratory inflows, this section focuses on this particular indicator of hospital congestion. Using the models previously discussed, I renew the empirical analysis while modifying the set of medical facilities and hospital departments over which the index is calculated.

Firstly, as recalled in Section 2, the Italian NHS is grounded on accredited private and public hospitals. While the two structures charge the same price for medical treatment, the former can levy a premium for additional services. As more foreign residents recur to the NHS, patients may tend to migrate from public to private accredited hospitals, being the former usually more crowded (the average beds' usage rate is above 80% for public facilities, and only around 66% for private ones). In this case, while the overall impact could remain negligible, it can be hypothesized a positive effect limited to accredited private hospitals, and a negative one otherwise. Understanding whether immigration drives partial redistribution of patients across facilities of different kind and, in turn, whether this is sufficient to drive remarkable discrepancies in utilization could help regional governments to tailor the most suitable strategy to optimize treatment delivery. Hence, I repeat the estimates using the utilization rate of hospital beds calculated separately for private and public accredited hospitals. Consistent with the previous approach, I present in Appendix the results at the baseline, as well as the two IV regressions (Section A.V, Table A.V.6).

With regards to private hospitals, no information is available for 12 provinces, which limits the sample size below 1000 data points. The main coefficient of interest swings from positive to negative, but it never reaches significance, neither for private (Panel [I]) nor for public centres (Panel [II]). Therefore, redistribution of patients across the two typologies of facility does not contribute to explain the absence of impact on the utilization rate of hospital beds.

Secondly, usage of hospital beds could respond differently to immigration even across hospital departments. Medical conditions that push comparatively young migrants to seek hospitalization could remarkably diverge from those affecting the natives, and *vice versa*. As such, acknowledging whether immigration creates congestion in a subset of hospital departments, while relieving pressure on some others, could help to direct the resources available in the most effective way. To explore this possibility, I estimate the effect of migration on the utilization rate of hospital beds, now calculated for Acute Care departments (*Degenza per acuti*, ACs) and Long Term Care departments (*Lungodegenza*, LTCs). While the former provide active but short-term treatment for severe injuries, illness, and during recovery from surgeries, the latter meet the needs of patients with chronic illness and disability, and are mostly visited by senior citizens. In line to what observed before about the age distribution in Italy, comparatively young foreign residents may crowd ACs and rarely demand LTC services[49]. However, the results reported in Table A.V.6 (Panels [III] and [IV]) do not seem to validate this hypothesis. The coefficient fluctuates again between positive and negative values, but it is never significant[50].

Once again, very little support for heterogeneity in the effect on beds' utilization has emerged. Together with the rest of the section, this last result contributes to enhance the following discussion on the empirical findings of this paper.

[49]The average age of the Italian native population is roughly 44 years, compared to the significantly lower average (around 32) years of the foreign population residing permanently in the country.

[50]Data on LTC departments are not available for 2 provinces.

8 Discussion

The analysis conducted has shown very limited impact of migration on province-level hospital congestion in the Italian NHS. The number of ER visits does not appear to respond to the variation in migratory inflows, and the effect on the usage rate of hospital beds, when significant, is economically sparse. Conversely, a positive impact on hospitalizations per 100 inhabitants cannot be completely ruled out, despite relatively modest magnitude of the coefficients.

A primary consideration arising from these findings concerns the role played by immigration in the future of the Italian (and European) welfare provision: the belief that migrants may put additional pressure on the NHS by overcrowding hospital facilities does not find confirmation in the data. Several factors could potentially explain this outcome. For instance, an immediate justification could be the adequate response of Italian authorities to the increasing migratory pressure. By correctly redistributing resources on the territory, regional governments may avoid bottlenecks that would otherwise emerge in provinces mostly targeted by migrants. Alternatively, without denying the existence of discrepancies in utilization of healthcare services between immigrants and natives, these may not be remarkable enough to drive an effect at aggregate level, also considering that the share of foreign population in Italy is still relatively low. Even the tendency to settle where rooted communities of individuals from the same country of origin already exist may contribute to explain the results: previous migrants could inform the newcomers on the correct patient pathway, supporting adequate utilization of facilities. With the information at hand, it is impossible to pinpoint which determinants may be primarily responsible for the findings highlighted. Nonetheless, this does not discredit the importance of the results for the economic and political debate regarding the effect of migration on the host countries.

Additionally, the evidence retrieved in the paper can complement the discussion on the key reform priority areas in the Italian NHS. The provision of public services in the country has suffered from pressures to reduce the stock of sovereign debt to comply with the EU requirements. This, in addition to two consecutive periods of recession after 2007, has implied an increasing lack of resources in health care which, in turn, has reflected into a decreasing satisfaction with medical facilities. In 2002, 64% of users were found extremely satisfied with the treatment received (Ministero della Salute, 2004), while a survey conducted by the Research Center for Social Investments (*Centro Studi Investimenti Sociali*, Censis) eight years later shows importantly lower scores, with more than 19% of the interviewed considering hospitals and emergency departments' quality scarce or even mediocre (Censis, 2010). This figure has dramatically increased to over 30% in 2018 (Censis, 2018). Furthermore, higher hospital fees and prices of subsidized drugs have forced families to divert part of their available income to the purchase of health-related goods and services: between 2007 and 2015, household expenditure on health care, as a share of final consumption spending, has grown at the average rate of 1.8%[51].

Seeing that efficiency gains become even more crucial for the sustainability of the NHS, the results of this analysis do not deny that migrants may benefit from policies aimed to strengthen their familiarity with the healthcare system. Data reported by the Ministry of the Interior, retrieved from De Luca et al. (2013), shows that, in 2007, only 68% of those holding a valid residence permit had also signed up with the NHS. As such, educating foreign residents to regularly visit GPs and specialist practitioners and, at the same time, trying to ease the access barriers that prevent them from regular engagement may generally improve their health status and enhance their satisfaction with the treatment received. Moreover, it might positively reflect on the ability of migrants to integrate in the host society. Under these hypotheses, it is important to further investigate whether, and to what extent, immigrants suffer from limited access to healthcare provision.

This said, however, the capacity of such policies to effectively reduce resource utilization may be rather limited. Even if, based on the empirical results of this paper, helping migrants understand the best practices in health care could decrease hospital admissions (either from ERs or after regular consultation), the effect is predicted to be relatively small. Conversely, visits to emergency departments and utilization of hospital beds (in either public or private facilities, as well as AC and LTC departments) are not expected to react to the interventions. Furthermore, as shown in Section 7, there is no evidence that concentrating efforts on nationals of specific origins would entail substantial additional gains for the healthcare system. Accordingly, reforms that hold the main objective of maximizing cost-efficiency in

[51]See Appendix, Section A.IV, Figure A.IV.5.

the NHS shall not see migrants as a first-order priority. A more urgent concern, for instance, is the progressive ageing of the Italian population, as a consequence of increasing life expectancy and low fertility rate. Potential measures in this area may include initiatives to promote active ageing and facilitate home care and self-help groups.

9 Caveats and Limitations

Before providing a conclusive thought on the results presented in this paper, notwithstanding relatively stable evidence, some caveats are in order. This section aims to enlist the limitations of the approach presented and to evaluate the residual presence of potentially confounding elements.

Firstly, due to perceived lower quality of treatment facilities and longer waiting lists, individuals may be more likely to seek medical consultation through non-accredited hospitals. While an increasing number of patients migrating from public to fully private provision should affect the number of ER visits only marginally (i.e. most non-accredited structures do not offer emergency services (AIOP, 2016)), it might have an impact on hospitalizations and beds' utilization. Indeed, in this scenario, migrants could still be a source of hospital congestion, but their true effect would not be captured in the measures. Natives, in response to migratory flows, could turn to private non-accredited facilities, and this would rather decrease their available income instead of reflecting in treatment quality. Unfortunately, to my knowledge, no official statistics on hospitalizations in non-accredited structures are produced at province level in Italy. However, it is reassuring to recall that, as argued in Section 2, private health care is a very small fraction of the overall provision (around 3%).

Secondly, the retrieved measures of hospital congestion do not constitute an indication of service as experienced by native Italians. In fact, while another major strain in the anti-immigrant argument is that waiting times have increased and service quality has dropped as a result of immigration (Giuntella et al., 2018), the selected variables cannot inform on such aspects of treatment delivery. In addition, the paper cannot assess whether the perception of natives in Italy in this sense has been affected by the growing migratory inflows. Conditional on data availability[52], providing an answer to these questions could offer fertile ground for further investigation.

Thirdly, while the findings of this paper have relevant economic and policy implications, they can neither confirm nor deny the presence of heterogeneity in healthcare utilization between migrants and natives, previously observed in the literature. The absence of any strong effect on the independent variables included can have several explanations. Being on average younger than the Italians, migrants may be relatively in good health, which would support the existence of a "healthy immigrant effect". Possibly, as argued in Section 8, regional governments have been capable to effectively redistribute resources to prevent bottlenecks. Alternatively, despite the increasing magnitude of the phenomenon, migration in Italy may simply not be unsustainable for public health care. The fiscal impact of migrants might be null as they contribute to the economic activity and generate enough public revenues to preserve equilibrium in welfare provision.

Lastly, important variability in the composition and intensity of migratory inflows across host countries limits the external validity of the findings. Despite the evidence presented in Section 7 should support the belief that the result is not strongly dependent on migrants' origins, it may reasonably be susceptible to other characteristics, such as education or personal income. In addition, the ability to enhance migrants' integration in a country's society and economy is strongly dependent on the attitude of authorities towards migration and the relative policies in place. As such, exporting this result to other settings deserves a word of caution.

On a related note, the dataset assembled in this paper does not cover the peak years of the European migration crisis. It is reasonable to assume that, following the emergence of new migratory routes (e.g. through the Mediterranean or the Eastern EU borders), the composition of foreign presence in Italy has already changed since the 2004-2014 decade[53]. Accordingly, results and conclusions of this analysis may potentially evolve as migrants with different socio-economic characteristics enter the country.

[52] Statistics on waiting lists are not publicly accessible through the sources employed in this paper.

[53] Immigrants for typically economic reasons have recently been followed by asylum seekers and refugees.

10 Conclusion

The potential threats to the European welfare state imposed by immigration are a subject of great controversy, economically and politically. In the discussion, the relationship between migratory flows and health care is far from being clearly established. A major concern motivating the hostility towards granting migrants access to public health care is that these may have a negative net fiscal impact on the healthcare system. In addition, lack of familiarity with the correct patient pathway, and generally worse health conditions, may imply that immigrants create congestion in some specific medical facilities.

Using a DID fixed-effects model, this paper has shown blurred to non-existent impact of migration on three measures of hospital congestion in Italy: ER visits, hospital admissions (both per 100 inhabitants), and usage rate of hospital beds. The baseline results have been reinforced by the use of an IV approach, which takes previous settlements as a predictor of current migration and allows to control for unobservable time-varying factors that may bias the estimates. Moreover, the findings have proved stable to a series of robustness checks, which included an alternative IV specification that employed migration to the Nordic countries, as well as considerations on undocumented migrants. The paper has later expanded these findings: it has shown no heterogeneous effect across migrants' countries of origin, has supported only partially that migration increases the probability that ER visits result in hospital admission, and has found no discrepancies in utilization of hospital beds across medical facilities and departments.

In view of the information retrieved, the paper rejects the claim that migrants overcrowd healthcare facilities in the Italy. Furthermore, despite targeting foreign residents may still enhance the health and satisfaction of this group of patients with the NHS, the paper suggests the limited impact of such policies on overall resource utilization. Accordingly, the paper has argued that migrants may constitute a second-order priority for health authorities in Italy.

Notwithstanding the importance of these findings for the debate about the effect of migration on the host country, the analysis cannot ascertain whether foreign residents tend to seek medical treatment differently from natives, as this tendency may be counteracted by the adequate reaction of regional governments in Italy. Furthermore, the paper cannot ensure on the external validity of the results, considering the evolving composition of migration to the country. As such, future research shall continue to investigate this topic, as newly released data shed more light on the effects of the recent "migration crisis". In addition, researchers shall continue to focus on the disparities in healthcare utilization between migrants and natives in Europe, to help designing policy interventions and possibly enhance migrants' integration in the host society.

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A Appendix

A.I Series heterogeneity and data manipulation

A.I.1 Rebalancing the number of provinces in the panel

Following progressive reorganization in administrative boundaries in Italy, from 2004, 7 new provinces were added to the initial cohort of 103: 4 in 2007 (Carbonia-Iglesias, Ogliastra, Olbia-Tempio, Medio Campidano) and 3 in 2009 (Barletta-Andria-Trani, Fermo, Monza e della Brianza). The new boundaries were created inside an existing province or by aggregating municipalities previously belonging to 2 units. Table A.I.1 compares the new administrative division to the former situation. More than one entry in the second column signals that the province is created from multiple former ones.

Table A.I.1: New provinces and respective original division

New Province	Original Province(s)
Barletta-Andria-Trani	Bari, Foggia
Carbonia-Iglesias	Cagliari
Fermo	Ascoli Piceno
Monza e della Brianza	Milan
Medio Campidano	Cagliari
Ogliastra	Nuoro
Olbia-Tempio	Nuoro, Sassari

To avoid breaks in the panel that may add noise in the estimates, I do not comply with the change in boundaries in the econometric analysis, and I instead recompute the values of each variable for the original 103 provinces. To conduct the calculation, I separate between *Index* and *Count* variables. The former are expressed as ratios and percentages (e.g. utilization rate of hospital beds, unemployment rate etc.): in this case, I recompute the value in the original provinces according to the following equation:

$$\begin{aligned} y^*_{o,t} &= y_{o,t} * \frac{N_{o,t}}{N_{o,t} + \alpha_t N_{n,t}} + y_{n,t} * \frac{N_{n,t}}{N_{o,t} + \alpha_t N_{n,t}} \\ &= y_{o,t} * \left(1 + \frac{N_{o,t}}{\alpha_t N_{n,t}}\right) + y_{n,t} * \left(\frac{N_{n,t}}{N_{o,t}} + \frac{1}{\alpha_t}\right) \end{aligned} \tag{A1}$$

where $y^*_{o,t}$ is the new recomputed value of variable y in the original province o and year t, while $N_{o,t}$ and $N_{n,t}$ represent the resident population respectively in the new and old province in year t. The term α_t depicts the relative "loss" of the old province after the separation in time t; it is calculated as the resident population (n) in the k municipalities that previously belonged to the old province, divided by N_n.

$$\alpha_t = \frac{\sum_{m=1}^{k} n_{k,t}}{N_{n,t}} \tag{A2}$$

When the new province is created from a single existing one, α_t will assume value 1. Otherwise, in Table A.I.2 below, I list the municipalities that enter the calculation. A similar rationale is applied to *Count* variables (e.g. number of ER visits, hospitalizations etc.), which are recomputed according to a simple weighted sum:

$$y^*_{o,t} = y_{o,t} + \alpha_t * y_{n,t} \tag{A3}$$

with all terms defined as before.

Table A.I.2: Province of origin and destination: municipalities involved in administrative reorganization

New province	Old Province	Municipalities
Barletta-Andria-Trani	Foggia	Trinitanapoli, Margherita di Savoia, San Ferdinando di Puglia
	Bari	Andria, Barletta, Bisceglie, Canosa, Minervino Murge, Spinazzola, Trani
Olbia-Tempio	Sassari	Aggius, Aglientu, Alà dei Sardi, Arzachena, Berchidda, Bortigiadas, Buddusò, Calangianus, Golfo Aranci, La Maddalena, Loiri Porto San Paolo, Luogosanto, Luras, Monti, Olbia, Oschiri, Padru, Palau, Sant'Antonio di Gallura, Santa Teresa Gallura, Telti, Tempio Pausania, Trinità d'Agultu, Vignola
	Nuoro	Budoni, San Teodoro

Notes: The table lists the municipalities that enter the calculation of α_t. The first column indicates the destination province, while the second column reports the province of origin.

While this approach allows to restore balance in the panel with a minimal loss of data points, using weights based on resident population to recompute the value of other measures (such as ER visits, hospitalizations etc.) is clearly an approximation. To mitigate the concern that data manipulation may affect the results of the analysis, I repeat the estimations (using the baseline and the different IV specifications) excluding the provinces involved in the administrative reorganization. The main findings are reported in Section A.V, Table A.V.I, and are roughly unchanged. Only the effect on the usage rate of hospital beds seems to gain some more significance which, however, is not robust to the different IV strategies.

A.I.2 Measurement and series heterogeneity concerns

In 2007, the Regulation (EC) No 862/2007 has dictated the new criteria to be adopted by the European Community in the collection of data on migration and international protection, with the objective to harmonize the statistical production at European level and enhance cross-country comparability. As such, from 2008 onward, ISTAT publishes revisited statistics on valid residence permits. Compared to the previous standard, two main discrepancies are particularly worrisome for the scope of this analysis.

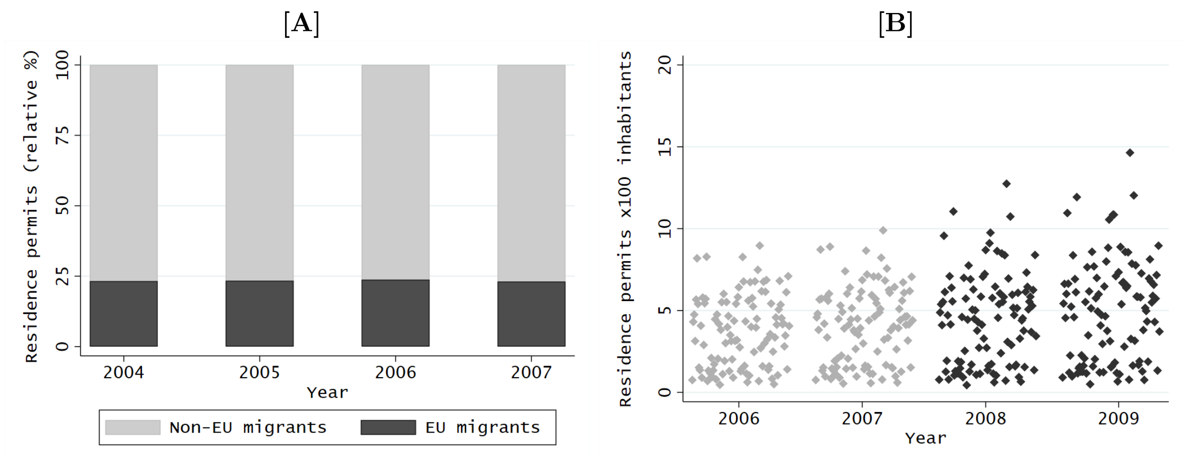
Firstly, nationals of other EU countries holding a residence permit in Italy are no more included in the count after the regulation, while still present in the years before[54]. As recalled in Section 2, EU citizens enjoy privileged rights to transit and settle in the country; still, the number or residence permits issued to other EU nationals is a significant fraction (roughly 25%) of overall migration to the country between 2004 and 2007 (Figure A.I.1, Panel [A]). The inclusion of fixed effects and regional trends surely helps to gauge the issue, but it cannot be excluded that the discontinuity may influence the estimates, under the assumption of heterogeneous variation in the inflow of EU nationals both across provinces and through time. There is no mean to verify the presence of bias in the baseline OLS specification, as ISTAT does not provide estimates that could serve to homogeneize the series. Nonetheless, the spatial allocation model presented in Section 5 allows to address this concern by excluding immigration from other EU member countries. By focusing on the 20 individually identified countries of origin, while excluding all EU nationalities from the *Other countries* category, the model predicts province-level migratory inflows of non-EU residents. As long as the residence permits recomputed under this approach are a good predictor of actual migration in the province, the IV strategy will get rid of the potential bias. Focusing on non-EU migrants is also consistent with the premises of analysis, as argued in Section 5.

Secondly, after 2007, all minors who were formally inscribed on the residence permit of one of their parents have been assigned an individual certificate with identical length of validity. As such, minors that fall under these characteristics start to be counted as separate migrants after the regulation (ISTAT, 2018). Unfortunately, ISTAT does not quantify the magnitude of the adjustment implied by the new standard, limiting the ability to completely address the problem. This said, I try to allay the concern in two ways. Firstly, I visually represent the number of residence permits per 100 inhabitants in each province, between 2006 and 2009 (Figure A.I.1, Panel [B]). Taking into consideration the increasing trend

[54]See ISTAT - *Permessi di soggiorno dei cittadini non comunitari.*

in the data, there is no evident jump at the 2007-2008 threshold. Despite the aggregate picture might suggest that newly inscribed minors have a negligible effect on the series, as claimed above, heterogeneity may persist across provinces, and bias may affect the findings. In this case, however, it is worth noticing that, in case a positive relation between the regressor and the regressand, the estimated coefficient would tend to be overestimated in the first years of the panel. Indeed, between 2004 and 2007, the assumption of a one to one correspondence between valid residence permits and the number of immigrants in the province may underestimate actual migration. In turn, the marginal effect of an additional residence permit on the dependent variable (e.g. ER visits per 100 inhabitants) would be magnified: a one-unit increase in the data might imply, in reality, two (or more) new individuals entering the country. Under these premises, the potential noise in the estimates would still not invalidate the overall finding of a negligible effect of migrants on healthcare congestion in Italy. Furthermore, even in case it would be assumed negative correlation between dependent and independent variable, although the situation would be reversed, the paper's conclusions could be nuanced, but not totally invalidated.

Figure A.I.1: EU migration and 2007-2008 series discontinuity



Notes: Panel [A] plots immigration from other EU countries as a share of the overall migration to Italy, in the years preceding the of new European regulation. In Panel [B], the number of residence permits per 100 inhabitants in each province is plotted in the two years before (*Grey*) and after (*Black*) the series discontinuity following the regulation.
Source: author's rendering on ISTAT data.

A.II Geographic clustering of Italian provinces and source countries

Table A.II.1: Italian provinces, by region and area

Area	Region	Province
North	Piedmont	Turin, Vercelli, Novara, Cuneo, Asti, Alessandria, Biella, Verbano-Cusio-Ossola
	Aosta Valley	Aosta
	Lombardy	Varese, Como, Sondrio, Milan, Bergamo, Brescia, Pavia, Cremona, Mantua, Lecco, Lodi
	Liguria	Imperia, Savona, Genoa, La Spezia
	Trentino-South Tyrol	Bolzano-Bozen, Trento
	Veneto	Verona, Vicenza, Belluno, Treviso, Venezia, Padova, Rovigo
	Friuli-Venezia Giulia	Udine, Gorizia, Trieste, Pordenone
	Emilia-Romagna	Piacenza, Parma, Reggio Emilia, Modena, Bologna, Ferrara, Ravenna, Forlì-Cesena, Rimini
Centre	Tuscany	Massa-Carrara, Lucca, Pistoia, Florence, Livorno, Pisa, Arezzo, Siena, Grosseto, Prato
	Marche	Pesaro e Urbino, Ancona, Macerata, Ascoli Piceno
	Abruzzo	L'Aquila, Teramo, Pescara, Chieti
	Umbria	Perugia, Terni
	Lazio	Viterbo, Rieti, Rome, Latina, Frosinone
South	Campania	Caserta, Benevento, Naples, Avellino, Salerno
	Molise	Campobasso, Isernia
	Basilicata	Potenza, Matera
	Apulia	Foggia, Bari, Taranto, Brindisi, Lecce
	Calabria	Cosenza, Catanzaro, Reggio Calabria, Crotone, Vibo Valentia
Islands	Sicily	Trapani, Palermo, Messina, Agrigento, Caltanissetta, Enna, Catania, Ragusa, Syracuse
	Sardinia	Sassari, Nuoro, Cagliari, Oristano

Notes: The table reports Italy's administrative division as defined in year 2003. Province-level variables are adjusted to take into account changes and additions in the total number of provinces throughout the panel years. See Section A.I for more details.

Table A.II.2: Individually identified countries of origin, by macro-area

East Europe	**North Africa**	**West Africa**	**Asia**	**America**
Albania (AL)	Egypt (EG)	Ghana (GH)	Bangladesh (BD)	Brazil (BR)
Moldova (MD)	Morocco (MA)	Nigeria (NG)	China (CH)	Peru (PE)
Russia (RU)	Tunisia (TN)	Senegal (SN)	India (IN)	Unites States (US)
Serbia-Montenegro (RS)			Pakistan (PK)	
Ukraine (UK)			Philippines (PH)	
			Sri Lanka (SL)	

Notes: Serbia and Montenegro is considered as a single country for statistical purposes. All other non-EU countries of origin are included in the analysis through an aggregated category named *Other countries*. ISO2 code is reported in parenthesis.

Table A.II.3: Share of 2003 foreign residents, top 15 provinces, by nationality.

Albania	Milan, Bari, Brescia, Florence, Rome, Perugia, Treviso, Turin, Cuneo, Bergamo, Pistoia, Varese, Vicenza, Padova, Pordenone
Bangladesh	Rome, Vicenza, Milan, Palermo, Bologna, Venice, Brescia, Arezzo, Treviso, Mantua, Ancona, Varese, Bolzano-Bozen, Gorizia, Naples
Brazil	Rome, Milan, Turin, Verona, Brescia, Florence, Treviso, Naples, Mantua, Bergamo, Varese, Bologna, Genoa, Perugia, Vicenza
China	Milan, Florence, Prato, Rome, Turin, Naples, Brescia, Treviso, Bologna, Modena, Reggio Emilia, Verona, Mantua, Padova, Venice
Egypt	Milan, Rome, Brescia, Turin, Florence, Bergamo, Pavia, Lodi, Cremona, Reggio Emilia, Varese, Bologna, Savona, Como, Lecco
Ghana	Brescia, Vicenza, Verona, Modena, Pordenone, Reggio Emilia, Treviso, Bergamo, Udine, Como, Mantua, Parma, Palermo, Milan, Turin
India	Brescia, Rome, Cremona, Mantua, Reggio Emilia, Vicenza, Bergamo, Verona, Milan, Modena, Parma, Latina, Treviso, Florence, Piacenza
Moldova	Rome, Padova, Bologna, Verona, Turin, Venice, Milan, Vicenza, Modena, Trento, Brescia, Treviso, Parma, Perugia, Ravenna
Morocco	Turin, Milan, Brescia, Bergamo, Bologna, Modena, Verona, Treviso, Vicenza, Cuneo, Reggio Emilia, Padova, Varese, Mantua, Perugia
Nigeria	Verona, Turin, Rome, Padova, Brescia, Modena, Treviso, Mantua, Milan, Vicenza, Naples, Ancona, Bergamo, Venice, Reggio Emilia
Other countries	Rome, Milan, Turin, Treviso, Genoa, Florence, Brescia, Naples, Perugia, Vicenza, Bergamo, Verona, Bologna, Varese, Trento
Pakistan	Brescia, Milan, Bologna, Reggio Emilia, Modena, Macerata, Bolzano-Bozen, Rome, Varese, Prato, Bergamo, Trento, Vicenza, Ferrara, Arezzo
Peru	Milan, Rome, Turin, Genoa, Florence, Perugia, Varese, Bologna, Naples, Bergamo, Verona, Pesaro e Urbino, Brescia, Livorno, Bolzano-Bozen
Philippines	Milan, Rome, Florence, Bologna, Turin, Messina, Modena, Reggio Calabria, Padova, Brescia, Naples, Parma, Como, Pisa, Palermo
Senegal	Bergamo, Brescia, Milan, Treviso, Pisa, Vicenza, Ravenna, Lecco, Parma, Novara, Turin, Florence, Verona, Cagliari, Rimini
Serbia and Montenegro	Vicenza, Trieste, Rome, Treviso, Brescia, Verona, Milan, Bergamo, Udine, Trento, Bolzano-Bozen, Bologna, Florence, Venice, Padova
Sri Lanka	Milan, Verona, Rome, Palermo, Messina, Naples, Brescia, Catania, Florence, Bologna, Genoa, Como, Modena, Vicenza, Varese
Tunisia	Trapani, Ragusa, Modena, Milan, Bologna, Rome, Parma, Brescia, Ancona, Reggio Emilia, Palermo, Varese, Turin, Verona, Como
Ukraine	Rome, Naples, Milan, Caserta, Salerno, Bologna, Brescia, Perugia, Udine, Ascoli Piceno, Turin, Macerata, Modena, Treviso, Avellino
United States	Rome, Milan, Florence, Naples, Catania, Turin, Perugia, Palermo, Bari, Vicenza, Bologna, Lucca, Pordenone, Caserta, Genoa

Notes: The table reports in descending order the top 15 provinces where foreigners tend to settle, by country of nationality. There provinces are therefore associated with higher weights ϕ^j_{i,t_0}, as calculated in Section 5.

A.III Variables' description and sources

Dependent variables

ER visits: number of visits to the ERs per 100 inhabitants $\left(\frac{Visits}{P} * 100\right)$. Source: HFA Italia.

Stays: number of hospitalizations per 100 inhabitants $\left(\frac{Hospitalizations}{P} * 100\right)$. Source: HFA Italia.

Beds utz: percent ratio between actual and potential days of hospitalization in aggregate terms $\left(\frac{Days}{Days_{potential}} * 100\right)$. The same variable is further separately calculated for accredited private (*Private*) and public hospitals (*Public*), as well as for Acute Care (*ACs*) and Long Term Care departments (*LTCs*). Source: HFA Italia.

% Hosp (ER): share of ER visits resulting in hospital admissions $\left(\frac{Visits_{HOSP}}{Visits} * 100\right)$. Source: HFA Italia.

Independent variable

Migration: number of valid residence permits on 1st January per 100 inhabitants. Source: ISTAT.

$\widehat{Migration}$*:* recomputed number of residence permits using the spatial allocation model, in each province and year. The weights are calculated using resident foreign population by nationality in each province in year 2003. Source: DemoISTAT.

$\widehat{Migration}^{Nordics}$*:* total number of migrants to the Nordic countries (Sweden, Denmark, Finland), assigned to Italian provinces using the spatial allocation model. Data are retrieved from *Statistiska centralbyrån* for Sweden (*Immigrations and emigrations by country of birth and sex. Year 2000 - 2018*), *Danmarks Statistik* for Denmark (*Immigration by sex, age, country of origin and citizenship (1980-2018)*), and *Tilastokeskus* for Finland (*Immigration and emigration by nationality, origin and language, 1990-2017*).

Controls: Short

Aging (M): share of male population of Italian origin between 0 and 5 and above 75 over the overall resident population in each province and year. Source: ISTAT and DemoISTAT.

ER dept. (%): share of hospitals equipped with an emergency department, in each province and year. Source: HFA Italia.

Beds: number of available hospital beds per 100 inhabitants in each province and year. Source: HFA Italia.

$Migr_H$*:* hospital immigration, defined as the share of hospital discharges in province l of patients that do not reside in province l $\left[\frac{Dim^l_{res\ j\neq l}}{Dim^l}\right]$. Source: HFA Italia.

Stay length: average length of the hospital stay, in days $\left[\frac{Days}{Stays}\right]$, in each province and year. Source: HFA Italia.

Controls: Long

Income: individual taxable income (*Reddito IRPEF*). Source: Ministry of Economy and Finance[55].

Unempl: unemployment rate in each province and region. Source: ISTAT.

Education: percentage of resident population in each province completing compulsory education (*Educ (%)*), 10 years in Italy, in each region and year (*Diploma 2-3 anni*). Data at province level are not publicly available. Source: ISTAT

Crime: Number of allegations for violent crimes reported to judicial authorities by the police, in each province and year (*Delitti denunciati dalle forze di polizia all'autorità giudiziaria*)[56]. Source: ISTAT.

Accidents: number of road accidents that involved personal injuries, in each province and year (*Incidenti stradali con lesioni alle persone*). Source: ISTAT.

% Constr: share of employment in the construction sector, as defined by the ATECO2002 classification before 2007, and by the ATECO2007 classification after that year, in each province and year (*Costruzioni*). Source: ISTAT.

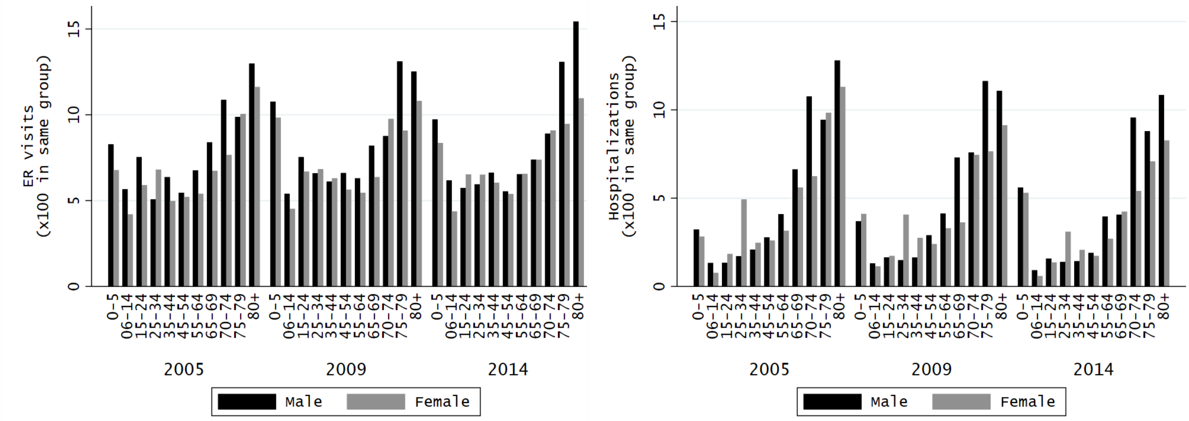
% Agric: share of employment in the agriculture sector, as defined by the ATECO2002 classification before 2007 (*Agricoltura, Caccia e Pesca*), and by the ATECO2007 classification after that year, in each province and year (*Agricoltura, Silvicoltura e Pesca*). Source: ISTAT.

[55] As taxation in Italy is regulated at state level, the variable is more likely to capture differences in financial wealth rather than heterogeneity in the share of taxable income across provinces.

[56] Among violent crimes, I include bodily harm, culpable, negligent, and involuntary homicide, mass murder, attempted murder, battery, kidnapping, rape, brawl, private violence, resisting arrest.

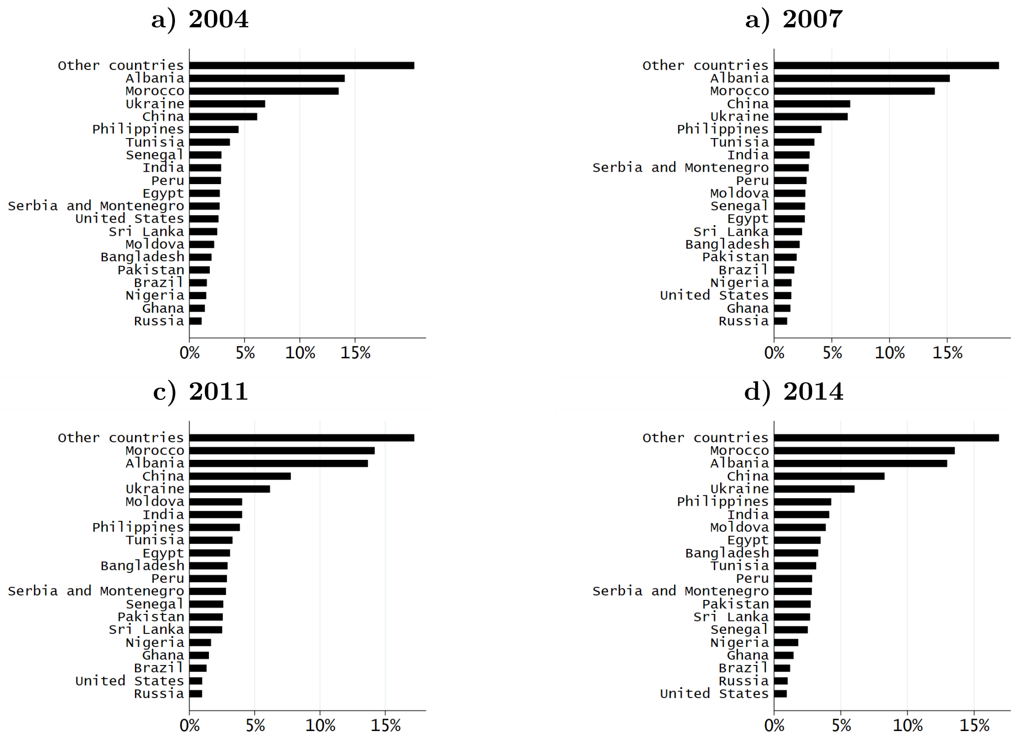
A.IV Additional charts and figures

Figure A.IV.1: Probability of visiting ERs and being hospitalized, by age cohort



Notes: "Aspects of daily life" (*Aspetti della vita quotidiana*) is a multiscope survey conducted by ISTAT at country level. In the graph, it is reported the probability that a respondent has visited the ER (a) or has been hospitalized (b) in the 3 months preceding the interview, by sex and age group. In both cases, a comparatively higher probability is associated with infants and senior citizens. With main exception of hospitalizations of individuals between 25 and 34 (most likely due to pregnancies and childbirth), the probability seems to be systematically higher for males.
Source: author's rendering on ISTAT data.

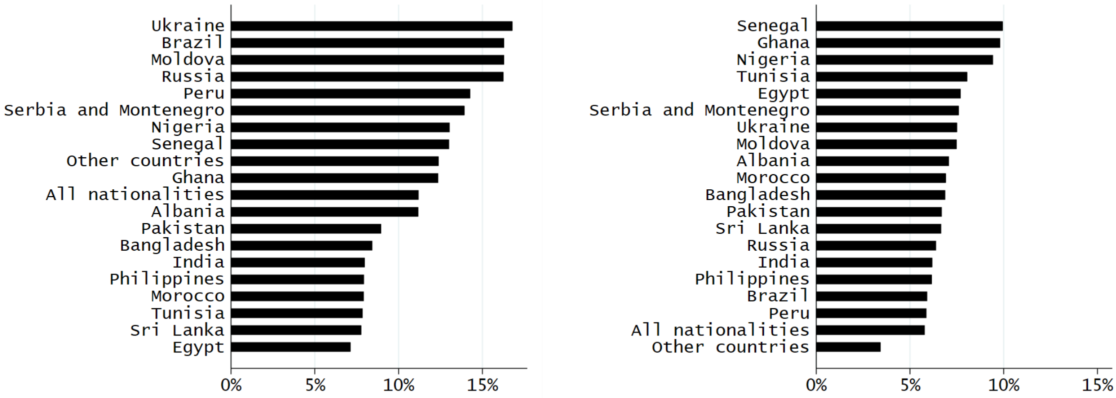
Figure A.IV.2: Shares of migration to Italy, by country of origin



Notes: the figure shows migration from each of the 20 individually identified countries of origin plus the *Other countries* group, as a share of total migration to Italy, in four different panel years. Only non-EU nationals are included in the *Other countries* category.
Source: author's rendering on ISTAT data.

Figure A.IV.3: Share of undocumented migrants over total foreign presence, by country of origin

I) 2004 **II) 2014**



Notes: the figure shows undocumented migrants from each of the 20 individually identified countries of origin, plus the *Other countries* group, as a share of total number migrants present in the 11 provinces of the region of Lombardy in Italy, at the beginning (I) and at the end (II) of the panel period. Only non-EU nationals are included in the *Other countries* category. Data are retrieved from the ISMU foundation.
Source: author's rendering on ISMU data.

Figure A.IV.4: Distribution of regular and irregular migrants, Lombardy region, 2004 and 2014

I) 2004

I.a) Legal migrants per 100 inhabitants

I.b) Illegal migrants per 100 inhabitants

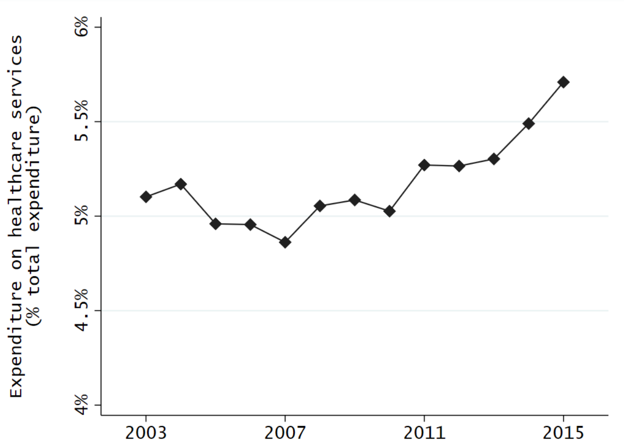
II) 2014

II.a) Legal migrants per 100 inhabitants

II.b) Illegal migrants per 100 inhabitants

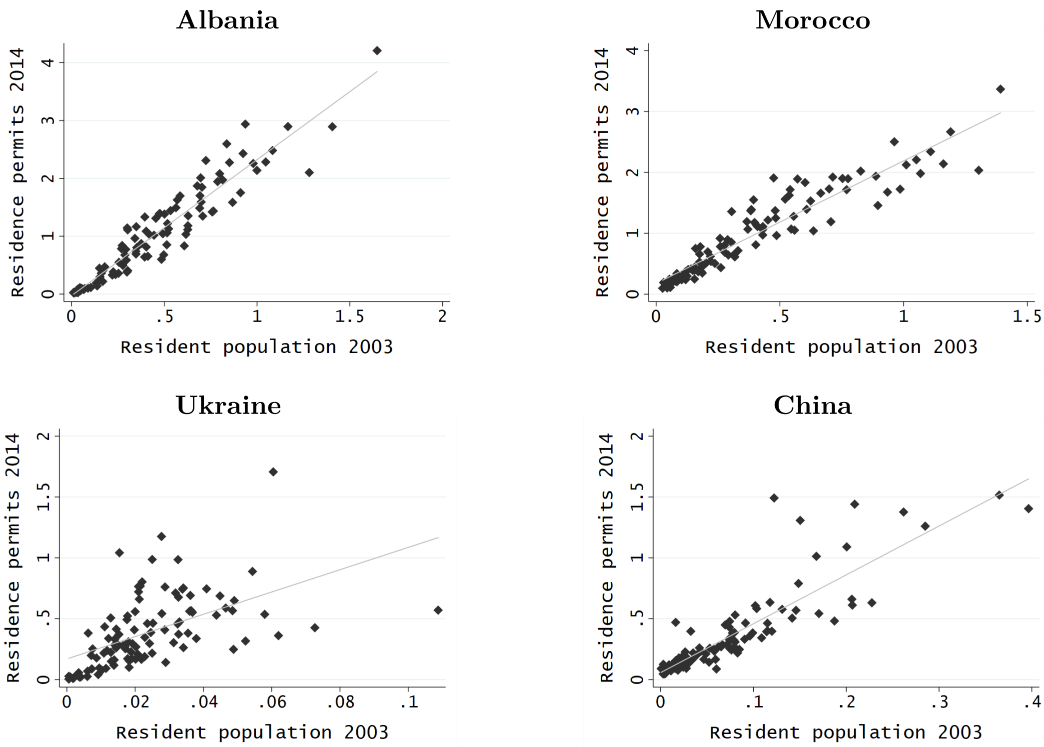
Notes: The figure shows the correlation between the number of legal (I.a and II.a) and illegal migrants (I.b and II.b) per 100 inhabitants in the region of Lombardy. Among legal migrants are included those holding a valid residence permit on 1st January. The distribution of regular and irregular migrants across provinces is plotted at the beginning (Panel [I]) and at the end of the sample period (Panel [II]).
Source: author's rendering on ISMU data.

Figure A.IV.5: Household expenditure on healthcare services, 2004-2014



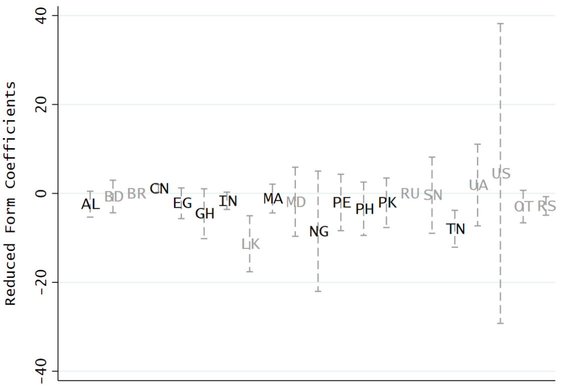
Notes: The figure shows the trend of household expenditure on health care (including drugs, hospital and outpatients services) as a share total final consumption expenditure in Italy, throughout the panel years. Source: ISTAT. Series: Main Yearly Indexes of National Accounting (*Principali aggregati di contabilità nazionale*).
Source: author's rendering on ISTAT data.

Figure A.IV.6: Foreign resident population in 2003 and number of residence permits in 2014, selected top-ranking countries for number of incoming migrants

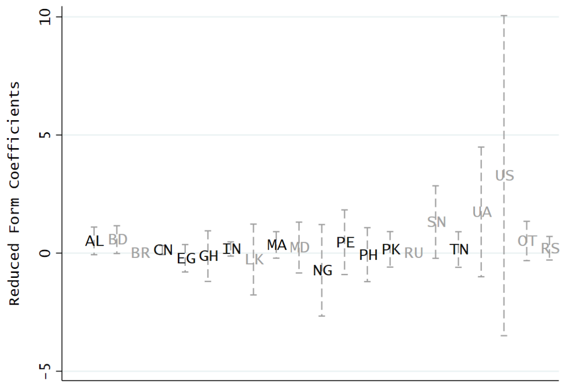


Notes: The figure shows the correlation between earlier settlements and later arrivals of migrants in each province. Foreign resident population in 2003 is plotted against the number of valid residence permits in 2014 for the four top-ranking countries of origin by number of incoming migrants.
Source: author's computation and elaboration on ISTAT data.

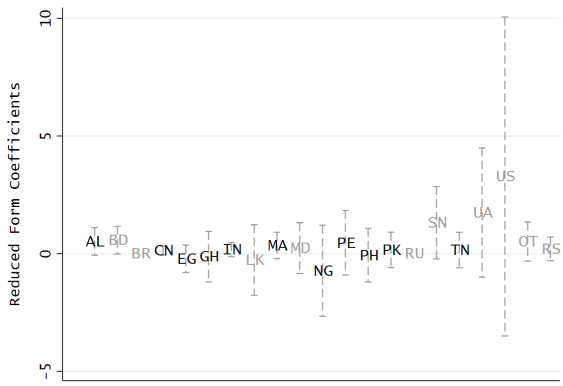
Figure A.IV.7: Reduced-form coefficients and confidence intervals for single-country IV regressions



I.a) ER visits



I.b) Hospitalizations



I.c) Beds utilization rate

The graph shows the reduced form coefficients estimated using residence permits recomputed according to Equation 6 (Section 7). The term n^* includes a single country of origin, indicated using the respective ISO2 code. Dashed lines represent 5% confidence intervals of each coefficient. To simplify graphic content, confidence intervals are not reported for Brazil (BR) and Russia (RU); the two coefficients are not significantly different from zero, and they are reported at the zero threshold. Moreover, whenever the first-stage coefficient β_1:

$$\widehat{migr_{irt}} = \beta_0 + \beta_1 \sum_{j}^{n^\star < n} \left[\mathbf{\Phi}^j_{ir,t_0} * migr^j_t \right] + \mu_i + \varphi_t + \eta_{rt} + \mathbf{A}S_{irt} + \mathbf{B}L_{irt} + \epsilon_{it}$$

is not significantly different from zero at 5% level, the country is reported in grey. This notation is adopted to signal whenever the model-predicted residence permits are not following similar trends of actual migration in the province, implying lack of correlation between the two. Hence, coefficients of countries depicted in grey should be interpreted with caution.

A.V Supplementary regression tables

Table A.V.1: Regression estimates - Exclusion of provinces subjected to administrative reorganization

	[I] ER visits			[II] Stays			[III] Beds utz		
	OLS	**IV1**	**IV2**	**OLS**	**IV1**	**IV2**	**OLS**	**IV1**	**IV2**
[A] Second stage									
Migration	-0.196	-0.606	-0.408	0.108**	0.185*	0.156	0.475**	0.847*	0.229
	(0.361)	(0.614)	(0.645)	(0.0530)	(0.107)	(0.118)	(0.220)	(0.472)	(0.559)
[B] First stage									
$\widehat{Migration}$		0.70***			0.72***			0.72***	
		(0.13)			(0.13)			(0.13)	
$\widehat{Migration}^{Nordics}$			26.17***			27.07***			27.07***
			(6.69)			(6.60)			(6.60)
R^2	0.359			0.744			0.396		
R^2-uncent.		0.356	0.358		0.743	0.743		0.394	0.395
F-stat. (excl.)		27.76	15.32		28.17	16.83		28.17	16.83
Mean of y									
Observations	1,044	1,044	1,044	1,048	1,048	1,048	1,048	1,048	1,048
N. of provinces	96	96	96	96	96	96	96	96	96
Prov. FE	✓	✓	✓	✓	✓	✓	✓	✓	✓
Year FE	✓	✓	✓	✓	✓	✓	✓	✓	✓
Region X Year	✓	✓	✓	✓	✓	✓	✓	✓	✓
Controls Short	✓	✓	✓	✓	✓	✓	✓	✓	✓
Controls Long	✓	✓	✓	✓	✓	✓	✓	✓	✓

Notes: The table presents estimates of the effect of migration on ER visits per 100 inhabitants ([I]), hospitalizations ([II]), and utilization rate of hospital beds (Panel [III]), using the baseline DID model (OLS), the spatial allocation model (IV) and the migration to the Nordics instrument (IV2). All the provinces in Table A.I.1 are excluded from the regression. Region-specific trends, *Short* and *Long* controls are included. Both first-stage ([A]) and second-stage coefficients ([B]) are reported. Standard errors clustered at province level. *** p<0.01, ** p<0.05, * p<0.1.

Table A.V.2: Regression coefficients - *Short* and *Long* controls

	[I] ER visits			[II] Stays			[III] Beds utz		
	OLS	**IV1**	**IV2**	**OLS**	**IV1**	**IV2**	**OLS**	**IV1**	**IV2**
[A] Short controls									
Aging (M)	-57.56	-79.76	-72.10	21.21	23.38	22.92	-60.16	23.38	-72.25
	(111.7)	(111.6)	(114.3)	(26.22)	(25.74)	(25.78)	(118.5)	(25.74)	(116.8)
ER dept. (%)	0.0145	0.0136	0.0139						
	(0.0157)	(0.0154)	(0.0154)						
Beds				14.84***	14.82***	14.82***	-65.61***	14.82***	-65.47***
				(5.200)	(5.088)	(5.087)	(17.45)	(5.088)	(17.14)
Migr_H				-0.00907	-0.0105	-0.0102	-0.132*	-0.0105	-0.124
				(0.0172)	(0.0170)	(0.0172)	(0.0787)	(0.0170)	(0.0773)
Stay length				-0.645**	-0.641**	-0.642**	4.292***	-0.641**	4.272***
				(0.255)	(0.250)	(0.250)	(1.296)	(0.250)	(1.278)
[B] Long controls									
Unempl	-0.170	-0.165	-0.167	-0.00675	-0.00735	-0.00722	-0.0151	-0.00735	-0.0117
	(0.131)	(0.130)	(0.130)	(0.0252)	(0.0248)	(0.0249)	(0.0823)	(0.0248)	(0.0815)
Income	1.161	0.749	0.891	-0.167	-0.122	-0.131	-0.690	-0.122	-0.944
	(0.908)	(0.911)	(0.859)	(0.182)	(0.189)	(0.193)	(0.955)	(0.189)	(1.065)
Educ (%)	-0.609	0.843	0.342	-3.495	-3.620	-3.593	-7.608	-3.620	-6.912
	(17.29)	(17.10)	(16.92)	(4.475)	(4.414)	(4.409)	(17.12)	(4.414)	(16.80)
Accidents	-1.352	-2.491	-2.098	0.445	0.559	0.535	1.677	0.559	1.045
	(5.569)	(5.544)	(5.739)	(1.048)	(1.095)	(1.106)	(5.069)	(1.095)	(5.249)
Crime	4.985	5.427*	5.274*	0.386	0.334	0.345	-1.309	0.334	-1.017
	(3.243)	(3.150)	(3.165)	(0.989)	(0.960)	(0.964)	(4.601)	(0.960)	(4.507)
% Constr	16.38	14.44	15.11	-2.121	-1.919	-1.961	-18.93*	-1.919	-20.06*
	(11.42)	(11.11)	(11.40)	(2.109)	(2.043)	(2.038)	(11.02)	(2.043)	(10.65)
% Agric	11.04	10.26	10.53	7.182**	7.264***	7.247***	27.60**	7.264***	27.14**
	(13.22)	(12.96)	(12.91)	(2.801)	(2.746)	(2.753)	(12.23)	(2.746)	(12.01)
Constant	137.7			-545.9*			-974.0		
	(514.2)			(294.2)			(934.5)		

Notes: The table reports coefficients of the *Short* ([A]) and *Long* ([B]) sets of controls included in the regressions that estimate the effect of migration on the number of ER visits per 100 inhabitants (Panel [I]), hospitalizations (Panel [II]), and the utilization rate of hospital beds (Panel [III]). The first column of each panel employs the baseline DID specification (OLS), while the second and third report the estimates calculated using instrumental variable strategy, based respectively on the spatial allocation model (IV) and migration to the Nordics (IV2). 20 individually identified countries of origin are included in the IV strategy. Migrants from *Other countries* are excluded in the IV2 columns. Standard errors clustered at province level. *** p<0.01, ** p<0.05, * p<0.1.

Table A.V.3: Regression estimates - Exclusion of Southern provinces

	[I] ER visits			[II] Stays			[III] Beds utz		
	OLS	**IV1**	**IV2**	**OLS**	**IV1**	**IV2**	**OLS**	**IV1**	**IV2**
[A] Second stage									
Migration	-0.223	-0.749	-0.661	0.0704*	0.127*	0.0979	0.392*	0.792*	0.192
	(0.347)	(0.586)	(0.593)	(0.0366)	(0.0757)	(0.0963)	(0.215)	(0.439)	(0.554)
[A] First stage									
$\widehat{Migration}$		0.69***			0.72***			0.72***	
		(0.12)			(0.13)			(0.13)	
$\widehat{Migration}^{Nordics}$			27.63***			28.23***			28.23***
			(6.04)			(5.98)			(5.98)
F-stat. (excl.)		31.90	20.91		31.36	21.55		31.36	21.55
R^2	0.348			0.782			0.359		
R^2-uncent.		0.341	0.343		0.782	0.782		0.356	0.358
Mean of y	36.19	36.19	36.19	12.70	12.70	12.70	78.58	78.58	78.58
Observations	868	868	868	872	872	872	872	872	872
N. of provinces	80	80	80	80	80	80	80	80	80
Prov. FE	✓	✓	✓	✓	✓	✓	✓	✓	✓
Year FE	✓	✓	✓	✓	✓	✓	✓	✓	✓
Region X Year FE	✓	✓	✓	✓	✓	✓	✓	✓	✓
Controls Short	✓	✓	✓	✓	✓	✓	✓	✓	✓
Controls Long	✓	✓	✓	✓	✓	✓	✓	✓	✓

Notes: The table presents estimates of the effect of migration on the number of ER visits per 100 inhabitants (Panel [I]), hospitalizations (Panel [II]), and the utilization rate of hospital beds (Panel [III]), using the baseline DID model (OLS), the spatial allocation model (IV) and the migration to the Nordics instrument (IV2). 20 individually identified countries of origin are included in the IV strategy. Migrants from *Other countries* are excluded in the IV2 columns. Provinces from South Italy are dropped for all regressions (Geographical clusters of Italian provinces can be found in Appendix, Section A.II). For each regression strategy, the first column comprises only region-specific trends, while the second column includes only *Short* and *Long* controls. The full size specification is reported in the third column. Both first-stage ([A]) and second-stage coefficients ([B]) are reported. Standard errors clustered at province level. *** p<0.01, ** p<0.05, * p<0.1.

Table A.V.4: IV estimates - Selected countries

	[I] ER visits		**[II] Stays**		**[III] Beds utz**	
	IV1	IV2	IV1	IV2	IV1	IV2
			[‡] Exclusion of East Europe			
[A] Second stage						
Migration	-0.392	-0.775	0.104*	0.0535	0.435	0.122
	(0.588)	(0.552)	(0.0611)	(0.0647)	(0.325)	(0.407)
[B] First stage						
$\widehat{Migration}$	0.84***		0.85***		0.85***	
	(0.11)		(0.11)		(0.11)	
$\widehat{Migration}^{Nordics}$		34.59***		35.24***		35.24***
		(6.55)		(6.33)		(6.33)
F-stat. (excl.)	60.44	27.88	62.88	30.99	62.88	30.99
R^2-uncent.	0.349	0.345	0.752	0.752	0.383	0.382
			[‡‡] Exclusion of North Africa			
[A] Second stage						
Migration	-0.0850	-0.762	0.105*	0.0659	0.293	0.118
	(0.577)	(0.561)	(0.0639)	(0.0676)	(0.323)	(0.418)
[B] First stage						
$\widehat{Migration}$	1.02***		1.02***		1.02***	
	(0.10)		(0.10)		(0.10)	
$\widehat{Migration}^{Nordics}$		36.51***		37.17***		37.17***
		(7.06)		(6.74)		(6.74)
F-stat. (excl.)	98.20	26.78	109	30.44	109	30.44
R^2-uncent.	0.348	0.346	0.752	0.752	0.383	0.382
Observations	1,123	1,123	1,127	1,127	1,127	1,127
N. of provinces	103	103	103	103	103	103
Prov. FE	✓	✓	✓	✓	✓	✓
Year FE	✓	✓	✓	✓	✓	✓
Region X Year FE	✓	✓	✓	✓	✓	✓
Controls Short	✓	✓	✓	✓	✓	✓
Controls Long	-	-	-	-	-	-

Notes: The table reports IV estimates of the effect of migration on ER visits per 100 inhabitants ([I]), hospitalizations ([II]), and utilization rate of hospital beds ([III]). Recomputed residence permits using the spatial allocation model (IV1) and migration to the Nordics (IV2) are used as IVs for actual migration. From the 20 individually identified origins, 5 East European countries in Panel [‡] (Albania, Moldova, Russia, former Serbia and Montenegro, Ukraine) plus 6 North and West African countries in Panel [‡‡] (Egypt, Morocco, Tunisia, Ghana, Nigeria, Senegal) are excluded from the computation. Migrants of other nationalities are never included in the model. Region-specific trends and *Short* controls are added in the regression. Both first-stage ([A]) and second-stage coefficients ([B]) are reported. Standard errors clustered at province level. *** p<0.01, ** p<0.05, * p<0.1.

Table A.V.5: Regression estimates - Effect of migration on the percentage of ER visits resulting in hospitalization

	% Hosp (ER)								
	OLS			**IV1**			**IV2**		
[A] Second stage									
Migration	0.173	0.334**	0.136	0.308	0.646**	0.333	0.605**	0.785***	0.667**
	(0.208)	(0.166)	(0.232)	(0.355)	(0.256)	(0.438)	(0.277)	(0.269)	(0.338)
[A] First stage									
$\widehat{Migration}$				0.71***	0.84***	0.70***			
				(0.11)	(0.07)	(0.12)			
$\widehat{Migration}^{Nordics}$							29.73***	40.41***	28.13***
							(6.56)	(5.21)	(5.93)
F-stat. (excl.)				43.96	134	36.27	20.56	60.11	22.47
R^2	0.391	0.296	0.430						
R^2-uncent.				0.391	0.291	0.429	0.386	0.286	0.423
Mean of y	16.67	16.67	16.67	16.67	16.67	16.67	16.67	16.67	16.67
Observations	1,133	1,131	1,131	1,133	1,131	1,131	1,133	1,131	1,131
N. of provinces	103	103	103	103	103	103	103	103	103
Prov. FE	✓	✓	✓	✓	✓	✓	✓	✓	✓
Year FE	✓	✓	✓	✓	✓	✓	✓	✓	✓
Region X Year FE	✓	-	✓	✓	-	✓	✓	-	✓
Controls Short	-	✓	✓	-	✓	✓	-	✓	✓
Controls Long	-	✓	✓	-	✓	✓	-	✓	✓

Notes: The table presents estimates of the effect of migration on the percentage of ER visits resulting in hospital admission, using the baseline DID model (OLS), the spatial allocation model (IV1) and the migration to the Nordics instrument (IV2). 20 individually identified countries of origin are included in the IV strategy. Migrants from *Other countries* are excluded in the IV2 columns. For each regression strategy, the first column comprises only region-specific trends, while the second column includes only *Short* and *Long* controls. The full size specification is reported in the third column. Both first-stage ([A]) and second-stage coefficients ([B]) are reported. A full description of all variables included is reported in Appendix (Section A.III). Standard errors clustered at province level. *** p<0.01, ** p<0.05, * p<0.1.

Table A.V.6: Regression estimates - Utilization of hospital beds across facilities and departments

	Beds utz.											
	[I] Private			[II] Public			[III] ACs			[IV] LTCs		
	OLS	**IV1**	**IV2**	**OLS**	**IV1**	**IV2**	**OLS**	**IV1**	**IV2**	**OLS**	**IV1**	**IV2**
[A] Second stage												
Migration	0.184	-0.369	-0.195	0.169	0.261	-0.491	0.353	0.407	-0.244	-0.154	0.609	0.710
	(0.637)	(1.094)	(1.221)	(0.213)	(0.411)	(0.590)	(0.235)	(0.431)	(0.579)	(0.581)	(0.946)	(1.259)
[B] First stage												
$\widehat{Migration}$		0.68***			0.71***			0.71***			0.69***	
		(0.13)			(0.12)			(0.12)			(0.12)	
$\widehat{Migration}^{Nordics}$			25.53***			28.03***			28.05***			27.12***
			(6.10)			(6.03)			(6.04)			(5.70)
F-stat. (excl.)		27.15	17.54		34.96	21.59		34.96	21.58		34.77	22.67
R^2	0.235			0.387			0.356			0.192		
R^2-uncent.		0.234	0.235		0.387	0.382		0.356	0.352		0.190	0.189
Mean of y	66.36	66.36	66.36	81.21	81.21	81.21	77.31	77.31	77.31	83.96	83.96	83.96
Observations	955	954	954	1,124	1,124	1,124	1,125	1,125	1,125	1,060	1,060	1,060
N. of provinces	92	91	91	103	103	103	103	103	103	101	101	101
Prov. FE	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Year FE	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Region X Year FE	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Controls Short	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Controls Long	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

Notes: The table presents estimates of the effect of migration on the number of the utilization rate of hospital beds, calculated for accredited private (Panel [I]) and public facilities (Panel [II]), as well as for Acute Care (Panel [III]) and Long Term Care departments (Panel [IV]). The first column of each panel uses the baseline DID model (OLS), while the second and third column employ respectively the spatial allocation model (IV1) and the migration to the Nordics instrument (IV2). 20 individually identified countries of origin are included in the IV strategy. Migrants from *Other countries* are excluded in the IV2 columns. *Short* and *Long* controls are included in the regression. Both first-stage ([A]) and second-stage coefficients ([B]) are reported. A full description of all variables included is reported in Appendix (Section A.III). Standard errors clustered at province level. *** p<0.01, ** p<0.05, * p<0.1.