WORKING PAPER
N. 243
APRIL 2025

The Great Escape: Physicians Leaving the Public Sector

Paola Bertoli

Veronica Grembi

Università Bocconi
BAFFI
Centre on Economics, Finance and Regulation

Via Röntgen 1 | 20136 Milano – Italia | Tel +39 02 5836.5908/5564
baffi@unibocconi.it | www.baffi.unibocconi.eu

The Great Escape: Physicians Leaving the Public Sector*

Paola Bertoli †
University of Verona

Veronica Grembi
La Sapienza, University of Rome

Abstract

In many countries, public healthcare systems are facing the unprecedented challenge of attracting new physicians and retaining existing physicians. Given that the role of noneconomic factors in responding to such a challenge is as important as the role played by economic factors, we use outbreaks of healthcare scandals from 2000 to 2020 in approximately 100 Italian provinces to address the impact of perceived corruption on the density of public hospital physicians. The outbreak of a scandal is associated with a 3.6% decrease in the presence of public hospital physicians. The effect is explained mainly by so-called supply-side drivers, such as ethical concerns (i.e., a scandal related to a malpractice case), a lack of motivation in the workplace, concerns about the high salience of the scandal (e.g., more media coverage), and more outside options. Demand-side drivers, such as a lower level of trust on the patient side, which affects the patient distribution and, indirectly, the physician distribution, do not seem to play a crucial role within the institutional setting analyzed. Our results are robust to different staggered DID estimators, the inclusion of trends to capture potential time-varying attitudes toward corrupt behaviors, and the inclusion of variables that are expected to affect both the density of public hospital physicians and the occurrence of scandals. Healthcare scandals do not seem to affect the density of other types of civil servants, such as teachers or firefighters.

JEL Classification: D7, I19, J24.
Keywords: Healthcare, Corruption, Staggered Diff-in-Diff, Physicians' Supply

*We are thankful to Giovanni Crescenzi (Ministry of the Economy and Finance) for sharing data from the "Conto Annuale". We thank the participants in the seminar at the University of Verona, the 2023 Economics of Healthcare Workforce Workshop (University of Surrey), the 39th AIEL Conference (2024) and the 2025 Meeting of the European Public Choice Society for their comments.

†Corresponding author: paola.bertoli@univr.it, University of Verona, Via Cantarane 24, 37129 Verona, Italy.

1 Introduction

The recent pandemic has worsened the problem of low levels of job satisfaction among healthcare workers employed in the public sector, further threatening both the national and, sometimes, the regional sustainability of public healthcare systems. For example, in the UK, in 2018 and 2019, a total of 232,858 staff members resigned. Eastern and Southern European healthcare systems complain that they have lost physicians from their national health systems because of the austerity policies implemented in the aftermath of the Great Recession (Buchan, 2014). Kankaanranta et al. (2007) documented a worrisome shortage of physicians in Finnish public hospitals in the early 2000s, despite an increasing trend in the total number of physicians: a growing share of professionals moved to the private sector. Sweden suffers from a similar problem, with 6 out of 10 doctors considering changing their workplace, cutting their working hours or abandoning the profession (Swedish Medical Association, 2023).[1] This dire situation was only aggravated by the COVID-19 pandemic (Moberly, 2021). Through early retiring and quitting, the pandemic appears to have triggered a *great resignation from the public healthcare system*, while newly graduated physicians are less likely than in the past to be attracted by the public healthcare system.[2]

As the economic literature has focused on designing the best policy response to deal with the personnel crisis of public healthcare systems, better planning with regard to the number of trained physicians needed to make the system sustainable or better paychecks do not seem to be enough (Moscelli et al., 2022). In addition to economic incentives, noneconomic drivers still play a crucial role in explaining the physician distribution in and out of the public system (e.g., Falcettoni, 2017). Although it is common knowledge that politics has a strong role in public healthcare systems (e.g., Bloom et al., 2015), its pervasiveness in terms

[1] In particular, the shortage seems to involve specialized doctors (National Board of Health and Welfare, 2022). A move to the private sector has also been observed among Danish doctors, who prefer better-paid jobs as consultants to their full-time public-sector employment (Friss Wang, 2021). Outside the EU, the case of South Africa is interesting. Although South Africa can rely on an appropriate supply of physicians, it suffers from a severe imbalance between the public and private sectors, with the latter employing 46% of nurses and 56% of all specialized physicians in 2009 (Econex, 2009). The choice of private-sector employment does not seem to be driven purely by more generous financial incentives. In fact, public-sector physicians report a greater level of distrust in healthcare authorities (i.e., the Department of Health) and poorer perceived career opportunities despite more frequently feeling "needed" and "relevant" (Ashmore, 2013).

[2] It appears that between 2021 and 2022, Google searches for "leaving the NHS" were up 129% year on year, which shows that more people may be considering leaving public health services, the end of the pandemic emergency notwithstanding. See the post *The NHS Great Resignation* (written on 8th March 2022 by Richard Money-Kyrle, `https://www.boyesturnerclaims.com/news/nhs-great-resignation`. Link accessed March 2025. Other countries are experiencing similar problems. According to a survey of the Italian Association of Executive Physicians (ANAAO, 2020), almost half of the physicians currently working for the National Health System want to quit their position in the short run (i.e., next two years). Similarly, in 2020, 4% of Spanish physicians reported their intention to leave the profession, while 30% admitted that they were considering this option (Foundation, 2020).

of constrained opportunities for professional progression and lack of attractiveness of the workplace is not frequently addressed in the management of healthcare personnel. Buchan et al. (2014) identified perceived corruption and professional nepotism as being among the main factors incentivizing the migration of healthcare personnel; at the same time, Buchan et al. (2014) stressed that the provision of the total removal of any appearance of corruption is a key element in keeping physicians in their home country. Nevertheless, these factors have been substantially disregarded when the physician distribution in and out of the public system is at stake. Hence, we contribute to this literature by assessing the role of scandals involving the public healthcare system in the capacity of the Italian healthcare system to attract and retain physicians.

Italy is a perfect setting for testing the role of scandals for several reasons. In recent decades, the debate over the lack of physicians has been mounting, and restrictions on the entrance of training physicians (the so-called *numerous clausus*) have been identified as among the main causes of the scarce supply for the public system. However, compared with international standards, the average physician density in Italy does not raise dramatic concerns, unlike the case of the average nurse density (Table B1). As shown in Figure B1, in 2019, Italy was ranked among the countries with above the OECD average medical graduates per capita. However, a great deal of fleeing from public hospitals (both early retiring and a lack of newcomers) seems to have taken place, as qualitatively shown in the newspaper clippings highlighted in Appendix C. Even with the substantial increase in the number of fellowships and slots in postgraduate programs before the COVID-19 emergency (Subsection 2.2), new physicians did not translate into more physicians working at public hospitals.

To address how perceived corruption in the healthcare system affects the presence of physicians in public hospitals, we explore the staggered outbreak of scandals in healthcare during the 2000-2020 period. By searching news databases (e.g., Factiva and Nexis Uni) and conducting our own research, we identify 16 main scandals that could also be classified according to their nature (e.g., medical malpractice, bribery), location, and specific outbreak. These scandals impacted different regional healthcare systems at different points in time. Hence, we move away from a canonical two-way fixed effect estimation approach and instead rely on the estimator proposed by Borusyak et al. (2023) for staggered adoption designs.

We assess that the outbreak of a healthcare scandal is associated with a 3.6% decrease in the physician density (physicians in public hospitals per 1,000 inhabitants). Our baseline estimates are robust to the introduction of regional time trends to control for the exogeneity of scandal outbreaks and to control for the presence of physicians and healthcare personnel among regional politicians. Since regions are the administrative level for institutional competence in the healthcare sector, a higher incidence of healthcare personnel might affect both

the probability of experiencing a scandal and the physician density in public hospitals. The baseline findings are also robust to the application of alternative estimators for staggered adoption designs (i.e., Arkhangelesky et al., 2021; Callaway and Sant'Anna, 2021; and De Chaisemartin and d'Haultfoeuille, 2020). We also exclude the possibility that our findings may be driven by public-sector phenomena other than outbreaks of scandals by testing our model using both teacher and firefighter densities (i.e., teachers and firefighters per 1,000 inhabitants), for which no significant effect is estimated.

Analyzing the mechanisms that explain our average results, the limited availability of data prevents an analysis of the impact on the inflow of new physicians rather than the outflow of existing physicians. Therefore, we focus on mechanisms that are potentially of interest for both flows and categorize them into the supply side or the demand side. On the supply side, among the top reasons for leaving the public sector are a low level of satisfaction with the professional career and a negative perception of the work environment (e.g., Kroezen et al., 2015; El Koussa et al., 2016), and the effect of scandals might be reinforced through those channels through the reactions of physicians. On the demand side, scandals may harm the reputation of hospitals in a given location, lowering patients' trust and affecting their choices of where to be treated. From a policy perspective, a drop in physicians due to a change in patient mobility (e.g., less trust) requires a policy response different from a similar drop due to a demotivation channel related to low satisfaction with the work environment.

We show that the average outcomes are mainly explained by supply-side mechanisms: the effect is stronger when there are more outside options, when there are more concerns about the work environment, both in terms of ethical concerns and career prospects, and when the salience of the scandal is greater.

As public healthcare systems struggle to retain their physicians, our results stress the importance of improving not only wages, which are normally considered the main problem in selecting and retaining civil servants, but also transparency and clarity in career patterns and the selection of managerial positions according to the actual competence required by the position. The perceived low level of prestige of the public healthcare system, concerns for patient safety, and the lack of clarity regarding career opportunities deserve to be accounted for more when defining retention policies for physicians, similar to other professional figures in the public sector.

The paper is organized as follows. Section 2 describes the main features of the Italian healthcare system, the training of physicians, and policies that have limited hiring for a long time; it also addresses the beliefs of Italian physicians depending on their type of employment (private vs. public sector). Section 3.1 provides a description of the main dataset used in the econometric section and the definition of scandal used throughout the paper, while Section 3.3

defines our identification strategy. Section 4.1 discusses the baseline results and robustness checks. Section 5 examines the channels that conceptually clarify the average effects, and Section 6 concludes the paper.

2 Institutional Background

2.1 The Italian NHS and the Training of Physicians

There are 19 regions and 2 autonomous provinces (the Autonomous Province of Trento and the Autonomous Province of Bolzen) that are responsible for providing medical assistance to their residents. While regional governments must comply with national standards (Lisac et al., 2008), they can freely choose how to regulate and structure healthcare delivery within their territory.[3] As a result, Italy includes 21 micro-healthcare systems that rely on different mixes of local health authorities (LHAs) running their own hospitals, independent hospitals (e.g., teaching hospitals, hospital trusts), and private facilities (Anessi-Pessina et al., 2004). Private providers can either operate under the national health system (i.e., the so-called *privato accreditato*) or not. With respect to accessing public or private accredited services, patients are covered by health plans provided by LHAs according to their place of residence; however, there may be intra- and interregional mobility flows (proxies for the quality of the systems).

The central government regulates not only the healthcare system but also the training of physicians through its university system. Basic medical training at a public or private university lasts 5-6 years and is followed by a state examination that qualifies candidates to be listed in the national register and to be allowed to practice the medical profession.[4] Since 1999, access to university medical programs has been limited through a competitive assessment exam and the introduction of the *numerus clausus*.[5] Around the same year, the Ministry of University also started to set the total number of seats available for postgraduate degrees (i.e., residency programs). The number of students eligible for graduate programs is decided at the national level in agreement with regional governments on the basis of an evaluation of needs, including those at the local level, and the capacity of universities

[3]National standards include the definition of minimum levels for the quality of services provided (*i.e., Livelli Essenziali di Assistenza, LEA*), rules on the recruitment of professionals, and allowed expenses.

[4]To achieve and maintain their professional status, both private-sector and public-sector doctors must undertake a three-stage educational path, including university education, postgraduate education (i.e., specialization) and lifelong continuing medical education.

[5]Owing to Law 264/99, each medical school must define a yearly numerus clausus. This legislation follows European directives 78/687/CEE and 93/16/CEE, which define uniform standards for the training of professionals within the EU.

(de Belvis et al., 2022). Fellowships for residency programs might also be entirely funded by regional governments, as they might regard it necessary to invest more in specific professional profiles. The duration of residency programs is between 3 and 6 years (e.g., cardiology: 4 years; obstetrics and gynecology: 5 years). From the 2017/2018 academic year to the 2018/19 academic year, the number of residency slots increased by 44% (following a couple of years with only a +2% increase). In the 2019/20 academic year, this increase reached +62%.

2.2 Physicians in Public Hospitals

Physicians are hired by the NHS on the basis of public competitions, whereas hospitals and clinics operating in the private sector autonomously manage their recruitment processes. Once employed by the NHS, physicians acquire the status of civil servants and are salaried. Hospital physicians employed in the public sector are paid more than those employed in the private sector. The difference is approximately 30% of the annual wage for nonreligious hospitals and approximately 20% of the annual wage for religious hospitals.[6] The public sector also provides more worker protections than does the private sector, but it imposes more restrictions in terms of running a private practice.

Public hospital physicians cannot hold a position as employees in both public and private hospitals (Legislative Decree 502/1992). Under specific and regulated conditions, outside their working hours, they are allowed to engage in private practice within their own hospital (the so-called "intramural" regime) with which they will share revenues or outside their hospital under the so-called "extramural" regime. Under no circumstances are they allowed to practice in a private hospital while working for the public NHS.

The recruitment of public-sector physicians has been affected by two policies that impose restrictions on hiring. A short-term policy was implemented as a reaction to the 2008 Great Recession. This policy aimed to contain the total expenditures of the whole public sector. In particular, regarding the hiring process, the 2010 Budget Law (*i.e., Law 191/2009*) set a maximum budget.[7] A strict limitation on the recruitment of personnel was introduced, causing a contraction in the demand for healthcare workers in the public sector. The same law also banned the retirement of NHS personnel until December 31, 2012 (*i.e.,* 2 years following implementation).

[6]It is difficult to produce an average wage since it depends not only on seniority in the system (less than 5, from 5 to 15 years, etc.) but also on whether a physician performs night shifts or works on weekends. Hence, if a physician decides not to have night shifts or not to work on weekends, she will receive a lower wage than another physician with her same seniority who decides to do at least one of them.

[7]Specifically, the annual maximum expenditure for NHS personnel faced by each region was capped according to the threshold represented by the payrolls registered in 2004, which was reduced by 1.4%. Although this rule is still in place, the 2018 Budget Law lowered the threshold for the labor cost registered in 2004 by 1.3%, while Law Decree 35/2019 replaced the labor cost in 2004 with that in 2018.

The limitations introduced due to the constraints of the Great Recession added up to a long-term policy ruling the healthcare system with respect to the containment of expenditures. The 2006 National Budget Law (Law 266/2005) introduced a new tool for the central government to monitor and regulate the budgets of regions with healthcare-related deficits, the so-called repayment plans (i.e., *Piani di rientro*). These plans are contractual agreements between the national and regional governments that are initially imposed whenever the regional healthcare deficit is greater than or equal to a set threshold (i.e., 7%) of the previous year's deficit (Ministero della Salute, 2006). Under a repayment plan, a region must provide the central government with a credible plan for reorganizing its healthcare system. Regarding personnel, regions need to adopt a turnover ban. They have to reduce temporary staff and the number of hospital beds by 50%.[8] Overall, the goal of this measure is to promote efficiency in regional healthcare systems while preserving the minimum level of assistance established by national standards.

The consequences of the Great Recession policies, the poor management of healthcare services triggering the adoption of repayment plans, and poor planning for residency slots have fueled growing distress and dissatisfaction among public-sector healthcare physicians. The overall perception of the work environment in the Italian public healthcare system is well captured by the following statement: *Italy is not an attractive place to work. Inadequate working conditions, little stability, growth, or potential for career progression, low salaries, the mixture of politics and the healthcare system, and fake recruitment committees (the notorious Concorsi Truccati) hit the headlines regularly* (*The Lancet*, 2019). In general, compared with other types of civil servants, healthcare workers seem to particularly suffer from the perception that hard work does not make too much of a difference. On the basis of the 2013 *European Quality of Government Index* Survey, Figure B2 shows that healthcare workers working in the Italian public system agree more than other types of civil servants with the following statement: "*Hard work is no guarantee of success in the public sector for most people; it is more a matter of luck and connections*" (Charron et al., 2015).

For all these reasons, it is also easy to understand why physicians trained abroad account for 0.9% of the total in Italy, whereas in France, Germany, and the United Kingdom, they account for 12%, 13%, and more than 30%, respectively (OECD, 2022). Low attractiveness within the country coincides with low attractiveness outside the country.

[8]This reduction is usually undertaken to induce patients to rely on (less expensive) outpatient clinics and to encourage hospitals to directly distribute drugs to patients with chronic conditions. In addition, the region has to increase its regional tax rates (i.e., the income surcharge and the regional tax on production). In exchange, the central government provides access to supplementary budget funds to improve the region's financial position and ensure that health assistance can be provided to its citizens (Bertoli and Grembi, 2017).

3 Empirical Analysis

3.1 Data

Our baseline analysis exploits three main data sources; the first two are used to define the main outcome, whereas the third is used to select the controls. First, to measure the distribution of doctors in the country, we leverage administrative data from the Ministry of Health on the number of doctors working in public hospitals.[9] These data allow us to construct a panel dataset at the provincial level since provinces represent the most disaggregated and meaningful geographical area of reference to focus on when the distribution of doctors is at stake. Second, we complement these data with information on the resident population at the provincial level obtained from the Italian Institute of Statistics (ISTAT) to compute our outcome of interest, namely, the *doctor density*, which is defined as the number of doctors working in public hospitals per 1,000 inhabitants in a province. Third, we integrate the panel with province-level information collected from theHealth for All (HFA) ISTAT database. In particular, we recover information on the percentage of public hospital beds and on the demographic and socioeconomic structure of the population in each Italian province in our dataset. Hence, we construct indexes on the population share by age group (i.e., the share of the population younger than 14 years, that between the ages of 15 and 64, and that older than 65 years). To capture the socioeconomic status of residents, we also compute several measures of the average level of education (i.e., the share of residents with a high school diploma and the share of residents with a bachelors degree) and on the average income, adjusted for inflation.[10] Overall, our panel includes 99 provinces for the 2000-2020 period, with an average doctor density of 1.66 doctors employed in public hospitals for every 1,000 inhabitants.[11] Almost 22% of the provincial population is aged 65 or older, while almost 19% is aged 15 or younger. On average, 54% of the provincial population holds a high school diploma, while 13.4% holds a bachelor degree (for more descriptive information, see Table A2).

[9] Data on the distribution of doctors working in the private sector are unavailable. The "Health For All (HFA) - ISTAT" dataset provides some statistics but has important limitations. First, the HFA collects information on the distribution of physicians working in private accredited hospitals only. Second, these data are available from 2011 onwards. In contrast, there are no publicly accessible data on the personnel employed in private hospitals.

[10] Table A1 provides a detailed description of our variables.

[11] Comparisons with the doctor density in other countries are difficult as the available statistics generally look at physicians in the public sector as a whole, rather than at public hospital physicians only. We exclude the provinces located in Sardinia, as it is not possible to reconstruct the actual distribution of doctors due to several changes in their number and territorial competence. At the beginning of our observation period (i.e., 2000), 4 provinces in Sardinia were affected (i.e., Cagliari, Nuoro, Oristano and Sassari). In 2005, four new provinces were instituted (i.e., Medio Campidano, Sulcis Iglesiente, Ogliastra and Gallura), which were later dismantled in 2016 when the province of Cagliari was split to create the new province of Sud Sardegna.

3.2 The Scandals

Our empirical strategy views the outbreak of a healthcare scandal as an exogenous shock impacting the presence of doctors working in public hospitals at the provincial level. The outbreak of a scandal occurs once there is official news on police and/or judiciary investigations of illicit activities involving physicians, directors or structures and institutions within the public healthcare system. Hence, for example, we do not consider possible complaints or allegations that did not produce an intervention from the competent authorities.

We focus mainly on outbreaks of scandals rather than on their judicial outcomes for several reasons. First, Italy is well known for the excessive length of its judicial proceedings. For example, in the middle of our observation period, in 2012, the average disposition time of a civil case amounted to almost 9 years, according to CEPEJ statistics.[12] Second, these are cases that end up with the Court of Cassation, that is, the highest court of appeal in Italy. These two aspects combined mean that there is still no actual resolution for most recent cases (i.e., from 2015 onward). Third, in those cases on which the Court of Cassation has already ruled, there has been no full acquittal for any of the suspects. Moreover, the room devoted in the media to rulings by the Court of Cassation is often irrelevant. A representative example of the complexity and length of these scandals and related trials is the scandal that involved the governor of the Abruzzo region, Ottaviano Del Turco, in 2008. Del Turco was arrested and charged with engaging in criminal associations, corruption, and extortion in the management of the regional healthcare system. The scandal received great media attention to the extent that it became the "Sanitopoli" case. In 2013, the court of first instance sentenced Del Turco to 9 years and 9 months in prison for the crimes of criminal association, corruption, extortion, attempted extortion and forgery. In 2015, the sentence was reduced to 4 years and 2 months by the Court of Appeal of L'Aquila for the crimes of criminal association and undue inducement, while Del Turco was acquitted of corruption and forgery. Later, in 2017, the sentence was further reduced to 3 years and 11 months as the Court of Appeal of Perugia acquitted Del Turco of the charge of criminal association. Finally, in 2018, the Court of Cassation confirmed the sentence of 3 years and 11 months for undue inducement.

To identify scandals and their main geographical area of influence, we perform extensive research on several digital archives of newspaper articles. Specifically, we rely on two of the most comprehensive global archives of news content, namely, Factiva and Nexis Uni. The former covers 18,000 sources from 159 countries in 22 languages, whereas the latter covers over 15,000 sources in the news field. Then, we perform specific studies in the online archives of the main and most read newspapers in the country (e.g., La Repubblica, Il Corriere della

[12]Data available at `https://public.tableau.com/app/profile/cepej/viz/EfficiencyEN/Efficiency`. Last accessed on March 14th, 2025.

Sera, and La Stampa). As a result, we reconstruct the history of scandals in the Italian healthcare sector during our observation period. For each province, we then identify the outbreak of the first scandal, as summarized in Table 1, which provides an overview of the scandals, with a focus on where they took place, the year they broke out, and their nature. In particular, while all scandals entailed (to different extents) corruption and bribery, some of them also entailed a direct threat to patient health (i.e., medical malpractice).[13]

Table 1: **Scandals in the healthcare sector**

Year	**Provinces**	**Type of scandal**
2001	Alessandria, Asti, Biella, Cuneo, Novara, Torino, Verbano-Cusio-Ossola, Vercelli	Corruption
2003	Belluno, Padova, Treviso, Venezia, Verona, Vicenza	Medical malpractice
2005	Avellino, Benevento, Caserta, Napoli, Salerno	Corruption
2006	Frosinone, Latina, Rieti, Roma, Viterbo	Medical malpractice
2006	Campobasso, Isernia	Corruption
2007	Bergamo, Brescia, Como, Cremona, Lecco, Lodi Mantova, Milano, Pavia, Sondrio, Varese	Medical malpractice
2008	Chieti, L'Aquila, Pescara, Teramo	Corruption
2009	Bari, Brindisi, Foggia, Lecce, Taranto	Corruption
2009	Genova, Imperia, La Spezia, Savona	Medical malpractice
2009	Agrigento, Caltanissetta, Catania, Enna, Messina Palermo, Ragusa, Siracusa, Trapani	Corruption
2010	Perugia, Terni	Corruption
2014	Bologna, Ferrara, Forlí-Cesena, Modena, Parma, Piacenza, Ravenna, Reggio nell'Emilia, Rimini	Corruption
2016	Catanzaro, Cosenza, Crotone Reggio Calabria, Vibo Valentia	Medical malpractice
2018	Matera, Potenza	Corruption
2019	Arezzo, Firenze, Grosseto, Livorno, Lucca Massa-Carrara, Pisa, Pistoia, Prato, Siena	Corruption
2019	Ancona, Ascoli Piceno, Macerata, Pesaro-Urbino	Corruption

Notes: This table reports the first healthcare scandal that broke out in each Italian province in our dataset during the 2000-2020 period. No scandals were registered in the following provinces: Aosta, Bolzen, Gorizia, Pordenone, Trento, Trieste and Udine.

The decade preceding our observation period (i.e., 1990-1999) was characterized by an unprecedented national scandal regarding the corruption of the political system, that is, the so-called *Clean Hands* (i.e., "Mani pulite") scandal. In this context, some corruption cases

[13]For example, in 2002, the directors of the cardiac surgery department of the fourth largest public hospital in Italy (i.e., Le Molinette in Turin) were charged with awarding a supply contract for heart valves to two companies in exchanges for bribes. These valves were subsequently found to be defective, causing the death of 7 patients.

within the healthcare sector were brought to light, but they still had a national dimension. Specifically, in 1993, Duilio Poggiolini, the former director general of the National Pharmaceutical Service, was indicted for taking bribes from pharmaceutical companies to include their products in the National Pharmaceutical Handbook. One year later, in 1994, the former minister of health, Francesco De Lorenzo, was arrested for accepting approximately 9 billion lire (i.e., approximately 4.5 million euros) in bribes from pharmaceutical companies to make the vaccination against hepatitis B mandatory. The only "local" scandal took place in 1997, when Giuseppe Poggi Longostrevi, the owner of several private clinics in Lombardy, was accused of bribing Italian general practitioners to prescribe useless and expensive clinical tests to be performed in his clinics. Although this last scandal broke out some years before the beginning of our observation period, there may be concerns that Lombard provinces should not be included in our analysis since they were treated before 2000. To address such concerns, we run a robustness check excluding these provinces from our estimation (Section 4.2).

3.3 Econometric Strategy

We identify the impact of healthcare scandals on the density and distribution of public-hospital doctors by exploiting the quasi-experimental variation triggered by staggered outbreaks of scandals across provinces and time.

A traditional approach to such a setting relies on the two-way fixed-effects (TWFE) estimator, which consists of ordinary least squares (OLS) estimation with time and unit fixed effects of the following equation:

$$Outcome_{pt} = \alpha_p + \beta_t + \sum_y \tau^{ATE} d_{pt} + \epsilon_{pt} \tag{1}$$

where α_p are province fixed effects to control for time invariant sentiments toward corruption episodes and social norms on the acceptability of corrupt behaviors, β_t are year fixed effects, d^y_{pt} d_{pt} is a province-year-level estimator of treatment indicating whether a healthcare scandal broke out in province p before year t, and τ^{ATE} identifies the average effect of the outbreak of a healthcare scandal.

However, the TWFE estimator does not provide consistent estimates when treatment effects are heterogeneous across treated groups and/or time (Borusyak, Jaravel, and Spiess 2023; Callaway and SantAnna 2021; Goodman-Bacon, 2021; Sun and Abraham 2021; De Chaisemartin and dHaultfoeuille, 2020). The standard TWFE estimator results from a weighted average of causal effects (ATE) across group-time cells with groups that are treated

at different points in time. In a staggered setup, this means that the control group (i.e., the group not experiencing a change in its treatment status) includes both not-yet-treated units and units treated in earlier periods. Thus, problems arise whenever the impact of the treatment on earlier treated units varies over time as the evolution of their outcome embeds both the impact of the treatment and the counterfactual trend. Hence, in this case, earlier treated units cease to be legitimate counterfactuals, and the TWFE estimator leads to biased estimates for the ATE.

The assumption about homogeneity in the treatment effect is likely not met in our setting, as the outbreak of a scandals varies considerably in terms of timing; additionally, the impact of scandals can be expected to change over time. As documented in Section 2, working conditions in the public healthcare sector have been deteriorating over time. Simultaneously, the concept of doctors as professionals has started to be increasingly challenged by patients, especially in the public sector, with the extreme case of some medical professions being downgraded to dequalifying careers (e.g., GPs or emergency medicine doctors). Overall, the dissatisfaction of doctors working in public hospitals has been increasing. Hence, one can reasonably expect that, for example, a corruption case would impact doctors' willingness to abandon public-sector employment differently if it was brought to light in 2000 rather than in 2020. This means that the TWFE provides us with a weighted average of province-year treatment effects characterized by a likely uneven distribution of weights with the further threat that some of these weights may be negative for some units (De Chaisemartin and d'Haultfoeuille, 2020). To formally test this concern, we follow De Chaisemartin and d'Haultfoeuille (2020) and check the weights in the TWFE estimation of the average treatment effect in our setting. Out of 1,016 province-level estimates, 20.6% are assigned a negative weight, and the canonical TWFE estimation is likely to be ill-defined and to provide downward-biased estimates.

Instead of the TWFE, we follow Borusyak et al. (2023), who proposed a three-step estimation procedure. Therefore, our outcome of interest in each province-year is expressed as follows:

$$log\ outcome_{pt} = \alpha_p + \beta_t + \tau_{pt} d_{pt} + \omega Z_{pt} + \epsilon_{pt} \tag{2}$$

where τ_{pt} represents the province-year-specific treatment effect, which cannot be estimated (separately from ϵ_{pt}).[14] We want to identify the ATE across all post-treatment years, that is, the (conditional) expectation of τ_{pt}.

[14]Standard errors are clustered at the provincial level.

Then, $\hat{\alpha_p}$ and $\hat{\beta_t}$ are estimated using only untreated observations. Once estimated, these fixed effects are used to obtain treatment effects for each treated province-year (i.e., $\hat{\tau_{pt}} = Outcome_{pt} - \hat{\alpha_p} - \hat{\beta_t}$), which, as a final step, are averaged. The weighting procedure is performed to pair the respective relevant aggregate estimates. For example, in this case, the average procedure equally weights all estimates from all treated periods when looking at the average effect. In contrast, when the focus is on the average affect for a specific year y following the treatment, the average procedure applies a null weight to all province-year estimates other than those referring to y years since the treatment.

Finally, Z_{pt} is a vector of provincial time-varying controls. Z_{pt} includes the share of the population younger than 14 years, the share of the population older than 65 years, the share of the population with a high school diploma, the share of the population with a bachelors degree, the average income, the percentage of public hospital beds, and the share of hospital discharge for patients who are residents of a given province and are registered in other regions. In addition, we include a dummy indicating whether a given province in a given year belongs to a region subject to a specific recovery plan. This dummy allows us to control for the quality of healthcare management at the regional level and for restrictions on public health expenditures.

To simplify the interpretation of the results, we estimate our model using the natural logarithm of the *doctor density* as the dependent variable.[15]

4 Results

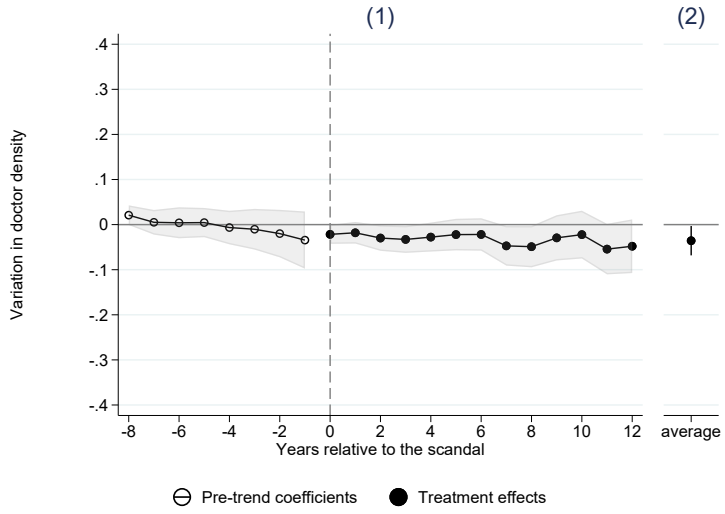
4.1 Baseline Results and Alternative Estimators

Figure 1 graphically presents our main findings. Column (1) presents an event study analysis with yearly pretreatment estimates for the 8 years preceding the scandal outbreak (i.e., treatment introduction) and yearly treatment estimates for the 12 years after the scandal outbreak.[16] As shown, no anticipation effect is detected, whereas there is a statistically significant decrease in the density of public-hospital doctors in the post-treatment years. Column (2), as well as Table 2, shows that a scandal outbreak results in, on average, a 3.6% decrease in the number of public-hospital doctors per 1,000 inhabitants.

[15] We also estimate our model using *doctor density* as the dependent variable without applying logarithmic transformation. The results are robust.

[16] This time window has been chosen considering the distribution of scandals during our observation period. In particular, looking at 8 pre-trends means having complete observations for all those scandals from 2009 and onward. Since we do not have a truly large never-treated group, too many pre-trend coefficients would reduce the power of the joint test. Moreover, the number of pre-trend coefficients does not affect the post-treatment effect estimates as these are always computed under the assumption of parallel trends and no anticipation.

Figure 1: **Main results**



Notes: The figure shows average treatment effects relative to the scandal outbreak (i.e., treatment introduction). In Column (1) the circles represent estimates for pretreatment years, and the dots represent treatment estimates for the first 8 years since the scandal outbreak, while the shaded areas represent the 95% confidence intervals around the estimates. Column (2) shows the average treatment effect estimate with 95% confidence intervals. All estimates account for the set of covariates detailed in Table A1, and for year fixed effects and provincial fixed effects. Standard errors are clustered at the provincial level.

Table 2: **Alternative estimators**

	Point estimate	Standard error	Lower bound 95% confidence interval	Upper bound 95% confidence interval
Borusyak et al. (2023)	-0.036	0.017	-0.068	-0.003
Callaway and Sant'Anna (2021)	-0.065	0.027	-0.118	-0.012
De Chaisemartin and d'Haultfoeuille (2020)	-0.033	0.014	-0.061	-0.006
Arkhangelsky et al. (2021)	-0.071	0.019	-0.109	-0.033
Provincial Fixed Effects	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes
Provinces	99	99	99	99
Observations	2,079	2,079	2,079	2,079

Notes: This table shows the baseline estimates obtained by applying the alternative difference-in-differences estimators introduced in Callaway and Sant'Anna (2021), De Chaisemartin and d'Haultfoeuille (2020), and Arkhangelsky et al. (2021). The controls are those specified in Table A1.

There are several alternative estimators other than that of Borusyak et al. (2023) that can be applied for staggered adoption research designs whenever relatively strong assump-

tions about homogeneity in treatment effects may not hold. To address possible concerns about the reliability of our findings, we replicate them using the robust estimators introduced in Callaway and SantAnna (2021), De Chaisemartin and d'Haultfoeuille (2020) and Arkhangelsky et al. (2021).[17]

The estimator of Callaway and SantAnna differs from that of Borusyak et al. (2023) in that it compares treatment effects against one period before treatment rather than against the average of all pretreatment periods. This means that Callaway and SantAnna (2021) relate their pretrend coefficients to the period preceding the period under consideration. In contrast, Borusyak et al. (2023) interpret pretrend coefficients over a longer time frame by looking at the average of all periods before the period under consideration. As noted in Roth et al. (2023), the use of the average of multiple pretreatment periods allows the Borusyak et al. (2023) estimator to gain accuracy. Moreover, the pretrend coefficients depicted in Figure 1 show the absence of a distinguishable diverging trend over the years preceding a scandal, supporting the choice of the estimator of Borusyak et al. (2023) over that of Callaway and SantAnna (2021).

De Chaisemartin and d'Haultfoeuille (2020) proposed an estimator closer to that of Callaway and SantAnna (2021), with the additional element of not requiring treatment to be an absorbing state. Groups that are treated in a period are compared to groups whose treatment status does not change over the same period. This implies the so-called no carryover assumption: i.e., the current treatment status, rather than the full treatment history, drives potential outcomes (Roth et al., 2023). In our context, this assumption is quite restrictive since it would entail the unlikely scenario where the doctor density in period t depends only on whether a healthcare scandal broke out in period t and not on the history of scandals.

As an additional robustness check, we also test our findings using the synthetic difference-in-differences (DID) model proposed in Arkhangelsky et al. (2021). This model combines the synthetic control method and the difference-in-differences approach; thus, it can be thought of as a weighted regression with both unit and time fixed effects. As its most attractive feature, it does not assign equal weights to all control units; rather, it ensures that unit weights are such that treated units are compared to controls exhibiting similar parallel pretreatment trends. Hence, controls that follow very different trends are assigned very little weight or no weight at all. In this way, the synthetic DID model imposes a weaker parallel trend assumption.

As shown in Table 2, the estimates produced by these robust estimators are qualitatively

[17]As a further check, we also apply the canonical TWFE model, as described in Equation 1. As shown in Table A3, the average treatment effect is negative and statistically significant, and it represents a 2.3% decrease in the density of public-hospital doctors. As discussed in Section 3.3, the TWFE estimator is downward biased compared with our main findings.

similar to our baseline results.

4.2 Robustness Checks

We perform several checks to test the robustness of our results to alternative explanations. To control for the exogeneity of the year of the first scandal, we started introducing region-year fixed effects trends to account for changes in regional governments, which may increase the probability of a scandal outbreak related to the regional organization of the healthcare system. Region-year fixed effects trends also allow us to control for time-varying changes in cultural attitudes toward corrupt behaviors and what is considered to be acceptable. The results in Table 3, Column (1) confirm our baseline findings.

To control for potential confounding factors affecting both the presence of physicians in public hospitals and the outbreak of scandals involving the public healthcare system, we obtain data on the involvement of physicians and medical personnel in political life.[18] A higher incidence of physicians in regional governments may, for example, put pressure on the regional administration to increase hiring, but they can also become stuck in episodes of corruption, or they may want to identify episodes of corruption involving the healthcare system to make the system more efficient. Hence, we collect data on the composition of regional governments from 2000 to 2020 and calculate the incidence of physicians and medical personnel in their composition. As shown in Table 3, Columns (2) and (3), our results are robust to the inclusion of these variables.

There may be a further concern about the inclusion of Lombard provinces in our observation period as if they were unaffected by any scandal, as was the case for all other provinces in our dataset. As explained in Section 3.1, before the beginning of our observation period (i.e., before 2000), the Italian healthcare sector already suffered from scandals. Nevertheless, they had a national dimension. To address this concern, we test the robustness of our results to the exclusion of Lombard provinces.[19] As shown in Table 3, Column (4), our baseline findings are robust, and the estimated effect of scandals coincides with a 3.2% decrease in the density of public hospital doctors.

Since repayment plans are applied at the regional level, we question whether the observed decrease in doctor density may be driven by provinces under a repayment plan. As explained in Section 2.2, these plans have been imposed on regions since 2006 whenever their regional healthcare deficit exceeds a predetermined threshold, and they imply the implementation of

[18] Here, we refer to people either with an MD degree or a degree in medical sciences, even if they are not employed in the public healthcare system.

[19] In light of the estimator described in Borusyak et al. (2023), the decrease in the number of Lombard provinces or their inclusion in the dataset as always treated units is equivalent.

a turnover ban on personnel and a 50% reduction in temporary staff. Thus, we check the robustness of our results to the exclusion of provinces under a repayment plan. As shown in Table 3, our main findings are confirmed.

Table 3: **Alternative specifications**

	(1)	(2)	(3)	(4)	(5)
Treatment effect	-0.030**	-0.036**	-0.037**	-0.032*	-0.040***
	(0.017)	(0.017)	(0.017)	(0.019)	(0.016)
Provinces	99	99	99	88	99
Observations	2,079	2,079	2,079	1,848	1,380
Controls	✓	✓	✓	✓	✓
Provincial FE	✓	✓	✓	✓	✓
Year FE	✓	✓	✓	✓	✓
Regional time trends	✓				
% of doctors in the regional council		✓			
% of healthcare workers in the regional council			✓		
No Lombard provinces				✓	
No Regions under repayment plans					✓

Notes: All estimates account for the set of covariates detailed in Table A1, and for year fixed effects and provincial fixed effects. Standard errors are clustered at the provincial level. Significance at the 10% level is represented by *, that at the 5% level is represented by **, and that at the 1% level is represented by ***.

Finally, we need to exclude the possibility that the observed effect on doctor density was triggered by a general trend taking place in the public sector other than scandal outbreaks. To that end, we apply our model to the density of two other types of public-sector professionals: teachers and firefighters. Data on the number of teachers and firefighters for the 2000-2020 period are available through the *Conto Annuale*, which is a census survey conducted by the Ministry of Economic and Finance on public sector employees. However, the use of these data forced us to move to a regional level analysis, since the regional level is the most disaggregated level at which this information is available. Additionally, data on firefighters are not available for the Valle d'Aosta region for the 2005-2020 period and are not collected at all for the Trentino Alto Adige region, as this region comprises two autonomous provinces (i.e., Trento and Bolzano). This means that for firefighters, we have to work with an unbalanced panel of 19 rather than 20 regions, for a total of 383 observations. Similarly, data on teachers are not available for Valle d'Aosta for the 2000-2007 period or for Trentino Alto Adige for the 2000-2005 period. Therefore, when focusing on teachers, we have an unbalanced panel of 20 regions, for a total of 421 observations.

Given the regional dimension of the data, we have to work at the regional level rather than at the provincial level, as was done in our main analysis. Hence, we compute teacher density as the number of teachers per 1,000 inhabitants and firefighter density as the number

of firefighters per 1,000 inhabitants in a region. Then, we take the logarithmic form of these densities, and we apply the baseline model presented in Section 3.3 but with the addition of macro-areas and year fixed effects. The original set of controls is modified to include the following: the regional birth rate, the regional share of people older than 64 years, the regional share of people younger than 15 years, the regional average income and the regional population.[20] As shown in Table 4, we do not observe any effect on either teachers or firefighters.

Table 4: **Other public professions - Regional level**

	Teacher density	Firefighter density
	(1)	(2)
Treatment effect	-0.001	-0.004
	(0.011)	(0.020)
Regions	20	19
Observations	421	383

Notes: This table shows the average effect estimates for teacher and firefighter densities at the regional level. *Teacher density* indicates the number of teachers employed in the public sector per 1,000 inhabitants at the regional level. *Firefighter density* indicates the number of firefighters per 1,000 inhabitants at the regional level. Data on teachers and firefighters for the 2000-2020 period are taken from the "Conto Annuale", which is a census survey on public administrations conducted by the Ministry of Economy and Finance. Discrepancies in the number of observations and regions are due to data availability/collection. Data on firefighters are not collected for Trentino Alto Adige and are not available for Valle d'Aosta between 2005 and 2020. Data on teachers in Valle d'Aosta are not available for the 2000-2007 period or for Trentino Aldo Adige between 2000 and 2005. All estimates account for year fixed effects and macro areas fixed effects. Standard errors are clustered at the macro area level in parentheses. Significance at the 10% level is represented by *, that at the 5% level is represented by **, and that at the 1% level is represented by ***.

5 Mechanisms

Our average results could be explained by several mechanisms that differ in two dimensions: the nature of the response to scandals (i.e., demand- vs. supply-side responses) and the personnel flow interested in such a response (i.e., new physician inflows vs. old physician outflows). The nature of the response to a scandal is relevant to the extent that we must design a policy response. In fact, on the supply side, changes in the main outcome may be due to changes in physicians' choices directly triggered by the outbreak of a scandal. In

[20]Regions are grouped into 5 macro-areas: Northeast, Northwest, Central, South and Islands.

contrast, on the demand side, the outbreak of a scandal may also affect patients' choices, which ultimately impact physicians. Even if the final outcome is the same (i.e., a decrease in the number of public hospital doctors), policy responses may differ on the basis of the nature of the channel.

In addition, for policy purposes, we need to disentangle which part of the average effect is explained by new physicians not entering the labor market of public hospitals and which part is due to early retirement or quitting. Unfortunately, these data are available neither for our observation period nor for our unit of observation.[21] Hence, we focus on mechanisms on both the supply and demand sides that could affect both the decision to not enter this specific labor market and the decision to quit or opt for early retirement.

5.1 Supply Side Channels

As public hospital physicians are better paid, have stronger professional rights (e.g., maternity leave, sick leave), and have more constraints in managing their own private practice, when supply-side channels are at stake, we focus on three groups of measures: the outside option group, the discouragement effect group, and the saliency of the scandal group. To study these channels, we perform heterogeneity analysis via the following model:

$$Outcome_{pt} = \alpha_p + \beta_t + D_{x_p} + \tau_{pt} d_{pt} + \omega Z_{pt} + \epsilon_{pt} \tag{3}$$

where D_{x_p} is a dummy that captures the channel considered; it takes the value of 1, for instance, if a province was the one in which the scandal broke out and zero otherwise (see Sections 5.1.1, 5.1.2, and 5.1.3 for the specific definitions of the considered channels). Basically, this is equivalent to first running Equation 2 separately for the subsample of provinces when D_x is one and for the subsample of provinces for which D_x is equal to zero and then testing for differences in the estimated effects, as implemented by Borusyak et al. (2023). In particular, the estimation procedure uses weights summing up to -1 for provinces with D_x equal to 0 and up to 1 for those with D_x equal to 1, and the equality hypothesis is tested by using the resulting estimand and standard error.

[21] The available data on the age of physicians are at the Board of Physicians level. Therefore, they include all physicians working for private and public hospitals and those who have their own practice and do not work in hospitals. The same problem holds with respect to data on physician retirements, which are again provided at this aggregate level; thus, they are not meaningful for our study.

5.1.1 Outside options

Outside options in the labor market are expected to play a crucial role both in the decision to avoid working in public hospitals and in the decision to retire or quit early. The obvious and always available outside option is private practice, whose rules did not change during our observation period. However, there are no existing data on this option. Hence, we propose a set of proxies to measure the impact of outside options: the presence of a medical school, being a bordering province, the restrictions introduced in the aftermath of the 2008 Great Recession, and the presence of private providers.[22]

The presence of a school of medicine is usually associated with more lively networks of both general physicians and specialists, which is also relevant from the perspective of opening a private practice. Moreover, it usually implies the presence of a teaching hospital and other training facilities and labs, which are not necessarily public and represent attractive alternatives for physicians (e.g., the Policlinico Gemelli, the San Raffaele hospital and the Policlinico Campus Biomedico in Rome). By the same token, working in an urban province may ensure more outside options if a doctor decides to resign from public-sector employment, not in terms of private practice but, rather, in terms of employment opportunities. Being a bordering province (with Switzerland, France, Austria, and Slovenia) may provide the additional alternative of looking for a job abroad in a system that is considered more attractive in the aftermath of a scandal. In addition, we proxied for the importance of the private sector using the rate of private hospital beds per 10,000 inhabitants at the provincial level: in fact, in the governance of hospitals, personnel are directly correlated with the number of available beds.

Finally, we also consider whether the ban on turnover implemented right after the 2008 Great Recession (the 2010 Budget Law, see Section 2) was in place, as the turnover ban should have mainly affected the channel of new entrance into the system. Clearly, we do not exclude the possibility that it might have also played a role in the decision to quit or retire early. The effects of such decisions do not have a unique expected direction. If, with fewer entrances or replacements, the pressure on personnel may have incentivized some physicians to opt out of the system, then commitment to the social role of the job and mutual support among colleagues might have incentivized other physicians to stay in the system.

As specified in the model of Equation 3, D_x is equal to 1 when there is a school of medicine, when the turnover ban is in place, when a province is located on the border of the country,

[22]During the pandemic, healthcare personnel stopped quitting during the emergency because they did not want to abandon their colleagues. After the pandemic crisis, an additional outside option was the so-called "Doctors paid per shift" *Medici a gettone*, who might quit the public system and then return to work for it as freelance physicians for a certain number of shifts. However, this phenomenon obviously depends on a lack of personnel in the first place.

when a province is classified by ISTAT as urban, and when a province records a value above the mean of the distribution of the rate of private hospital beds. The results shown in Table 5 confirm our initial expectations: the more outside options there are, the stronger the impact of scandals on the exit of physicians from the public sector. A stronger decrease in the density of public hospital doctors is registered in provinces with a school of medicine that are urban, that border a foreign country (i.e., bordering provinces), in the years following the turnover ban, and when the private market is more developed, as measured by the distribution of beds in the private sector. However, we record a significant effect only for urban provinces, bordering provinces and provinces with more private beds, which experienced a greater loss of physicians.

Table 5: **Heterogeneity analysis: Outside options**

	School of medicine	Border province	Urban province	Turnover ban	Private hospital beds
	(1)	(2)	(3)	(4)	(5)
	Yes	**Yes**	**Yes**	**Yes**	**More**
Treatment effect	-0.041**	-0.081***	-0.051***	-0.033*	-0.071***
	(0.018)	(0.022)	(0.019)	(0.020)	(0.020)
	No	**No**	**No**	**No**	**Less**
Treatment effect	-0.033*	-0.027	-0.019	-0.044***	-0.021
	(0.018)	(0.017)	(0.018)	(0.013)	(0.012)
p-value H_o: coefficients identical	0.663	0.015	0.074	0.535	0.013
Provinces	99	99	99	99	99
Observations	2,079	2,079	2,079	2,079	2,079

Notes: This table shows the average effect estimates for different subsamples, defined by sample splits using the dummy created to indicate the different provincial characteristics shown in the table header. *School of medicine* takes the value of 1 if the province hosts a school of medicine and 0 otherwise. *Border province* takes the value of 1 if the province borders a foreign country and 0 otherwise. *Urban province* takes a value of 1 if the province is an urban province and 0 otherwise. *Turnover ban* takes the value of 1 if it occurred after 2010 (i.e., after the enactment of the Budget Law 2010) and 0 otherwise. *Private hospital beds* takes the value of 1 if a given province has a number of private hospital beds above the average value in the sample and 0 otherwise. Tests for coefficient differences are described in Section 5. All estimates account for the set of covariates detailed in Table A1, and for year fixed effects and province fixed effects. Standard errors are clustered at the province level in parentheses. Significance at the 10% level is represented by *, that at the 5% level is represented by **, and that at the 1% level is represented by ***.

5.1.2 Discouragement channels

Under the discouragement label, we grouped mechanisms that channel dissatisfaction with the work environment, such as ethical concerns for patient safety and the lack of hope that a real change can take place at the workplace.

To proxy ethical concerns for patient safety, we look at the nature of the scandal. We can distinguish between cases involving corruption and bribes that did not constitute an actual

or severe threat to patient health (e.g., a case of auction rigging) and those involving both corruption and medical malpractice/manslaughter (e.g., bribes to use faulty heart valves). Hence, we create a dummy indicating whether the scandal had a medical malpractice nature. The intuition is that when facing a scandal that might directly jeopardize a patient's life, the ethical concern channel should be activated. Table 6, Column (1) shows that the outbreak of a scandal involving a malpractice case triggers a stronger reaction by public hospital doctors, whose density decreases more than when there is only a corruption case.

To proxy for discouragement due to the lack of improvement prospects with respect to the workplace, we obtain data on the ward or departmental managers (DMs) of Italian public hospitals, the so-called *Direttori di struttura complessa*. In the Italian healthcare system, several types of managerial positions exist: general managers (*Direttori Generali*) are selected from a short list of names considered suitable for the job by the regional (political) authority. General managers select DMs, who are in charge of wards and are paid more than other physicians are. DMs must have both administrative and healthcare skills, and they are selected among directors with at least 5 years of experience within the medical specialty of the ward they should manage. Once they land the position, there are no specific limits to their renewal. The fewer the changes in the DM position there are, the fewer the opportunities for career advancement, and the fewer the opportunities to introduce novelties, for instance, in the management practices within a given ward or even between wards in a given hospital. In other words, there may be less room for innovation. At the same time, if the governance of the healthcare system in certain areas is organized such that there are fewer DM positions, everything else being equal, there are fewer opportunities for promotions. Finally, if the selection of the DM is not predicated on the best credentials, then the perception that the relevance of merit and competences is residual can be stronger, and in the aftermath of a scandal, this could play a role in both the decision to quit and the decision not to enter the market of public hospitals.

Hence, we obtain information for over 12,000 DMs via a repository of the Italian Ministry of Health. We then calculate the total number of managers per province weighted on the provincial population, the number of changes in the same position, and some DM characteristics that proxy for the human capital and expertise of DMs, such as years of working experience (calculated as the time between the year of graduation and the year in which the DM obtained the managerial position), the average age when a DM took the position, the average time spent obtaining a medical degree, and the average number of specializations. Some of these measures are obviously correlated, such as years of experience and the average age at appointment. The idea is that more years of experience before taking the position might capture better profiles, whereas younger people might not necessarily be a bad choice

if they have more competences (e.g., more specializations).

As shown in Table 6, the negative effects of the outbreak of a scandal are driven by provinces characterized by fewer changes in the managerial tenure of public hospitals (both in absolute and percentage values) and by a lower number of DMs. On average, having managers with less working experience exacerbates the negative effect of scandals, whereas no significant effect is associated with the other indices.

Table 6: **Heterogeneity analysis: Discouragement factors**

	Malpractice	Changes	Managers	% Changes	Degree	Experience	Specializations	Appointment
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Yes	**More**	**More**	**More**	**More**	**More**	**More**	**More**
Treatment effect	-0.064***	0.014	-0.013	0.016	0.039**	-0.023	-0.027	-0.036*
	(0.018)	(0.026)	(0.019)	(0.025)	(0.018)	(0.021)	(0.018)	(0.019)
	No	**Less**	**Less**	**Less**	**Less**	**Less**	**Less**	**Less**
Treatment effect	-0.016	-0.040**	-0.046***	-0.041**	-0.032*	-0.056***	-0.044**	-0.045**
	(0.020)	(0.016)	(0.016)	(0.016)	(0.018)	(0.015)	(0.018)	(0.020)
p-value H_o: coefficients identical	0.031	0.006	0.024	0.003	0.633	0.067	0.260	0.702
Provinces	99	99	99	99	99	99	99	99
Observations	2,079	2,036	2,079	2,036	2,079	2,079	2,079	1,904

Notes: *Less* = below the mean value of the variable, and *More*= above the mean value of the variable. This table shows the average effect estimates for different subsamples, which are defined by sample splits using the means of different variables shown in the table header. *Malpractice* takes the value of 1 if the healthcare scandal that broke out in a given province concerns a malpractice case and 0 otherwise. *Changes* is the yearly number of replacements of public hospital managers in a given province. *Managers* is the yearly number of public hospital managers over the provincial population in a given province. *% change* is the proportion of public hospital managers replaced annually in a given province. *Degree* is the average number of years that it takes the public hospital managers in a given province to obtain their medical degree. *Experience* is the average working experience (expressed in years) of public hospital managers in a given province. *Specializations* is the average number of medical specializations of public hospital managers in a given province. *Appointment* is the average age at appointment of public hospital managers in a given province. Tests for coefficient differences are described in Section 5. All estimates account for the set of covariates detailed in Table A1 and for year fixed effects and province fixed effects. Significance at the 10% level is represented by *, that at the 5% level is represented by **, and that at the 1% level is represented by ***.

5.1.3 Salience

Our baseline specification leverages the *first* healthcare scandal that broke out in a province during the 2000-2020 period, regardless of the occurrence of later scandals and the importance of such scandals. Nevertheless, these factors can play a role in influencing doctors' perceptions of the severity of the scandal itself and/or of the overall level of corruption of the environment in which they work or are planning to work. To capture these dimensions, we construct five heterogeneity variables.

To proxy for the general intensity of scandals in a province, we look at the occurrence of later scandals, the press coverage of scandals, and the province in which the scandal broke

out. In particular, the occurrence of later scandals is expressed by a variable measuring the annual number of healthcare scandals that took place in a given province, as well as a variable indicating the overall number of scandals during our observation period. We also attempt to capture the potential outcry caused by these scandals by examining the press coverage of them through (i) the number of published newspaper articles concerning a healthcare scandal in a given province in any given year during our observation period and (ii) the number of articles concerning a healthcare scandal in any given province published in the two main national newspapers, i.e., "Il Corriere della Sera" and "La Repubblica". These two heterogeneity variables are constructed by crossing two of the most comprehensive news databases (i.e., Factivia and Nexis Uni). However, only the 2005-2020 period is fully covered for Italian news by these databases; thus, these two heterogeneities are run on a shorter time frame, as shown in Table 7, which reports separate treatment effects for the subsamples defined by each variable's mean split. Finally, even if a scandal involved multiple provinces, the most affected province was generally the province from which the related investigation originated. Thus, the outbreak of a scandal may be expected to have a stronger impact in such a province, as it can be perceived as the actual center of illicit activities. Therefore, we also create a dummy indicating whether the treatment (i.e., the first healthcare scandal) first developed in a given province.

As shown in Table 7, provinces suffering from more intense scandals (Columns (1)-(4)) (regardless of the intensity measure) report a greater decrease in the density of public hospital doctors than do provinces suffering from less intense scandals. More importantly, these differences are statistically significant, suggesting that a further worsening of the perception of the public healthcare system due to scandal outbreaks can favor the exit of doctors from public hospitals. Similarly, Column (5) shows that the negative impact is greater in provinces where the scandal first originated than in the provinces where it later spread. Moreover, both of these differences in doctors' response to a healthcare scandal are statistically significant.

5.2 Demand Side Channels

Patients might be less inclined to use the public healthcare system in response to outbreaks of scandals. If this is the case, the mechanism driving our results would be significantly different from those discussed thus far since the trigger would be a shift in demand toward areas not involved in a scandal owing to a decrease in patients trust in their local NHS.[23] Thus, a reduction in the skilled healthcare workforce would simply represent the adjustment of supply to a shift in demand. We estimate the role of demand side channels using the

[23]We cannot check the choice to opt out of the private system since access to the private system is covered by either out-of-pocket expenditures or private insurance coverage for which there are not available data.

Table 7: **Heterogeneity analysis: Intensity of scandals**

	Newspaper articles	Yearly scandals	Overall scandals	Articles on national newspapers	Outbreak province
	(1)	(2)	(3)	(4)	(5)
	More	**More**	**More**	**Yes**	**Yes**
Treatment effect	-0.059***	-0.046***	-0.069***	-0.066***	-0.069***
	(0.021)	(0.018)	(0.020)	(0.020)	(0.026)
	Less	**Less**	**Less**	**No**	**No**
Treatment effect	-0.026	-0.025	-0.001	-0.027	-0.028*
	(0.016)	(0.017)	(0.017)	(0.017)	(0.017)
p-value H_o: coefficients identical	0.010	0.021	0.000	0.001	0.096
Provinces	99	99	99	99	99
Observations	2,033	2,079	2,079	2,033	2,079

Notes: *Less* = below the mean value of the variable, and *More*= above the mean value of the variable. This table shows the average effect estimates for different subsamples, which are defined by sample splits using the means of different variables shown in the table header for Columns (1)-3. For Columns (4)-(5), the split is carried out using the dummy shown in the table header. *Newspaper articles* indicates the yearly number of published newspaper articles concerning any healthcare scandals that occurred in a given province. *Yearly scandals* indicates the yearly number of scandals that occurred in a given province. *Overall scandals* indicates the number of scandals that occurred in a given province during our observation period. *Articles in national newspapers* indicates the yearly number of articles concerning any healthcare scandals that occurred in a given province that were published in the two main Italian newspapers (i.e., "Il Corriere della Sera" and "La Repubblica"). Outbreak province takes the value of 1 if the province is where the scandal broke out first and 0 otherwise. Tests for coefficient differences are described in Section 5. All estimates account for the set of covariates detailed in Table A1 and for year fixed effects and province fixed effects. Standard errors are clustered at the provincial level in parentheses. Significance at the 10% level is represented by *, that at the 5% level is represented by **, and that at the 1% level is represented by ***.

model of Equation 2 and we proxy the level of trust of potential patients in the healthcare system of the province of residency with patient mobility and trends in medical malpractice premiums.

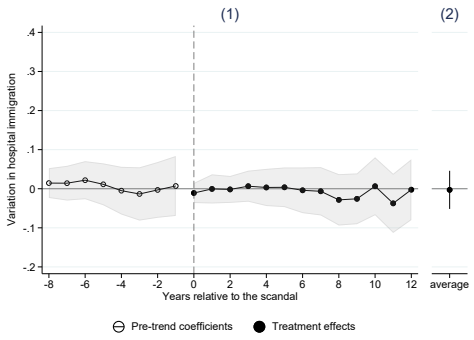
5.2.1 Patients Mobility

An intuitive way to address a change in the demand for service would be by examining the trend of waiting lists for specialist services and elective admissions. Since these data are not available at the provincial level, we proxy for this mechanism by using data on both incoming and outgoing patient mobility. *Incoming* provincial mobility is defined as the share of patients discharged by public hospitals not residing in a given province out of the total number of discharges registered by public hospitals in that province. *Outcoming* provincial mobility is defined as the share of patients discharged by public hospitals residing in a given province who choose another province for hospitalization in a public facility. Figure 2 plots the effects of scandal outbreak on both incoming and outgoing patient mobility and estimates

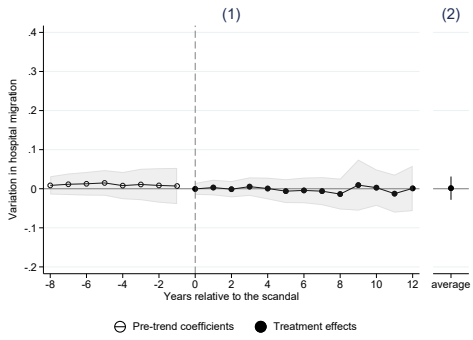
no significant effects.

Figure 2: **Patient mobility**

(a) Incoming mobility



(b) Outgoing mobility



Notes: The figure shows average treatment effects relative to scandal outbreaks (i.e., treatment introduction) on incoming and outgoing provincial mobility. Incoming provincial mobility is defined as the share of patients discharged by public hospitals not residing in a given province out of the total number of discharges registered by public hospitals in that province. Outgoing provincial mobility is defined as the share of patients discharged by public hospitals residing in a given province who choose another province for hospitalization in a public facility. In Column (1) of each subfigure, the circles represent estimates for pretreatment years, the dots represent treatment estimands for the first 12 years since the scandal outbreak, and the shaded areas represent the 95% confidence intervals around the estimates. Column (2) shows the average treatment effect estimate with 95% confidence intervals. All estimates account for the set of covariates detailed in Table A1 and for year fixed effects and province fixed effects. Standard errors are clustered at the provincial level.

5.2.2 Malpractice Premium

Another potential channel is related to increased litigation. The emergence of scandals in the public healthcare system may reduce patients' trust, leading them to be more inclined to pursue legal action in the case of negative effects and/or side effects associated with the treatments received. This, in turn, could increase pressure on physicians, deteriorating the work environment and leading to resignations. To understand the influence of this phenomenon, it is important to investigate whether, in addition to changes in the presence of medical staff, there has been an increase in the frequency of malpractice cases around the periods of scandal outbreaks. It is useful to test whether these changes affected provinces subject to scandals differently from those that were not subject to scandals. This mechanism is not mediated by the supply system, and its detrimental effects may be mitigated, for instance, by improving communication between patients and physicians.

In Italy, there are no national official statistics on either medical errors or requests for compensation: victims of malpractice can seek compensation not only through civil justice but also through the criminal system, suing the physician, the hospital, or both. Hence, we use a proxy to capture changes in trends in claims: the medical malpractice premiums

paid by local health authorities (LHAs), which manage public hospitals, and those paid by independent hospital trusts (IHs), which belong to the public healthcare network even if they are not directly managed by a local health authority. In Italy, physicians are held jointly liable with the hospital they work for (Traina, 2008). Hospitals are legally required to provide malpractice insurance coverage to their employees, and this insurance covers professional liability against third parties.[24]

Like all public agencies in Italy, public healthcare providers are not allowed to access the market to select an insurer at their discretion: they need to open a call for tenders (public procurement auctions) to contract out the coverage. The insurers operating in the Italian market for medical malpractice are private companies, either national or international. These insurance companies cover healthcare providers mainly on the basis of a yearly premium calculated as an adjustable percentage of the annual gross payroll of the public entity (Ministry of Health, 2006). While insurance premiums have substantially increased, with a shift from *occurrence-based* liability insurance coverage to *claims-made* liability, their calculation does not generally contain any reference to other activity-related statistics such as the number of beds, the average recovery length, or the average number of surgeries.[25] Moreover, experience ratings are not considered in Italy when medical malpractice liability premiums are set, similar to what happens in several other countries. Starting at the end of the 1990s, Italian hospitals began to detect a degree of uneasiness in finding full and affordable coverage for medical liability from the private market. For this reason, LHAs and his also started to accumulate reserves as a form of public insurance.

The intuition behind the use of premiums is that, even if they correspond to contracts at the LHA or IH level, they should be correlated with the pressure perceived in the work environment. However, since insurance contracts are not subscribed to annually for these structures and it may take some time to renew a contract, an effect (if any) should be detectable only a few years after the outbreak of a scandal.

We obtain data from the LHA and IH budgets, as validated by the Italian Ministry of Health. However, information on insurance premiums per case of medical malpractice has been available since 2008; thus, our observation period for running this test was limited to 2008-2020. We normalize the premiums paid for medical malpractice to the total amount of premiums for risks paid by the structure since a particularly risky environment may pay higher premiums regardless of the level of scandals. Insurance reserves are the funding set

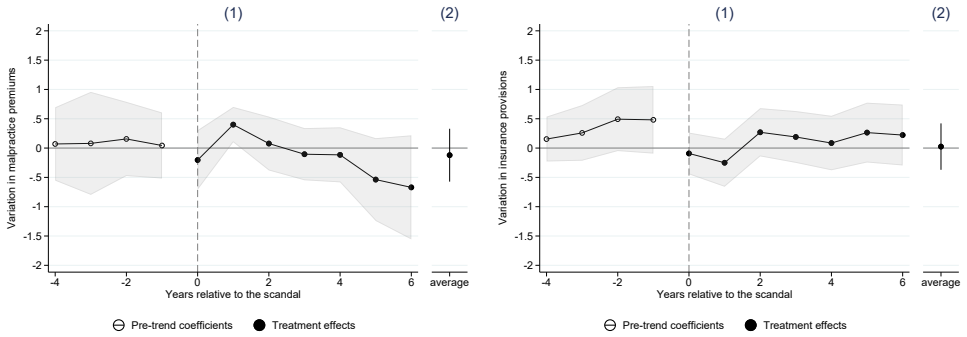
[24]Physicians typically look for additional coverage in the market, and since 2017, they have been legally required to have such coverage (i.e., Gelli-Bianco legislation). There are no publicly available data on the premiums they paid disaggregated at the local level.

[25]According to a *occurrence-based* policy, the insurance covers all accidents occurring in the policy year. In a *claims-made* scheme, the insurance covers only those claims that are filed in the policy year.

aside to meet future claims by public hospitals, and we weight them on the resident population of the province since the resident population is a proxy for the level of hospital activity. In Figure 3, we plot the coefficients of Equation 2, now estimated using malpractice premiums and insurance reserves as outcomes. No significant effects are detected.

Figure 3: **Medical Malpractice**

(a) Malpractice premiums (b) Insurance reserves



Notes: The figure shows average treatment effects relative to scandal outbreaks (i.e., treatment introduction) on two measures capturing malpractice exposure. *Malpractice premiums* represent the share of malpractice premiums out of the total insurance premiums paid by public hospitals in a given province. *Insurance reserves* are the funding set aside to meet future claims by public hospitals in a given province per 10,000 inhabitants. In Column (1) of each subfigure, the circles represent estimates for pretreatment years, the dots represent treatment estimands for the first 4 years since the outbreak of a scandal, and the shaded areas represent the 95% confidence intervals around the estimates. Column (2) shows the average treatment effect estimate with 95% confidence intervals. All estimates account for the set of covariates detailed in Table A1 and for year fixed effects and province fixed effects. Standard errors are clustered at the provincial level.

6 Concluding Remarks

Starting from the observation that perceived corruption and professional nepotism are major drivers of the migration of healthcare professionals, we address the role of outbreaks of scandals in the density of physicians working in Italian public hospitals. Adopting a staggered DID model, we show that there is a negative impact of scandals on the presence of physicians in the public sector, and in doing so, we contribute to shedding light on a factor that is often ignored in explaining the retention of highly skilled personnel in public administration.

To address the increasing scarcity of public hospitals physicians, higher salaries and more medical school enrollees are the most debated policy interventions. Nevertheless, our findings also stress the importance of the perception of the public sector as a work environment. In fact, our results are explained mainly by the intensity of scandals, the availability of outside options, concerns about career prospects, and patient safety. Hence, to favor the selection

and retention of public physicians, an important policy role could be played by interventions aimed at improving the transparency of the public healthcare system.

References

Anessi-Pessina, E., Cant, E., Joninii, C., 2004. "Phasing out market mechanisms in the Italian national health service." Public Money Management 24 (5), 309-316.

Arkhangelsky, D., Athey, S., Hirshberg, D. A., Imbens, G. W. and S. Wager, 2021. "Synthetic Difference-in-Differences." American Economic Review, 111(12): 4088-4118.

Ashmore, J., 2013. "Going private: a qualitative comparison of medical specialists' job satisfaction in the public and private sectors of South Africa." Human Resources for Health, 11(1): 1478-1491.

ASSOMED, 2021. "Il lavoro in ospedale ai tempi del COVID."

Barili, E., Bertoli, P., Grembi, V., and V. Rattini. 2024. "COVID angels fighting daily demons? Mental well-being of healthcare workers and religiosity." European Economic Review, 162: 1-25.

Barili, E., Bertoli, P., Grembi, V., and V. Rattini. 2022. "Job satisfaction among healthcare workers in the aftermath of the COVID-19 pandemic, PLoS ONE 17(10).

Bertoli, P. and V. Grembi, 2017. "The Political Economy of the Diagnosis-Related Groups." Social Science and Medicine, 190C: pp.38-47.

Bloom, N., Propper, C., Seiler, S., and J. Van Reenen, 2015. "The impact of competition on management quality: evidence from public hospitals." The Review of Economic Studies 82: 457-489.

Borusyak, K., 2023. "*did_imputation*: Stata Module to Perform Treatment Effect Estimation and Pre-Trend Testing in Event Studies." Statistical Software Components, Boston College Department of Economics.

Borusyak, K., Jaravel, X. and J. Spiess, 2023. "Revisiting Event Study Designs: Robust and Efficient Estimation.", arXiv:2108.12419

Buchan, J., Wismar, M., Glinos, I. A., and J. Bremner, 2014. "Health professional mobility in a changing Europe: new dynamics, mobile individuals and diverse responses." European Observatory on Health System and Policy, WHO.

Callaway, B., and P.H.C. Sant'Anna, 2021. "Difference-in-differences with Multiple Time Periods." Journal of Econometrics, 225(2): 200-230.

Charron, N., Lewis, D., and V. Lapuente, 2015. "Mapping the regional divide in Europe: A measure for assessing quality of government in 206 European regions." Social Indicators Research, 122(2), 315-346.

D'Arienzo, M., F. Ragazzo, A. Rossi, C. Rivetti, E. Marcante, D. Montemurro, and C. Palermo, 2020. "La mappa delle carenze di medici specialisti regione per regione." ANAAO Assomed, Pp. 1-9.

De Belvis AG, Meregaglia M, Morsella A, Adduci A, Perilli A, Cascini F, Solipaca A, Fattore G, Ricciardi W, Maresso A, and G. Scarpetti, 2022. "Italy: Health system review. Health Systems in Transition", 24(4).

De Chaisemartin, C. and X. d'Haultfoeuille, 2020."Two-Way Fixed Effects Estimators with Heterogeneous Treatment Effects." American Economic Review, 110(9): 2964–96.

Econex, 2009. NHI Note 4: Supply Constraints. Stellenbosch: Econex.

El Koussa M, Atun R, Bowser D, Kruk ME, 2016. "Factors influencing physicians' choice of workplace: systematic review of drivers of attrition and policy interventions to address them". Journal of Global Health, 6(2): 020403.

Falcettoni, E., 2017. "The Determinants of Physicians' Location Choice: Understanding the Rural Shortage."

Friss Wand, L. (2021). Speciallger dropper faste job for at tjene markant mere som konsulent med samme opgaver. https://www.information.dk/indland/2021/10/specialaeger-dropper-faste-job-tjene-markant-mere-konsulent-samme-opgaver .Link at February 2024.

Foundation, G. 2020. "Repercusiones del covid-19 sobre la salud y el ejercicio de la profesion de los medicos de Espana."

Goodman-Bacon, A., 2021. "Difference-in-differences with Variation in Treatment Timing." Journal of Econometrics, 225(2): 254–77.

Goodman-Bacon, A., Goldring, T. and A. Nichols, 2019. BACONDECOMP: Stata Module to Perform a Bacon Decomposition of Difference-In-Differences Estimation. Statistical Software Components S458676, Boston College Department of Economics.

Kankaanranta,T., Nummi, T., Vainiomäki, J., Halila, H., Hyppölä, H., Isokoski, M., Kujala, S., Kumpusalo, E., Mattila, K., Virjo, I., Vänskä, J., and P. Rissanen, 2007. "The role of job satisfaction, job dissatisfaction and demographic factors on physicians' intentions to switch work sector from public to private." Health Policy, 83(1): 50-64.

Heponiemi T, Kuusio H, Sinervo T, Elovainio M., 2011. "Job attitudes and well-being among public vs. private physicians: organizational justice and job control as mediators." European Journal of Public Health. 21 (4): 520-525.

Heponiemi T, Kouvonen A, Sinervo T, Elovainio M., 2013. "Is the public healthcare sector a more strenuous working environment than the private sector for a physician?" Scandinavian Journal of Public Health, 41(1):11-17.

Kroezen M, Dussault G, Craveiro I, Dieleman M, Jansen C, Buchan J, Barriball L, Rafferty A M, Bremner J, Sermeus W. 2015, "Recruitment and retention of health professionals across Europe: a literature review and multiple case study research". Health Policy, 119:1517–28.

Istat, 2015. "Health For All Database."

Lisac, M., Blum, K., Schlette, S., Maarse, H., Bartholomee, Y., McDaid, D., Oliver, A., Abasolo, I., Lopez-Valcarcel, B.G., Fiorentini, G., et al., 2008. Health systems and health reform in Europe. Intereconomics, 43 (4): 184-218.

Lancet, 2019. "Health worker gap in Italy: the untold truth Italy is not an attractive place to work." Correspondence, Vol 394 August 17, p.561.

Ministry of Health. 2006. "Rapporto sulla prima rilevazione nazionale relativa agli aspetti assicurativi in ambito di gestione aziendale del rischio clinico. Roma: Ministero della Salute".

Moberly, T. 2021. "Doctors' early retirement has trebled since 2008." British Medical Journal 373(1594).

Moscelli, G, Sayli, M., and M. Mello, 2022. "Staff Engagement, Coworkers' Complementarity and Employee Retention: Evidence from English NHS Hospitals." IZA DP No. 15638.

Newhouse, J.P., Williams, A. P., Schwartz, W. B., and B. W. Bennet, 1982. The Geographic Distribution of Physicians: Is the Conventional Wisdom Correct? Rand Corporation Report.

OECD, 2019. Recent Trends in International Migration of Doctors, Nurses and Medical Students, OECD Publishing, Paris.

OECD, 2022. Health at a Glance: Europe 2022. State of health in the EU cycle.https://www.oecd-ilibrary.org/docserver/507433b0-en.pdf?expires=1708530470\&id=id\&accname=oid029882\&checksum=5E6B9B550B06374E278DD53D4E13513F. Link at February 2024.

OECD, 2023. Health at Glance. https://www.oecd-ilibrary.org/docserver/7a7afb35-en.pdf?expires=1708529775\&id=id\&accname=oid029882\&checksum=5A3ABF55BD70F7CB8E9FB47C88898A1E Link at February 2024.

Parkkila-Harju, M. 2018. Perusterveydenhuollon kestämätön tilanne. https://www.laakariliitto.fi/uutiset/blogi/perusterveydenhuollon-kesta-maton-tilanne/. Link at February 2024.

Roth, J., Sant'Anna, P.H., Bilinski, A., Poe, J., 2023. "What's trending in difference-in-differences? A synthesis of the recent econometrics literature." Journal of Econometrics, 235(2): 2218–2244.

Sermeus, W. and L. Bruyneel, 2010. "Investing in Europe's health workforce of tomorrow: scope for innovation and collaboration." European Observatory on Health Systems and Policies Report, pp. 1-53.

Sun, L. and S. Abraham, 2021. "Estimating Dynamic Treatment Effects in Event Studies with Heterogeneous Treatment Effects." Journal of Econometrics, 225(2): 175–99.

Swedish medical association (2023). "6 av 10 läkare längtar bort" `https://slf.se/app/uploads/2022/08/arbetsmiljo-enkat2022-del1.pdf`. Link at February 2024.

Appendix A

Table A1: **Variable definitions**

Outcome	**Definition**
Doctor density	Number of doctors working in a public hospital per 1,000 inhabitants in a province
Controls	
Above 65	Share of the residents in a province aged 65 or older
Bachelor	Share of the residents in a province with a bachelors degree
Below 15	Share of the residents in a province aged 14 or younger
Diploma	Share of the residents in a province with a high school diploma
Hospital beds	Rate of public hospital beds
Hospital migration	Share of hospital discharges of patients resident in a given province registered in other regions
Income	Averaged income at the province level (adjusted for inflation)
Recovery plan	Dummy=1 if the region which a given province belongs to is under a recovery plan and 0 otherwise
Heterogeneity variables	
Border	Dummy=1 if the province borders with a foreign country and 0 otherwise
Breakout province	Dummy=1 if the province is where the scandal broke out first and 0 otherwise
Malpractice	Dummy=1 if the scandal refers to a malpractice case and 0 otherwise
National news	Numbers of articles concerning an healthcare scandal that took place in a given province published by one of the two major Italian newspapers (e.g., Il Corriere della Sera and La Repubblica)
News	Numbers of published newspaper articles concerning a healthcare scandal that took place in a given province
Nonrural	Dummy=1 if the province is a rural one and 0 otherwise
Overall scandals	Total number of healthcare scandals that took place in a given province during the 20002020 period
Yearly scandals	Number of healthcare scandals that took place each year in a given province
School of Medicine	Dummy=1 if there is a school of medicine in a given province and 0 otherwise
Turnover ban	Dummy=1 if the year is after the implementation of the Budget Law 2010 and 0 otherwise

Table A2: **Descriptives**

Outcome	**Mean**	**Std. Dev.**	**Min**	**Max**
Doctor density	1.657	0.463	0.362	3.551
Controls				
Above 65	21.770	3.965	12.149	29.514
Bachelor	18.784	5.812	5.300	37.500
Below 15	13.429	1.666	9.267	19.701
Diploma	54.356	7.769	30.900	73.000
Hospital beds	28.551	9.712	0	158.540
Hospital migration	9.569	5.931	1.621	30.569
Income	17,121.530	3,327.863	7,884.924	25,864.13
Recovery plan	0.252	435	0	1
Heterogeneity variables				
Border	0.162	0.368	0	1
Breakout province	0.212	0.409	0	1
Malpractice	0.323	0.468	0	1
National news	0.222	6.000	0	4
News	1.222	2.845	0	21
Nonrural	0.475	0.499	0	1
Overall scandals	7.616	6.444	0	21
Yearly scandals	0.363	0.750	0	6
School of medicine	0.343	0.475	0	1
Turnover ban	0.476	0.500	0	1

Table A3: **Results: Two-way fixed effects model**

	Doctor density
Treatment effect	-0.024*
	(0.012)
Provinces	99
Observations	2,079

Notes: This table shows the baseline estimates obtained by applying the canonical two-way fixed effects model. The estimate accounts for the set of covariates detailed in Table A1, as well as for year fixed effects and province fixed effects. Standard errors are clustered at the province level in parentheses. Significance at the 10% level is represented by *, that at the 5% level is represented by **, and that at the 1% level is represented by ***.

Appendix B

This Appendix provides additional tables and figures, which are also discussed in the paper.

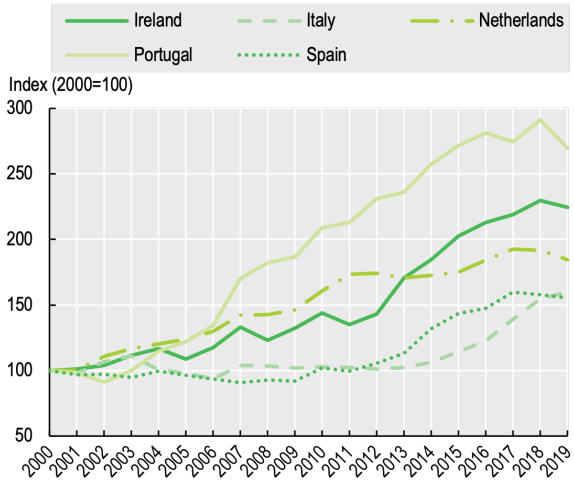
Table B1: **Density of doctors and nurses: International comparison**

Group	Year	Value	Italian Value
Panel A: Doctors			
OECD 36	2000	2.8	4.1
OECD 37	2011	3.2	3.4
OECD 37	2021	3.7	3.9
EU 28	2016	3.6	3.8
EU 27	2020	4.0	4.0
Panel B: Nurses			
OECD 36	2000	7.4	4.2
OECD 37	2011	8.2	5.2
OECD 37	2021	9.2	6.2
EU 28	2016	8.4	5.6
EU 27	2020	8.3	6.3

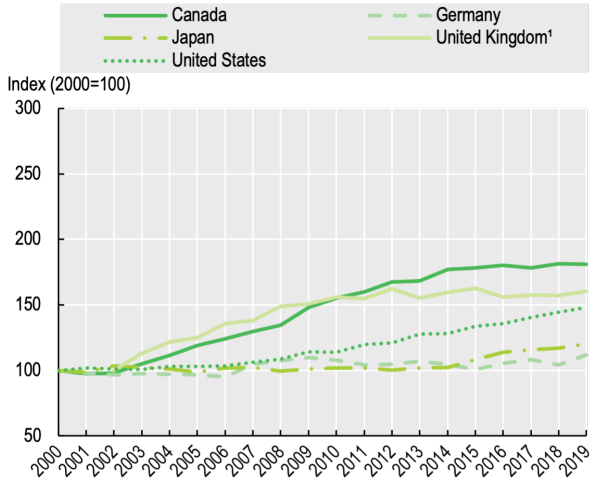
Notes: Practicing doctors and practicing nurses per 1,000 population, $OECD36$ and $OECD37$ refer to data available through OECD (2023) and previous editions. $EU28$ refers to data obtained through OECD (2022). The data refer to the OECD and EU statistics available on the website of the publication *Health at Glance*.

Figure B1: **Evolution in the number of medical graduates for selected OECD countries, 2000-19 (or nearest year)**

(a) Countries above OECD average in graduates per capita in 2019



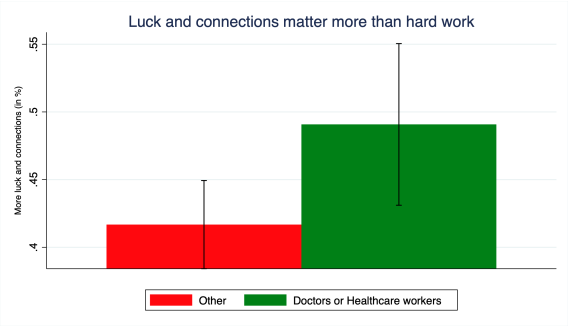
(b) Countries below OECD average in graduates per capita in 2019



Notes: Data as available in OECD (2023).

Figure B2: **Luck and connections matter more than hard work in regard to succeeding in public administration**

(a) Among civil servant

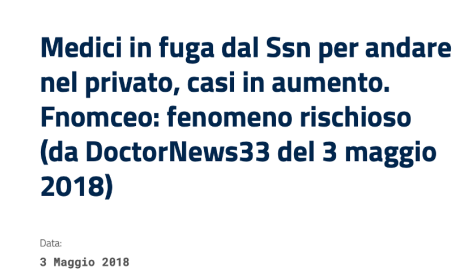


Notes: We are using 2013 data from the *European Quality of Government Index*, as described in Charron et al. (2015). In this plot, we only consider respondents employed in the public sector. The information on healthcare personnel is only available for civil servants. Importance of connections is defined as "Hard work is no guarantee of success in the public sector for most people; it's more a matter of luck and connections." We construct a dummy which is equal to 1 if respondents state that he or she agreed with the statement using answers 8, 9 or 10 from a scale ranging from 0 (totally disagree) to 10 (totally agree). Confidence intervals at 95%.

Appendix C

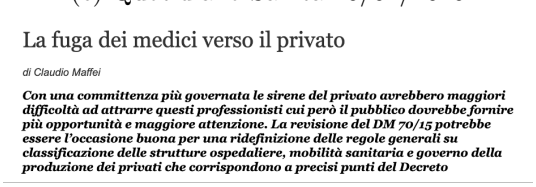
Figure C1: **News (1)**

(a) Latina Medical Board 03/05/2018



(b) AGI 28/09/2018

(c) Quotidiano Sanita 20/01/2020



(d) Anaao-Assomed 21/04/2022

Notes : (a) Physicians on the run from the National Health System; numbers are growing. according to the FNMCEO [National Federation of Ordinary Medicine and Odontoiatrists], this is a dangerous phenomenon. (b) The mass migration of hospital physicians to the private sector. (c) The escape of physicians to the private sector. (d) #IGOAWAY... Physicians' Great Resignation: about 21,000 run away in the last 3 years.

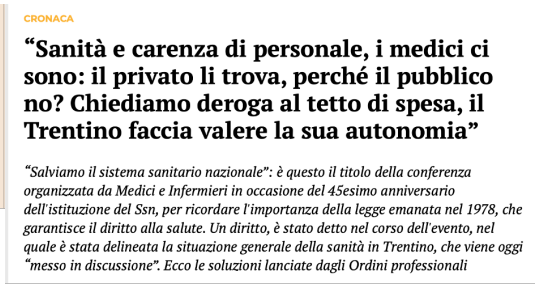
Figure C2: **News (2)**

(a) Ansa 16/02/2023

(b) Il Manifesto 23/02/2023

(c) Il Sole24Ore 25/02/2023

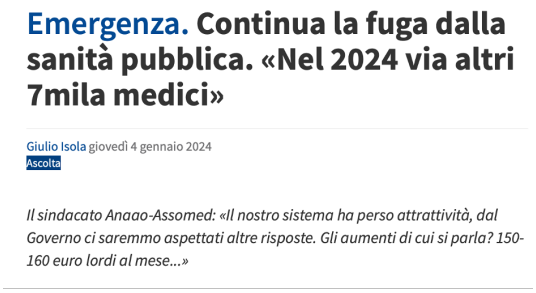
(d) Il Dolomiti 21/12/2023



Notes: (a) According to Schillaci [Minister of Health since October 2022], 10,000 physicians escaped in 10 years; enough with mass migration. (b) Residents, say goodbye to the public healthcare sector: 6,000 physicians are on the run. (c) From the emergency room to intensive care units, young physicians run away from wards in a symbol of the COVID-19 pandemic. (d) The healthcare sector and its lack of personnel: there are physicians, so if the private sector can find them, why can the public sector not? We ask for an exemption to the expenditures cap for Trentino [an Italian region in the North] as this region comprises two autonomous provinces .

Figure C3: **News (3)**

(a) Avvenire 04/01/2024



(b) Corriere Trentino 23/02/2024

Notes: (a): Emergency: The escape from the public sector continues. "In 2024, another 7,000 physicians are gone." (b) The healthcare sector, waiting lists and the escape of physicians to the private sector. "Call for the General States."