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REFORMING THE PROVISION OF CROSS-BORDER MEDICAL CARE EVIDENCE FROM SPAIN [*]

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ABSTRACT: Cross-border medical care, defined as care facilitated by a local health provider under pre-established regional agreements as in the case of EU citizens accessing care within EU countries, has been on the rise. Unlike medical tourism, typically sought by patients through their own volition and paid for out-of-pocket, cross-border medical care is often reimbursable or paid for directly by the responsible government. Yet, because nations vary in the extent of health coverage offered to their residents, these expenditures are often only partially reimbursed. The resulting financial burden for some countries can be large and not reciprocal, straining regional and country-level finances. We analyze the effectiveness of a legislative measure adopted by a Spanish region in January 2012 with the purpose of curbing cross-border medical care. Using a comprehensive administrative dataset of all medical procedures performed in the country between 2008 and 2015, we find that the measure led to a drastic drop in the number of foreigners' hospitalizations and a reduction of 4.8 million euros/trimester in costs. Finally, the decrease in hospitalizations did not disproportionally affect patients based on their gender, age, or origin; although it fostered a reduction in scheduled hospitalizations, as would be expected.

JEL Codes: H51, I12, I18
Keywords: Cross-border medical care, health care regulation, EU, Spain

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1. Introduction

Medical travel, broadly defined as those individuals travelling to another country to receive medical care, has been on the rise.[1] Although it is hard to estimate its magnitude, some estimations point to approximately 20 to 24 million patients worldwide spending an average of 3,410 U.S. dollars annually, sizing the market at 65-87.5 billion U.S. dollars (Woodman, 2020). Much of this medical travel is medical tourism, which is typically characterized by patients seeking care elsewhere through their own volition, often against the advice of their local health provider, and paying out-of-pocket.[2] However, a growing share of medical travel is cross-border medical care, which refers to health care facilitated by a local health provider under pre-established regional agreements, as in the case of EU citizens accessing care within EU countries. Unlike medical tourism, cross-border medical care is often reimbursable or paid for directly by the responsible government. Yet, because nations vary in the extent of health coverage offered to their residents, these expenditures are never fully reimbursed. The resulting financial burden for countries providing the care can be large and not reciprocal, straining regional and country-level finances.

In Spain, most medical travel is cross-border medical care originating from countries in the European Union (EU). In the EU context, nationals from any of the 27 EU countries, Iceland, Liechtenstein, Norway, and Switzerland visiting another of these countries, are entitled to the same health care treatment as nationals from those countries. Within Europe, Spain ranks second, after France, in the number of medical interventions performed on foreigners, with 700,000 non-resident patients originating primarily from the United Kingdom, Germany,

[1] Rationales for seeking medical treatment in a country other than their own vary, including shorter waiting lists, non-availability of a particular treatment in the origin country's public health care system, the belief that the quality of care received will be higher in the foreign country, as well as lower costs (Escuela de Organización Industrial, 2013).

[2] The top world destinations in this category are Costa Rica, India, Israel, Malaysia, Mexico, or Singapore (see: https://www.patientsbeyondborders.com/media).

the Netherlands, and Belgium seeking treatment in 2012 (Escuela de Organización Industrial, 2013). In principle, the cost associated with treating these patients –initially covered by the Spanish social security system– should be reimbursed by the patients' governments. However, many times it is not. As of December 31, 2009, unreimbursed costs amounted to 138 million euros (Tribunal de Cuentas, 2012). In addition, in most cases, this cost does not include pharmaceutical provision. As an example, during 2009, Valencia only issued 304 invoices including pharmaceutical services. In 2009, an audit highlighted that the Spanish government spent 441 million euros on medical assistance to non-residents from other European Union nations, whereas the cost imposed by Spanish citizens on other European Union countries amounted to 46 million euros (Tribunal de Cuentas, 2012). Close to forty percent of the cost was incurred in just one Spanish region: Valencia, which spent 165 million (37.4 percent of the total) on medical assistance to non-residents from other European Union nations (Tribunal de Cuentas, 2012). In view of these developments, in 2012, Valencia adopted a new policy according to which non-resident individuals treated in one of its hospitals would be directly charged for the incurred costs (*i.e.* Law 9/2011 on fiscal measures, administrative and financial management, and organization of the Generalitat). The purpose was to ensure upfront payment for the health services, independently of whether the patient could later seek reimbursement by her/his home country.

Our *primary* aim is to examine the effectiveness of the new policy in curbing cross-border medical care hospitalizations and total costs. A *second* related aim is to learn about the channels through which the policy might be operating, by identifying the components of cross-border care being impacted –namely, types of intervention (*e.g.* type of surgical procedures, including hip implants, pacemaker implants, and cataracts), duration of treatment/length of hospital stay, readmissions, mortality; as well as changes in patient characteristics (*i.e.* gender, age, and origin).

Medical travel is a relatively unexplored topic in the health literature due to difficulties in finding adequate data. A 2010 review of the literature on the effects of medical travel in destination and origin countries concluded that "additional primary research on the effects of medical tourism is needed if the industry is to develop in a manner that is beneficial to citizens of both departure and destination countries" (Johnston *et al*. 2010). Thus far, most of the literature has presented descriptive evidence on the direction of medical tourism flows and on its determinants, including the availability, quality, and relative cost of medical treatments (Mathijsen 2019; Forgione and Smith 2007; Johnston *et al*. 2010; Guy *et al*. 2015; Hanefeld *et al*. 2014; Lunt and Carrera 2010; Lunt and Carrera 2011; Padilla-Meléndez and Del Águila Obra 2016; Ramírez de Arellano 2007; Runnels and Carrera 2012).[3] This study extends our current understanding of travel for medical care by providing causal evidence on the effectiveness of policy aimed at managing the financial burden imposed by cross-border medical care on some regions.

To this end, we make use of administrative data on the universe of hospitalizations taking place between 2008 and 2015 –that is, four years prior to and four years after the reform, from the Ministry of Health, Consumption and Social Welfare –namely, the Spanish Minimum Set of Basic Data (MSBD). This database gathers information directly from public hospitals and contains detailed medical records on all hospitalizations at discharge. Specifically, for each entry, we have information on individual and hospital characteristics (including the region of hospitalization), estimated cost, diagnosis, whether it involved surgery or was previously scheduled, length of hospital stays, readmissions, and mortality. We focus on hospitalizations of non-residents 18 years of age and older who are not pregnant, given the free access to medical care of minors and pregnant women.[4] Using a quasi-experimental approach, we

[3] More information can be found in Mathijsen *et al.* (2020).

[4] According to Organic Law 4/2000 and Royal Decree 16/2012.

exploit the fact that the policy was adopted by one of the 19 regions (also referred to as autonomous communities) in Spain to assess its impact on cross-border medical care hospitalizations and total costs. Subsequently, we zoom in to learn about the mechanisms at play –focusing on changes in treatments or interventions, patients' demographic traits, and the specifics of each case (as captured by its estimated resource consumption, duration of treatment/length of hospital stay, readmissions, mortality, and cost incurred).

We find that the policy adopted by Valencia helped contain cross-border medical care hospitalizations and costs in public hospitals. These effects did not predate the reform, are long-lasting, and are not observed when alternative reform dates are used in placebo checks. The impacts also prove robust to changes in the composition of the control and treated groups, to the time window used as reference, and to the methodology employed. Finally, the effectiveness of the reform in curtailing cross-border medical care and costs does not appear to stem from the reduction in a particular type of procedure or surgical intervention, such as those with a higher cost; nor does it appear to have significantly changed the duration of treatment, mortality, or patient demographic traits of individuals seeking care (such as age, gender, or origin). Rather, it seems to stem from widespread reductions in the number of non-residents seeking admission and readmission. Overall, the findings are informative of prospective patients' responses to health care regulations and, more specifically, of the impact of alike policies on the provision of cross-border medical care in the EU context and similarly regulated multinational agreements. This is important in light of the increase in cross-border medical care and the lack of a uniform health care coverage menu with the EU, which creates an incentive to seek care in other EU countries covering the treatment in question.

The rest of the paper is structured as follows. Section 2 describes the institutional framework. Section 3 presents the data used in the analysis and some descriptive evidence. Section 4 explains the methodology, whereas Section 5 discusses the main findings, along with

identification and robustness checks. Section 6 contemplates plausible channels, and Section 7 concludes.

2. Institutional Framework

According to the existing EU regulation (1408/71 of 14th June 1971, 574/72 of 21st March 1972, 883/2004 of 1st May 2010 and 987/2009 of 1st May 2010), nationals from any of the 27 EU countries, Iceland, Liechtenstein, Norway, and Switzerland are entitled to receive the same health care treatment in the same conditions as nationals from those countries when they are visiting. Since 2010 (1231/2010 of 29th December 2010), this rule has also applied to third country nationals who are legal residents in the EU (except in Denmark, Iceland, Liechtenstein, Norway, and Switzerland). Individuals insured by the health care system of one of the EU countries listed above are entitled to receive the same type of care as nationals from the country of destination, regardless of whether they are temporarily visiting or permanently residing in that host country (Directive 2011/24/EU of 9th March 2011).

Each country should reimburse other nations for the medical expenses incurred by its nationals. The Administrative Commission on Social Security for Migrant Workers is the European Commission's organism in charge of coordinating agreements and reimbursement procedures between member countries. However, problems arise when the medical treatment received in the destination country is not covered by the health care system of the origin country. For example, at the end of 2009, unreimbursed costs amounted to 138 million euros (Tribunal de Cuentas, 2012) –a figure that typically excludes pharmaceutical services. Estimates suggest that, in 2009, Spain required the reimbursement of 441,181,488 euros for medical treatments provided to citizens from the EU26, Iceland, Liechtenstein, Norway and Switzerland. In the same year, the Spanish government received claims from these countries that only amounted to 46,185,639 for the treatment received by Spanish citizens in one of these

countries (Tribunal de Cuentas, 2012). This large difference is because Spain is a net receiver of medical tourism and has a sizeable community of foreign residents.[5]

In addition to the above-mentioned EU-wide regulations, there are bilateral international agreements. In 2012, Spain had 20 bilateral agreements signed with third countries.[6] Healthcare is included in seven of those 20 countries –namely, Andorra, Brazil, Chile, Ecuador, Morocco, Peru, and Tunisia.

Due to difficulties arising with the reimbursement of medical expenses incurred by foreigners, in January 2012, one of the 19 Spanish regions (*i.e.* Valencia) decided to directly charge non-residents treated in their hospitals.[7] The aim was to ensure payment of any medical procedures –an expense patients could later seek reimbursement for in their respective home countries. This eliminated the need to go through the European-wide reimbursement mechanism. The policy change was approved through the Law 9/2011 on fiscal measures, administrative and financial management, and organization of the Generalitat on December 26, 2011.[8] It was announced by the Vice-President of the regional government at that time in a press conference held on the same day of the measure's approval during which it was stressed that "medical tourism was over in Valencia".[9]

[5] In addition to these two factors, the proximity of countries in Europe and the availability of affordable flights between EU countries have contributed to the proliferation of online providers of planned health tourism. These online companies offer packages that include accommodation, flights, and medical interventions in the destination country. For example, "Medical Tourism Corporation", a U.S. based company, ranks Spain among the top destination countries for health tourism because of the quality of the health care system and other country amenities, such as culture, food, beaches, etc.

[6] Spain currently has bilateral agreements with Andorra, Argentina, Australia, Brazil, Cape Verde, Canada, Chile, Colombia, Korea, Ecuador, United States, Philippines, Japan, Morocco, Mexico, Paraguay, Peru, Dominican Republic, Russia, Tunisia, Ukraine, Uruguay and Venezuela. More information can be found at: http://www.seg-social.es/wps/portal/wss/internet/InformacionUtil/32078/32253?changeLanguage=en.

[7] Over the period under examination, Spanish regions have autonomy and legislative powers over several topics, including health.

[8] A few days later (5th January 2012), another Decreto-Ley 1/2012 laid down some additional details on the implementation of the Ley 9/2011 of 26th December.

[9] Some of the coverage in the media can be found here: https://www.levante-emv.com/comunitat-valenciana/2012/01/07/consell-sujeta-caballo-batalla-turismo-sanitario-c-valenciana/870487.html

Valencia ranks among the top destinations for cross-border medical care in Spain. Close to 40 percent of all medical expenses incurred by the Spanish public health care system associated to the provision of cross-border medical care occurs in Valencia (Tribunal de Cuentas, 2012). Within the region of Valencia, the province of Alicante receives the second largest flow of medical tourists in Spain, mostly from the United Kingdom, Nordic countries, The Netherlands, and France. The typical individual seeking cross-border medical care is familiar with the region (has vacationed or resided there, possibly received health care before) and is advised by a firm that facilitates the provision of such services (Escuela de Organización Industrial, 2013).

In practical terms, European individuals seeking medical treatment in Spain should follow several steps, including checking with the Spanish hospital for available dates for the operation, processing any lab tests needed prior to the procedure and discussing the intervention with their home country general practitioner (GP), among other things.[10] Additionally, for some specific types of operations, individuals might need to ask for authorization from the home-country National Health Service. Typically, this information is available online for most European country members.[11] However, due to the language and bureaucratic barriers that individual patients may encounter when arranging a medical intervention abroad, a number of companies have started to market cross-border medical care packages that include trip, accommodation, needed paperwork, lab work, and medical intervention for a price that, in many occasions, is still substantially lower than the cost of the same procedure in the home country.[12]

[10] More information can be found at: https://europa.eu/youreurope/citizens/health/unplanned-healthcare/going-to-doctor-hospital-abroad/index_en.htm

[11] For instance, in the U.K., the information is available at: https://www.nhs.uk/using-the-nhs/healthcare-abroad/going-abroad-for-treatment/going-abroad-for-medical-treatment/

[12] One example is “treatmentabroad” at https://www.treatmentabroad.com/

3. Data and Some Descriptive Evidence

To evaluate the impact of the reform on cross-border medical care, we use data on hospitalizations from the Spanish Minimum Set of Basic Data (MSBD). The MSBD is a clinical-administrative database provided by the Ministry of Health, Consumption and Social Welfare. It gathers data directly from public hospitals and contains administrative and detailed medical records on hospitalizations at discharge. We use data from 2008 to 2015 –namely, from four years prior to and four years after the reform. For each entry, the database provides information on some basic individual and hospital characteristics, length of hospital stays, diagnosis, procedures, mortality, and estimated cost.[13]

Our sample excludes children and pregnant women because these populations enjoy free access to care.[14] In addition, we remove hospitalizations due to traffic or work accidents, since they should not be considered cross-border medical care, as well as those with unknown or wrong diagnostic coding.[15] We use information on the patient's region of residence to identify non-resident hospitalizations for each region. We work with 17 of the 19 Spanish regions as we cannot include Navarra and La Rioja since the database does not allow us to identify non-resident hospitalizations.[16] In addition, although in robustness checks we experiment with including it, we exclude the region of Andalucía from the main analysis. Although there is no policy that has been specifically introduced in Andalucía to charge patients for incurred hospitalization costs, as in the case of Valencia, there is evidence in some

[13] See Table C in the appendix for further detail.

[14] Under Organic Law 4/2000 and Royal Decree 16//2012.

[15] GRDAP=470.

[16] In some instances, the region of residence is unknown. This is the case for those residing in Spain and lacking access to public healthcare when the law is enacted. Similarly, as noted by Chapaprieta *et al*. (2015), that would also be the case for individuals residing abroad, and for those seeking health care in a region other than the one in which they reside. Hence, hospitalizations among non-residents are underestimated.

media outlets of some hospitals in the region directly charging non-residents for procedures.[17] Therefore, as there seems to be evidence of a non-formalized change in charging behavior in that region, we conduct our analysis excluding Andalucía from both the treated and the control groups, to later include it in the treated group in robustness checks. In sum, since the request of direct payment for services from non-residents was only officially introduced in Valencia, that region constitutes the *treated* region, which we compare to the rest of *control* regions included in the study.[18]

Panel A of Figure 1 shows the number (dots) of non-resident hospitalizations for each trimester *before* and *after* the reform in Valencia (left panel) vs. the remaining regions (right panel). We fit a linear trend to the pre-reform and post-reform observations to graphically identify any break in the trend in response to the policy adoption (shaded areas capture 95% confidence intervals). There was a clear reduction in the number of hospitalizations in Valencia following the policy implementation from an average of 750/trimester to close to 50/trimester –a 90 percent drop. In contrast, in the control regions, hospitalizations did not significantly change from before to after the policy change implemented by Valencia.

At this juncture, a couple of facts are worth pointing out. First, there was no apparent "race to the bottom" –that is, other Spanish regions did not legislate a policy similar to the one adopted by Valencia, despite their ability to do so. Second, there was no apparent spillover impacts on the remaining Spanish regions, which could have prompted other regions to follow on Valencia's steps. A potential reason for the lack of spillover impacts can be found in patients' self-reports when asked about the factors driving their decision to seek cross-border care, which point to their familiarity with the region as a primary driver. For instance, survey

[17] Some hospitals in Andalucía required direct payment for the procedures performed from non-residents, *e.g.* https://www.lavanguardia.com/local/sevilla/20121107/54354259730/condenan-al-pago-de-2-265-euros-a-un-extranjero-por-la-asistencia-dada-en-el-hospital-costa-del-sol.html.

[18] Non-treated regions include Balearic Islands, Castilla-La Mancha, Madrid, Murcia, Ceuta, Melilla, and Castilla–León, Aragón, Asturias, Canary Islands, Cantabria, Cataluña, Extremadura, Galicia, and Basque Country.

data from the Flash Eurobarometer administered by the European Commission in 2007 shows that Europeans are much more likely to travel abroad to receive medical treatment if they have already received some medical assistance in that location before (Flash Eurobarometer, 2007). Similarly, lack of familiarity with the destination is identified as an important factor discouraging individuals from seeking medical care abroad. This suggests that many of those seeking care in Valencia were probably familiar with the area and only considered seeking care in that location, not necessarily in other Spanish regions they might be unfamiliar with.

In consonance with the results in Panel A of Figure 1, there is a significant reduction in the cost associated to the hospitalization of non-residents in Valencia after the policy was implemented from 5 million euros in the first quarter of 2011 to half a million euros right after (Panel B of Figure 1). In contrast, in the remaining Spanish regions, total costs per quarter remained roughly unchanged. Overall, the descriptive evidence in Figure 1 hints on the policy effectiveness in curtailing non-resident hospitalizations and costs.

From a public health point of view, it is important to identify which treatments and costs were responsible for the observed response. The MSBD contains detailed information on diagnostics, which allow us to determine the most treated diseases and the estimated cost of treatment. In Table 1, we use that information to descriptively examine changes in hospitalizations from *before* to *after* the first quarter of 2012, in *Valencia* versus the *control* regions, according to Mayor Diagnostic Category.[19] Hospitalizations due to diseases and disorders related to the musculoskeletal, circulatory, digestive, respiratory and nervous systems all experienced very large reductions. Together, they accounted for more than 70 percent of the decrease in hospitalizations.

[19] The Mayor Diagnostic Category is a group of diagnostics which is divided in 25 groups plus an additional category that cannot be included in the previous one. Note that we do not report pregnant diagnostic category since we remove pregnant women from the analysis.

Table 2 repeats the same exercise, although focusing on the estimated average cost (in thousands of euros) of each hospitalization. The largest savings originate from diagnoses responsible for most hospitalizations, such as diseases and disorders related to the musculoskeletal, circulatory, digestive, respiratory and nervous systems. They accounted for 67 percent of the cost savings. The most expensive diagnoses (pre-MDC and human immunodeficiency/virus infections) only dropped by 1.2 percent,[20] but they lowered costs by 5.5 percent.

In sum, the descriptive statistics in Figure 1 and Table A in the appendix uncover significant reductions in non-resident hospitalizations and costs in Valencia, when compared to other regions, after 2011. In addition, Table 1 and Table 2 document how the observed reduction in non-resident hospitalizations and costs did not disproportionally impact a few diagnoses.

4. Methodology

Thus far, we have provided descriptive evidence of the impact of the reform on cross-border hospitalizations and related costs. In what follows, we conduct a more thorough analysis relying on a quasi-natural experimental approach that compares changes in both outcomes (non-resident hospitalization and costs) before and after the policy change, across treated and control regions, while accounting for regional and temporal fixed-effects, as well as linear or treated-region specific time trends. To that end, we estimate the following benchmark model:

(1) $$y_{rqy} = \beta_0 + \beta_1 Post_{qy} + \beta_2 Treated_r + \beta_3 \left(Post_{qy}\, x\, Treated_r\right) + \mu_r + \delta_q + \lambda_y + \varepsilon_{rqy}$$

[20] The pre-MDC diagnosis includes transplants, tracheostomies, as well as wrong diagnoses, contributing to its higher-than-average costs.

where y_{rqy} is the outcome of interest (number or hospitalizations or total cost) in region *r*, quarter q and year y. $Post_{qy}$ is a dummy variable equal to 1 after the reform; that is, the first quarter of 2012 onward. $Treated_r$ is an indicator for the treated region –namely, Valencia.[21] The model includes region fixed effects (μ_r), quarter fixed effects (δ_q) and year fixed effects (λ_y). Standard errors are bootstrapped.

The causal effect of the reform would be captured by β_3, which can be interpreted as the change in non-residents' hospitalizations and their corresponding cost induced by the reform. Note that the specification already controls for changes over time in the dependent variable, as well as for average differences between non-resident patients across treated and control regions. The identification assumption is that trends in the two outcomes would have been the same in treated and control regions in the absence of the policy change. We thus include either region-specific time trends *(r*t)* or treated region-specific time trend ($Treat_r$*t). Additionally, in an event study, we will explore if the trends in non-resident hospitalizations and costs already differed in Valencia, when compared to the control regions, prior to the change in the billing policy.

5. Did the Reform Reduce Cross-border Medical Care?

5.1. Main Findings

Our primary goal is to learn about the effectiveness of the reform in reducing cross-border medical care costs by ensuring the upfront payment for services provided to non-residents. To that end, Table 3 shows the difference-in-difference estimate of the reform on those two outcomes based on three model specifications of equation (1) that progressively add controls. Specification (1) includes regional, trimester and year fixed-effects; specification (2)

[21] In robustness checks, we experiment with adding Andalucía, where informal reports are suggestive of a similar practice to the one followed by Valencia, to the treated group.

adds region-specific time trends; and specification (3) adds a treated region-specific time trend to the first model specification –allowing us to check the common trends assumption. Results are rather consistent, regardless of the model specification being used. Based on the last and most complete model specification, the reform lowered hospitalization costs associated to non-residents by 4.8 million euros/trimester in Valencia, when compared to other autonomous communities. This substantial savings originated from a sharp reduction in hospitalizations among non-residents of roughly 800/trimester –a 98 percent drop.

5.2. Identification

The estimates in Table 3 rely on a difference-in-difference estimation that assumes that the outcomes being examined were no different prior to the adopted measures in treated vs. control region. To gauge the parallel pre-trends assumption, as well as to evaluate outcome dynamics following the reform, we conduct an event study for each outcome –namely, the number of non-resident hospitalizations in the region and its associated cost. To that end, we estimate the following equation:

(2) $$y_{rqy} = \beta_0 + \sum_{qy=-15}^{15} \beta_{1,qy}\, Trim_{qy} + \beta_2 Treat_r + \sum_{qy=-15}^{15} \beta_{3,qy}\left(Trim_{qy}\, x\, Treat_r\right)_{rqy} + +\mu_r + \varepsilon_{rqy}$$

where y_{rqy} continues to stand for the number of hospitalizations or total cost in region *r*, quarter *q* and year *y*. We examine the existence of pre-trends up to 15 trimesters prior, as well as outcome dynamics up to 15 trimesters after the reform. Figure 2 displays the coefficients from the event study (β_3), along with 95 percent confidence intervals. All estimates for the periods prior to the reform are close to zero, strongly supporting the assumption of no differential pre-trends. In addition, there is a clear break in the trend in both the number of hospitalizations (Panel A), as well as in its total cost (Panel B), surrounding the adoption of the policy. Both significantly drop and stay down thereafter. The persistence of the reform's impacts is

suggestive of its effectiveness in curtailing cross-border medical care and its cost in the medium- and long-run.

To dissipate additional identification concerns, we also conduct a series of placebo checks. Specifically, we experiment with shifting the adoption of the policy by one trimester at a time. Figure 3 illustrates the distribution of the new point estimates (Panel A), as well as the cumulative distribution of *t*-values from those regressions (Panel B) when compared to a zero-mean normal distribution. As shown therein, the point estimates from the placebo interventions are almost always lower than our estimated effect (indicated by the dashed vertical line) and as expected, centered around zero. Furthermore, a Kolmogorov-Smirnov test of normality of the empirical distribution of the placebo *t*-values cannot be rejected at conventional significance levels. As such, the placebo reforms would have no significant impact on either non-resident hospitalizations or their associated cost.

5.3. Robustness Checks

We next perform several robustness checks aimed at gauging the reliability of the estimates in Table 3 to changes in the sample period, the control group, the treated group, and the estimation methodology. Columns (1) and (2) of Table 4 display the results from our *first* robustness check, where we experiment with restricting the sample to *a 3-year period around treatment* to better gauge the impact of the adopted measures. Results prove remarkably robust. Estimates become, if anything, slightly larger, lowering regional medical costs by 5.4 million euros/trimester (vs. 4.8 million) as hospitalizations drop by 909/trimester (vs. 800) in Valencia.

Next, we experiment with *altering the control group*. Causal inference ultimately depends on having similar treated and control groups. To that end, we use data from the Hotel Occupancy Survey (INE) and select regions that, as Valencia, have more than one million of travelers per year (see Appendix C). This exercise results in a different control group composed of the following regions: Cataluña, Balearic Island, Canary Island, Madrid, Galicia, Basque

Country, and Castile-Leon. Using this new control group, we repeat our analyses. As shown in columns (3) and (4) of Table 4, the estimates continue to prove remarkably robust.

In a similar vein, we explore altering the control group by *removing control regions – one at a time*. Figure 4 displays graphically the estimated impacts of the reform from each of those regressions for the two outcomes we focus on. As can be seen in Panel A of Figure 4, the reform continued to lower hospitalizations by roughly 800/trimester, regardless of which control region was being removed. Similarly, costs dropped by 4.8 million euros/trimester independently of the control region being removed. In sum, the estimates are not driven by one specific control region.

In columns (5) and (6) of Table 4, we try *changing the treated group*. As pointed out earlier, we include Andalucía in the treated group together with Valencia because, although there was no formal normative change, there is evidence of informal advice to charge foreigners directly for some procedures. As can be seen in the last columns of Table 4, our results prove robust to this robustness check. The reform lowered hospitalizations by 500/trimester and overall costs by 2.9 million euros/trimester.

To conclude, we experiment with conducting the analysis using two *alternative methodologies*. *First*, we use a regression discontinuity (RD) design exploiting the fact that reform was introduced in January 2012 to estimate the following model:

$$(3) \quad y_{rqy} = \beta_0 + \beta_1 Trend_{qy} + \beta_2 Post_{qy} + \beta_3 (Trend_{qy} x\ Post_{qy}) + \varepsilon_{rqy}$$

where $Trend_{qy}$ stands for a linear trend of our running variable by quarter, and $Post_{qy}$ is a binary indicator equal to 1 for the post-reform period. We also allow for a differential trend after the reform ($Trend_{qy} x\ Post_{qy}$). Therefore, the coefficient on $Post_{qy}$ identifies jumps in the dependent variable at the time of the reform –namely, in January 2012. Finally, to check the robustness of our findings to the use of non-linear trends, we also experiment with adding a quadratic pre-reform trend and a quadratic post-reform trend. Table 5 displays the results

from this exercise. As shown therein, the reform lowered hospitalizations in Valencia by 760/trimester in the most complete model specification –a 92 percent reduction. Additionally, it cut total costs by 4.5 million euros/trimester.

Second, we experiment with estimating the impact of the reform using a synthetic control method approach. In Figure 5, Panel A, we display the results for the total number of hospitalizations. The results for overall costs in thousands of euros are shown in Panel B. In both cases, we observe similar pre-reform trends in treated and synthetic control regions, which ends up being Cataluña –a non-surprising result considering the similarities of the hospitalization system and the use by foreigners of the system in the two regions. As previously found using the difference-in-differences and regression discontinuity design methodologies, there is a strong reduction in both hospitalizations and costs immediately after the reform –a decline driven by the change in the treated region. In contrast, hospitalizations and costs display trends like the ones prior to the reform.

In conclusion, the robustness checks confirm the results from our baseline specification, enhancing the credibility and reliability of the estimates and conclusions.

6. Mechanisms

Thus far, we have shown that the reform adopted by Valencia significantly curtailed non-resident hospitalizations and costs. The impacts did not predate the reform, proved long-lasting, and are not observed when alternative reform dates are used as a placebo. Finally, the effects of the policy change prove robust to cutting the sample to narrow window around treatment, altering the control and treated groups, and to the use of alternative methodologies. In this section, we aim to learn about the mechanisms at play by gaining a better understanding of the types of procedures most responsive to the policy and the effects of the reform on patients.

6.1. Heterogenous Impacts by Type of Intervention

Table 6 provides further insight into the mechanisms at play by looking at how various types of interventions were impacted by the reform. The first two columns in Table 6 differentiate according to whether the intervention required surgery. As shown therein, both surgical and non-surgical medical attention dropped by similar percentages –between 94 and 98 percent, respectively. Further information on the type of intervention affected by the reform is provided in columns (3) through (9). There were similarly large and significant reductions in interventions related to the musculoskeletal and circulatory systems, including hip implants and pacemakers. Similarly, cataract procedures were cut by two and a half times.

In sum, the reform led to very large reductions in all medical interventions, with and without surgery, as well as across all the most typical procedures, including hip and pacemaker implants or cataracts.

6.2. Heterogeneous Impacts by Patients' Age, Gender and Country of Origin

We next look at whether the reform impacted differently patients by gender, age, or country of origin. As shown in Table 7, there were significant reductions among both male and female patients, as well as among younger and older patients. We also look at the nationalities of treated patients –information that is unfortunately not available for most regions. However, we do have the data for Valencia, which we use to tabulate changes in the origin of patients before and after the adoption of the reform. Once again, as in Tables 6 and 7, we observe large reductions across the board, even though most patients were originally coming from the U.K., Germany, and France (see Table 8). Figures A and B in the appendix provide us with a different view of the ongoing changes. Prior to the reform, approximately 93 percent of patients in Valencia originated from Europe. After the reform, that share is not substantially different, at about 89 percent (see Figure A), even though the reductions occurred, primarily, among patients originating from Europe (Figure B).

In sum, the effectiveness of the reform did not rely on the selection of patients based on their gender, age, origin, nor on the type of intervention sought.

6.3. Heterogeneous Impacts by Intervention Attributes

Finally, we use the individual level data on the resources associated to the treatment/intervention sought by non-residents, its anticipated vs. unanticipated nature, duration of treatment, readmissions, mortality, as well as individual intervention costs to further understand which intervention parameters were impacted by the reform. Uncovering this information sheds some light on selective changes and, in turn, on the mechanisms at play.

To that end, we re-formulate the model in equation (1) to gauge the effect of the reform on non-residents' choice of treatment/intervention, duration of treatment, length of hospital stays, readmissions, mortality and expenditures incurred using case level data, as follows:

$$(4) \qquad y_{irqy} = \beta_0 + \beta_1 Post_{qy} + \beta_2 Treat_r + \beta_3 \left(Post_{qy}\, x\, Treat_r\right) + \mu_r + \delta_q + \lambda_y + \varepsilon_{irqy}$$

The regressors, now referred to individual patients, coincide with those in equation (1). The dependent variable denotes the outcomes noted above. Table 9 displays the results after including a treated region-specific time trend. Standard errors are bootstrapped.

The reform only marginally increased the per unit cost of sought procedures, but not the estimated consumption of resources, the duration of the hospitalization, or mortality. The implemented change in billing only seems to have lowered the number of scheduled hospitalizations and readmissions by 45 percent and 73 percent, respectively. Therefore, these results highlight the fact that the new direct billing system introduced by the reform reduced scheduled hospitalizations, as would be expected.

All in all, the estimates in Tables 6, 7 and 9, along with the descriptive statistics in Table 8 and Figures A and B in the appendix, reveal the broad reduction in cross-border medical care, which did not concentrate among certain demographics (as captured by gender, age, origin) nor on specific medical interventions. Similarly, declines occurred for all sorts of medical

procedures (*i.e.* with or without surgery, as well as with higher or lower estimated resource consumption) without significantly altering the duration of treatment or mortality. Rather, non-citizens became 45 percent less likely to schedule a hospitalization in Valencia and, among those who did, readmissions dropped by 73 percent.

7. Summary and Conclusions

Cross-border care is a relatively unexplored topic in the health literature due, in part, to difficulties in finding adequate data. Yet, cross-border medical care is rather extensive, and can impose a significant financial burden on some nations. We focus on Spain –a country receiving most of its foreign patients from the European Union (EU). In the EU context, nationals from any of the 27 EU countries, Iceland, Liechtenstein, Norway, and Switzerland visiting another of these countries, are entitled to receive the same health care treatment in the same conditions than nationals from those countries. While, in principle, the cost associated with treating these patients should be reimbursed by the non-resident's country members, this is often not the case due to the distinct health coverage offered by each country.

We examine the impact of a reform introduced in 2012 in Valencia, Spain, to curtail cross-border medical care costs. Using administrative data on all interventions to non-residents in the country, along with a quasi-experimental approach, we find that the reform significantly curtailed non-resident hospitalizations by 98 percent and lowered medical cost by 4.8 million euros/trimester. We also explore the channels through which such reductions took place to gauge any disproportionate impact by type of patient, procedure, or outcomes in order to learn about selection biases emanating from the policy change. We find that the reform uniformly reduced hospitalizations and readmissions for most medical procedures, regardless of whether they were estimated to consume more resources or required surgical interventions. In addition, the reform had no significant impact on the type of patient admitted (as captured by age, gender,

or country of origin), nor on the duration of the hospital stay or on mortality. It uniformly reduced scheduled hospitalizations by 45 percent, and readmissions by 73 percent.

One might wonder about the welfare implications of the impacts documented in this study. While we cannot gauge the well-being effects on foreigners seemingly choosing to be treated elsewhere, we can get a sense of what the yearly savings of 20 million euros –amounting to 0.3 percent of the health care budget of Valencia in 2011– represent for the region. Given the current salary scales for doctors and nurses in the public health care sector in Spain, the yearly cost savings would allow for the hiring of an additional 600 nurses or 325 doctors in a system that, as made evident by the COVID-19 pandemic, is deficient in medical personnel.

Overall, the findings extend our understanding of medical travel by providing causal evidence on the impact of the policy introduced in Valencia, Spain, in containing the financial burden imposed by cross-border medical care. In the absence of more equitable and enforceable reimbursement agreements, directly billing patients, who may later seek reimbursement in their home countries for the incurred medical expenses, can prove effective in reducing the cost burden borne by some regions. This is important considering the increase in cross-border medical care and the lack of a uniform health care coverage menu in the EU context, which creates incentives to seek care in other EU countries covering the treatment in question.

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Table 1: Hospitalizations by Type of Diagnosis

Mayor Diagnostic Category	Percent Distribution	Treated Region			Non-Treated Regions			DD (DT-DC)
		Pre	Post	DT	Pre	Post	DC	
Diseases and Disorders of the Musculoskeletal System and Connective Tissue	16%	2,092	168	-1,924	2801	2877	76	-2,000
Diseases and Disorders of the Circulatory System	16%	2,474	206	-2,268	2593	2654	61	-2,329
Diseases and Disorders of the Digestive System	12%	1,530	127	-1,403	2121	2320	199	-1,602
Diseases and Disorders of the Respiratory System	12%	1,573	130	-1,443	2167	2126	-41	-1,402
Diseases and Disorders of the Nervous System	11%	1,607	172	-1,435	1802	1959	157	-1,592
Diseases and Disorders of the Hepatobiliary System and Pancreas	5%	782	57	-725	894	945	51	-776
Diseases and Disorders of the Kidney and Urinary Tract	5%	470	43	-427	774	954	180	-607
Diseases and Disorders of the Skin, Subcutaneous Tissue and Breast	3%	294	31	-263	591	517	-74	-189
Mental Diseases and Disorders	3%	342	43	-299	436	528	92	-391
Diseases and Disorders of the Ear Nose, Mouth and Throat	2%	268	21	-247	428	335	-93	-154
Injuries, Poison and Toxic Effect of Drugs	2%	214	39	-175	342	389	47	-222
Infectious and Parasitic DDs (Systemic or unspecified sites)	2%	249	28	-221	280	374	94	-315
Diseases and Disorders of the Endocrine, Nutritional and Metabolic System	2%	213	18	-195	314	288	-26	-169
Diseases and Disorders of the Female Reproductive System	2%	175	12	-163	311	291	-20	-143
Pre-MDC	1%	130	18	-112	271	226	-45	-67
Myeloproliferative DDs (Poorly Differentiated Neoplasms)	1%	104	5	-99	186	166	-20	-79
Factors Influencing Health Status and Other Contacts with Health Services	1%	72	9	-63	154	212	58	-121
Diseases and Disorders of the Blood and Blood Forming Organs and	1%	109	5	-104	162	165	3	-107
Human Immunodeficiency Virus Infection	1%	60	7	-53	152	182	30	-83
Diseases and Disorders of the Male Reproductive System	1%	73	5	-68	131	186	55	-123
Alcohol/Drug Use or Induced Mental Disorders	1%	111	13	-98	134	96	-38	-60
Diseases and Disorders of the Eye	1%	87	3	-84	102	121	19	-103
Multiple Significant Trauma	0%	66	3	-63	52	103	51	-114
Burns	0%	32	3	-29	48	44	-4	-25
All	100%	13,127	1,166	-11,961	17,246	18,058	812	-12,773

Source: CMBD 2008-2015 and own elaboration.

Table 2: Total Cost of Hospitalizations by Type of Diagnosis (in thousands of €)

Mayor Diagnostic Category	Average Cost per Patient	Treated Region			Non-Treated Regions			DD (DT-DC)
		Pre	Post	DT	Pre	Post	DC	
Diseases and Disorders of the Musculoskeletal System and Connective Tissue	5	10,711	781	-9,931	13,463	14,999	1,536	-11,467
Diseases and Disorders of the Circulatory System	5	12,649	1,062	-11,586	14,012	14,268	256	-11,842
Diseases and Disorders of the Digestive System	5	7,499	557	-6,943	9,598	10,242	644	-7,587
Diseases and Disorders of the Respiratory System	4	6,261	510	-5,751	9,112	9,144	32	-5,783
Diseases and Disorders of the Nervous System	6	8,407	1,057	-7,350	10,820	11,449	630	-7,980
Diseases and Disorders of the Hepatobiliary System and Pancreas	5	3,730	273	-3,457	4,070	4,576	506	-3,963
Diseases and Disorders of the Kidney and Urinary Tract	4	1,704	135	-1,569	2,707	3,510	803	-2,372
Diseases and Disorders of the Skin, Subcutaneous Tissue and Breast	4	1,061	112	-949	2,203	1,876	-327	-622
Mental Diseases and Disorders	6	1,863	324	-1,539	2,396	3,974	1,578	-3,117
Diseases and Disorders of the Ear Nose, Mouth and Throat	3	799	53	-746	1,410	1,026	-385	-361
Injuries, Poison and Toxic Effect of Drugs	5	1,008	155	-852	1,574	1,771	198	-1,050
Infectious and Parasitic DDs (Systemic or unspecified sites)	6	1,625	160	-1,466	1,628	2,308	680	-2,146
Diseases and Disorders of the Endocrine, Nutritional and Metabolic System	4	934	69	-865	1,346	1,220	-126	-739
Diseases and Disorders of the Female Reproductive System	4	637	33	-604	1,119	1,069	-50	-554
Pre-MDC	57	8,785	1,116	-7,669	16,077	11,049	-5,027	-2,642
Myeloproliferative DDs (Poorly Differentiated Neoplasms)	8	966	29	-938	1,345	1,370	25	-963
Factors Influencing Health Status and Other Contacts with Health Services	4	167	31	-135	699	1,013	313	-449
Diseases and Disorders of the Blood and Blood Forming Organs and	4	436	20	-417	652	642	-10	-407
Human Immunodeficiency Virus Infection	17	1,089	119	-971	2,844	2,886	42	-1,013
Diseases and Disorders of the Male Reproductive System	3	234	11	-223	432	659	226	-450
Alcohol/Drug Use or Induced Mental Disorders	4	404	60	-344	439	462	24	-368
Diseases and Disorders of the Eye	4	357	10	-347	386	394	8	-355
Multiple Significant Trauma	8	375	84	-291	433	913	480	-771
Burns	11	288	40	-247	589	480	-109	-138
All	5	71,991	6,799	-65,191	99,354	101,301	1,947	-67,138

Source: CMBD 2008-2015 and own elaboration.

Table 3
Difference-in-Difference Estimates of the Effect of the Reform on Cross-border Medical Care

Outcome:	**Hospitalizations**			**Total Cost (in 1,000 euros)**		
Column:	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
Post * Treated	-750.946***	-800.107***	-800.107***	-4,082.574***	-4,786.445***	-4,786.445***
	(18.657)	(40.750)	(53.211)	(175.410)	(382.820)	(344.845)
Observations	512	512	512	512	512	512
R-squared	0.871	0.896	0.871	0.879	0.902	0.881
Dep. Var Mean	820.44	820.44	820.44	4,499.42	4,499.42	4,499.42
Std. Deviation	(91.81)	(91.81)	(91.81)	(668.88)	(668.88)	(668.88)
Region FE	Y	Y	Y	Y	Y	Y
Trimester FE	Y	Y	Y	Y	Y	Y
Year FE	Y	Y	Y	Y	Y	Y
Linear Trend	N	Y	N	N	Y	N
Treated Trend	N	N	Y	N	N	Y

Notes: Bootstrap standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Table 4
Robustness Checks

Check No.:	**Check #1**		**Check #2**		**Check #3**	
Specification:	**Using a 3-Year Window Around Treatment**		**Using Regions with Similar Tourism**		**Including Andalucía as a Treated Region**	
Outcome:	**Hospitalizations**	**Total Cost (in 1,000 euros)**	**Hospitalizations**	**Total Cost (in 1,000 euros)**	**Hospitalizations**	**Total Cost (in 1,000 euros)**
Column:	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
Post * Treated	-909.917***	-5,338.634***	-797.444***	-4,741.954***	-492.079***	-2,893.719***
	(226.238)	(1,401.876)	(54.975)	(405.049)	(91.138)	(477.806)
Observations	403	403	256	256	544	544
R-squared	0.848	0.862	0.866	0.875	0.818	0.828
Dep. Var Mean	769.77	4,344.10	820.44	4,499.42	577.19	3,174.39
Std. Deviation	(233.97)	(1,342.11)	(91.98)	(668.88)	(256.83)	(1,441.06)
Region FE	Y	Y	Y	Y	Y	Y
Trimester FE	Y	Y	Y	Y	Y	Y
Year FE	Y	Y	Y	Y	Y	Y
Linear Trend	N	N	N	N	N	N
Treated Trend	Y	Y	Y	Y	Y	Y

Notes: Bootstrap standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Table 5
RDD Estimates of the Effect of the Reform on Cross-border Medical Care

Outcome:	**Hospitalizations**		**Total Cost (in 1,000 euros)**	
Column:	**(1)**	**(2)**	**(1)**	**(2)**
Post	-808.213***	-757.365***	-4,888.113***	-4,540.666***
	(47.023)	(73.259)	(284.893)	(439.437)
Observations	32	32	32	32
R-squared	0.973	0.974	0.968	0.969
Dep. Var Mean	820.44	820.44	4,499.42	4,499.42
Std. Deviation	(91.81)	(91.81)	(668.88)	(668.88)
Linear Trend	Y	N	Y	N
Quadratic Trend	N	Y	N	Y
Different trend after the reform	Y	Y	Y	Y

Notes: Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Table 6
Mechanisms #1: DD Estimates of the Effect of the Reform on Frequent Medical Interventions

Category:	**Surgery**		**Musculoskeletal System**			**Circulatory System**			**Eyes**
Outcome:	**Yes**	**No**	**All**	**With Surgery**	**Hip Implants**	**All**	**With Surgery**	**Pacemaker Implants**	**Cataract**
Column:	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**	**(9)**
Post * Treated	-226.893***	-573.214***	-127.07***	-95.733***	-8.566***	-133.116***	-35.930***	-3.746***	-0.459*
	(15.741)	(25.837)	(8.449)	(7.277)	(1.498)	(6.328)	(3.459)	(0.762)	(0.253)
Observations	512	512	512	512	512	512	512	512	512
R-squared	0.844	0.876	0.859	0.853	0.694	0.889	0.861	0.506	0.195
Dep. Var Mean	241.12	579.31	132.62	95.56	8.06	154.19	42.62	3	0.18
Std. Deviation	(34.10)	(65.76)	(19.30)	(15.27)	(2.26)	(14.60)	(6.5)	(1.71)	(0.40)
Region FE	Y	Y	Y	Y	Y	Y	Y	Y	Y
Trimester FE	Y	Y	Y	Y	Y	Y	Y	Y	Y
Year FE	Y	Y	Y	Y	Y	Y	Y	Y	Y
Linear Trend	Y	Y	Y	Y	Y	Y	Y	Y	Y
Treated Trend	Y	Y	Y	Y	Y	Y	Y	Y	Y

Notes: Bootstrap standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Table 7
Mechanisms #2: DD Estimates of the Effect of the Reform by Gender and Age Groups

Group:	**By Gender**		**By Group of Age**			
Outcome:	**Women**	**Men**	**18-34**	**35-54**	**55-74**	**+75**
Post * Treated	-318.460***	-481.653***	-95.959***	-168.546***	-378.569***	-157.034***
	(18.427)	(23.331)	(12.969)	(18.914)	(12.581)	(9.338)
Observations	512	512	512	512	512	512
R-squared	0.854	0.879	0.841	0.826	0.900	0.771
Dep. Var Mean	324.37	496.06	106.87	168	391.19	154.37
Std. Deviation	(40.73)	(52.91)	(27.29)	(45.51)	(23.33)	(15.97)
Region FE	Y	Y	Y	Y	Y	Y
Trimester FE	Y	Y	Y	Y	Y	Y
Year FE	Y	Y	Y	Y	Y	Y
Linear Trend	N	Y	N	N	Y	N
Treated Trend	N	N	Y	N	N	Y

Notes: Bootstrap standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Table 8
Top Ten Hospitalizations by Country of Residence in Valencia
(Number of hospitalizations per quarter)

Origin	Pre	Post	Var (%)
U.K.	268	19	-93%
Germany	115	6	-95%
France	95	9	-91%
Romania	53	2	-96%
Belgium	27	3	-90%
Norway	26	2	-92%
Netherlands	24	4	-84%
Sweden	24	2	-93%
Italy	20	3	-85%
Switzerland	14	2	-86%

Source: CMBD 2008-2015 and own elaboration.

Table 9
Mechanisms #3: DD Estimates of the Effect of the Reform on Based on Individual Case Traits

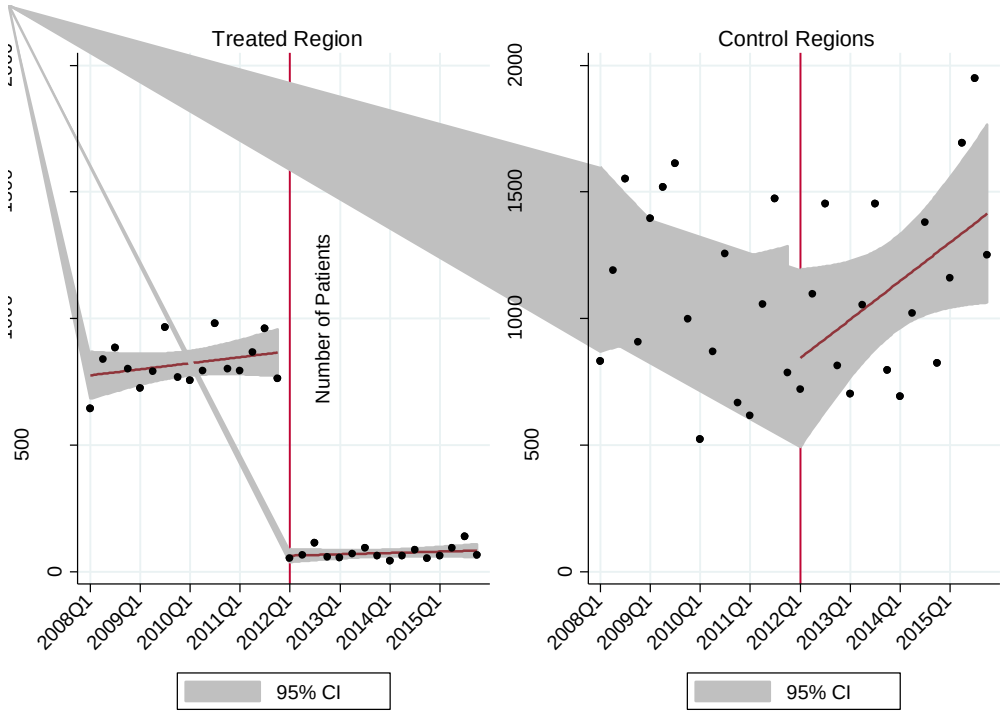
Outcome	Cost	Resources	Scheduled Hospitalizations	Readmissions	Duration	Mortality
Post * Treated	0.801*	0.158	-0.027**	-0.044***	-0.403	-0.005
	(0.412)	(0.097)	(0.013)	(0.010)	(0.410)	(0.010)
Observations	49,594	49,594	49,594	49,594	49,594	49,594
R-squared	0.006	0.006	0.066	0.008	0.020	0.020
Dep. Var Mean	5.48	1.20	0.06	0.06	6.68	0.05
Std. Deviation	(7.91)	(1.66)	(0.24)	(0.23)	(8.52)	(0.21)
Age, gender	Y	Y	Y	Y	Y	Y
Region FE	Y	Y	Y	Y	Y	Y
Trimester FE	Y	Y	Y	Y	Y	Y
Year FE	Y	Y	Y	Y	Y	Y
Linear Trend	N	N	N	N	N	N
Treated Trend	Y	Y	Y	Y	Y	Y

Notes: Total cost in thousands of euros. Bootstrap standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

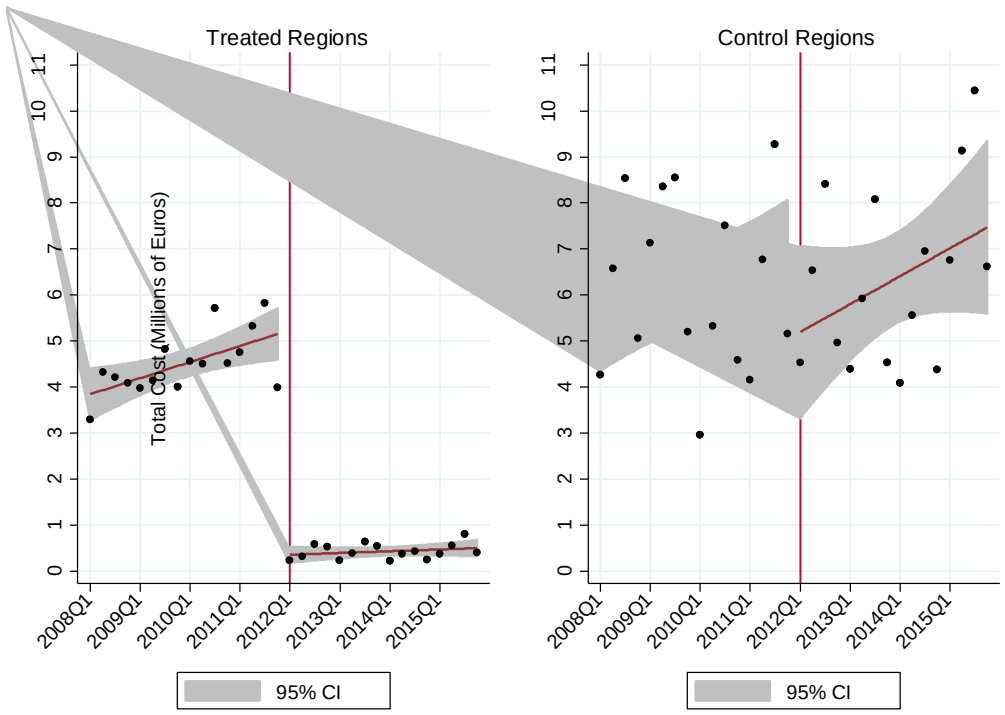
FIGURES

Figure 1
Cross-border Medical Care (2008-2015)

Panel A: Hospitalizations



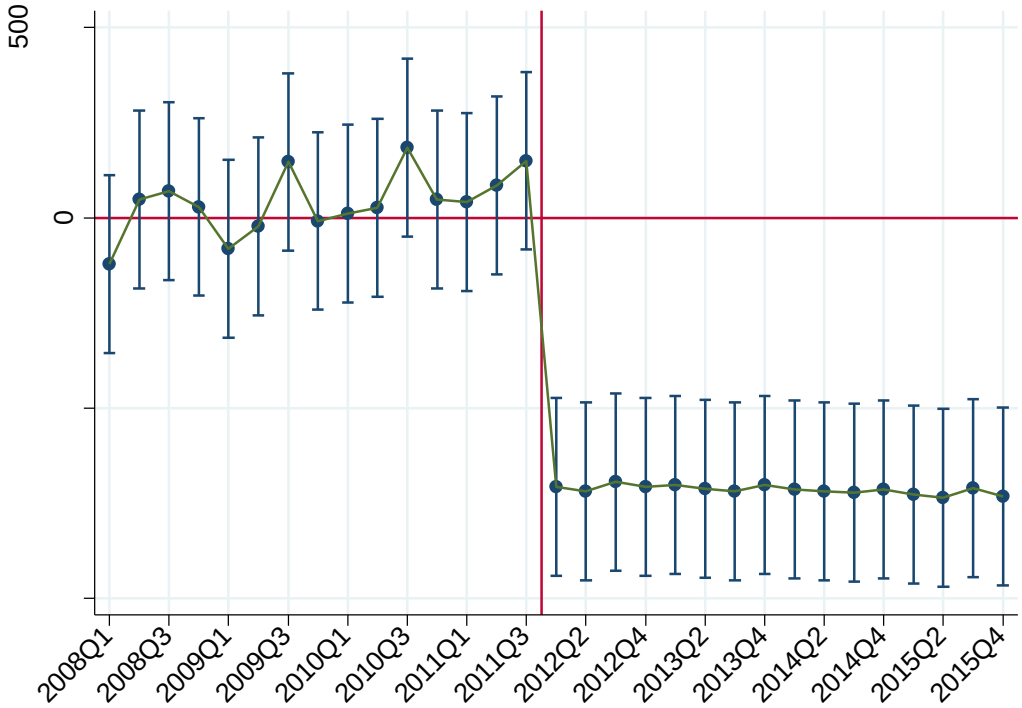
Panel B: Total Cost (in 1,000 euros)



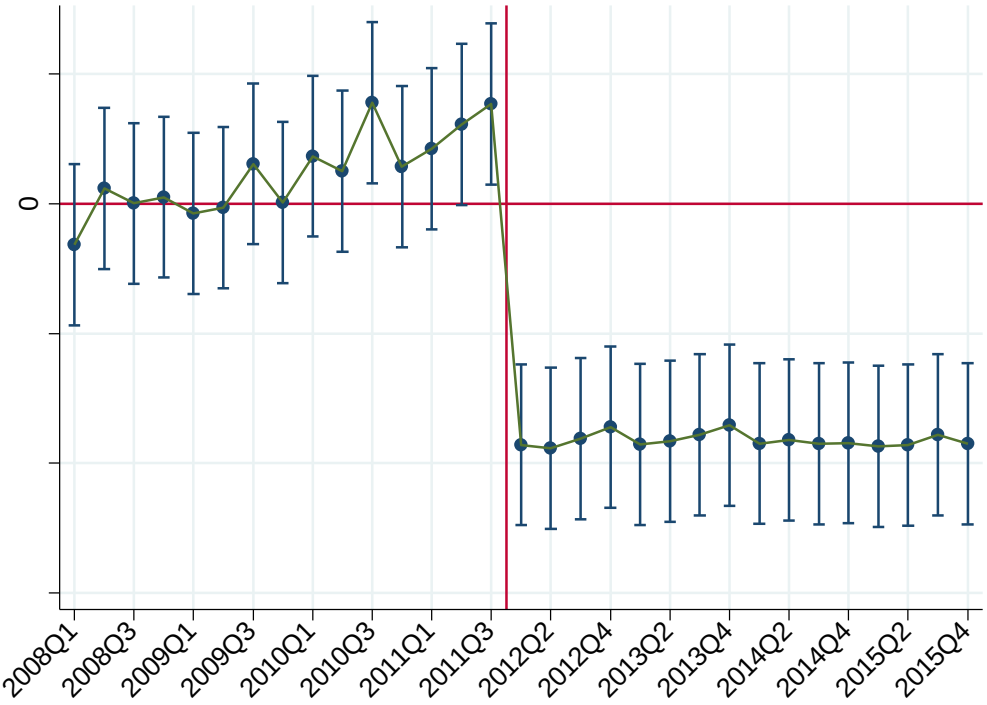
Source: CMBD 2008-2015 and own elaboration.

Figure 2
Event Study Figures

Panel A: Hopitalizations



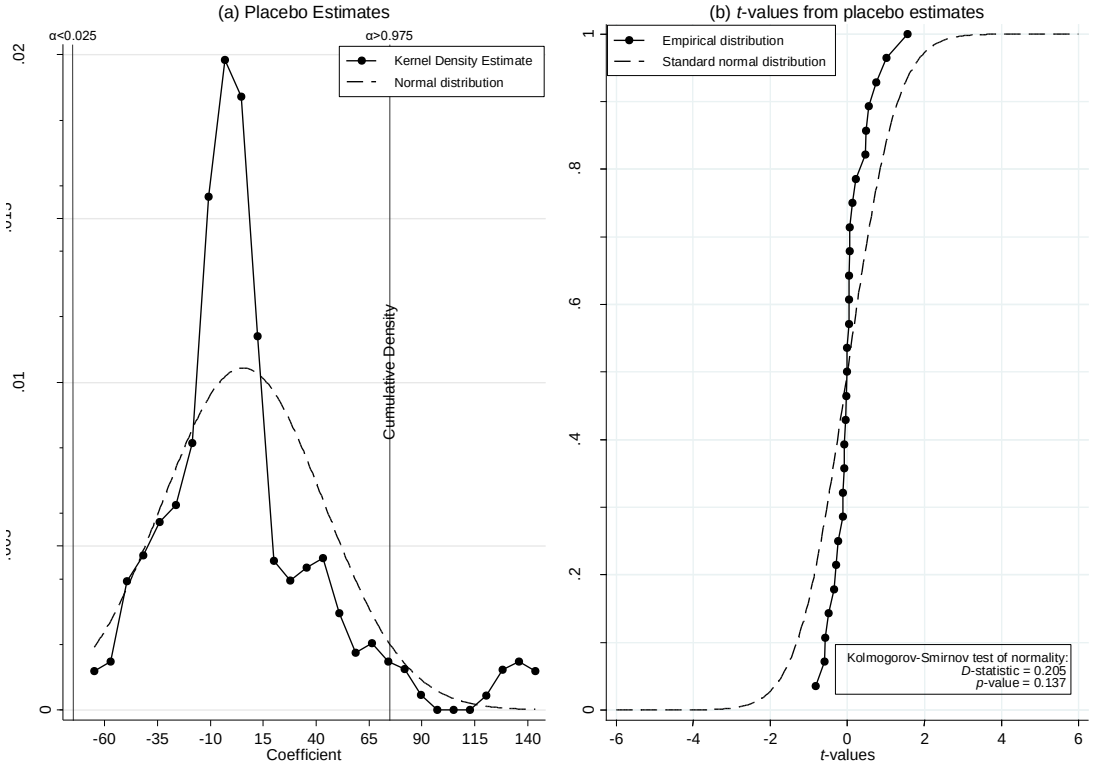
Panel B: Total Cost (in 1,000 euros)



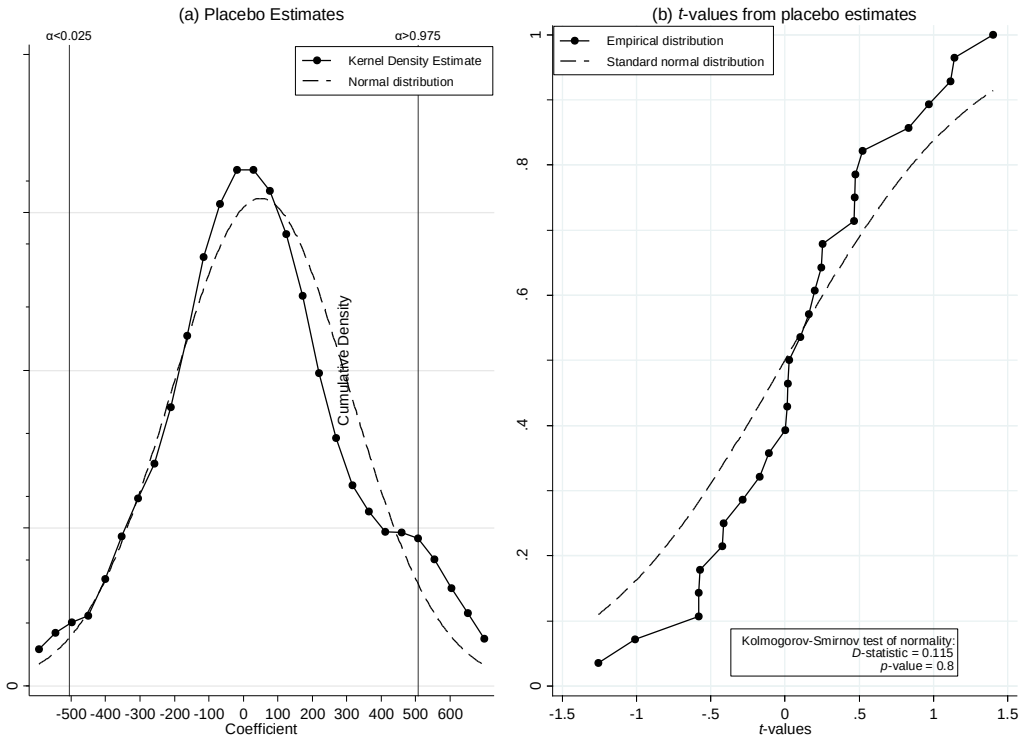
Source: CMBD 2008-2015 and own elaboration.

Figure 3
Placebo Tests

Panel A: Number of Hospitalizations



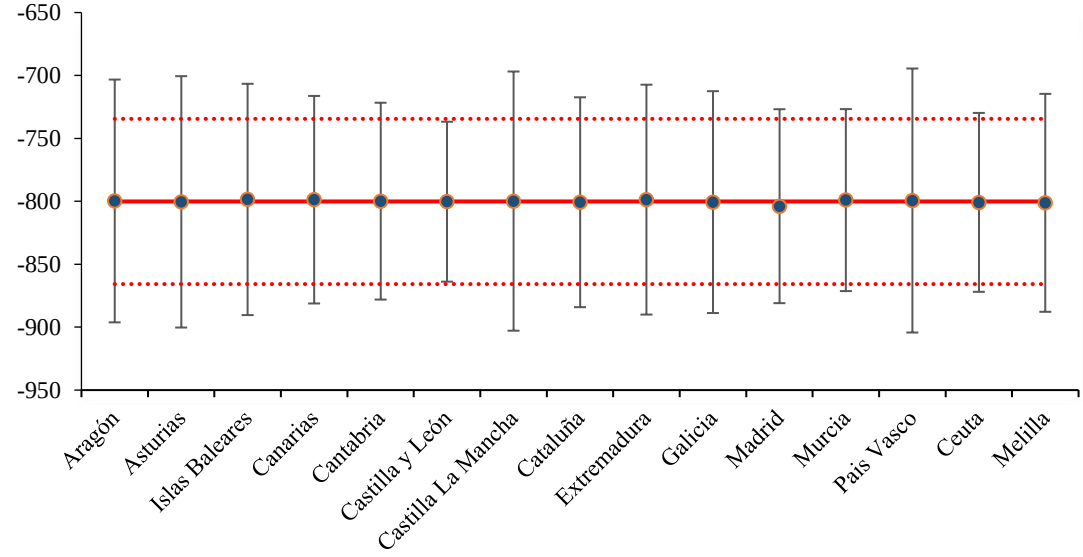
Panel B: Total Cost (in thousands of euros)



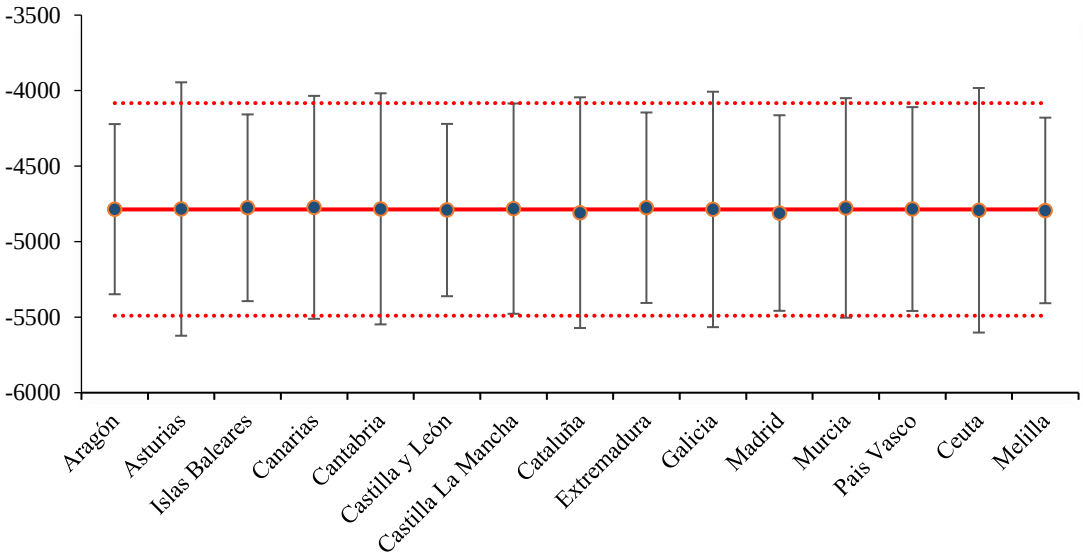
Source: CMBD 2008-2015 and own elaboration

Figure 4
Sensitivity Analysis to Changes in the Control Group
(Removing One Region at a Time)

Panel A: Hospitalizations



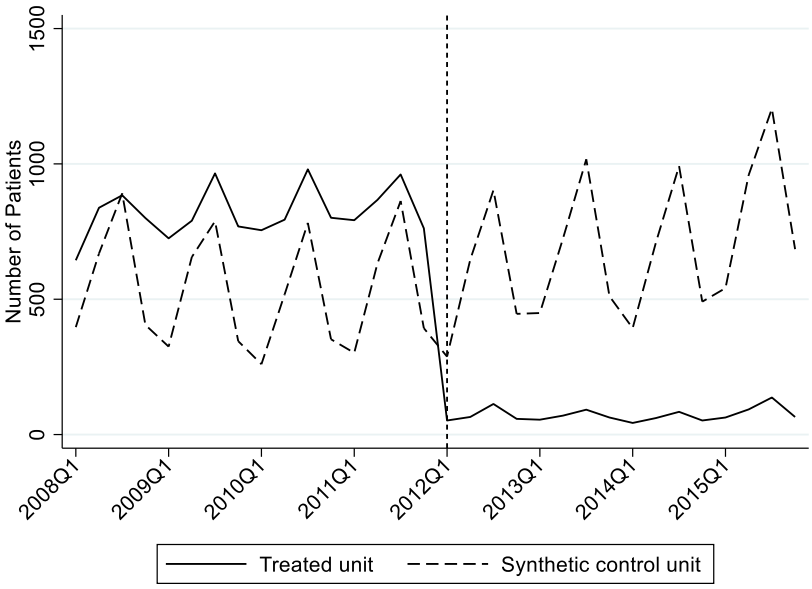
Panel B: Total Cost (in 1,000 euros)



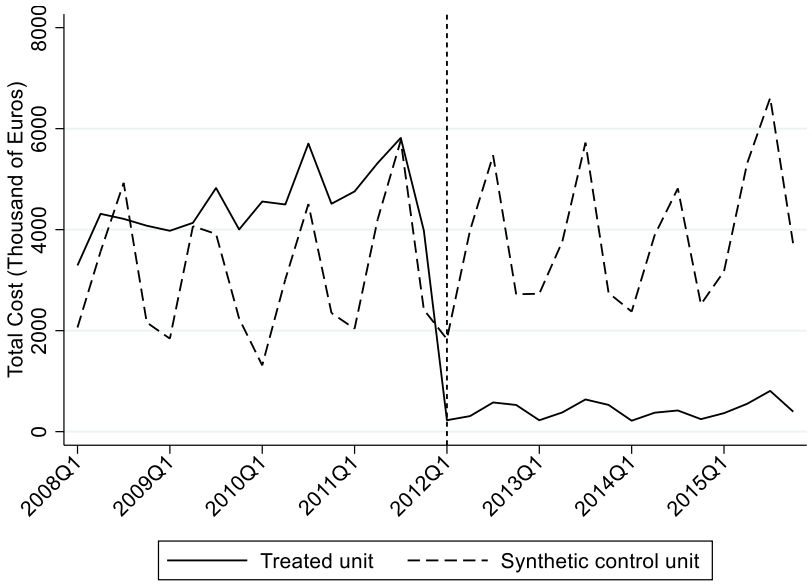
Source: CMBD 2008-2015 and own elaboration.

Figure 5
The Impact of the Reform using a Synthetic Control Methodology

Panel A: Hospitalizations



Panel B: Total Cost (in 1,000 euros)



Source: CMBD 2008-2015 and own elaboration.

APPENDIX

Table A
Some Descriptive Statistics by Treated and Control Regions, Pre vs. Post the Policy Change

Variable	Average	Treated Region			Non-Treated Regions			DD
		Pre	Post	DT	Pre	Post	DC	(DT-DC)
Hosp./ quarter	96.87	820.44	72.88	-446.66***	71.86	75.24	3.38	-750.94***
	(208.11)	(22.95)	(6.25)	(23.14)	(9.49)	(11.94)	(15.25)	(59.49)
Cost/ quarter	545.79	4,499.42	424.96	-4,074.46***	413.97	422.09	8.11	-4,082.57***
	(1,159.97)	(167.22)	(42.24)	(172.47)	(54.78)	(66.04)	(85.80)	(335.71)

Source: CMBD 2008-2015 and authors' own tabulations.

Table B
Number of Travelers with Residence Abroad (in Millions)

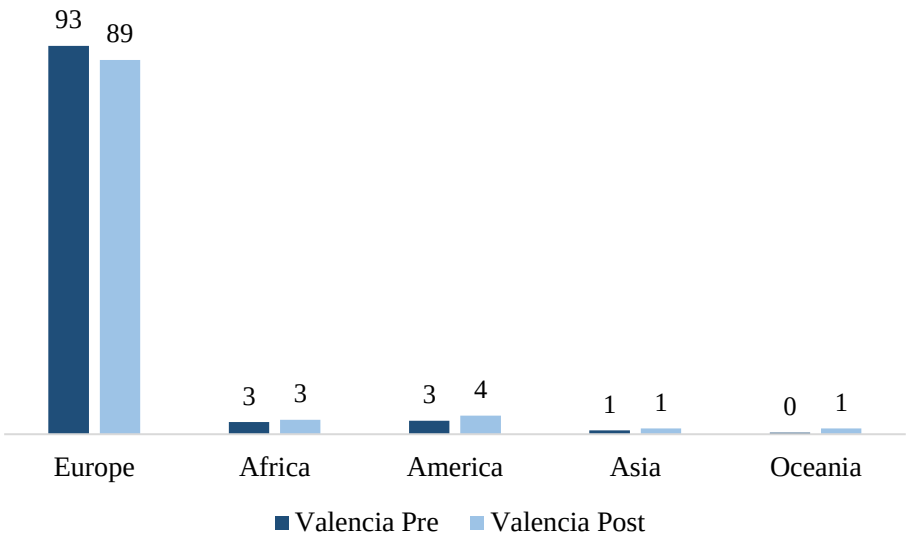
	2007	2008	2009	2010	2011	2012	2013	2014	2015
Cataluña	8.19	8.34	7.81	9.01	9.90	9.94	10.26	10.41	10.75
Baleares	6.57	6.39	5.70	6.15	6.97	7.30	7.44	7.43	7.65
Andalucía	6.10	5.93	5.03	5.30	5.90	6.10	6.33	6.64	7.35
Islas Canarias	4.75	4.94	4.20	4.75	5.69	5.70	6.04	6.64	6.79
Madrid	3.81	3.81	3.65	4.30	4.67	4.30	4.04	4.47	4.95
Valencia	2.45	2.45	2.11	2.20	2.28	2.45	2.69	2.72	2.86
Castilla-León	0.83	0.82	0.74	0.81	0.84	0.83	0.89	0.95	1.04
Galicia	0.73	0.69	0.64	0.73	0.72	0.74	0.83	0.98	1.16
País Vasco	0.68	0.70	0.64	0.74	0.81	0.86	0.92	0.93	1.01
Aragón	0.34	0.38	0.30	0.35	0.37	0.38	0.40	0.44	0.49
Castilla-La Mancha	0.32	0.32	0.29	0.32	0.33	0.31	0.30	0.33	0.34
Murcia	0.21	0.21	0.17	0.18	0.18	0.17	0.19	0.22	0.23
Cantabria	0.18	0.19	0.17	0.19	0.19	0.19	0.20	0.19	0.20
Navarra	0.18	0.17	0.16	0.17	0.18	0.19	0.22	0.24	0.26
Asturias	0.17	0.17	0.15	0.17	0.18	0.18	0.19	0.22	0.25
Extremadura	0.15	0.14	0.15	0.16	0.20	0.17	0.18	0.18	0.21
La Rioja	0.08	0.08	0.08	0.09	0.09	0.09	0.09	0.10	0.11
Ceuta	0.01	0.01	0.02	0.02	0.02	0.02	0.03	0.02	0.03
Melilla	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.02
All Regions	35.78	35.76	32.00	35.66	39.54	39.94	41.25	43.13	45.69

Source: Hotel Occupancy Survey (INE).

Table C: Variable Definition

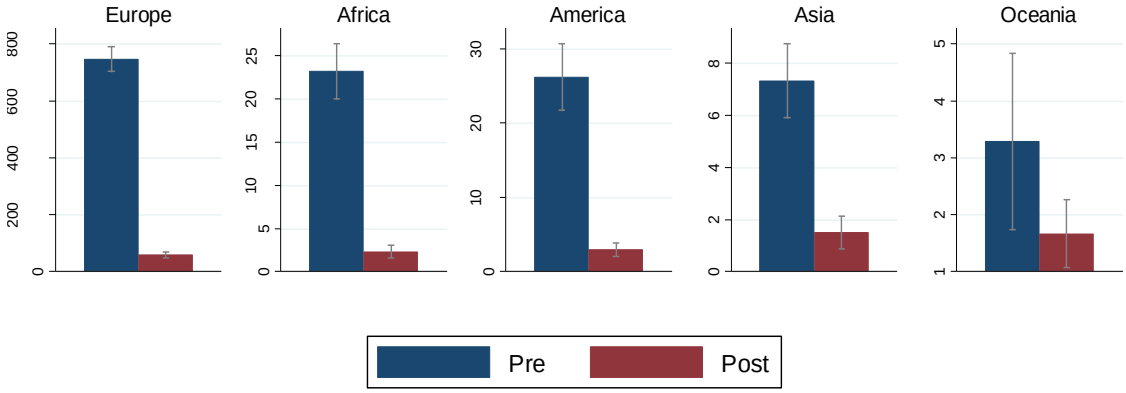
Variable Name	Definition
Hospitalizations	Total number of hospitalizations refers to the total number of new hospitalizations in a particular year and quarter.
GRD-APR	GRD-APR (or diagnosis related groups) is a system that groups patients with similar clinical characteristics like the risk of death and as well as its associated level severity, along with its consumption of resources.
MDC	CDM (or Mayor Diagnostic Category) classifies GRD-APR in 26 categories.
Cost	Cost in euros. This value represents the estimated average cost of the GRD assigned to the hospitalization. It does not imply this is the real cost of the treatment, especially in infrequent cases.
Resources	The GRD system attributes a relative weight to each GRD based on the required resources. It is obtained through an analytical accounting system and equals 1 if it requires the same resources as the average, less than 1 if it requires less resources than the average, and more than 1 if it requires more resources than the average. For instance, if the weight equals 2, it means that the hospitalization requires twice the resources that a hospitalization would require on average.
Mortality	Equals 1 if the patient dies.
Readmissions	Equals 1 if the hospitalization is a readmission (in the same hospital and year within 30 days after the last hospitalization).
Scheduled Hospitalizations	Equals 1 if hospitalization has been scheduled.
Duration	Length of hospital stay in days.
Surgery	Equals 1 if the GRD is a surgical GRD (if it is associated to an intervention).

Figure A
Distribution of Hospitalizations by Continent of Origin in Valencia (in percentages)



Source: CMBD 2008-2015 and authors' own tabulations.

Figure B
Average Number of Hospitalizations per Quarter by Continent of Origen in Valencia



Source: CMBD 2008-2015 and authors' own tabulations.

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