Spatial Inequalities in Potential and Revealed Accessibility to Health Care: Evidence from an Alpine Region in Europe*

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Abstract

Taking Piedmont, an Alpine region characterized by sharp morphological differences, as a case study, we explore two interrelated issues: we first measure the extent of spatial inequalities in the access to health care services in regions characterized by the presence of rural areas; we then investigate the relationship between potential accessibility and patients' behavior, looking both at the frequency of utilization of the services and at patients' mobility. We provide three main findings. First, peripheral, mountain areas are associated with the lowest degree of access to health care, and the distance to the nearest hospital is strictly related to other indicators of socioeconomic deprivation. Second, people living in places marked by poor accessibility tend to use less than other citizens health care services. Third, people living in places marked by poor accessibility are also less mobile than other citizens. We discuss the policy implications of these findings.

JEL codes: H75, I14, I18, R53.

Keywords: hospital services, spatial inequalities, potential and revealed accessibility, patients' mobility.

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1. Introduction

The issue of physical accessibility to health care services in remote areas has been addressed by a stream of research dating back to the original contribution by Joseph and Bantock (1982) on general practitioners in Wellington County, a mostly rural area of Southern Ontario (Canada). The interest towards this topic was recently revived by the increasing availability of Geographical Information System (GIS), allowing better measures of physical distance, and better visualizations and assessments of the spatial inequalities in the access to healthcare. While many papers focus on countries like Canada, the USA, and Australia (e.g., Bamford et al. 1999; Carriere et al., 2000; Hare and Barcus, 2007), very few works consider the occurrence of spatial imbalances in Europe, where rural areas are still very common (e.g., WHO, 2010).

Among the latter, Italy represents an interesting case study for at least three reasons. First, because half of the 8,000 municipalities are classified as "inner areas" and are the subject of specific rural development projects managed by the Italian government, including access to basic public services[1]. Second, because the universal and comprehensive access to health care is formally guaranteed by the Constitution, also through the definition of Essential Levels of Care to be provided in all regions[2]. Third, because the recent economic crisis hardened the budget constraint of the public sector, determining the need to revise the supply of services in order to obtain a greater efficiency, in principle without threatening the equity in the access to health care (De Belvis et al., 2012). But maintaining health care facilities in rural areas could be costly and inefficient, because these are sparsely populated areas; hence, there is the risk of closures of local hospitals, especially in these remote areas.

Despite the relevance of this topic, the analysis of the geographical distribution of health care facilities in the Italian context is limited to the recognition of the North-South divide, and the subsequent patients' migration from Southern regions to Northern ones (e.g., Fabbri and Robone, 2010). Very little is known about the spatial divide in the access

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[1] In particular, the Department of Development and Economic Cohesion of the Ministry of the Economy and Finance. For more details, see http://www.dps.gov.it/it/arint/Cosa_sono/index.html.

[2] Article 32 of the Italian Constitution states that "The Republic safeguards health as a fundamental right of the individual and as a collective interest, and guarantees free medical care to the indigent".

to health care facilities *within* regions, between urban and rural areas in the same context.[3] The aim of this paper is to fill this gap, providing some evidence on accessibility to health care services in Piedmont, an Alpine region bordering France and Switzerland included in the EUSALP, a macro-regional strategy endorsed by the European Council aimed at fostering growth, but also ensuring accessibility and connectivity for all the inhabitants in the Alps[4]. In particular, considering the definitions proposed by Joseph and Phillips (1984), we focus here on two distinct dimensions of accessibility: potential and revealed. The *potential accessibility* of health care services is defined as the minimum distance between the place of residence of the recipient and the nearest health care provider. It is a proxy for the availability of the service, which is interpreted in terms of physical accessibility, relying on the assumption that the rational patient will choose the closest provider so as to minimize her travel costs (Joseph and Bantock, 1982). The *revealed accessibility* of health care services is a measure of the utilization of the health facilities (Khan, 1992). The two dimensions are strictly related but not equivalent: accessibility does not guarantee utilization (e.g., Martin and Williams, 1992) and, in turn, utilization depends on a number of elements other than accessibility, among which, for instance, patients' education and income (e.g., Field and Briggs, 2001). Starting from these two definitions, we first investigate the extent of spatial inequalities in the access to health care services and their relationship with other indicators of socioeconomic deprivation. We then study the effect of proximity on patients' behavior and, in particular, on the choice of the hospital where to be treated, providing a novel definition of mobility.

The paper is organized as follows. In the next section we briefly discuss the organization of the Italian National Health Service (NHS), with a focus on Piedmont. Section 3 is devoted to the analysis of potential accessibility, while Section 4 is focused on revealed accessibility and patients' mobility within the region. Conclusions and policy implications are discussed in the last section.

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[3] Regions are the level of government directly below the central government, and above provinces and municipalities. There are 20 regions in Italy, very different in terms for instance of size, population, and per-capita GDP.

[4] More on EUSALP at http://www.alpine-region.eu/index.html.

2. Institutional background on the Italian NHS and the importance of the regional dimension

The Italian National Health Service (NHS) is a nice example of the difficulties in finding a balance between spending efficiency and equity (e.g., Turati, 2014). It was created in 1978, by consolidating over 100 health insurance funds in financial difficulties, largely the reflection of the corporative nature of the Italian Welfare State. Unsurprisingly, given the differences across workers characterizing the pre-1978 period, one of the goals of the reform was to guarantee more equality with respect to access to services[5]. However, after its foundation, throughout the Eighties, because of the original focus on equity, a remarkable increase in spending has been recorded for all regions, with large annual deficits that were almost regularly bailed out by the central government. At the beginning of the Nineties, a sovereign debt crisis and the need to improve public finances to meet the targets imposed by the Maastricht Treaty, made the need to reform the NHS pressing, this time with the aim of improving efficiency. To reach this goal, changes were introduced both at the macro and at the micro level. As for the former, the idea was to exploit the potential of decentralization, assigning regional governments a clearer responsibility in terms of managing and funding health care services. As for the latter, the government tried to implement the "quasi-market" model taking from the UK experience.

The result of these reforms is a multi-layered organization, involving the central government, the regional governments and the Local Health Authorities (LHA), sub-regional public bodies that act as local insurers for citizens. The Ministry of Health is responsible for the framework legislation and the rules governing the NHS, based on the principle of universal coverage guaranteed by the Constitution. The central level is also in charge of partly funding the NHS, by redistributing the financial resources via a system of intergovernmental grants (negatively related to the availability of a tax base for local taxes), to allow all regions the funds they need to provide the same set of Essential Levels of Care constitutionally guaranteed to citizens. However, the regional governments are the main actors, in charge of both planning and managing the provision of services, and of (partly) funding the provision via a blend of regional taxes.

[5] For instance, art. 2 of the Law 833/78 states – among other issues – that the NHS aims at overtaking spatial imbalances in the social and health conditions of the country.

In each region, citizens are enrolled in a given LHA according to their municipality of residence. However, they are entirely free to choose the provider from which to receive the medical treatment they need, either within their LHA or not, either from a private (licensed) provider or from a public one. Hospital treatments are fully free of charge for the patient: the cost of service provision is paid up by her LHA of residence according to a prospective payment system based on Diagnosis Related Groups (DRG). Hence, a system of infra-regional and inter-regional transfers remunerate providers for patients that decide to obtain a treatment from a hospital outside their LHA of residence.

Despite the strong flavor in terms of equity, which should allow for minor differences in the availability and in the quality of services provided at the local level, a relatively large flow of patients, especially from Southern to Northern regions, has been observed since NHS inception (and it is still observed). In 2009, more than 851,000 patients (about 7.9 per cent of the total discharges) received health care services outside their region of residence. This has been historically interpreted with the persistence of broad differences in the quality of the service provided (e.g., Giannoni and Hitiris, 2002).

However, while interregional mobility received attention in the literature, very little is known about the flows of infra-regional mobility and on the role played by accessibility on patients' behavior. This is important in Italy, since half of the municipalities are located in rural areas, and the urban-rural divide can potentially add up to the North-South divide in shaping spatial inequalities. Here we concentrate on Piedmont, a region located in the North-Western corner of Italy, bordering with the French Alps (to the West) and the Swiss Alps (to the North). It is the second largest region in Italy, with a population of about 4.36 million of residents. The analysis of the spatial imbalances in the accessibility of health care services is particularly interesting in the case of Piedmont for at least three reasons:

a. The territorial morphology is highly differentiated among mountain, hill and plain areas. According to the classification provided by the National Institute of Statistics (ISTAT), more than 40 per cent of the resident population lives in mountain or hill zones (Table 1). Hence, the identification of potentially under-served areas is a relevant issue for regional health care policies.

b. The administrative organization is highly fragmented. While the regional area accounts for nearly 8.4 per cent of the national territory, the number of municipalities (1,206) represents 15 per cent of the more than 8,000 characterizing the entire country. Therefore, the small average size of towns allows for an accurate measurement of residents' accessibility to health care services, avoiding potential biases from the definition of the spatial units (Hewko et al., 2002).

c. Finally, the Regional Health Service (RHS) is one of the best performing from the point of view of the quality of services compared with the rest of the country, and it is characterized by a positive net flow of migration for hospital treatments from other regions. However, the financial performance is not as good, and the regional government is strictly monitored by the central government, that is asking since 2007 to restructure the hospital network in order to cut inefficient spending and deficit.

INSERT TABLE 1 ABOUT HERE

3. Potential accessibility to health care services

3.1. Spatial inequalities in potential accessibility

The aim of this section is to point out the spatial imbalances in the potential accessibility to the nearest hospitals given the current hospital network. Potential accessibility is measured, for each of the 1,206 Piedmont's municipalities, by the shortest distance between each municipality (geographic centroid) and the nearest hospital providing a specific service. The assumption underlying this approach to accessibility is discussed in the literature as the "rational health care consumer" assumption, according to which patients base their decision mostly on travel costs (e.g., Exworthy and Peckham, 2010). In order to avoid biased estimation due to the uneven morphological characteristics of the region, especially when we consider differences between rural and urban areas, distance is expressed in terms of travel time by car.[6] This represents a clear improvement with respect to a straight line distance ("as the crow flies"), which is somewhat common also in this line of research (e.g., Lin et al., 2005).

We focus on the provision of a set of nine basic health care services (Table 2), mainly for two reasons. First of all, as we deal with basic care services (like vein ligation and stripping), accessibility should be guaranteed to all citizens and the occurrence of any spatial inequality should be considered as relevant from a policy perspective. Second,

[6] In particular, distances are obtained using the STATA routine *traveltime3* developed by Bernhard (2013).

because for several basic treatments, empirical evidence on the Italian NHS suggests that patients tend to gravitate around the place of residence (e.g., Fabbri and Robone, 2010).

INSERT TABLE 2 ABOUT HERE

For the sake of brevity, we only report here the analysis related to caesarean deliveries (DRG 371) considering hospitals with a birth center. Nevertheless, all the findings presented below are consistent across all the other treatments listed in Table 2[7]. In the year 2009, 33 municipalities in Piedmont out of 1,206 were endowed with a birth center: 11 of these are located in hill areas, 10 in the Po Valley but outside the metropolitan area, 8 are part of the metropolitan area, and only 4 cities are classified as mountain towns. Figure 1 shows the distribution of towns based on two indicators of potential accessibility: the distance to the nearest hospital and the average distance to the three closest hospitals.

INSERT FIGURE 1 ABOUT HERE

The average minimum distance to the nearest hospital is about 22 minutes and 60 per cent of the municipalities are below this value. The same holds true for the average distance to the three nearest health care facilities with a birth center[8], since in 65 per cent of the cases travel time is lower than the average (33.5 minutes). This means, however, that the spread between the mean and the maximum value is larger than the one observed in the left-hand side of the histogram. Both graphs appear to be skewed to the right, with several cities located at more than 40 minutes from the nearest hospital.

Figure 2 maps the municipalities with a hospital supplying deliveries (white polygons) and those characterized by a potential accessibility indicator higher than 40 minutes (dark grey areas). The 84 municipalities marked by the largest distances to hospitals are peripheral areas, mainly in the western and northern part of the region, where the Alps makes the natural border with France and Switzerland, and the resident population cannot access services alternative to those provided by the regional health care

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[7] Results are available from the authors upon request.
[8] The two measures of accessibility are highly correlated: pairwise correlation is equal to 0.865 and significant at the 0.01 level.

system. Moreover, all these villages are placed in mountain (71 out of 84) or hill (13) areas, characterized by poor road and railway connections towards other Italian regions (Valle d'Aosta to the North and Liguria to the South). The population concerned is certainly relatively low, being slightly above 24,700 units. Nevertheless, the evidence reported in the map points out two important policy issues.

INSERT FIGURE 2 ABOUT HERE

The first one involves the spatial association of accessibility. Municipalities with the lowest potential accessibility define a spatial cluster clearly visible from Figure 2 and confirmed by the Moran's I spatial autocorrelation test reported in Table 3. The latter points out how the geographical association of the two measures of potential accessibility (to the nearest and to the three nearest hospitals) is persistent and statistically significant, also considering alternative specification of the distance matrix. This finding warns, at least above a certain threshold of travel time, about an inefficient organization of the public health care providers, due to the morphological structure of the region, which makes difficult to serve some part of the population. As suggested by Burkey (2012), solutions may involve the expansion of transport services such as shuttles and helicopters to facilitate the access of people living in remote areas.

INSERT FIGURE 3 ABOUT HERE

The second message conveyed by the analysis of potential accessibility refers to the disparities across different morphological areas. Figure 3 shows the potential accessibility to the nearest hospital for the four groups of municipalities identified according to the ISTAT classification in Table 1. The travel time for all the towns in the metropolitan area is less than 20 minutes, while 40 per cent of mountain villages, and especially those in the Alps, are characterized by an indicator of accessibility higher than 30 minutes. Rural areas are therefore, in general, characterized by a disadvantage in the access to health care services.

INSERT TABLE 3 ABOUT HERE

3.2. Inequalities in potential accessibility and other indicators of deprivation

The previous section pointed out the occurrence of spatial inequalities in the access to health care services. We now try to understand whether these spatial imbalances are associated with other disparities in some indicators of socioeconomic welfare. Many studies provide evidence on the association between poor accessibility to public services and other indicators of deprivation. In the case of health care, for instance, the most distant areas from the health care providers are often those marked by the lowest average level of per capita income and educational attainment and by the highest rates of unemployment (e.g., Hare and Barcus, 2007). In order to answer this question, we collect a set of indicators at the municipal level, whose detailed description is available in Appendix A.

Table 4 shows the results of an analysis of variance (ANOVA) across groups of towns. In Panel A, municipalities with a potential accessibility to the nearest hospital above 40 minutes were contrasted to those below this threshold. In Panel B, the same analysis was replicated for the towns with a potential accessibility to the three nearest hospital higher than 50 minutes.

INSERT TABLE 4 ABOUT HERE

The results are very similar across the two panels, highlighting significant differences in the socioeconomic characteristics of the groups of towns marked by different accessibility levels. Not surprisingly, based on the findings from the previous section, less accessible communities are rural villages with low population density. More than 38 per cent of the residents in these areas are over 60 years, an age significantly higher than the average of the rest of the region (31 per cent). The share of population with tertiary education is lower (5.7 per cent) compared with the other municipalities (6.7 per cent). Finally, poor accessibility is associated with an average level of income well below the per capita level of Piedmont's residents. This evidence conveys a relevant message for policy makers, since those groups of citizens having the most difficult access to health care services are also characterized by a level of socioeconomic deprivation higher than the average.

4. Revealed accessibility to health care services

4.1. From service availability to utilization

Once recognized the occurrence of spatial inequalities in the potential accessibility to health care, the issue addressed in this section concerns the relationship between peripheral locations and the utilization of the services: is there any relationship between potential accessibility and patients' behavior? We analyze in particular two distinct issues. The first one is the frequency of utilization of health care services for communities characterized by different degrees of potential accessibility. Previous literature pointed out a "distance decay effect": hospitalization rates tend to decrease as the distance from the hospital increases. Evidence supporting this mechanism comes, for instance, from the analysis of the provision of acute health care services in North Carolina (Arcury et al., 2005) and British Columbia (Lin et al., 2002). Similar evidence is found across different typologies of diagnoses (Mayer, 1983) and socioeconomic groups of patients (Brustrom and Hunter, 2001). Based on these findings, we expect more peripheral areas to be characterized, *ceteris paribus*, by a lower level of utilization of health care services, hence lower hospitalization rates.

The second issue we are interested in is patients' mobility. As discussed above, in the Italian NHS patients are free to choose where to be hospitalized among all the hospital facilities in and out of the administrative LHA of residence. This choice can be assumed to rely on three distinct factors: (*1*) the minimization of the travel costs from the place of residence to the hospital; (*2*) the maximization of the quality of the service received; and, (*3*) a specific preference for the place of hospitalization, which is however unrelated to the quality of services provided by the hospital.[9] According to (*1*), patients should always choose the closest-to-home solution, and also in this case there might be a "distance decay effect": mobility tend to decrease as the distance from the hospital increases.

To properly assess the determinants of patients' mobility, we depart from the literature and define here what might be called a "spatial approach" to mobility. The current definition of mobility in most empirical works is simply based on administrative criteria; i.e., in the Italian case, whether or not the patient is hospitalized within the LHA

[9] For instance, a patient might prefer to be hospitalized where her/his parents lives, or in the municipality where she/he has more social connections, simply to have somebody visiting her/him during the stay.

of residence. However, disregarding the spatial proximity between the patients' place of residence and all the providers of the service, this approach suffers from one main limitation. Consider for instance two neighboring LHAs, A and B, represented in Figure 4. Both LHAs are provided with a hospital, respectively H_A and H_B. Suppose H_A to be close to the South-Western border of its administrative area, while H_B to be close to the North-Western border of LHA B. Consider now a patient living in town C, within the LHA A. If she moves to the hospital located in the LHA B (H_B), according to the mainstream approach she would be classified as a mobile patient and the motivations of this behavior would be searched among the characteristics of the health care services supplied (the quality maximizing behavior discussed above). Nevertheless, if the distance between town C and H_B is lower than the distance to H_A, the choice might be based just on the minimization of travel costs. In other words, the patient might not necessarily prefer the hospital facility of the LHA B because of higher quality, but simply because it is the most accessible one.

INSERT FIGURE 4 ABOUT HERE

Neglecting this issue would lead to biased results, especially when mobility within a small area is analyzed. As far as the Italian case is concerned, in fact, empirical analyses on patients' migrations (Levaggi and Zanola, 2004; Fabbri and Robone, 2010) mainly explained long-distance mobility from Southern to Northern LHAs characterized by a broad recognized divide in the quality of the services provided. Very little is known about patients' mobility within the same RHS and the present paper fill this gap. To avoid the bias described above, in what follows we define mobility by considering physical accessibility instead of administrative borders. Hence, a resident in C is mobile if she decides to consume health care services offered by H_A, *avoiding the closest solution* H_B.

4.2. Revealed accessibility: municipal hospitalization rates

4.2.1. Model specification

We focus first on the relationship between potential accessibility and the frequency of use of health care facilities. For all the 9 DRG identified in Table 2 and for each of the 1,206 municipalities in Piedmont we calculate a weighted municipal-specific hospitalization rate (*WMHR*), where the weights are the number of discharges for the relevant age cohorts. [10] The frequency-adjusted use of health care services is then regressed on a set of controls, including the potential accessibility indicator, defined in section 3.1 as the travel time by car from the municipality of residence of the patient to the nearest hospital providing the specific health care service (*potential accessibility*). In particular, our model takes the following specification:

$$WMHR_m = \beta_0 + \beta_1 potential\ accessibility_m + \beta_2 av.\ pc\ income_m + \\ +\beta_3 pop.density_m + \beta_4 metropolitan\ area_m + \beta_5 distance\ to\ Milano_m + \varepsilon_m \quad [1]$$

where the other controls defined at the municipality level *m* include: (*i*) the average per capita income (*av. pc income*), as a proxy for the socioeconomic characteristics of the patients, which previous literature has shown to influence the consumption of health care services. The impact of income, however, is not clear a priori. On the one hand, low-income populations are those with the lowest rates of overall service utilization (Cromley and Lafferty, 2002). On the other hand, in the case of some specific diseases (such as, for instance, cardio-vascular problems), rates of hospitalization are negatively associated with income, since wealthier patients access preventive care services, and thus avoid acute episodes (Dowler, 2001). (*ii*) Population density (*pop. density*), to control for the clustering of hospital facilities in urban areas, which implies different modes of production and consumption of the health services. In this regard, the literature has pointed out that knowledge spillovers resulting from the concentration and competition of hospitals may yield better health outcomes (Bates and Santerre, 2005). As a further check for the impact of these "agglomeration economies" on the frequency of usage of hospital facilities, we included a dummy variable (*metropolitan area*) equal to one for the 53 municipalities belonging to the Torino Metropolitan Area. (*iii*) Finally, we consider the distance between each town and Milano (*distance to Milano*) in order to account for the fact that discharges of Piedmontese residents from hospitals outside the regional borders are not included in our data. Since interregional mobility outflows are mainly directed towards Lombardy and the

[10] For each of DRG in Table 2 we weighted the number of hospital discharges for the population included in the same age cohorts of patients. In the case of deliveries, for instance, we considered the resident population of women of childbearing age.

eastern part of the country, we may expect (at least for some DRGs) the hospitalization rates measured in our analysis to be underestimated in the case of the municipalities close to Milano, which is an attraction pole for all its hospitals, some highly specialized and of very good quality.[11]

4.2.2. Results

Regression results are reported in Table 5. Two specifications have been estimated for each DRG: in the first specification (model [a]), hospitalization rates are regressed just on *potential accessibility*; all the other controls discussed above are then added in the second specification (model [b]). Spatial autocorrelation tests point out the occurrence of spatial dependency in OLS estimates (Appendix B). Based on this evidence, Spatial Error Models (SEM) are used for the empirical analysis[12]. Empirical findings show that the potential accessibility is associated in five cases out of nine to lower hospitalization rates, while coefficients are not statistically significant in the remaining cases. This evidence supports the "distance decay effect" usually found in the literature, i.e., the lower frequency of utilization of health care services from residents in peripheral areas. It is worth recalling that this result is not influenced by the structural differences in demographic characteristics of the resident population across municipalities, since they are taken into account in the calculation of the *WMHR*.

This evidence is also robust once controlling for the other factors at the municipal level. The inclusion of these variables conveys further interesting insights. As expected, the distance from Milano is always statistically significant and with a positive sign, implying that municipalities closer to the eastern regional border are characterized by lower hospitalization rates also because of the unobserved outflows of patients. The relationship between the frequency of usage, on one side, and population density and per capita income, on the other, varies across different medical treatments, but - when the related coefficients are significant - lower population density or poorer communities are

[11] According to the Italian Ministry of Health, more than the 60 per cent of Piedmontese patients receiving health care services outside their region of residence are directed towards hospital in the neighboring region of Lombardy, whose capital is Milano.

[12] The sole exception is represented by model [b] for DRG 42, where OLS estimates are reported, based on the results of the spatial autocorrelation analysis. The spatial weights matrix employed in the analysis is an inverse distance matrix with distance band equal to the largest minimum one. Results are consistent under other specifications of the spatial weights.

always associated to lower hospitalization rates. These findings have relevant implications for the more peripheral areas, since the municipalities with low potential accessibility are also those less densely populated and those with the lowest per capita income (see Table 4). Results reported for model [b] show that a peripheral location is, *per se*, often associated to lower hospitalization rates, and this effect is reinforced when remoteness is combined with other indicators of socioeconomic deprivation.

INSERT TABLE 5 ABOUT HERE

4.3. Revealed accessibility: individual patients' mobility

4.3.1. Model specification

We finally focus on the relationship between potential accessibility to health care services and the mobility of patients towards alternative hospital facilities with respect to the closest-to-home solution. Compared with the analysis of the previous section, here we consider individual level variables. The question we want to address is the following: once controlling for the factors influencing patients' preferences for a hospital different from the nearest one, is there a role for potential accessibility in explaining intra-regional mobility? Our hypothesis is that there might be a "distance decay effect" at work also for mobility: *ceteris paribus*, whenever patients want to compare the quality of different hospitals, residents in peripheral areas have to face higher costs of information collection for at least two reasons. First, because an increase in the physical distance between the place of residence and the nearest hospital raises the travel costs for a *direct* access to this information.[13] Second, because peripheral areas are also those characterized by the lowest levels of population density (Table 4); as a consequence, residents are less likely to have also an *indirect* access to relevant information via other patients' experiences. These higher costs to collect information will make less likely, for patients living in remote areas, to select a hospital facility more distant than the closest one.

[13] A direct access to the information about the quality of alternative health care providers could also be represented by reports and data published on the Internet. Nevertheless, in 2008 only 53.7 of households in Piedmont were using Internet, and the diffusion of this technology was considerably higher in urban areas. Moreover, in the same year, only the 11.9 per cent of the population chose Internet to contact a doctor (OICT, 2010).

To test this hypothesis, an indicator of individual mobility is regressed on a set of explicative variables, among which the travel time by car to the nearest hospital (our indicator of *potential accessibility* defined in section 3.2 and log transformed) is included. The model takes the following general form:

$$Mobility_i = \theta log(potential\ accessibility_m) + \alpha X_i + \beta Q_h + \gamma S_m + u_h + \tau_t + \varepsilon_i \quad [2]$$

where *i* stands for the patient, *h* for the hospital, *m* for the municipality of residence, and *t* for the year. The dependent variable *Mobility* is defined as the ratio between the extra-distance (in terms of travel time) covered by the patient with respect to the nearest facility and the minimum distance he could have traveled if he had chosen the closest hospital (*Mobility = Δ distance with respect to minimum/minimum distance*). Descriptive statistics in Appendix C show that the maximum extra-time covered by patients in our sample is 34.69 times the distance to the closest solution. Since this indicator catches a relative dimension of mobility, to control the robustness of our results we also tested three alternative definition of *Mobility*, where the previous relative indicator is replaced by binary variables equal to 1 if the difference between the distance traveled by the patient and the closest facility is respectively higher than 15, 30 and 45 minutes, and equal to 0 otherwise (*Mobility = 1 if Δ distance with respect to minimum* > *15/30/45 minutes*). When *Mobility* takes the form of a binary variable, Linear Probability Models (LPM) replace multiple linear regression.[14]

Controls are classified into three main categories (see Appendix D). The first group includes *individual characteristics* (X_i) such as gender, age and education of the patient. These factors are expected to play a role in the decision of where to receive the medical treatment. The family network, for instance, is likely to be linked to the propensity of moving away from the nearest hospital. Italian citizens are expected, compared with foreigners, to have better information about the quality of the service provided. Higher education may have contrasting effects on patients' mobility. On the one hand, high-educated patients could be more able than low-educated ones to assess the quality of the hospitals, which would lead to higher mobility rates. On the other hand, they might also be more likely to be personally connected with people employed in the health care sector,

[14] The same findings are obtained under alternative specifications of the model, such as binomial probit or logit. Results are available from the authors upon request.

therefore having an easier access (such as shorter waiting times) to the closest hospital facility, which would imply lower mobility rates. Other two variables considered at the individual level are helpful in describing the hospitalization episode: both the occurrence of multiple diagnoses and the length of stay (LOS) are directly linked to the complexity of each single medical case. It may be assumed the most problematic patients to be also those considering more carefully alternative providers of the health care service.

The second group of explicative variables is a set of controls defined at the *hospital level* (Q_h). The inclusion of these factors aims at capturing both the characteristics of the hospital (i.e., its size and specialization) and the quality of the services provided. As for the supply features of hospital facilities, our controls include the yearly number of discharges (which reflects the overall size of the provider), the yearly number of discharges for the DRG under consideration (a proxy for the hospital specialization), and a dummy equal to 1 if the hospital is privately-owned and equal to 0 otherwise. The quality of health care services is proxied by three indicators, all defined with reference to the specific DRG analyzed: the LOS, the occurrence of Day Hospital (DH) discharges over the total treatments, and the relative number of cases of repeated hospitalization within the same year.

The third group of controls includes some *socioeconomic and spatial characteristics* at the *municipal level* (S_m), considering both the place of residence and the destination facility of patients. As in the previous section, population density and average per capita income are added based on the assumption that they may have an influence on individuals' behavior. Again, the distance to Milano is included to account for unobserved interregional mobility flows. Finally, a dummy variable equal to 1 if the hospital providing the medical treatment is located in Torino accounts for urbanization economies typical of large urban areas. Given city size and the multifunctional activities located in Torino, the assumption here is that patients may prefer to be hospitalized in the capital of the region simply because it provides additional services not available elsewhere (e.g., the patient may work in this city or have social connections here).

Finally, to account for unobserved characteristics of health care providers and for time fixed effects, we included in all specifications two sets of dummies respectively at the hospital (u_h) and year level (τ_t). Standard errors are cluster-robust at the municipal level, based on the place of residence of the respondent.

4.3.2. Data on hospital discharges

The empirical analysis is based on data from the Piedmont's Hospital Discharge Register (HDR) for the period 2006-2010. The register includes all the discharges of Piedmontese residents from Piedmontese hospitals, both public and private licensed. Besides information on some individual characteristics of the patients (age, gender, level of education, family and occupational status, nationality) and on the hospitalization episode (type of treatment and relative DRG code, length of stay, number of diagnoses), the HDR include information on the municipality of residence of each patient, thus allowing to calculate the physical distance between this residence and the hospitals offering the specific treatment.

Regression analysis is carried out on all the patients residing in Piedmont, excluding those living in the city of Torino, for whom measures of intra-municipal mobility are not available. Indeed, the capital city of the region hosts a high number of hospital facilities, but in our analysis the distance is calculated from the centroid of the municipality of residence of the patients to the centroid of the municipality where the treatment is delivered. As a consequence, all those residents in Torino who receive the health care service within the city are characterized by an indicator of mobility equal to 0, even if the hospital they chose is not the nearest one to their place.

4.3.3. Results

For each of the nine DRG analyzed we estimated three models. The first one (model [a]) includes the measure of *potential accessibility* and the individual characteristics of the patients (X_i). The second specification (model [b]) controls also for factors defined at the hospital-level (Q_h) and for potential (unobserved) outflows of patients towards Milano. Finally, model [c] extends the previous ones to account for socioeconomic and spatial features of the municipalities (S_m). For the sake of brevity, Table 6 reports only the coefficients for the three geographical variables included in the model (namely our measure of potential accessibility, the distance to Milano and the dummy for the hospitals located in Torino) for all the four alternative definitions of *Mobility*. Results are strongly consistent across nobility definitions and model specifications.

INSERT TABLE 6 ABOUT HERE

First, potential accessibility has always a strong and negative effect on our mobility measures: for all the DRGs we consider, people living in less accessible municipalities are less likely to move away from the nearest hospital, consistently with the presence of a "distance decay effect". Take for instance the estimates for DRG 6 and $y = 1$ *if* Δ *distance with respect to minimum* > *15 minutes*: considering estimates in model [c], a 100 percent increase in potential accessibility (for instance, from 10 to 20 minutes of travel time needed to reach the closest hospital) implies a reduction of about 0.24 in the probability of choosing a hospital more distant (of at least 15 minutes) than the closest one. The dummy for the hospitals located in Torino has most of the times a significant and positive coefficient, reflecting the differentiated supply of health care providers available in the capital and the role of "urbanization economies". Finally, the travel time distance to Milano is positively correlated with the probability of selecting a hospital away from the nearest one, most likely because we are unable to directly control for the behavior of those patients that are closer to Milano and often choose a hospital outside the Piedmont's RHS.

As for the other controls, we provide in Appendix E the tables with the whole set of estimates for our continuous definition of *Mobility*.[15] The relationship between individual characteristics (X_i) and mobility varies across the different typologies of treatments. The only factor whose impact is consistent across the nine DRGs analyzed is the nationality of the patient: as expected, foreigners are less likely than Italians to move away from the nearest hospital. Lower levels of cultural proximity appears therefore as an obstacle for the comparison of alternative health care providers. As for the role of family network, married people are those who, in general, are less likely to travel more than the minimum distance. The same applies – even if coefficients are not always significant and stable across DRGs – for the high-educated patients, suggesting an easier access to the health care provider close to their place of residence. Finally, the individual LOS and the number of diagnoses – i.e.,

[15] Findings described here are however consistent when using alternative definitions. Complete tables are available upon request from the authors.

our proxies for the complexity of the treatment – do not exhibit stable correlations with the mobility indicator.

Mixed results also characterize the set of variables defined at the hospital level (Q_h). Based on previous literature on patients' choices this evidence is not surprising. For instance, Moscone et al. (2012) pointed out how patients' hospital choice is mainly driven by social interactions that may lead, due to information asymmetries, to the selection of sub-optimal hospitals in terms of the quality of the service provided. This assumption is consistent with the results reported in Appendix E, marked by the poor statistical significance of the objective indicators for the characteristics and the quality of health care providers. The most stable result is the one involving privately-owned hospitals, generally associated to lower mobility. This can be explained by the specific structure of these facilities, usually of smaller size and serving mainly local consumers.

As for socioeconomic and spatial features of municipalities (S_m), both population density and average per capita income are associated with lower departures from the minimum travel time to the nearest hospital. These two variables capture the benefit of living in urban and peri-urban municipalities in the Po Valley, characterized by the highest levels of wealth and population density and, also, by a marked spatial proximity to different hospitals.

5. Concluding remarks

Focusing on the case of Piedmont in Italy, this study aims first at measuring the extent of spatial inequalities in the access to health care services and, then, at investigating the relationship between potential accessibility and patients' behavior, looking both at the frequency of utilization of the services and at patients' mobility. Our analysis offers three main findings. First, the extent of potential accessibility is far from being uniform within the region. Peripheral, mountain areas are those associated with the lowest degree of access to health care. Moreover, the distance to the nearest hospital is also strictly related to other indicators of socioeconomic deprivation, such as average income, educational attainments and age dependency ratios. This picture is likely to worsen in the future, assuming the potential occurrence of a vicious cycle: the lack of accessibility to basic services may induce further depopulation of these rural alpine areas, with the migration of young generations towards urban areas, which – in turn – will make more difficult to justify from the point of view of efficiency the decision of making services more accessible to those who remain.

Second, people living in places marked by poor accessibility tend to use less than other citizens health care services. This effect is reinforced when peripheral location is associated with low levels of average income and population density. The cost of commuting from the place of residence to the hospital reduce the probability to receive the medical treatment, which implies – assuming homogeneous health care needs within the region – that part of the demand is not met by the supply. Put it differently, the right to health is not guaranteed in the same way to all citizens, which makes pressing the question of whether this have an effect on health inequalities.

Third, people living in places marked by poor accessibility are also less mobile than other citizens. Added to previous results, this means that residents in less accessible areas tend to use less than the others the health care facilities and, when they do, they are less likely to choose a hospital different from the nearest one. As before, this mechanism is reinforced when low accessibility comes together with socioeconomic deprivation.

The policy implications of our spatial analysis in the provision of health care services are extremely important, especially in a context like the Italian one, where the right to health for all citizens is supposed to be Constitutionally guaranteed and remote areas constitute a consistent part of the country. Our results call for finding innovative ways to provide the services, making possible to reach two potentially contrasting goals: efficiency and equity in health care supply. The current policy debate rarely involves these issues, but according to our findings they should be included in the political agenda for the next years.

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Table 1. Number of municipalities and resident population in Piedmont by morphological area

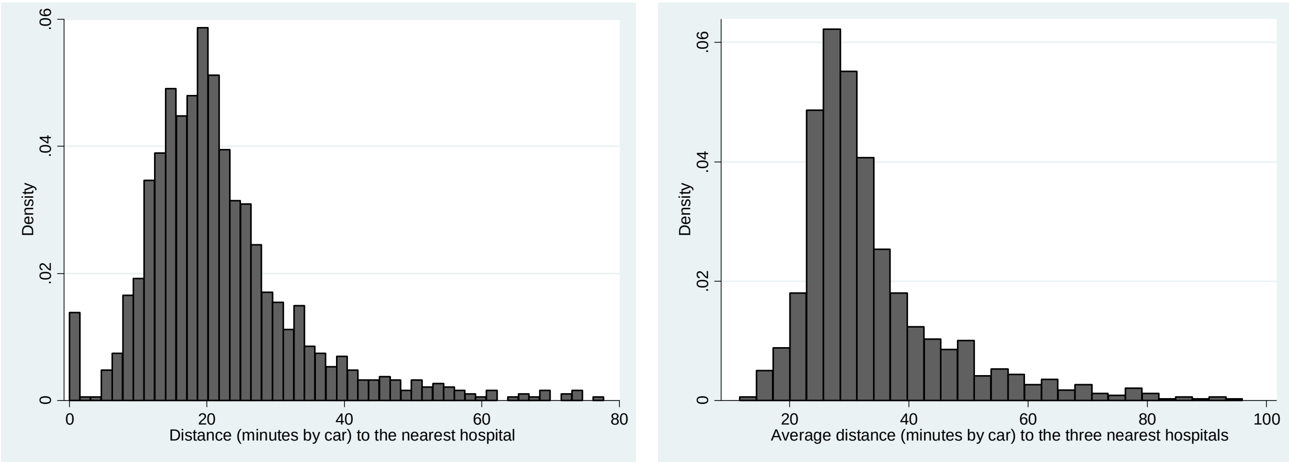
	Mountain	**Hill**	**Plain (no metropolitan area)**	**Metropolitan area**	**TOTAL**
Number of municipalities	347	581	225	53	1,206
%	*28.77*	*48.18*	*18.66*	*4.39*	*100.00*
Resident population	495,899	1,349,684	814,332	1,704,001	4,363,916
%	*11.36*	*30.93*	*18.66*	*39.05*	*100.00*

Source: ISTAT.

Table 2. Selection of DRG for the empirical analysis

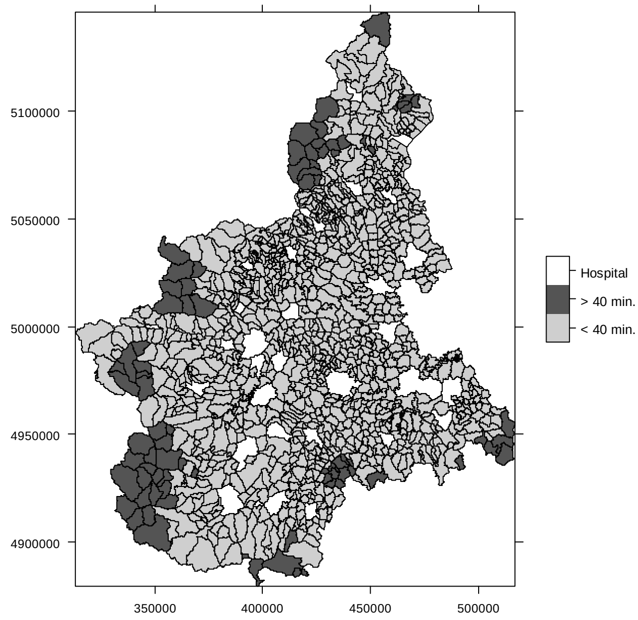
DRG number	Description
DRG 6	Carpal tunnel release
DRG 42	Intraocular procedures except retina, iris and lens
DRG 119	Vein ligation & stripping
DRG 225	Foot proc
DRG 229	Hand and wrist proc, except major joint proc w/o CC
DRG 359	Uterine and adnexal procedures for non-malignancy without CC
DRG 371	Cesarean section w/o cc
DRG 381	Abortion with D and C, aspiration curettage or hysterotomy
DRG 410	Chemotherapy without acute leukemia as secondary diagnosis

Figure 1. Potential accessibility of Piedmont's municipalities to hospitals with a birthing center



Source: authors' own elaborations.

Figure 2. Map of the municipalities whose travel time distance from the nearest hospital is more than 40 minutes



Source: authors' own elaborations.

Table 3. Measures of global spatial autocorrelation (Moran's I)

Variable	Distance band: 25 km		Distance band: 50 km	
	Inverse distance matrix	Binary matrix	Inverse distance matrix	Binary matrix
Min. distance to the nearest hospital	0.243***	0.320***	0.141***	0.044***
Average distance to the 3 nearest hospitals	0.144***	0.261***	0.213***	0.123***

Figure 3. Distance to the nearest hospital for different groups of municipalities

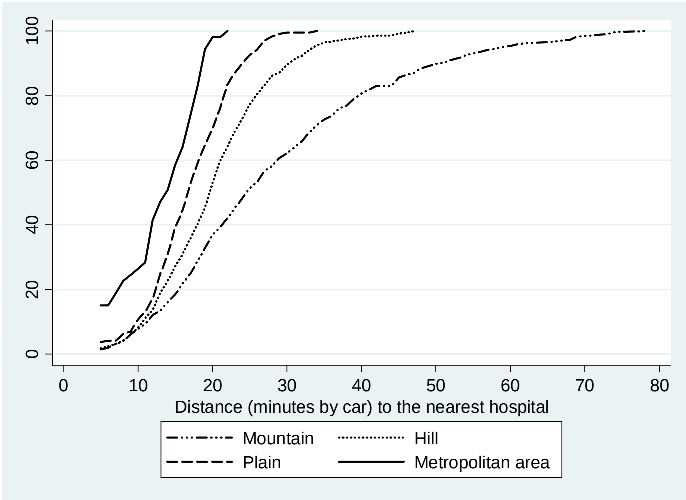


Table 4. Potential accessibility and some socioeconomic indicators: ANOVA results

	Variable	Mean		F-value
Panel A		0 (n=1,122)	1 (n=84)	
Distance to the nearest hospital > 40 min.	Population density	168.128	11.071	20.44 ***
	Share of pop. over 60	0.309	0.384	109.39 ***
	Share of graduated residents	0.067	0.057	13.45 ***
	Average income	18,675.14	14,878.21	140.70 ***
Panel B		0 (n=1,089)	1 (n=117)	
Distance to the 3 nearest hospital > 50 min.	Population density	172.818	11.711	29.29 ***
	Share of pop. over 60	0.306	0.361	111.14***
	Share of graduated residents	0.068	0.059	13.47 ***
	Average income	18,751.46	15,238.76	165.84 ***

Source: authors' own elaborations.

Figure 4. Definition of mobility: LHA A and LHA B

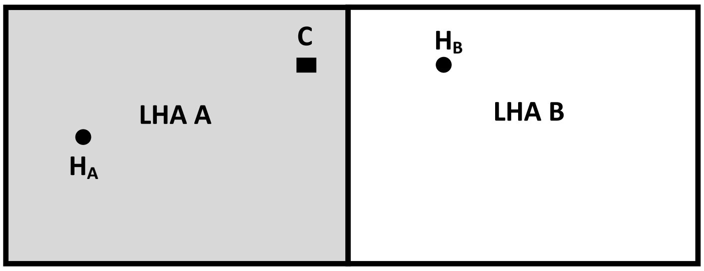


Table 5. Estimates of equation [1]: hospitalization rates in Piedmont's municipalities as a function of potential accessibility and other controls

	DRG 6		DRG 42		DRG 119	
VARIABLE	**model [a]**	**model [b]**	**model [a]**	**model [b]**	**model [a]**	**model [b]**
potential accessibility	-0.006***	-0.010***	-0.007***	-0.009***	0.002	-0.002
	-0.002	-0.002	-0.002	-0.003	-0.003	-0.003
av. pc income		0.016***		0.016		0.021***
		-0.006		-0.01		-0.005
pop. density		-0.018		0.03		0.066
		-0.031		-0.038		-0.043
metropolitan area		-0.071		-0.088		0.06
		-0.052		-0.064		-0.046
distance to Milano		0.007***		0.004***		0.005***
		-0.001		-0.001		-0.001
constant	1.045***	0.086	1.019***	0.403*	0.793***	0.02
	-0.081	-0.066	-0.11	-0.237	-0.085	-0.03
observations	1,206	1,206	1,206	1,206	1,206	1,206

	DRG 225		DRG 229		DRG 359	
VARIABLE	**model [a]**	**model [b]**	**model [a]**	**model [b]**	**model [a]**	**model [b]**
potential accessibility	-0.002	-0.002	0.003	-0.001	-0.001	-0.008*
	-0.001	-0.001	-0.002	-0.002	-0.005	-0.005
av. pc income		0.004		0.011***		0.044***
		-0.004		-0.004		-0.01
pop. density		0.042**		0.027		0.066
		-0.021		-0.027		-0.077
metropolitan area		0.107***		-0.031		0.018
		-0.026		-0.031		-0.123
distance to Milano		0.001*		0.003***		0.008***
		-0.001		-0.001		-0.002
constant	0.319***	0.144	0.338***	0.029	1.223***	0.065
	-0.032	-0.1	-0.052	-0.018	-0.144	-0.057
observations	1,206	1,206	1,206	1,206	1,206	1,206

	DRG 371		DRG 381		DRG 410	
VARIABLE	**model [a]**	**model [b]**	**model [a]**	**model [b]**	**model [a]**	**model [b]**
potential accessibility	-0.010***	-0.011***	-0.029***	-0.035***	-0.006	-0.004
	-0.002	-0.002	-0.011	-0.013	-0.004	-0.004
av. pc income		0.056		0.02		0.060***
		-0.044		-0.035		-0.009
pop. density		-0.055		0.344***		-0.073
		-0.157		-0.133		-0.081
metropolitan area		0.509**		-0.016		-0.293***
		-0.257		-0.228		-0.096
distance to Milano		0.010**		0.011***		0.004**
		-0.004		-0.004		-0.002
constant	5.814***	3.743***	5.265***	3.721***	1.394***	0.068
	-0.313	-1.038	-0.327	-0.905	-0.146	-0.054
observations	1,206	1,206	1,206	1,206	1,206	1,206

Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table 6. Estimates of equation [2]: propensity to move away from the nearest hospital under different definitions of the dependent variable (y)

	y = Δdist./min. dist.			*y = 1 if Δdist. > 15 minutes*			*y = 1 if Δdist. > 30 minutes*			*y = 1 if Δdist. > 45 minutes*		
DRG 6	**model**	**model [b]**	**model**	**model [a]**	**model [b]**	**model [c]**	**model [a]**	**model [b]**	**model [c]**	**model [a]**	**model [b]**	**model [c]**
pot. accessibility (log)	-0.974***	-1.104***	-1.410***	-0.112***	-0.150***	-0.241***	-0.071***	-0.096***	-0.132***	-0.021***	-0.032***	-0.041***
	(0.137)	(0.139)	(0.128)	(0.027)	(0.026)	(0.028)	(0.023)	(0.024)	(0.024)	(0.008)	(0.009)	(0.009)
distance to Milano		0.027***	0.023***		0.008***	0.006***		0.005***	0.005***		0.002***	0.002***
		(0.007)	(0.007)		(0.001)	(0.001)		(0.001)	(0.001)		(0.001)	(0.001)
hospital in Torino			2.244*			0.351*			0.115			0.045
			(1.177)			(0.210)			(0.081)			(0.042)
individual controls	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
hospital controls	no	yes	yes	no	yes	yes	no	yes	yes	no	yes	yes
socioeconomic controls	no	no	yes	no	no	yes	no	no	yes	no	no	yes
observations	25,057	25,048	25,048	25,057	25,048	25,048	25,057	25,048	25,048	25,057	25,048	25,048
R-squared	0.194	0.217	0.227	0.210	0.245	0.277	0.116	0.146	0.160	0.067	0.087	0.092
DRG 42	**model**	**model [b]**	**model**	**model [a]**	**model [b]**	**model [c]**	**model [a]**	**model [b]**	**model [c]**	**model [a]**	**model [b]**	**model [c]**
pot. accessibility (log)	-1.979***	-1.999***	-2.483***	-0.139***	-0.159***	-0.288***	-0.142***	-0.153***	-0.244***	-0.089***	-0.085***	-0.112***
	(0.322)	(0.318)	(0.310)	(0.050)	(0.053)	(0.047)	(0.040)	(0.042)	(0.039)	(0.024)	(0.022)	(0.026)
distance to Milano		0.034***	0.031***		0.004***	0.001		0.002**	0.000		-0.001	-0.002*
		(0.008)	(0.009)		(0.001)	(0.001)		(0.001)	(0.001)		(0.001)	(0.001)
hospital in Torino			2.824**			0.376*			0.306**			0.141*
			(1.372)			(0.193)			(0.127)			(0.084)
individual controls	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
hospital controls	no	yes	yes	no	yes	yes	no	yes	yes	no	yes	yes
socioeconomic controls	no	no	yes	no	no	yes	no	no	yes	no	no	yes
observations	18,782	18,782	18,782	18,782	18,782	18,782	18,782	18,782	18,782	18,782	18,782	18,782
R-squared	0.223	0.230	0.259	0.124	0.150	0.262	0.125	0.137	0.208	0.095	0.104	0.116
DRG 119	**model**	**model [b]**	**model**	**model [a]**	**model [b]**	**model [c]**	**model [a]**	**model [b]**	**model [c]**	**model [a]**	**model [b]**	**model [c]**
pot. accessibility (log)	-1.300***	-1.494***	-1.890***	-0.083***	-0.128***	-0.222***	-0.091***	-0.136***	-0.199***	-0.037**	-0.054***	-0.068***
	(0.162)	(0.165)	(0.155)	(0.026)	(0.025)	(0.025)	(0.030)	(0.030)	(0.030)	(0.015)	(0.016)	(0.017)
distance to Milano		0.038***	0.032***		0.009***	0.007***		0.009***	0.008***		0.003***	0.003***
		(0.007)	(0.008)		(0.001)	(0.001)		(0.001)	(0.001)		(0.001)	(0.001)
hospital in Torino			0.446			-0.018			-0.190*			-0.089*
			(1.157)			(0.207)			(0.102)			(0.050)
individual controls	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
hospital controls	no	yes	yes	no	yes	yes	no	yes	yes	no	yes	yes
socioeconomic controls	no	no	yes	no	no	yes	no	no	yes	no	no	yes
observations	32,512	32,512	32,512	32,512	32,512	32,512	32,512	32,512	32,512	32,512	32,512	32,512
R-squared	0.250	0.294	0.308	0.306	0.356	0.386	0.144	0.230	0.253	0.102	0.138	0.141

Table 6. Estimates of equation [2]: propensity to move away from the nearest hospital under different definitions of the dependent variable (y) – continued 1

	y = Δdist./min. dist.			*y = 1 if Δdist. > 15 minutes*			*y = 1 if Δdist. > 30 minutes*			*y = 1 if Δdist. > 45 minutes*		
DRG 225	**model [a]**	**model [b]**	**model [c]**	**model [a]**	**model [b]**	**model [c]**	**model [a]**	**model [b]**	**model [c]**	**model [a]**	**model [b]**	**model [c]**
pot. accessibility (log)	-1.827***	-1.944***	-2.373***	-0.115***	-0.143***	-0.238***	-0.100***	-0.123***	-0.169***	-0.063***	-0.070***	-0.090***
	(0.219)	(0.210)	(0.206)	(0.034)	(0.031)	(0.032)	(0.034)	(0.032)	(0.036)	(0.019)	(0.019)	(0.021)
distance to Milano		0.018**	0.015		0.005***	0.005***		0.004***	0.004***		0.001	0.001
		(0.009)	(0.010)		(0.001)	(0.001)		(0.001)	(0.001)		(0.001)	(0.001)
hospital in Torino			2.627**			0.395*			0.161			0.048
			(1.251)			(0.207)			(0.158)			(0.067)
individual controls	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
hospital controls	no	yes	yes	no	yes	yes	no	yes	yes	no	yes	yes
socioeconomic controls	no	no	yes	no	no	yes	no	no	yes	no	no	yes
observations	15,830	15,830	15,830	15,830	15,830	15,830	15,830	15,830	15,830	15,830	15,830	15,830
R-squared	0.250	0.288	0.301	0.215	0.262	0.296	0.172	0.220	0.232	0.150	0.172	0.179
DRG 229	**model [a]**	**model [b]**	**model [c]**	**model [a]**	**model [b]**	**model [c]**	**model [a]**	**model [b]**	**model [c]**	**model [a]**	**model [b]**	**model [c]**
pot. accessibility (log)	-0.911***	-1.116***	-1.407***	-0.086***	-0.131***	-0.212***	-0.063***	-0.097***	-0.123***	-0.022**	-0.039***	-0.036***
	(0.163)	(0.160)	(0.154)	(0.031)	(0.029)	(0.031)	(0.021)	(0.021)	(0.023)	(0.009)	(0.011)	(0.009)
distance to Milano		0.034***	0.031***		0.008***	0.007***		0.006***	0.005***		0.003***	0.003***
		(0.008)	(0.009)		(0.001)	(0.001)		(0.001)	(0.001)		(0.001)	(0.001)
hospital in Torino			1.936*			0.331*			0.029			-0.053
			(1.169)			(0.200)			(0.095)			(0.053)
individual controls	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
hospital controls	no	yes	yes	no	yes	yes	no	yes	yes	no	yes	yes
socioeconomic controls	no	no	yes	no	no	yes	no	no	yes	no	no	yes
observations	24,356	24,356	24,356	24,356	24,356	24,356	24,356	24,356	24,356	24,356	24,356	24,356
R-squared	0.202	0.241	0.248	0.212	0.259	0.281	0.134	0.184	0.191	0.078	0.111	0.113
DRG 359	**model [a]**	**model [b]**	**model [c]**	**model [a]**	**model [b]**	**model [c]**	**model [a]**	**model [b]**	**model [c]**	**model [a]**	**model [b]**	**model [c]**
pot. accessibility (log)	-1.329***	-1.399***	-1.783***	-0.099***	-0.121***	-0.210***	-0.097***	-0.111***	-0.166***	-0.049***	-0.051***	-0.076***
	(0.147)	(0.152)	(0.143)	(0.028)	(0.029)	(0.027)	(0.022)	(0.023)	(0.022)	(0.014)	(0.013)	(0.015)
distance to Milano		0.009	0.006		0.004***	0.004***		0.002**	0.002*		-0.000	-0.001
		(0.008)	(0.008)		(0.001)	(0.001)		(0.001)	(0.001)		(0.001)	(0.001)
hospital in Torino			0.814***			0.216***			0.087			0.048
			(0.235)			(0.079)			(0.061)			(0.032)
individual controls	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
hospital controls	no	yes	yes	no	yes	yes	no	yes	yes	no	yes	yes
socioeconomic controls	no	no	yes	no	no	yes	no	no	yes	no	no	yes
observations	36,377	36,377	36,377	36,377	36,377	36,377	36,377	36,377	36,377	36,377	36,377	36,377
R-squared	0.264	0.299	0.311	0.276	0.306	0.357	0.154	0.201	0.220	0.103	0.151	0.160

Table 6. Estimates of equation [2]: propensity to move away from the nearest hospital under different definitions of the dependent variable (y) – continued 2

	y = Δdist./min. dist.			*y = 1 if Δdist. > 15 minutes*			*y = 1 if Δdist. > 30 minutes*			*y = 1 if Δdist. > 45 minutes*		
DRG 371	**model [a]**	**model [b]**	**model [c]**	**model [a]**	**model [b]**	**model [c]**	**model [a]**	**model [b]**	**model [c]**	**model [a]**	**model [b]**	**model [c]**
pot. accessibility (log)	-0.503***	-0.532***	-0.843***	-0.062***	-0.080***	-0.147***	-0.076***	-0.085***	-0.131***	-0.032***	-0.030***	-0.053***
	(0.123)	(0.124)	(0.139)	(0.022)	(0.022)	(0.021)	(0.019)	(0.020)	(0.020)	(0.009)	(0.009)	(0.011)
distance to Milano		0.008	0.001		0.005***	0.003***		0.003***	0.002*		-0.001	-0.001*
		(0.007)	(0.007)		(0.001)	(0.001)		(0.001)	(0.001)		(0.001)	(0.001)
hospital in Torino			2.134**			0.335***			0.214***			0.127***
			(0.839)			(0.122)			(0.073)			(0.041)
individual controls	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
hospital controls	no	yes	yes	no	yes	yes	no	yes	yes	no	yes	yes
socioeconomic controls	no	no	yes	no	no	yes	no	no	yes	no	no	yes
observations	31,741	31,741	31,741	31,741	31,741	31,741	31,741	31,741	31,741	31,741	31,741	31,741
R-squared	0.208	0.213	0.238	0.215	0.237	0.292	0.139	0.150	0.181	0.098	0.100	0.124
DRG 381	**model [a]**	**model [b]**	**model [c]**	**model [a]**	**model [b]**	**model [c]**	**model [a]**	**model [b]**	**model [c]**	**model [a]**	**model [b]**	**model [c]**
pot. accessibility (log)	-0.784***	-0.856***	-1.212***	-0.134***	-0.160***	-0.245***	-0.085***	-0.102***	-0.158***	-0.030***	-0.032***	-0.053***
	(0.119)	(0.122)	(0.121)	(0.023)	(0.022)	(0.025)	(0.020)	(0.021)	(0.020)	(0.009)	(0.009)	(0.012)
distance to Milano		0.020***	0.014*		0.007***	0.006***		0.005***	0.004***		0.000	0.000
		(0.008)	(0.008)		(0.001)	(0.001)		(0.001)	(0.001)		(0.001)	(0.001)
hospital in Torino			2.939***			0.462***			0.157*			0.121***
			(0.944)			(0.149)			(0.086)			(0.041)
individual controls	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
hospital controls	no	yes	yes	no	yes	yes	no	yes	yes	no	yes	yes
socioeconomic controls	no	no	yes	no	no	yes	no	no	yes	no	no	yes
observations	40,692	40,692	40,692	40,692	40,692	40,692	40,692	40,692	40,692	40,692	40,692	40,692
R-squared	0.210	0.223	0.243	0.239	0.272	0.307	0.106	0.135	0.170	0.050	0.053	0.069
DRG 410	**model [a]**	**model [b]**	**model [c]**	**model [a]**	**model [b]**	**model [c]**	**model [a]**	**model [b]**	**model [c]**	**model [a]**	**model [b]**	**model [c]**
pot. accessibility (log)	-0.862***	-1.014***	-1.614***	-0.047	-0.089**	-0.218***	-0.053**	-0.081***	-0.159***	-0.027**	-0.036***	-0.075***
	(0.197)	(0.179)	(0.159)	(0.042)	(0.036)	(0.032)	(0.026)	(0.024)	(0.026)	(0.012)	(0.014)	(0.016)
distance to Milano		0.019**	0.009		0.006***	0.004***		0.004***	0.002**		0.001	0.001
		(0.008)	(0.007)		(0.001)	(0.001)		(0.001)	(0.001)		(0.001)	(0.001)
hospital in Torino			0.531***			0.176***			0.037			0.025
			(0.191)			(0.057)			(0.031)			(0.025)
individual controls	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
hospital controls	no	yes	yes	no	yes	yes	no	yes	yes	no	yes	yes
socioeconomic controls	no	no	yes	no	no	yes	no	no	yes	no	no	yes
observations	70,256	70,256	70,256	70,256	70,256	70,256	70,256	70,256	70,256	70,256	70,256	70,256
R-squared	0.217	0.258	0.319	0.210	0.280	0.396	0.104	0.179	0.242	0.068	0.082	0.122

Appendix A. Socioeconomic indicators at the municipal level: source and description of the data

Indicator	**Description**	**Source**	**Mean**	**Min.**	**Max.**
Population density	Density of resident population per square kilometer	ISTAT	157.19	0.92	6,709.94
Share of pop. over 60	Share of resident population over 60 years	ISTAT	0.31	0.17	0.66
Share of graduated residents	Share of resident population with tertiary education (ISCED level 5 and 6)	ISTAT, Census data (2011)	0.07	0.00	0.26
Average income	Average income of the resident population	Ministry of Economy and Finance (2011)	1,8413.25	6,879.00	35,530.00

Appendix B. Diagnostic tests for spatial dependence in OLS regression

	DRG 6		DRG 42		DRG 119	
	model [a]	**model [b]**	**model [a]**	**model [b]**	**model [a]**	**model [b]**
Spatial error						
Moran's I	1.960**	1.941**	0.539	0.677	1.733*	1.653***
Lagrange Multiplier	469.703***	401.762***	9.436***	1.137	347.834***	177.813***
Robust Lagrange Multiplier	427.468***	360.331***	10.789***	0.775	333.627***	157.774***
Spatial Lag						
Lagrange Multiplier	51.666***	54.047***	0.007	0.415	14.399***	22.855***
Robust Lagrange Multiplier	9,531***	12.617***	1.360	0.053	0.192	2.816*

	DRG 225		DRG 229		DRG 359	
	model [a]	**model [b]**	**model [a]**	**model [b]**	**model [a]**	**model [b]**
Spatial error						
Moran's I	0.719	0.917	2.436**	2.198**	2.982***	3.088***
Lagrange Multiplier	29.878***	17.765***	779.955***	402.929***	1227.221***	964.874***
Robust Lagrange Multiplier	17.686***	7.792***	690.735***	346.874***	1078.277***	801.634***
Spatial Lag						
Lagrange Multiplier	24.119***	25.435***	97.816***	63.437***	201.751***	253.636***
Robust Lagrange Multiplier	11.926***	15.462***	8.596***	7.382***	52.807***	90.396***

	DRG 371		DRG 381		DRG 410	
	model [a]	**model [b]**	**model [a]**	**model [b]**	**model [a]**	**model [b]**
Spatial error						
Moran's I	0.877	1.061	0.916	1.182	2.105**	2.061**
Lagrange Multiplier	63.367***	41.605***	63.843***	55.303***	558.579***	339.426***
Robust Lagrange Multiplier	47.915***	26.976***	48.487***	38.037***	496.822***	310.293***
Spatial Lag						
Lagrange Multiplier	39.701***	45.145***	37.197***	47.491***	69.833***	30.036***
Robust Lagrange Multiplier	24.249***	30.516***	21.841***	30.674***	8.076	0.903

Appendix C. Descriptive statistics for patients' mobility (y = Δdist./min. dist.) and potential accessibility

	Patients' mobility			***Potential accessibility***		
	Mean	Min.	Max.	Mean	Min.	Max.
DRG 6	1.87	0.00	32.37	10.52	5.00	69.15
DRG 42	2.28	0.00	34.69	12.42	5.00	79.13
DRG 119	2.24	0.00	28.91	10.10	5.00	74.93
DRG 225	2.48	0.00	32.09	9.73	5.00	73.72
DRG 229	1.97	0.00	22.97	10.61	5.00	74.33
DRG 359	2.23	0.00	22.97	10.41	5.00	72.55
DRG 371	1.35	0.00	25.82	11.97	5.00	72.33
DRG 381	1.47	0.00	22.97	10.51	5.00	72.33
DRG 410	1.85	0.00	25.58	10.29	5.00	73.72

Appendix D. Description of the explicative variables for patients' mobility

Variable	Description
potential accessibility	Minimum travel time by car from the municipality of residence of the respondent to the nearest hospital facility.
INDIVIDUAL CHARACTERISTICS (X_i)	
female	Dummy equal to1 if the patient is a woman and 0 otherwise.
age	Age of the respondent (a quadratic term is added to check for non-linear effects).
nationality	Dummy equal to 1 if the patient is Italian and 0 otherwise.
family status	Set of dummies for the family status of the patient. Single person is the reference category; the other groups are: married, separate/divorced, widow.
education	Dummy equal to 1 if the patient is graduated and 0 otherwise.
secondary diagnosis	Dummy equal to 1 for those patients with more than one diagnosis and 0 otherwise.
LOS (patient)	Length of stay of the patient.
HOSPITAL CHARACTERISTICS (Q_h)	
yearly nr. of cases (DRG-specific)	Yearly number of cases (for the DRG analyzed) treated by the hospital of recovery.
yearly nr. of cases (all DRGs)	Yearly number of cases (for all DRGs) treated by the hospital of recovery.
private hospital	Dummy equal to 1 if the hospital is privately-owned and 0 otherwise.
frequency of DH (DRG-specific)	Share of Day Hospital treatments (for the DRG analyzed) over the total treatments in the hospital of recovery.
LOS (DRG-specific)	Average length of stay (for the DRG analyzed) in the hospital of recovery.
repeated hospitalization (DRG-specific)	Share of repeated hospitalization cases (for the DRG analyzed) in the hospital of recovery.
SOCIOECONOMIC AND SPATIAL CHARACTERISTICS OF MUNICIPALITIES OF RESIDENCE (S_m)	
population density	Population density in the municipality of residence of the patient.
average per capita income	Average per capita income in the municipality of residence of the patient.
hospital in Torino	Dummy equal to 1 if the chosen hospital facility is in Torino.
distance to Milano	Travel time by car from the municipality of residence of the respondent to Milano.
OTHER CONTROLS	
hospital dummies (u_h)	Set of dummies for the unobserved characteristics at the hospital-level.
year dummies (τ_t)	Set of dummies for the unobserved characteristics at the year-level.

Appendix E. Estimates of equation [2]: propensity to move away from the nearest hospital facility as a function of potential accessibility and other controls

	DRG 6			DRG 42			DRG 119		
VARIABLE	**model [a]**	**model [b]**	**model [c]**	**model [a]**	**model [b]**	**model [c]**	**model [a]**	**model [b]**	**model [c]**
potential accessibility (log)	-0.974***	-1.104***	-1.410***	-1.979***	-1.999***	-2.483***	-1.300***	-1.494***	-1.890***
	(0.137)	(0.139)	(0.128)	(0.322)	(0.318)	(0.310)	(0.162)	(0.165)	(0.155)
female	-0.074*	-0.054	-0.042	0.021	0.026	0.029	0.082***	0.079***	0.066**
	(0.040)	(0.039)	(0.038)	(0.061)	(0.061)	(0.060)	(0.030)	(0.029)	(0.029)
age	0.026***	0.029***	0.029***	-0.004	-0.003	0.003	0.015*	0.015*	0.015*
	(0.008)	(0.008)	(0.008)	(0.012)	(0.012)	(0.012)	(0.009)	(0.009)	(0.008)
age ^{2}	-0.000***	-0.000***	-0.000***	-0.000	-0.000	-0.000	-0.000**	-0.000**	-0.000**
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
nationality	0.274***	0.275***	0.281***	0.544**	0.527**	0.479**	0.501***	0.470***	0.440***
	(0.066)	(0.066)	(0.065)	(0.220)	(0.218)	(0.210)	(0.085)	(0.083)	(0.081)
married	-0.085**	-0.081**	-0.082**	-0.422***	-0.414***	-0.360***	-0.127**	-0.100*	-0.089*
	(0.035)	(0.036)	(0.037)	(0.091)	(0.088)	(0.083)	(0.054)	(0.052)	(0.053)
sep./div.	-0.005	0.006	0.015	-0.859***	-0.863***	-0.805***	0.021	0.040	0.058
	(0.087)	(0.085)	(0.085)	(0.205)	(0.199)	(0.181)	(0.083)	(0.080)	(0.081)
widow	0.016	0.021	0.016	-0.449***	-0.432***	-0.380***	-0.073	-0.058	-0.058
	(0.067)	(0.065)	(0.065)	(0.134)	(0.129)	(0.123)	(0.079)	(0.078)	(0.079)
education	0.039	0.048	0.029	0.124	0.117	0.016	-0.054	-0.048	-0.095*
	(0.056)	(0.053)	(0.052)	(0.130)	(0.129)	(0.120)	(0.046)	(0.050)	(0.052)
secondary diagnosis	0.052	0.040	0.040	-0.042	-0.001	-0.004	-0.105	-0.120	-0.121
	(0.065)	(0.065)	(0.065)	(0.061)	(0.062)	(0.061)	(0.073)	(0.078)	(0.082)
LOS (patient)	0.030*	0.033**	0.029*	0.042***	0.046***	0.040***	0.004	0.018	0.010
	(0.016)	(0.017)	(0.016)	(0.015)	(0.015)	(0.014)	(0.017)	(0.022)	(0.021)
yearly nr. of cases (DRG-specific)		-0.000	-0.000		0.000	0.000		0.000	0.000
		(0.001)	(0.001)		(0.000)	(0.000)		(0.000)	(0.000)
yearly nr. of cases (all DRGs)		0.000	0.000		-0.000	-0.000		-0.000	-0.000*
		(0.000)	(0.000)		(0.000)	(0.000)		(0.000)	(0.000)
private hospital		2.707***	4.739***		-1.213	1.599		-0.014	0.419
		(0.923)	(1.816)		(0.811)	(1.812)		(0.679)	(1.529)
frequency of DH (DRG-specific)		-0.831	-0.489		-2.003***	-1.955***		0.151	0.230*
		(1.565)	(1.575)		(0.569)	(0.574)		(0.136)	(0.129)
LOS (DRG-specific)		0.982**	1.114**		1.112***	1.042***		0.217	0.155
		(0.468)	(0.458)		(0.377)	(0.375)		(0.160)	(0.154)
repeated hospitalization (DRG-specific)		-2.332	-2.228		1.598***	1.575***		-0.415	-0.215
		(1.636)	(1.634)		(0.594)	(0.594)		(1.012)	(0.994)
distance to Milano		0.027***	0.023***		-0.001	-0.010		0.038***	0.032***
		(0.007)	(0.007)		(0.007)	(0.008)		(0.007)	(0.008)
population density			-0.506***			-0.730***			-0.406***
			(0.098)			(0.122)			(0.115)
average per capita income			-0.081***			-0.216***			-0.156***
			(0.022)			(0.048)			(0.028)
hospital in Torino			2.244*			2.824**			0.446
			(1.177)			(1.372)			(1.157)
hospital and year dummies	yes	yes	yes	yes	yes	yes	yes	yes	yes
constant	4.368***	0.321	1.398	8.951***	9.759***	13.992***	5.141***	2.493**	7.281***
	(0.438)	(1.403)	(2.058)	(0.984)	(1.437)	(2.403)	(0.500)	(0.999)	(2.008)
observations	25,057	25,048	25,048	18,782	18,782	18,782	32,512	32,512	32,512
R-squared	0.206	0.225	0.240	0.262	0.269	0.309	0.272	0.307	0.326

Appendix E. Estimates of equation [2]: propensity to move away from the nearest hospital facility as a function of potential accessibility and other controls – continued 1

	DRG 225			DRG 229			DRG 359		
VARIABLE	**model [a]**	**model [b]**	**model [c]**	**model [a]**	**model [b]**	**model [c]**	**model [a]**	**model [b]**	**model [c]**
potential accessibility (log)	-1.827***	-1.944***	-2.373***	-0.911***	-1.116***	-1.407***	-1.329***	-1.399***	-1.783***
	(0.219)	(0.210)	(0.206)	(0.163)	(0.160)	(0.154)	(0.147)	(0.152)	(0.143)
female	0.052	0.052	0.063	-0.046	-0.038	-0.035	-	-	-
	(0.064)	(0.062)	(0.062)	(0.035)	(0.033)	(0.033)			
age	-0.024***	-0.017**	-0.018**	-0.025***	-0.022***	-0.024***	-0.014***	-0.014***	-0.012***
	(0.009)	(0.009)	(0.008)	(0.007)	(0.007)	(0.007)	(0.005)	(0.004)	(0.004)
age^2	0.000	0.000	0.000	0.000**	0.000**	0.000**	0.000	0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
nationality	0.573***	0.531***	0.516***	0.212***	0.200**	0.204***	0.334***	0.372***	0.380***
	(0.167)	(0.165)	(0.163)	(0.082)	(0.079)	(0.078)	(0.075)	(0.071)	(0.071)
married	0.071	0.061	0.067	0.094*	0.111**	0.122**	-0.071	-0.052	-0.069*
	(0.080)	(0.077)	(0.076)	(0.050)	(0.048)	(0.048)	(0.046)	(0.042)	(0.041)
sep./div.	0.008	-0.004	0.016	0.189*	0.213**	0.238**	0.025	0.044	0.041
	(0.114)	(0.112)	(0.110)	(0.102)	(0.100)	(0.100)	(0.086)	(0.084)	(0.086)
widow	0.044	0.067	0.059	0.167**	0.200***	0.212***	-0.137**	-0.129**	-0.155**
	(0.111)	(0.106)	(0.104)	(0.073)	(0.074)	(0.074)	(0.065)	(0.061)	(0.062)
education	-0.133**	-0.125**	-0.145***	-0.087*	-0.086*	-0.099**	-0.074**	-0.068**	-0.098***
	(0.052)	(0.051)	(0.052)	(0.050)	(0.048)	(0.048)	(0.036)	(0.035)	(0.034)
secondary diagnosis	0.038	0.023	0.028	0.127***	0.089*	0.081*	0.043	0.037	0.038
	(0.049)	(0.048)	(0.047)	(0.046)	(0.046)	(0.046)	(0.033)	(0.032)	(0.032)
LOS (patient)	-0.003	-0.005	-0.007	0.038***	0.049***	0.044***	0.008	0.010*	0.005
	(0.007)	(0.007)	(0.007)	(0.015)	(0.017)	(0.016)	(0.005)	(0.006)	(0.005)
yearly nr. of cases (DRG-specific)		-0.001	-0.001		0.002***	0.002***		0.000	0.000
		(0.001)	(0.001)		(0.001)	(0.001)		(0.000)	(0.000)
yearly nr. of cases (all DRGs)		0.000**	0.000**		0.000	0.000		-0.000	-0.000
		(0.000)	(0.000)		(0.000)	(0.000)		(0.000)	(0.000)
private hospital		-2.469***	-0.372		0.691	2.259		-2.119***	-0.882
		(0.835)	(1.358)		(1.247)	(1.738)		(0.720)	(0.709)
frequency of DH (DRG-specific)		-1.904***	-1.860***		-0.071	-0.023		-1.739***	-1.411***
		(0.478)	(0.476)		(0.450)	(0.448)		(0.481)	(0.462)
LOS (DRG-specific)		1.649***	1.491***		0.972***	0.998***		2.453***	1.972***
		(0.281)	(0.260)		(0.247)	(0.238)		(0.514)	(0.490)
repeated hospitalization (DRG-specific)		2.029	2.076		-0.318	-0.159		0.201	0.777
		(1.283)	(1.263)		(1.687)	(1.705)		(1.284)	(1.277)
distance to Milano		0.018**	0.015		0.034***	0.031***		0.009	0.006
		(0.009)	(0.010)		(0.008)	(0.009)		(0.008)	(0.008)
population density			-0.666***			-0.523***			-0.558***
			(0.146)			(0.144)			(0.114)
average per capita income			-0.119***			-0.070***			-0.120***
			(0.042)			(0.026)			(0.028)
hospital in Torino			2.627**			1.936*			0.814***
			(1.251)			(1.169)			(0.235)
hospital and year dummies	yes	yes	yes	yes	yes	yes	yes	yes	yes
constant	7.896***	4.603***	6.731***	5.917***	0.914	1.959	6.893***	4.098***	7.934***
	(0.700)	(1.287)	(1.878)	(0.506)	(1.064)	(1.625)	(0.439)	(0.811)	(1.173)
observations	15,830	15,830	15,830	24,356	24,356	24,356	36,377	36,377	36,377
R-squared	0.273	0.309	0.326	0.211	0.247	0.256	0.284	0.316	0.333

Appendix E. Estimates of equation [2]: propensity to move away from the nearest hospital facility as a function of potential accessibility and other controls – continued 2

VARIABLE	DRG 371 model [a]	DRG 371 model [b]	DRG 371 model [c]	DRG 381 model [a]	DRG 381 model [b]	DRG 381 model [c]	DRG 410 model [a]	DRG 410 model [b]	DRG 410 model [c]
potential accessibility (log)	-0.503***	-0.532***	-0.843***	-0.784***	-0.856***	-1.212***	-0.862***	-1.014***	-1.614***
	(0.123)	(0.124)	(0.139)	(0.119)	(0.122)	(0.121)	(0.197)	(0.179)	(0.159)
female	-	-	-	-	-	-	-0.051	-0.042	-0.012
							(0.038)	(0.037)	(0.033)
age	-0.013	-0.014	-0.010	-0.026**	-0.027**	-0.023*	-0.018*	-0.014	-0.009
	(0.023)	(0.023)	(0.023)	(0.012)	(0.012)	(0.012)	(0.010)	(0.009)	(0.009)
age^2	0.000	0.000	0.000	0.000**	0.000**	0.000**	0.000	0.000	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
nationality	0.284***	0.281***	0.280***	0.379***	0.376***	0.377***	0.314**	0.269**	0.270**
	(0.048)	(0.047)	(0.046)	(0.035)	(0.034)	(0.034)	(0.130)	(0.123)	(0.114)
married	0.002	0.002	-0.009	-0.222***	-0.214***	-0.215***	-0.160***	-0.145***	-0.133***
	(0.030)	(0.029)	(0.029)	(0.044)	(0.045)	(0.045)	(0.045)	(0.043)	(0.042)
sep./div.	0.078	0.076	0.070	-0.048	-0.047	-0.046	-0.235***	-0.252***	-0.240***
	(0.069)	(0.070)	(0.068)	(0.062)	(0.062)	(0.062)	(0.082)	(0.079)	(0.074)
widow	-0.048	-0.036	-0.095	-0.126	-0.127	-0.132	-0.173**	-0.158**	-0.162**
	(0.235)	(0.236)	(0.227)	(0.112)	(0.110)	(0.113)	(0.069)	(0.065)	(0.063)
education	0.075	0.082	0.085	-0.046	-0.041	-0.078	-0.007	-0.012	-0.100***
	(0.074)	(0.075)	(0.077)	(0.063)	(0.063)	(0.060)	(0.045)	(0.041)	(0.039)
secondary diagnosis	-	-	-	-	-	-	-	-	-
LOS (patient)	0.027***	0.026***	0.025***	0.020	0.032**	0.028*	-0.006***	-0.007***	-0.006***
	(0.009)	(0.009)	(0.008)	(0.015)	(0.016)	(0.015)	(0.001)	(0.001)	(0.001)
yearly nr. of cases (DRG-specific)		-0.000	-0.000		0.000	0.000		-0.000	-0.000
		(0.000)	(0.000)		(0.000)	(0.000)		(0.000)	(0.000)
yearly nr. of cases (all DRGs)		0.000	0.000		0.000	0.000		0.000	-0.000
		(0.000)	(0.000)		(0.000)	(0.000)		(0.000)	(0.000)
private hospital		2.709**	2.349**		0.910	0.692		-10.368***	-9.424***
		(1.129)	(1.094)		(0.641)	(0.603)		(2.588)	(2.342)
frequency of DH (DRG-specific)		-	-		-0.477	-0.412		-0.339	-0.175
					(0.399)	(0.383)		(0.580)	(0.553)
LOS (DRG-specific)		1.352*	1.664**		0.664	0.544		1.572***	1.323***
		(0.720)	(0.714)		(0.423)	(0.394)		(0.345)	(0.320)
repeated hospitalization (DRG-specific)		7.670	8.970		-0.841	-1.064		-2.925***	-2.620***
		(21.951)	(22.082)		(1.464)	(1.453)		(0.987)	(0.942)
distance to Milano		0.008	0.001		0.020***	0.014*		0.019**	0.009
		(0.007)	(0.007)		(0.008)	(0.008)		(0.008)	(0.007)
population density			-0.580***			-0.568***			-1.040***
			(0.087)			(0.091)			(0.163)
average per capita income			-0.101***			-0.114***			-0.189***
			(0.018)			(0.020)			(0.031)
hospital in Torino			2.134**			2.939***			0.531***
			(0.839)			(0.944)			(0.191)
hospital and year dummies	yes	yes	yes	yes	yes	yes	yes	yes	yes
constant	3.371***	0.998	2.832**	5.415***	2.965***	4.535***	5.343***	3.242***	10.223***
	(0.410)	(0.972)	(1.131)	(0.422)	(1.002)	(1.131)	(0.525)	(0.746)	(1.329)
observations	31,741	31,741	31,741	40,692	40,692	40,692	70,256	70,256	70,256
R-squared	0.211	0.216	0.244	0.220	0.231	0.255	0.226	0.267	0.336