Equity in the delivery of inpatient care in the European Union

A pooled analysis

Abstract

Previous papers have analysed the level of inequity in GP and specialist visits in European countries. It is the aim of this paper to extend equity analyses to inpatient care. The estimates are presented for twelve countries of the European Union and the data was pooled for five years (from 1994 to 1998) to increase the power of the estimation. In most of the members of the European Union, the objective of horizontal equity is violated. The better-off are more likely to receive inpatient care. Although different combinations of supply and demand factors determine the level of inequity, inter-regional differences, and bed availability affect significantly the probability of being admitted to hospital in each health care system. The paper also shows that there is a positive relation between the level of inequity in inpatient care and the inequity in specialist care.

1. Introduction

The concept of equity in access to health care is a central objective of all European health care systems. All countries have universal or almost universal coverage of the population. However, there are relevant differences across countries. Although there is increasing concern about equity issues in the

European Union, there is also practical evidence that the objective of horizontal equity is often violated, i.e. individuals in equal need are treated unequally. In many countries, it seems that individuals with higher income have better access to health service in terms of both quality and quantity.

Previous papers (Van Doorslaer *et al*, 2000; Van Doorslaer *et al*, 2002c) have showed that in some European countries there is pro-poor inequity in GP visits, and that, in almost all countries, the inequity in specialist visits is pro-rich; yet, it was impossible to detect any inequity in hospital care. The reasons may be different. In fact, it is difficult to identify the need for hospital care and hospital care utilization is not frequent with a very skewed distribution. However, hospital care is an important issue and it represents a high percentage of the public health care expenditure in each country. In 1998, the total expenditure on inpatient care in percentage of the total health expenditure was 54% in Denmark, 50% in the Netherlands, 43% in Spain and 41.5% in Italy.

The purpose of this paper is to assess to what extent the countries that are members of the EU have achieved the goals of equal access to inpatient care for equal needs irrespective of income. Violations of the principle "of equal treatment for equal need" (Wagstaff and Van Doorslaer, 2000b) are tested and quantified by using the methodology described in the previous paper. Results are presented for twelve countries of the European Union: Austria, Belgium, Denmark, France, Greece, Ireland, Italy, the Netherlands, Portugal, Spain and the UK. The data are taken from the European Community Household Panel, which, since 1994, collects longitudinal data on demographic information, income, financial situation, accommodation, health, education, employment and social relations. The estimates are presented for five years (from 1994 to 1998). For the first time, the results are obtained by considering a longitudinal perspective. For all countries the data are pooled for all the five years to increase the power of the estimation. Long–run income-related inequity might differ from the picture that is obtainable by measuring only a cross-section span.

Across countries, inpatient care is insured at relatively low or almost zero financial costs, in particular for individuals at the bottom end of the income distribution. Moreover, the distribution of medical care is in favour of the worst-off almost everywhere without considering the population needs. Although it seems that there is pro-poor inequality, this does not necessarily imply equity in the health care distribution. The incidence of self-reported ill health is also concentrated among the less advantaged groups (Van Doorslaer *et al*, 1997) and, therefore, the final outcome might be in favour of the better-off after standardizing for the needs of the society.

The level of horizontal inequity in hospital admission is measured and quantified across European countries. The role of regional differences is also explored. The region of residence might be a discriminating factor in the access to health care. Recourses are often concentrated in the richer and more productive areas of a country. Consequently, people in equal need might have a different probability of being admitted in hospital due to their dissimilar region of residence.

Afterwards, it is analysed whether there is a relationship between the level of inequity in inpatient care and the level of inequity in specialist care. Previous papers have shown that there is pro-rich inequity in specialist visits. Specialists mainly decide on the access to hospitals. Therefore, it might be possible that the better-off have more probability of being admitted to hospitals through their facilitated access to specialist care.

2. Equity and cross-country differences in the delivery of hospital care

In all members of the European Union the population has universal or almost universal coverage and the access to health care depends mainly on needs, and not on the ability to pay. Yet, there are notable differences in the structure and characteristics of each health care system. For example, countries such as Denmark, Italy, and Spain finance health care mainly through general taxation; while others, such as Austria, Belgium, Germany, and the Netherlands, mainly through health insurance schemes. The number of people with private insurance is growing everywhere, but important cross-country differences are present, because in some, private insurance schemes have a complementary role, while in others a supplementary role. Moreover, in some countries, namely Denmark, Greece, Ireland, Italy, the Netherlands, Portugal, Spain, and the UK, the primary care physicians act as "gatekeepers", whereas in other countries the access to secondary care is direct.

No less disparities are present in the delivery and financing of inpatient care. Table 1 reports the differences across countries in the payment system of hospital care and physicians, and the role of private hospitals. In most countries, public and private hospitals co-exist. Private hospitals may have a complementary or a supplementary role for the public provision of inpatient care. This depends on the structure of each health care system. For example, in the Netherlands almost all hospitals are private but the government heavily regulates them. In almost all countries, hospitals are financed through a prospective system even if in some countries there are still elements of costs per case. There are only two exceptions: Greece and Portugal. In fact, in these two countries the hospital financing system is still retrospective. Since the second half of the '90s many developed countries have adopted a mainly prospective payment system to contain the increase in hospital expenditure. The effects of this financial change can be multiple: "moral hazard", "selection" and "practice style" (Randall and McGuire, 1996). Indeed, a prospective system could give providers more incentives to increase the admission rate, to select cases and to decrease the length of stay. Nevertheless, the financial mechanism is different between private and public organisations almost everywhere but there are exceptions (e.i. Belgium). Hospital physicians are generally salaried employees, in particular when they work in public hospitals. Only in Austria and Belgium they are paid on a fee-for-service basis. However, it is worth noting that in some countries hospital physicians are paid a salary when they treat public patients and, on the contrary, they are paid on fee-for-service basis when they treat private patients. For instance, in Italy, Portugal, Greece and the UK

hospital physicians can earn more by treating patients privately and the physicians can choose to work only part-time for the public hospitals. Moreover, in Greece unofficial payments are a prominent characteristic. Consequently, the system might give providers more incentives to treat private rather than public patients and to induce demand for hospital services.

Therefore, there is not one common health care system. Yet, there are notable differences in the finance and delivery of health care across European countries and the incentive might also vary within the country across regions. The health care system is, indeed, highly decentralised almost everywhere (Table 1 third column). Therefore, people in equal need might receive different treatments depending on their income level and on their region of residence.

Clearly, these supply characteristics are very important in explaining why people in equal need are treated not equally. However, also demand factors can influence the level of equity in the access to inpatient care. In effect, financial and non-financial costs associated with the receipt of the health care can, in part, determine the health-related behaviour of patients. As Van Doorslaer *et al* (1992) notice such "access costs" include "out-of-pocket payments, transport costs and the opportunity costs of time spent travelling and waiting". Inpatient care is generally insured at relatively low or almost zero financial costs, in particular for individuals at the bottom end of the income distribution. However, out-of-pocket payments are an important source of finance in so hospital care systems such as Greece. On the contrary, hospital services are almost free at the point of use in other countries such as Denmark, Italy, the Netherlands, Spain, Portugal, and the UK. In Ireland the better-off have limited access to public services, while people in lower socio-economic classes are covered completely. The less advantaged groups might also have higher transportation costs, because they may live far from the health institutions and may be forced to use public transport. Moreover, they may be likely to spend more time on waiting lists.

However, even supposing that the access costs do not vary with the income level, they may affect poor and rich people in different ways. Indeed, as Van Doorslaer *et al* (1992) suggest: "the sacrifice in terms of forgone utility would probably be greater for the persons on low incomes than for the persons towards the top of the income distribution".

Thus, demand and supply characteristics in each particular country might determine the level of horizontal inequity in inpatient care.

3. Defining and measuring horizontal inequity in health care delivery

To achieving horizontal equity in inpatient care, resources ought to be allocated according to needs, irrespective of personal characteristics not related with the needs, such as income. In fact, it is supposed that "people in different degrees of ill-health have different medical needs, and people in the same state of ill-health have the same need" (Wagstaff, Van Doorslaer and Ruffer, 1993).

To understand if people in equal needs receive similar treatments, regardless of their income it is necessary to quantify and test for violation of the principle of horizontal equity. The measure of inequity is based on the indirect standardization approach proposed by Wagstaff and Van Doorslaer (2000)[1]. In case of inequity favouring the better-off (worse-off) the medical care and needs concentration indices (respectively CM and CN), and the horizontal inequity index, HI_{WV}, have positive (negative) values.

It is possible to decompose the contribution of need and non-need variables to the income related inequality in health care by using the methodology proposed by Wagstaff, Van Doorslaer and Watanabe (2001)[2]. The decomposition method not only allows to separate the contributions of the various determinants, but also to identify the importance of each of these two components within each factor's total contribution. This property makes it a powerful tool for uncovering and describing the mechanisms contributing to a country's degree of inequality in the health care use.

4. Data and estimation methods

4.1 Data

The data are taken from the *European Community Household Panel* (ECHP) conducted by Eurostat. The ECHP is a survey based on a standardized questionnaire. Every year a representative panel of households and individuals 16 years and older are interviewed in each EU member state. Various topics are objects of the questionnaire such as demographic characteristics, income, labour market behaviour, housing, health, education, migration and social relations at both the household and the personal level. I analysed data for five years (the first year taken in consideration is 1994 and the fifth is 1998) for twelve members of the European Union: Austria, Belgium, Denmark, Italy, France, Germany, Greece, Ireland, the Netherlands, Portugal, Spain, and the UK. Finland and Sweden are not analysed[3]. For Austria data are available only from the second year (1995). For Germany and the UK the last two years are not analysed[4].

The variable *lninc* is the natural logarithm of the net household income per equivalent adult, derived by using the modified OECD scale[5]. The household income includes all the monetary income received by the household during the year of reference. It considers all the different sources of income: income from work, private income, pensions and other direct social transfers.

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[1] In the appendix 1 it is reported a description of the methodology.
[2] In the appendix 2 it is reported a brief description of the methodology.
[3] For Finland and Sweden data was available only for two years.
[4] For Germany and the UK, from 1997 different surveys were used, respectively GSOEP and BHPS. For sake of comparability we decided to analyse only the first three years.
[5] This scale gives a weight of 1.0 to the first adult, 0.5 to the second and to other persons 14 years and older, and 0.3 to each child under 14 in the household.

The measure of inpatient care is based on the question: "During the last 12 months, have you been admitted to a hospital as in-patient?"

Measurement of utilisation of medical specialists is based on the question "During the past 12 months, about how many times have you consulted a medical specialist?"

Two measures of self-reported health status are used: self assessed health (*SAH*) and hampered in daily activity (*healthlimit*). 1) Responders rate their health status in general by choosing between five categories: "very bad, bad, fair, good and very good" health conditions. Based on these five categories four dummy variables have been built; people in very good health are the reference category. 2) The other health measure is based on the following question: "Are you hampered in your daily activity by any physical or mental health problem, illness or disability?" The dummy variable, *healthlimit1*, represents the answer: "yes, severely"; *healthlimit2*: "yes, to some extent"; and the reference category is represented by individuals not hampered in their daily activity.

Age is captured by six dummy variables, namely 16-34, 35-44, 45-64, 65-74 and more than 75 years old. However, the effect of age was estimated in interactions with the gender. Male individuals between 16 and 34 years old are the omitted category.

The non-need variables are represented by education and activity status dummies. For the education level two dummies are used. Responders could choose among three categories: "third level of education; second level of education; less than second level of education". People with the highest level of education (*ED1*) represent the reference category. Concerning the activity status, employed people are the reference category. Based on the questionnaire, other six dummy variables were built: *inactive, house workers, retired, unemployed, student,* and *self-employed*. Moreover, for each year a year dummy was built. The reference category is the first year.

The regional information is very limited in the ECHP survey. No information is available for Denmark, Germany, the Netherlands and the UK and for the other countries region of residence uses the Nomenclature of Statistical Territorial Units (NUTS) of the EU.

4.2 Estimation methods

To test the level of need in hospital access we estimated a probit model. In a probit model, the dependent variable is discrete. Therefore, the dependent variable equals one if the individual was admitted in the hospital as inpatient in the last twelve months or equals zero otherwise:

$y = 1$ if $y^* > 0$

$y = 0$ otherwise

where,

$$y^* = a + b \ln inc + gX + dZ + e \qquad (2)$$

X is the vector of need variables (*sah*'s are dummies related to the self assessed health, *healthlimit*'s are dummies for restrictions in daily activity and *male/female* are dummies that represent the interactions between age and gender), and Z the vector of non-need variables (education, activity status and the year's dummies w_i).

The results are obtained by a pooled analysis. For each country, the data are pooled for all five years. As such, the power of the estimation is increased. In fact, it is possible to get more precise estimators and test statistics with more power (Wooldridge, 1999). However, it is necessary to correct the error term for mainly two reasons. On the one hand, the variance might change over time even if it does not change with the value of the dummies related to the needs of the population. The data are censored and the groups have different sample size. On the other hand, the variance might be different across groups. Thus, for each country the regression was run clustering for the individual identification number for correcting the standard error. By estimating a robust standard error the assumption of independence of the observation is relaxed.

Before proceeding with the pooling, we tested whether this procedure was appropriate. Indeed, for each country, we computed a Wald test on the nested model (model that includes not only the main variables but also their interactions with the year's dummies). If the null hypothesis H_o is not rejected, then equation 2 can be used for the estimation of the needs for hospital admission.

The results of the Wald test for pooling show that overall it is possible to pool the years. The null hypothesis, that the interactions between all the main variables and the year's dummies are zero, was not rejected in only two countries out of twelve. Therefore, given the strength of these results, the data was pooled for the five years in all countries.

Afterwards, we estimated the role that regions play in the level of income inequity in the European countries. Unfortunately, regional information is collected only for eight of the twelve countries: Austria, Belgium, Italy, France, Greece, Ireland, Portugal and Spain. In the Eurostat database, regional information is available only for the fourth and fifth years (1997-1998). Thus, for the other years, the region, in which each individual or group of people

lived, was imputed using the primary sample unit (PSU) information[6]. For Austria and France only the last two years were analysed (the PSU information is missing for these two countries).

To estimate the need for total hospital nights and for specialist care we ran a simple OLS regression pooling the data for the different years in each country. However, for specialist visits, we could not use the first year (1994), because in the ECHP database the number of specialist visits is available only from the second one. The regression was run clustering for the individual identification number.

It is worth noting that all the results are weighted (cross section personal weight).

5 Results

Throughout the European Union, since the beginning of the 1990s there has been a decline in the number of beds, in particular acute and psychiatric beds, and in the length of stay. During the same period admission rates increased, even if there were significant differences across countries. For example, over the period 1994-1998, the probability of being admitted in hospital was very high in Austria (14.5%) and Germany (13.5%), but it was low in Portugal (6%), Greece (7%) and the Netherlands (8%).

Countries with higher bed availability, on average, report also higher inpatient admission rate. However, the relation between the level of weighted inpatient rate and the number of hospital beds for 1000 individuals is not clear (figure 1).

5.1 Income-related inequity in inpatient care in each country

Although the goodness of fit (pseudo R^2) is rather low, indicating that other important factors are left out, the estimates confirm that the two measures of self-reported health status are the most important determinants of need for inpatient care overall. In each country, given the education level, the activity status, and income, the probability of being admitted to hospital increases when health conditions deteriorate. For having "equal treatment for equal need" the probability of being admitted in hospital ought to depend only on the health conditions of individuals and not on other personal characteristics such as income.

[6] The PSU is regressed on every single region for detecting the region of residence. In Italy, we needed to add a dummy variable (Residual) for the region's utilisation because it was very difficult to identify the regions of residence for some PSU (the residual primary sample units represent 18% of all the PSU). A dummy variable (residual) for the region of residence was added also in Belgium, because, for two PSUs, information was available only for the first three years and, hence, it was impossible to identify the corresponding regions to which these two primary sampling units belonged.

Nevertheless, the results show that the logarithm of the net equalised income has positive and statistically significant coefficients in almost all countries. The only two exceptions are Belgium and the Netherlands. Therefore, income seems to count.

It is important to notice that, for each country, the results can vary year by year. The reasons may be different. The sample size is not large enough in each year (in particular for some countries) and, hence, the estimates lack power. In addition, the admission to hospital might be influenced by emergency situations. Using a pooled analysis and adding dummies for the different years it is possible to increase the power of the estimates and to understand if there was a trend in the probability of being admitted to hospital. However, only in few countries the year's dummies are statistically significant. In fact, the Wald test applied to the year's dummies does not reject the hypothesis that the joint effect is not zero only in France, Greece, Italy, the Netherlands, Spain and the UK (Table 2). In Greece, Italy and the Netherlands there was a reduction in the probability of being admitted to hospital during the years and this can be related with the contemporaneous reduction of bed availability. In France the reduction in the likelihood of being admitted to hospital was statistically significant in the last two years. While in Spain, the results are opposite. In fact, year-by-year, the probability of being admitted in hospitals increases.

The concentration index for medical care is negative and statistically significant for all the countries (Figure 2), but Italy, where CM is nearly zero and not statistically significant. Therefore, the distribution of medical care is concentrated towards the lower-income groups almost everywhere. The worst-off are more likely to spend at least one night in hospital without considering the needs of the population. However, needs are not equally distributed across income groups. The less advantaged groups, given their socio-economic, employment and income status, report, on average, worse health conditions than their better-off counterparts. Childhood environment, work environment, employment status, regions of residence, pattern of social relationship, social exclusion, and not last income are determinants of differences in disease rates within and between societies. Given that the incidence of self-reported ill health is concentrated towards the less advantaged groups the final outcome might be in favour of the better-off after standardising for the needs of the population. Both the unstandardized and standardized[7] distribution of inpatient rate varies across income quintiles. Although people in lower quintiles are more likely to be admitted in hospitals, the pattern by income changes when we take in consideration the population's needs. The standardised distribution is more in favour of people in the upper end of the income distribution. Indeed, the distribution of medical care, even if it is in favour of the lower-income groups is not sufficiently skewed towards the bottom end of the income distributions to compensate for the higher needs of the worse-off.. Looking at the medical care and

[7] The standardised distribution (y_st) was obtained by adding to the difference between the observed and expected probability of being admitted to hospital the weighted mean of utilisation. It is worth remembering that the predicted probability was estimated holding the non-need variables at their means.

need concentrations indices[8] for each country it is clear that people in the lowest end of income distribution would have needed even more care than they actually received. Belgium, the Netherlands and the UK are the only exceptions.

Whenever the difference between the medical care and the need concentration index is positive there is inequity in favour of people with higher level of income. It is not surprising that in many countries the inequity in the probability of being admitted to hospital is statistically significantly pro-rich (figure 3). The value of the horizontal inequity index is particularly high in Portugal (0.073), Greece (0.051), Italy (0.05), Austria (0.05) and Ireland (0.045). Belgium is the only country in which the concentration index is negative and statistically significant. Therefore, ceteris paribus, poor people have 5% higher probability of being admitted to hospital than their counterparts even after standardising for the need of the population. In the Netherlands and the UK, the HI_{WV} index is negative but not significantly different from zero. In Denmark and Spain, the value is positive but not statistically significant. This means that it was impossible to detect any significant inequity in the distribution of inpatient care across income groups in these four countries.

5.2 Regional differences

In some countries regional disparities in supply availability might explain some of the inequity in hospital access. The level of inequity might increase or decrease by considering regions of residence among the regressors. To have an appropriate evaluation of regional effects, it would be necessary to have information, differentiated by regions, about bed availability, number of physicians, mean distance to hospitals, etc. However, given the difficulty in collecting these data, we considered only inter-regional differences in utilisation.

The Eurostat database does not provide regional information for Denmark, Germany, the Netherlands and the UK. Nevertheless, it would be interesting to have regional data for these countries, regions play an important role.

On average, regions play an important role in the distribution of inpatient care across income groups. The Wald test applied to regions of residence rejects the hypothesis that the joint regional effect is zero only in Greece (Table 3). Nevertheless, in Greece there is practical evidence that health care resources are distributed unevenly[9]. In the other countries, the Wald test rejects the hypothesis that the joint regional utilisation is zero; thus some regions' fixed effects are statistically significant.

[8] For being precise the figure 3.4 shows the value of the concentration indices multiplied by –1.

[9] The problem is that we have information only about four areas: Attiki, Kentriki, Nisia and Voreia. Therefore, we could not differentiate the probability of being admitted in hospital between the different geographic areas of the Peninsula and the Islands. Yet, in this country there is a large difference in the level of provision of health care services between rural and urban areas but, clearly, it is difficult to detect this kind of inequity only with information about so few areas of residence.

Although regional differences have an important role in hospital access, the horizontal inequity index is only marginally affected by the introduction of regional dummies among the regressors. No significant differences are noticeable [10].

To identify the importance of regional components and their role in the explanation of the level of inequality and inequity, a decomposition approach was used (see appendix 2 for a brief description of the methodology). Table 4 shows that the contribution of some regions to the overall level of inequality is particularly significant. For each region, the income concentration indices are also reported for mainly two reasons: 1) it is possible to differentiate wealthy from less well-off regions; 2) the interpretation of the contribution is clearer.

The analysis of the concentration indices evidences that the South of Italy and the Islands are less wealthy. Moreover, people living in the South, with the same level of needs and income, have less probability to be admitted in hospitals at least for one night. In Spain, there are significant disparities across regions. The Canary Islands, the South, the Northwest and Centre are poorer regions in comparison with Madrid, the Northeast and the East. Moreover, people who live in these areas have less probability to receive inpatient care. In Belgium, only the Walloon contributes significantly to horizontal inequity index. People who do not live in Brussels have more possibility to spend at least one night in hospital, leaving all other variables constant. Nevertheless, in the Brussels region the density of general hospitals is very high, for the presence of four university hospitals. Moreover, because in Belgium individuals can choose freely where to be treated, the Brussels region attracts many patients from the Flemish and Wallonian regions. In Ireland, only two categories are taken in consideration: 1) people who live in Dublin and 2) elsewhere[11]. For this country, more than for the others, it would have been useful to differentiate supply and demand factors, because the financial and non-financial costs for people who do not live in the capital or in the biggest cities are, on average, higher. Also in Austria and France, even if only two years are available, some differences in the level of inpatient care across regions are detected. For Portugal and Greece, although the regions' data are not very accurate[12] the results show that the all the regional contributions are positive and statistically significant. Hence, a more equal redistribution of resources among regions would have reduced the level of disparities in hospital admission.

Therefore, we can conclude that overall pro-rich inequity seems to be related to regional differences in utilisation.

[10] For Austria and France, it is worth remembering that the estimates for regions of residence consider only the last 2 years and not all the years available.
[11] 2.5% of people did not answer and, therefore, a dummy was built for these people.
[12] In Portugal, the database only differentiates the two autonomous islands, Madeira and Azores, from all the rest of Portugal. It could have been useful to have information about the different level of utilisation among the North, Centre, Lisbon and Tagus Valley, Alentejo and Algarve. Indeed, the Central and Northern regions of Portugal are more densely populated than the South. Health care resources are also concentrated in the capital, Lisbon, and along the coast. Alentejo and Algarve have no specialised or central hospital facilities and only few district hospitals.

5.3. Role of specialist visits in the probability of being admitted to hospital

From previous works (Van Doorslaer *et al*, 2000, and 2002c) we know that in the OECD countries the actual distribution of specialist visits across income groups is in favour of the better-off.

Our purpose was to verify if there is a link between the level of pro-rich inequity in specialist visits and in hospital access. The main way to access to hospital is through specialists. Therefore, people who visit more often specialists might have more probability to be admitted to hospitals. As seen before, in many countries, hospital physicians are paid a salary when they treat public patients and, on the contrary, they are paid on fee-for-service basis when they treat private patients. Examples of this are Italy, Portugal, Greece and the UK, where hospital physicians can top-up their income by treating patients privately, in particular physicians who work only part-time for public hospitals. Consequently, the system itself might give more incentives to the providers to treat patients privately.

The results show that in all countries there is statistically significant pro-rich inequity (Figure 4)[13]. Thus, ceteris paribus, higher-income and better-educated people are more inclined to visit specialists than lower-income people. Moreover, the level of inequity in specialist care does not seem to be related to any specific system characteristic. For Belgium and the Netherlands the hypothesis that there is pro-rich inequity is rejected with a 95% confidence interval, but it is not rejected at 90% confidence interval. Portugal has the highest level of inequity in specialist visits exactly as in the case of inpatient care. Furthermore, in all countries, the level of inequity is higher in specialist care than in inpatient care. The only difference, with the estimates of hospital access, is that, in Denmark, Spain, and the UK the actual distribution of specialist care is statistically significantly pro-rich; while the distribution of inpatient care is close to the need-expected distribution in these countries.

As expected, there is a positive relation between the level of horizontal inequity in specialist and inpatient care[14] (Figure 5). Therefore, the distribution of specialist visits across income groups is a relevant factor in the distribution of inpatient care. The better-off seem to have a higher probability to be admitted in hospital through the facilitated access to specialists' visits.

Thus, it would be interesting to measure the influence of specialist visits on the level of horizontal inequity in hospital admission and to verify whether there is still inequity in hospital admission after considering the pro-rich inequity in specialist visits.

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[13] Unfortunately, for France the information about specialist visits is not available.

[14] For the comparison the horizontal inequity index was recalculated pooling the data from the second year. There are no relevant differences with the previous results ad exception of Belgium. Indeed, leaving out the first year of the ECHP survey the horizontal inequity index is not anymore statistically significantly pro-poor. In contrast, no inequity was found in Belgium during the period 1995-1998.

With the intention of understanding the role of specialist visits on the probability of being admitted to hospitals, the total number of specialist visits was included among the regressors[15] for estimating the needs for hospital admission. Differences with previous results are noticeable (Figure 6). The value of the horizontal inequity index decreases in all countries. In Ireland it is not any more possible to detect any significant inequity in the distribution of inpatient care across income. However, these results may be misleading. Although the better-off are more facilitated to visit specialists than their counterparts, people with more needs tend to go more often to specialists whatever their socio-economic class.

We analysed also the probability of being admitted to hospital among the individuals who did not have specialist visits. These admissions are clearly non-elective. On average 80% of the people who received inpatient care visited also a specialist. Clearly, there are differences across countries and they can have an important influence in the interpretation of the results. However, it is worth noting that in the database there is no difference between the specialist visits that have taken place before and after the hospital admission.

Figure 7 shows that, considering only non-elective care, the differences in the horizontal inequity index are more important than previously. In Ireland, Spain, and the UK the horizontal inequity index is statistically significantly pro-poor. In Austria, Belgium, Denmark, Ireland, Italy, the Netherlands, and Portugal it was impossible to detect any significant inequity in non-elective admissions. Surprising, in Greece and Germany the horizontal inequity index is not only positive and statistically significant, but the value is also higher that the one obtained before.

Therefore, it seems that the pro-rich inequity in hospital admission is due to elective admissions rather than to the non-elective ones. Indeed, among the people who did not have specialist visits the distribution of inpatient care becomes more close to the need-expected distribution everywhere. The pro-rich inequity in inpatient care seems to be driven by the pro-rich inequity in specialist care.

6. Discussion and conclusions

The obvious question that can arise is whether there is a correlation between the level of inequity and the characteristics of each health care system. The main problem is that there is not one common health care system in the European Union; rather, there are notable differences across countries. Nevertheless, in almost all countries hospitals are financed through a prospective system even if in some countries there are still elements of costs per case. Private and public hospitals coexist almost everywhere but, depending on each health care system, private hospitals may have a complementary and/or a

[15] The total number of specialist visits is treated as a need variable for the calculation of the need concentration index.

supplementary role for the public provision of inpatient care. All health care systems are also highly decentralised; therefore there can be important inter-regional differences.

The role of regional differences on the probability of being admitted to hospital was tested. The Wald test rejects the hypothesis that the joint regional utilisation is zero in all the countries with the exception of Greece. Although in all countries the HI_{WV} index varies, its value is only marginally affected by the introduction of regional dummies among the regressors. However, there is practical evidence that people in equal needs may receive different treatments depending not only on their income but also on their region of residence. The contribution analysis shows that a more equal redistribution of resources across regions would have reduced the level of inequality in hospital admission everywhere.

It is common to think that the income inequity might be higher in countries where financial and non-financial barriers differ more by income level and where providers have more incentives to treat patients privately, even if the access to hospital care is free or almost free in the European countries. Hospital physicians are salaried employees almost everywhere, in particular when they work in public hospitals. Only in Austria and Belgium, they are paid on a fee-for-service basis. It is important to remember that in Italy, France, Portugal and the UK providers have financial incentives to treat patients privately. In Greece unofficial payments are common practices. The results show that in these countries there was pro-rich inequity with the exception of the UK, where it was impossible to detect any inequity. This can be related with the low number of hospital beds per 1000 inhabitants in this country (figure 1 and 8). Portugal, Italy and Greece also have a higher level of income inequity in admission rate than the other countries. Income inequity is particularly high in Portugal.

A relation between the level of horizontal inequity and the number of hospital beds for individuals in the European countries seems possible. For example, Austria that has a very high level of income-related inequity in hospital admission has also the highest number of hospital beds per 1000 inhabitants and the highest admission rate (figure 8). The only exceptions are Portugal, Italy and Greece where the level of horizontal inequity seems to be more related to regional disparities and specialist inequity. Although the relation is not linear, countries with higher bed availability have, on average, also a higher level of inequity in inpatient rate. Clearly, the priority is always given to people who have more needs for inpatient care. Supplier-induced demand and patient's selection can happen more easily when the number of beds is enough to cover the most important needs of the population.

Moreover, it is interesting to notice that in the Netherlands and Ireland there is no inequity in hospital admission for people in the lowest income quintiles. In both countries the eligibility depends on the income of individuals and, hence, people at the bottom end of the income distribution are completely covered; while the ones who have an income above a certain threshold have limited public coverage.

In all European countries there is pro-rich inequity in specialist visits. Thus, ceteris paribus, higher-income and better-educated people are more inclined to visit specialists than lower-income people. We tested the hypothesis that the level of inequity in specialist care can drive the level of inequity in hospital admission. Overall, the results show that there is a positive relation between the two inequity indices. Moreover, in the estimates of inpatient probability for people who did not have specialist visits the pro-rich inequity disappears in all countries with the exception of Greece and Germany. Surprising, in these two countries the level of inequity increases when we analyse non-elective admissions. In Greece, the high level of unofficial payments can be the cause of this phenomenon; while for Germany there are not clear reasons.

Therefore, from the results of this analysis, we can conclude that the higher income individuals are more likely to receive inpatient care in most countries. Although different combinations of supply and demand factors determine the level of inequity, the number of specialist visits, inter-regional differences, and bed availability affect significantly the probability of being admitted to hospital in each health care system. This can have interesting policy implications. Policies oriented to reducing the overall level of inequity in specialist care have important indirect effects also on the level of horizontal inequity in inpatient care.

It is worth noting that I could not estimate the level of inequity in hospital day-care. The overnight admissions are primarily emergency admissions and other cases such as childbirth; and we can expect that these treatments are more close to needs than day cases. Moreover, it was supposed that between poor and rich people there is no difference in the quality of care. Unfortunately, I do not have information to measure quality differences in hospital care among European countries. However, it is well known that the better-off not only have more probability to be admitted to hospitals but also receive better services.

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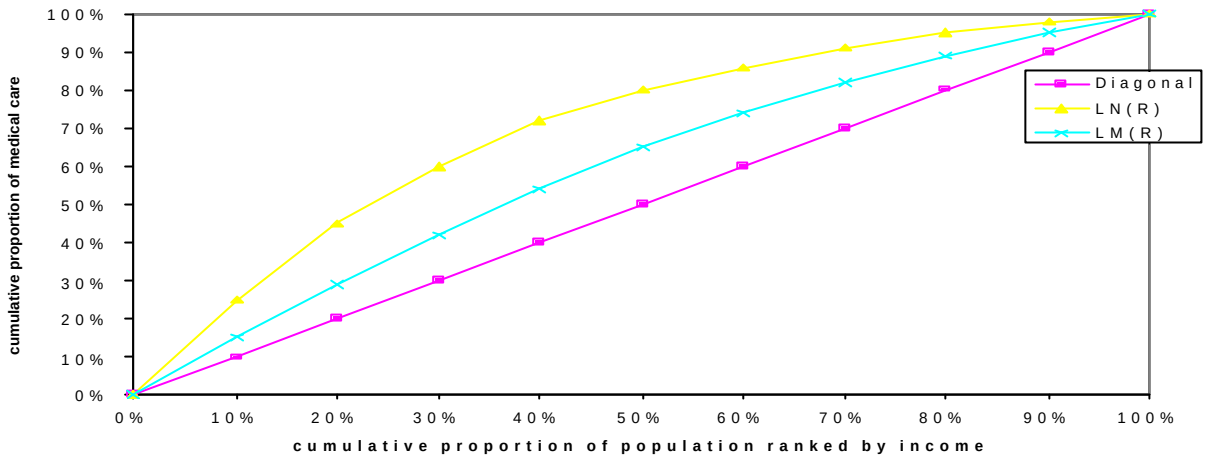
APPENDIX 1
How to measure the horizontal inequity index

Supposed that y_i is the amount of medical care received by an individual i in a given period, the distribution of medical care by income can be represented by the medical care concentration curve $L_M(R)$.

In figure 9, the horizontal axis is the cumulative proportion, R, of the sample ranked by income (from the worst-off to the most well-off), and the vertical axis is the cumulative proportion of medical care. Therefore, $L_M(R)$ plots the proportion of medical care used by each person ranked by income. If there is equality in medical need, $LM(R)$ coincides with the diagonal. If the delivery of medical care advantages the worse-off (better-off), $L_M(R)$ lies above (below) the diagonal.

Figure 9 Horizontal inequity index



The concentration index, *CM*, is a measure of the degree of inequality in the distribution of medical care that is associated with the income of individuals. Thus, *CM* is based on $L_M(R)$, and it is defined as twice the area between $L_M(R)$ and the diagonal.

2) However, the needs of health care are, on average, related with the income distribution. Thus, it is necessary to quantify also the degree of inequality in needs. Using the indirect standardization approach, it is possible to generate the predicted value of medical care for each individual that depends only on the population needs. The predicted value indicates the amount of medical care that each individual would have received if she/he had been treated, on average, by the system, as others with the same need characteristics. The concentration curve for needs, $L_N(R)$, plots the need of medical care. There is equality in needs if $L_N(R)$ coincides with the diagonal. On the contrary, if the delivery of medical care advantages the worse-off (better-off), $L_N(R)$ lies above (below) the diagonal.

3) To quantify the level of horizontal inequity in the delivery of health care it is necessary to compare the level of needs with the amount of medical care received by ranking each individual by income level. The principle of "equal treatment for equal need" is violated if the share of medical care does not equal the share of needs. Thus, the degree of horizontal inequity can be measured by comparing the curves $L_M(R)$ and $L_N(R)$. When there is horizontal equity, HI_{WV} equals zero. However, a zero index value is a sufficient but not necessary condition for implying no inequity. Yet, there is horizontal inequity favouring the better off (worse-off) if the need concentration curve lies above (below) the medical care concentration curve. Whenever the *CM*, *CN* and HI_{WV} are in favour of the better-off (worse-off) they have positive (negative) values.

The horizontal inequity index, HI_{WV}, can be defined as twice the area between $L_N(R)$ and $L_M(R)$ and it is equal to the difference between *CM* and *CN*. Alternatively, it is possible to compute *CM* and *CN* with a "convenient" regression (for references see Kakwani et al (1997), and Wagstaff, van Doorslaer (2000)).

APPENDIX 2

How to decompose the horizontal inequity in health care delivery

Suppose to have a linear regression model linking the variable of interest, the medical care use (*yi*), to need and non-need variables, respectively *xi* and *zi*:

$$y_i = a + \sum_i b_i x_i + \sum_i g_i z_i + e_i \qquad (1)$$

Given the relationship between y_i and xi, zi_i, the concentration index can be written as:

$$C_M = \sum_i (b_i \bar{x} / \bar{y}) C_{xi} + \sum_i (g_i \bar{z} / \bar{y}) C_{zi} + GC_e / \bar{y} \qquad (2)$$

where $\bar{y}$ is the weighted mean of y, $\bar{x}$ is the mean of x_i, $\bar{z}$ is the mean of zi, C_x is the concentration index for x_i (defined analogously to *CM*), C_z is the concentration index for z_i and GC_e is the generalized concentration index for ε_i.

Equation (2) shows that *CM* can be thought of as being made up of three components. The first two are the deterministic components, equal to the weighted sum of the concentration indices of the need and non-need regressors. The weight for each determinant is simply the health elasticity evaluated at the sample mean. The third is a residual component, captured by the last term. This reflects the inequality in health that cannot be explained by systematic variation across income groups. The causes of inequality can be divided into inequalities in each of the need and non-need variables. By replacing the weighted population means, coefficients, and residuals with the sample estimates, it is possible to define the estimated demand elasticity of each determinant as:

$$\hat{h}_k \equiv \hat{b}_k \bar{x}_k / \bar{y} \qquad (3)$$

Hence, the contribution of each determinant to total income-related inequality in health care demand can be decomposed into two meaningful parts: 1) its impact on demand, as measured by the demand health elasticity ($?_k$); 2) its degree of unequal distribution across income, as measured by the (income) concentration index (C_k).

To obtain HI_{WV} it is necessary to sum only the contribution of the non-need variables and of the error term, given that $HI_{wv} = C_M - C_N$.

Table 1 Differences in hospital care in Europe.

Countries	Financial system	Decentralisation	Private /public hospitals	Hospital financing	*Hospital payment*	Hospital physicians payment
Austria	Austria's social insurance funds cover almost all labour force participants and retirees.	The administration is federal and tasks are delegated to the Lander. For hospitals, the federal government only formulates the basic law; the Landers are charged with its implementation. They plan and regulate inpatient care	49 private hospitals. Inpatient care is provided by public and by non-profit organizations	Since 1997, 70% of the services provided by hospitals have been paid for by prospective arrangements; the other 30% retrospectively.	3.6-4.4 euros per days for up to 28 days.	Fee for services combined with capitations.
Belgium	Compulsory health insurance. There are essentially two schemes: one fore salaried workers and one for self-employed. Social solidarity principle.	The regulation and supervision of the health insurance system takes place at the federal level and the national government also transfer some funds to the insurance system. Different public health policies and services are provided in the French and the Flemish community.	Health care providers are predominately private (about 60%) non-profit institutions. The rest is public. The public and private organisations are complementary.	The legislation and financial mechanism are the same for public and private Hs. Non-medical Hs activity is funded via a fixed prospective budget system, while medical services are covered by f-f-s system.	co-payments I: not uniform, depending on type of intervention, but typically very low (around 5%).	Fee-for-services
Denmark	The system is mainly financed by state, county and municipal taxes. Other sources of finance include out of pocket payment and voluntary health insurance.	The responsibility for primary and secondary care is decentralized. The counties own and run hospitals and prenatal care centres. They also finance GP and other physicians. Few hospitals, mainly located in the Copenhagen area and private for-profit hospitals are regulated by the government.	There are very few private hospitals. Danish hospitals are general public hospitals.	The main way of financing hospitals is via prospective global budgets fixed by counties in negotiation with hospital administrators. However, since 1993 some counties have introduced contracts with hospitals.	Free of charges	Hospitals physicians are salaried employees
France	Statutory health insurance. The participation is based on professional status. There are 3 schemes. Until '96 the financing depended almost exclusively on contributions. Now it is more based on total income. The SHI system counts for almost 75% of health expenditure.	From 1996 regions have more responsibility. There are regional hospital agencies responsible for hospital planning and allocation of resources and adjustment of tariffs. There are also regional unions of the health insurance schemes. Needs of the population and priority are also settled at a regional level.	Public hospitals account for ¼ of the Hs and ¾ of the beds. Non-profit Hs account for 1/3 of Hs and 15% of beds. Private Hs account for 40% of Hs and 20% of beds. Public and private provide different services. Private: 1/3 of medical, surgery and obstetric and 1/2 of minor surgery.	The payment is mainly prospective. For public Hs it may change among regions. Regions allocate budgets. For non-profit Hs: fixed rate payments and technical environmental related to the procedures carried out. Private Hs whether participate in the public services can choose.	Access to hospital is not limited. A complex system of co-payments (and exemptions) applies, but close to 93% of hospital expenditure is covered by the social health insurance	Hospital physicians who work in private are paid on fee for service basis. Doctors working in public HS are state employees. University hospital doctors are allowed to work part-time to private practice within the hospital.
Germany	The health system is mainly financed towards statutory health insurance. Sickness fund membership is compulsory for employees. Other sources of finance are taxes, out of pocket payments and voluntary	The German health care system is highly decentralized between the Landers and the federal government.	Private non-profit and for-profit hospitals co-exist with public institutions.	The German-style budgets are not budgets, because hospitals get money independently of actual activity. Since '93 and mainly after '96 particular inpatient care are financed towards prospective	8.7 euros per day to a maximum of 14 days per year. Full or partial exemption for children (under 18), unemployed people, those on income support and students receiving grants.	Hospital physicians are salaried. The head of medical departments usually have the right to charge private patients for medical services on top of the hospital

	payments and voluntary health insurance.			towards prospective payments.		on top of the hospital charges.
Greece	A mix of tax-based and statutory or private insurance finances the health care system. It was estimated that about half of the total private expenditure involves unofficial payments.	The Ministry of Health and welfare is the leading institutions in developing and financing health policies. Even if the NHS is based on regional and district division, the country local authorities play a minor role.	The private sector is very large. The NHS owns and operates 32% of the hospitals. Private hospitals provide high quality care and are mainly located in urban areas.	Public hospitals are financed by social insurance funds on a per diem basis. While private hospitals are financed partly by sickness funds and partly by private out-of-pocket payments and voluntary insurance.	Public sector: Official payments through SI but unofficial payments still prevalent. Private sector: Large with most finance from OOP	All the doctors employed within the NHS are salaried. Private doctors are paid on a fee-for-service basis. Unofficial payments are a prominent feature.
Netherlands	The health care system is mainly financed by public and private insurances schemes. - National health insurance for exceptional medical expenses, compulsory. - Sickness funds, compulsory under a certain income; - Supplementary health insurance.	As said, there is private insurance for individuals above a certain income and supplementary health insurance that cover for example the cost of dental care, prosthesis and alternative treatment.	Even if almost all Dutch hospitals are private and are all non-profit organizations, government heavily regulates them.	Charges of hospital care services are uniform throughput the country, with the exception of the per diem price for a hospital bed. All hospitals have an overall annual budget, calculated prospectively.	Free at point of delivery.	The payment of physicians depends on their position. Recently, medical specialists can work also in private practice.
Italy	The health care system is mainly financed through regional and national taxation and co-payments.	The NHS is highly decentralised. The regional health plan translates the national objectives and targets into financing and organisational measures, considering regional needs. Moreover, all local health units and tertiary hospitals are autonomous (*aziendalizzazione*).	Hospital care is delivered mainly by public structures.	Since '92 university, highly specialised and national relevant hospitals have become trusts. They have considerable financial responsibility. The payment system in the financing of health care is prospective. Regions are free to determine the rates, but the maximum level is decided nationally.	Free at point of delivery.	Hospital physicians are classified in first and second level physicians. They are salaried employees but the salary depends on their level. In addition, they can earn up by treating patients privately.
Ireland	Health care system is financed through general taxation and private insurance. Access to health services is based on a means-tested system of eligibility. There are two categories of individuals: • Category I (people whose income fall under a certain threshold) has		Thirty of the hospitals are public hospitals. However, the private sector has grown considerably in the last years. There are 18 hospitals that are not funded by the state.	There are three different types of hospitals payments: • Voluntary Public Hospitals receive annual funds from the state; • Private hospitals have ceilings, if they exceed them, are paid on variant marginal costs;	Co-payments for category 2 patients in public wards of 25.4 euros per day up to a maximum of 254 euros in any 12-months period.	

	almost all the service free. • Category II has limited eligibility.			• For health Board hospitals the budget depends on historical expenditure. Since 1993,case-mix measures are also taken in consideration.		
Portugal	The health care system is - The NHS; - Special insurance schemes for certain professions; - Voluntary private health insurance. HC finance is partly public partly private. High percentage of out-of-pocket payments	Since 1993 five regions have been established. They have financial responsibility.	Private sector mainly plays a supplementary role. In 1996, 42% of hospitals were private and half of these were for-profit organisations.	Public hospitals have a global budget based on historical data. In addition, they receive payments from patients for special services, from beneficiaries of the health subsystems or private insurance.	Inpatient treatment is free.	In the NHS all doctors are paid a salary. They receive additional payment for overtime. Half of the NHS doctors work also in the private sector.
Spain	The health care system is financed mainly out of general taxation. Complementary sources of finances are: out-of-pocket payments and voluntary insurance.	Decentralisation is mainly based on the model of devolution, so that health care responsibility is transferred from the central government to the regions, in line with the basic constitutional structure of the country. There are seven special Autonomous and ten ordinary Communities. Formally, health areas are the basic structure of the health system. Each area is responsible for the management of facilities, benefits and health services programmes. They provide: PHC, specialized ambulatory care and hospital care.	Most hospitals are public. Sometimes autonomous health services and INSALUD contract out services, if necessary, to private hospitals. Thus, inpatient care is provided by public and private structures.	Hospitals are financed through a global budget. Since the early '90s some regional health services and INSALUD have used contracts between the third payer and the H. Now the financing is mainly trough negotiation, and it is mainly prospective. Hs outside the NHS may rely on their own sources of financing but they may also provide services to the NHS, through contracts.	Free at point of delivery.	In the hospital there is an extensive network of outpatients ambulatory centres. The majority of the staff is salaried employees. The physicians are paid by salary but there are also rewards available for meeting efficiency targets.
UK	The health care system is financed mainly through central government taxation and national insurance contributions. Complementary sources are private, out-of-pocket payments for non-prescription medicines and for private health care.	Since 1991 reform, many measures have been designed to increase efficiency, quality and choice decentralising the health care system. With the NHS and Community Care Act 1990, the responsibility for purchasing health care services was separated from the responsibility for providing them and the main purchasing function was allocated to district health authorities (DHAs). Each DHA assesses the health care needs of its population and commissions a range of services from providers to meet these needs.	There are about 230 independent medical/surgical hospitals. There have been some vertical integrations between insurance function and hospital ownership in the private health care market. For the most part, private acute services are supplementary to NHS, in other cases have	Contraction system: funds are transferred from purchasers to hospitals. There are three types of contracts. The sum of money agreed in these contracts depends on the historical data and on the costs of particular episodes, defined accurately. Overall, hospital payment is a mix of global budgets with elements of cost-per-case payments.	Free at point of delivery.	Hospital doctors are salaried employees. Full time NHS senior specialist can increase by 10% their gross income practising privately. Physicians who work only part time for the NHS can engage in private practice without restrictions. Doctors are paid fee-for – services for private

			replaced the insufficient NHS provision.			consultations

Source: WHO: Health Care System in Transition for all the countries ad exception of Ireland and the Netherlands for which I used different sources.

Figure 1. Relationship between bed availability and the probability of being admitted to hospital

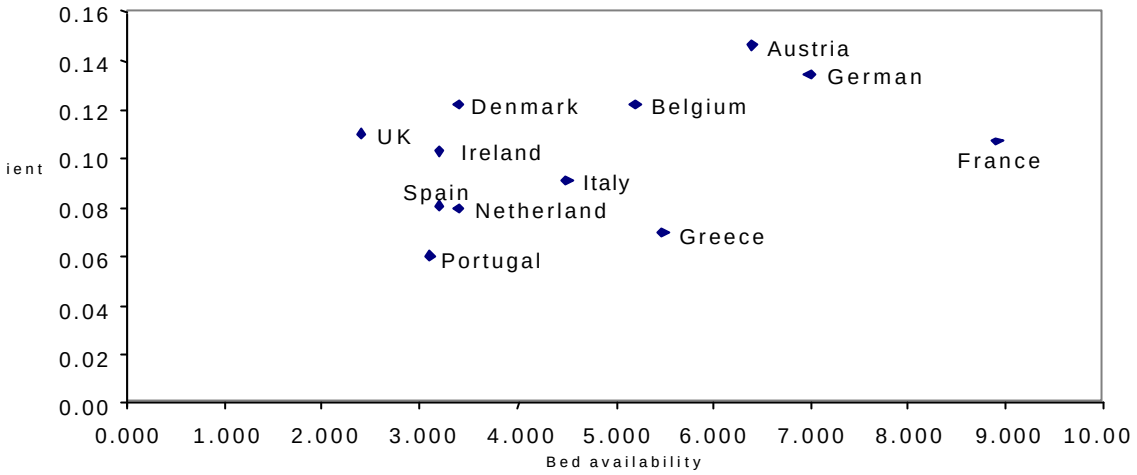


Table 2. Wald test for year dummies

	Austria	Belgium	Denmark	France	Germany	Greece	Ireland	Italy	Netherlands	Portugal	Spain	UK
Prob > chi2	0.729	0.230	0.279	0.003	0.815	0.000	0.845	0.006	0.025	0.603	0.023	0.045

Figure 2. Medical care and need concentration indices.

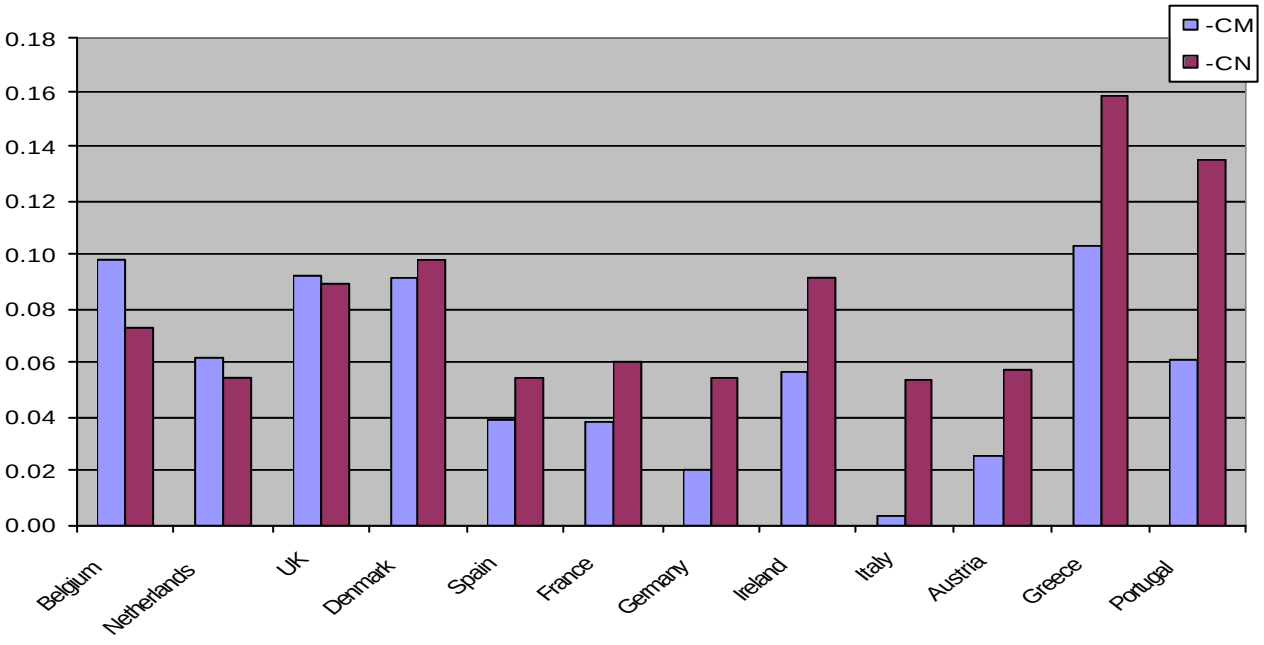
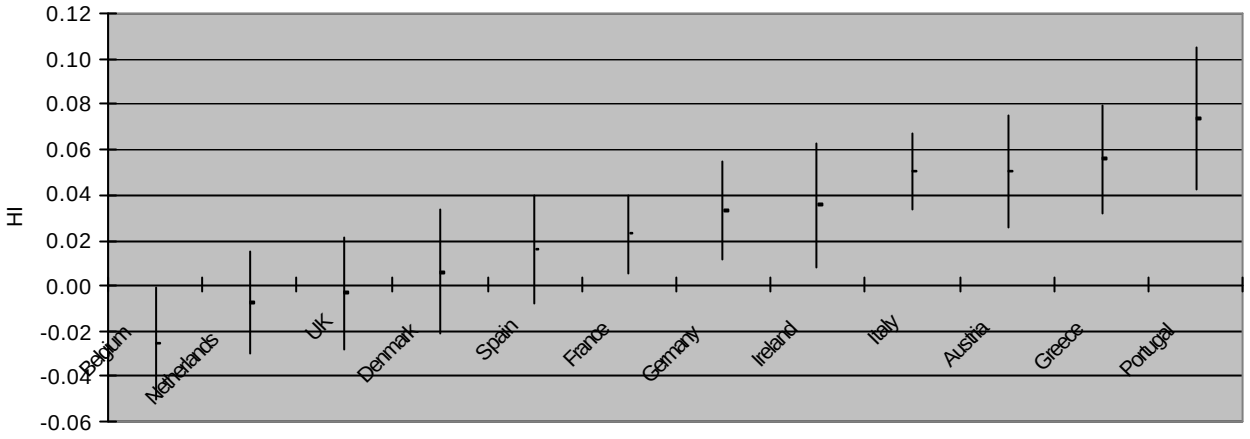


Figure 3. Horizontal inequity index for inpatient rate



	Austria	Belgium	France	Greece	Ireland	Italy	Portugal	Spain
Prob > chi2	0.000	0.001	0.009	0.648	0.009	0.000	0.000	0.001

Regions	Austria		Belgium		France		Greece		Ireland		Italy		Portugal		Spain	
	CI	%Con/HI	CI	%Con/HI	CI	%Con/HI	CI	%Con/HI	CI	%Con/HI	CI	%Con/HI	CI	%Con/HI	CI	%Con/HI
r2	0.07	**-13.54**	0.01	-2.77	-0.08	**3.11**	-0.03	**0.70**	-0.05	**-15.07**	0.15	**-1.38**	0.02	**4.59**	0.12	**-3.18**
r3	-0.10	**7.01**	-0.04	**7.16**	-0.18	**-2.68**	-0.14	**1.17**	0.10	0.29	0.12	**1.82**	0.00	**0.54**	-0.10	**11.97**
r4					0.02	1.03	0.20	**-6.92**			0.28	**2.65**			-0.21	**19.31**
r5					-0.07	**-0.36**					0.05	**-0.68**			0.12	**4.04**
r6					-0.08	**1.03**					0.09	**-0.83**			-0.20	**32.54**
r7					0.00	-0.08					-0.02	-0.04			-0.24	**7.44**
r8					-0.06	**-0.21**					-0.23	**3.65**				
r9											-0.22	**7.21**				
r10											-0.23	**7.07**				
r11											-0.21	**2.02**				

Table 4. Regional concentration indices and contributions in percentage of the horizontal inequity index

Note: The bold numbers are statistically significant at 5% level.

Regional codes: Austria- r1 West, r2 East, r3 South-. Belgium – r1 Brussels, r2 Flemish area, r3 Walloon-. France – r1 Ile de France, r2 Bassin Parisien, r3 North, r4 East, r5 West, r6 South-West, r7 Centre, r8 Meditterranee-. Greece – r1 Kentriki, r2 Nisia, r3 Voreia, r4 Attiki-. Ireland – r1 Dublin, r2 all the rest, r4 non-answered-. Italy – r1 Lombardia, r2 North-West, r3 North-East, r4 Emila, r5 Lazio, r6 Centre, r7 Abruzzo and Molise, r8 South, r9 Campania, r10 Sicilia, r11 Sardegna-. Portugal – r1 Portugal ad exception of islands, r2 Madeira, r3 Acores-. Spain – r1 Madrid, r2 North-East, r3 North-West, r4 Centre, r5 East, r6 South, r7 Canaries.

Figure 4. Horizontal inequity indices in specialist care

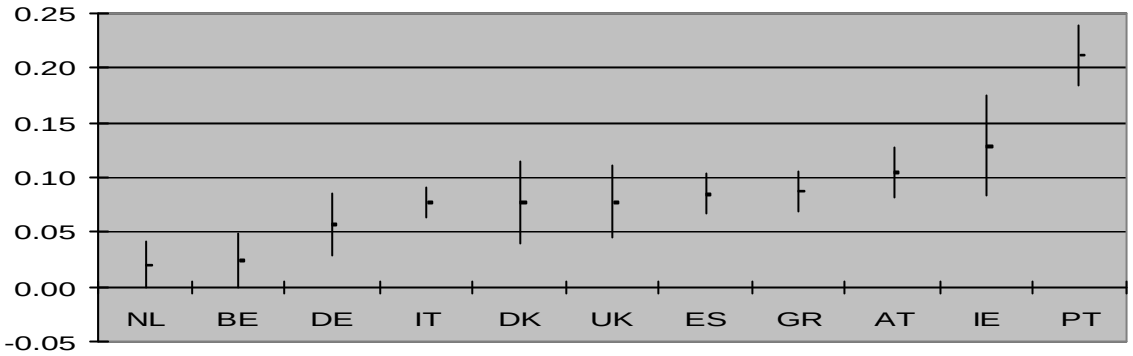


Figure 5. Relationship between horizontal inequity indices in inpatient care and in specialist visits

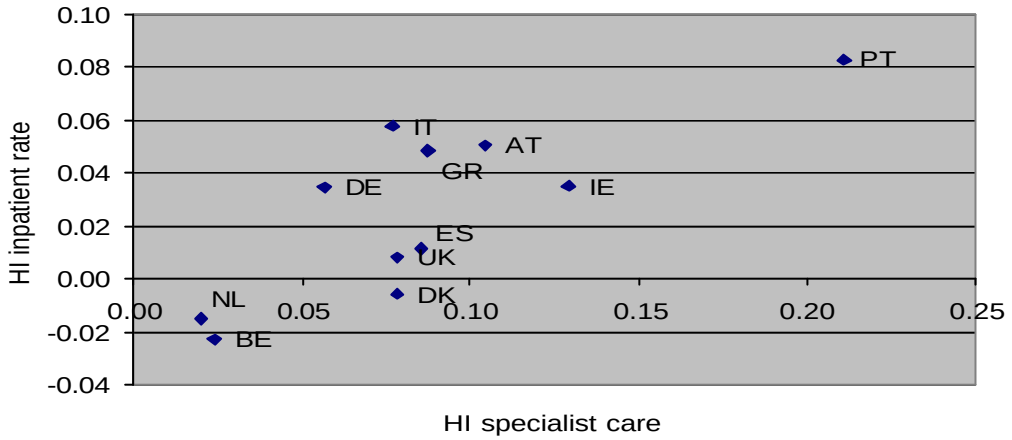


Figure 6. Differences in the horizontal inequity index due to the introduction of specialist visits among the regressors

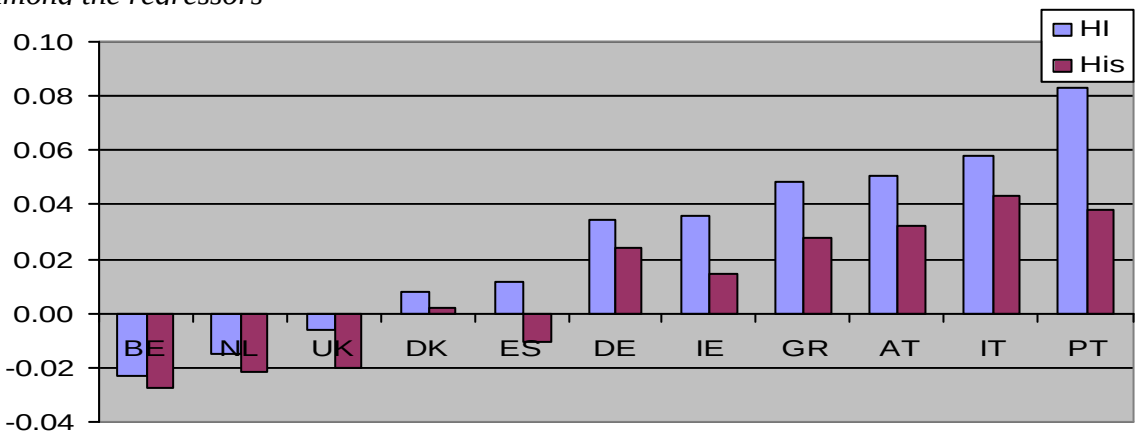


Figure 7. Horizontal inequity index for hospital admission conditioned on visiting a specialist at least once.

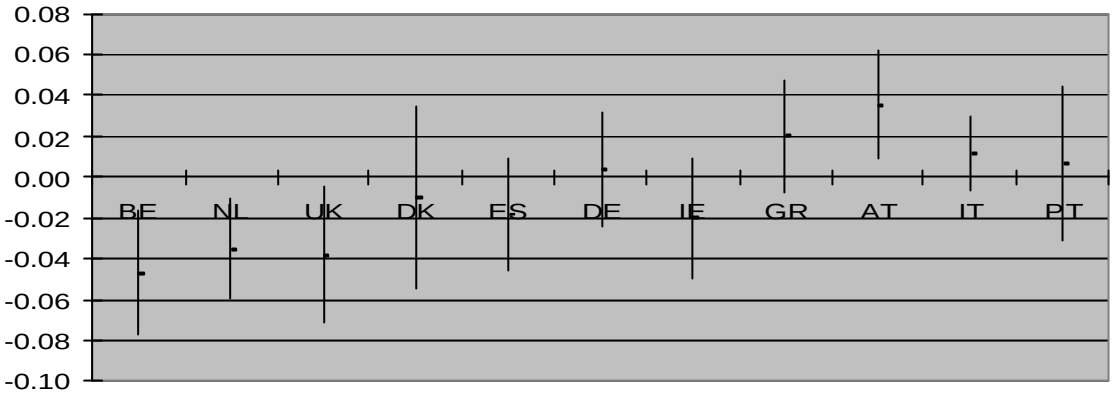


Figure 3.12 Relationship between bed availability and the horizontal inequity index