Equity in healthcare financing in Italy

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Dr. Domenico De Matteis

Supervisor   Co-Advisor
Prof. Margherita Giannoni   Prof. Guido Citoni

FACOLTÀ DI ECONOMIA

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Summary

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EXECUTIVE SUMMARY

This Ph.D. dissertation discusses equity in healthcare financing in Italy. Each of the three chapters of this dissertation constitutes an independent research output, answering stand-alone research questions. Chapter 1 is a systematic review on equity in healthcare financing in OECD and non-OECD countries. This deals both with the methodology used and the evidence around the world on vertical equity in healthcare financing. Chapters 2 and 3 report empirical evidence from Italy. Chapter 2 analyses the progressivity of healthcare financing in the Italian system and focuses on Italian regions, performing a comparison of progressivity of the healthcare financing across regional systems. Chapter 3 provides an assessment of how differences in co-payments between the Italian regions contribute to growing inequalities in access to public health care services in Italy. A common ground among chapters is the measurement of equity and inequalities in health financing, with particular reference to differences among the Italian regions.

INTRODUCTION

The regionalization of the Italian Health Care System (SSN- *Servizio Sanitario Nazionale*) dates back to the beginning of this century. The aims of the reform, adopted under pressure from political parties representing the Northern, more economically advanced regions, were both to improve the efficiency of public spending in health care and to obtain a better representation of specific needs and preferences of citizens, due to commitment of regional political bodies to territorial specificities. Though, any regional autonomy brings with it the risk of widening differences between Italian citizens, both in quantity and quality of care received, and in the resources needed to finance essential levels of care. A concern for equity has lagged for long, mainly because the reform was coupled in the first years with a soft budget constraint, allowing each region to increase the amount of resources available for their regional health services. After the 2008 global financial crisis, problems increased tremendously, because resources were reduced in real terms (and in some years, even financially) the burden of financing health care shifted to private resources either in the out-of-pocket form or through a growing sector of supplementary funds, strongly encouraged by central political bodies, but unevenly distributed in the regions, and mainly financed by firms, whose location was almost entirely concentrated in northern regions.

This work stems from the desire of assessing the relevance of income-related inequalities among Italian citizens with respect to specific health care equity issues of the SSN. In order to evaluate if a health care system is equitable, several types of inequities could be measured each referring to different equity concepts (Wagstaff and van Doorslaer [27]; Fleurbaey and Schokkaert [7]). A widely used approach measures income-related inequities in health care access (or use), inequities in healthcare financing and, ultimately inequities in health status [27]. The mainstream public economics literature focuses on the concept of horizontal equity when dealing with access/use of

health care services (ibid.). This would imply that individual citizens with the same needs should receive the same amount of care, i.e. irrespective of their socioeconomic status, particularly their ability to pay for such services [27]. This implies verifying if there are, e.g., for any given type of health care service, unacceptable differences based on income, or on education race, area of residence, sexual orientation or on other individual characteristics that could be considered as unacceptable sources of inequalities in services access or use. The evidence for Italy is mainly focused on the measurement of income-related horizontal inequities in health care use and access [9] and on the socioeconomic determinants of inequalities in health, particularly at the regional level [22]. Newly, this thesis deals with the less explored issue for Italy of measuring vertical inequities in financing. The underlined inequity concept is intended as the violation of the vertical equity principle of paying more for health care the richer you are, i.e., the higher the ability to pay for that [12],[27],[18]. We will refer therefore to this concept derived from the public economics literature. In our case, the aim will be to measure if the inhabitants of different Italian regions face the same pattern of progressivity/ regressivity in financing costs, both private (voluntary choices) and public (compulsory financing). The mainstream approach in the measurement of vertical inequities in health system financing is to use an index of progressivity, the Kakwani index[1]. By using such index in assessing the progressivity of healthcare financing in different regions, significant differences emerged, though probably not so wide as in health care utilization. Sometimes it is a matter of decimals, preserving the sign of the index for a specific source of financing in all the regions, other times we have a change in sign, implying a shift from progressivity to regressivity and vice versa, other times our assessment is rather tentative or cannot be subject to an easy interpretation. The last is mostly true when we have to deal with out-of-pocket payments or co-payments. In fact, out-of-pocket expenditure, if progressive, implies not only higher payments for the rich but also more utilization, while progressivity in public sources of financing is mostly independent from the use of services. A suitable concept, then, could be to assess the net benefit progressivity, i.e. if the difference between benefits and payments shows any definite pattern, correlated with the ability to pay. As data on health care services' benefits were not available this method could not be applied. Nonetheless, an effort was made to analyse another aspect of financing, closely related to the concept of catastrophic payments: the fact that having to pay high co-payments prevents needed consumption of services, acting as a barrier to access.

We know that, in economic theory, the rationale for co-payments is that they are the most effective way to fight ex-post moral hazard, though if they are used mainly as a source to raise money in an undifferentiated way, without taking account users' ability to pay and without using the tool of exemptions, they can affect the use of services when needed, fostering higher expenditures in the future.

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[1] Other approaches may be used to measure vertical equity in health financing as, e.g., those derived from the health care performance management literature. This work however, is focused on the methods developed by the public economics literature.

In Italy, along with regionalisation, there has been a devolution of governance on public co-payments (tickets) to regions. At the end of the past century, a political cycle was clear looking at the use of co-payments' rebates before national polls (and new increases afterwards). In the new century, the evidence is not clear-cut, as increases in co-payments (*supertickets*) are often associated with regional financial crises and to deficit reduction plans (*piani di rientro*). The amount and distribution of co-payments was then very scattered between regions, becoming a source of big differences in access, and a territorial bias is expected, as they were heavily concentrated in Southern regions.

In the last part of the research, the differences between regions in access to services were measured. It was found that our country, although equipped with a theoretically universal and egalitarian public system, does show forms of socio-economic inequalities in access to health services.

The first paper to be submitted to Applied Health Economics and Health Policy with M. Giannoni and G. Citoni co-authoring, is a systematic review of the international evidence on the measurement of equity in healthcare financing, i.e. of vertical equity. We refer to the vertical equity concept as above mentioned. There is increasing evidence showing inequities in healthcare financing [27],[7],[22]. However, there is a lack of updated studies systematically reviewing evidence on this topic by looking at both OECD and non-OECD countries. The main aims are: 1) to identify the main methods used; 2) to draw lessons for the Italian case, particularly looking at regionally decentralized systems. A systematic review of the literature was conducted and reported in line with the Preferred Reporting Items for Systematic Reviews and Meta-Analysis with a focus on health equity [29]. Preliminary search terms were identified and pre-tested on Google Scholar. The results were used to refine the search terms. The following electronic databases were searched: EconLit, Ideas, SSRN, PubMed, and Google Scholar. Based on the eligibility criteria, studies were selected through systematic screening made up of the following processes: exclusion of duplicates; screening based on titles; scrutiny of abstracts and finally a review of full articles. This process was conducted by a single reviewer and repeated by a second reviewer to ensure reliability. Each article has been independently reviewed and for each article the methodology has been critically examined. Disagreement was resolved through a refereed decision. Key study characteristics that were extracted include: author(s) and dates of publications, objectives of the study, the country where the study was carried out, study design, equity variables measured and key findings and conclusions. Moreover, reference lists of selected articles were manually searched in order to identify relevant publications for inclusion. The search was limited to English written peer-reviewed studies. The number of articles that met all the criteria for inclusion of the review was 32. The time frame of the articles included ranges from January 1977 to November 2019 (Table 1). For each article, we critically reviewed and compared methods. We followed PRISMA methodology extended with a focus on health equity. We reviewed the evidence for both OECD and non-OECD countries, with the aim of drawing lessons for countries where healthcare financing is heavily decentralized, such as Italy. This work contributes to the existing literature by adding recent years to the analysis and by taking into considerations both OECD and non-OECD countries. Newly, we have reported the results in a map

that gives a big picture of regressivity around the world and makes the interpretation of the results more intuitive.

This study can also contribute both to advancing the knowledge on methodologies aimed at measuring vertical equity in healthcare financing and to illustrate the great variability of inequity measures of financing across countries. We found that the most widespread method used is the Kakwani index. Studies that analyse equity at both national and decentralized level seem more precise and give a more detailed equity picture useful for policy makers. Aggregate results very often portray the average progressivity and therefore can conceal different results at the disaggregated level. Therefore, it would be important to have more evidence for decentralized health care systems. The overall levels of progressivity appear very variable across countries, given the high variability in the relative shares of the different sources of financing. For non-OECD countries, the main source of equity concerns are out-of-pocket expenses given the relevance of direct payments in the majority of low-income countries. This has led to increasing inequalities and it has been found that more and more people are falling into poverty due to high health costs. Direct payments show to be regressive even in OECD countries, but occupy a less substantial portion of total financing, and the overall financing system is influenced by other less regressive sources.

Predominantly tax-financed systems are slightly progressive, particularly in the poorest countries, where often health financing relies heavily on out-of-pocket (OOP) expenses. In OECD countries, direct payments are often regressive, but occupy a less substantial part of total financing. In OECD countries, systems funded mainly through general taxation, tend to be proportional or moderately progressive, while social insurance systems appear moderately regressive, whereas systems based on private financing are the most regressive. In some countries, such as Italy, the introduction of VAT as a source of health financing has led tax financing to become regressive, whereas previously it appeared progressive. Results show the importance for Non-OECD countries of improving equity in healthcare financing by reducing the relative weight of direct household's payments source of financing. This appears also to be a growing challenge for decentralized OECD countries where, after the global economic crisis, the relative share of direct payments increased due to cost containment policies. The COVID-19 pandemics is making even more evident that the health systems of countries affected by vertical inequities need urgently to be further reformed.

The overall degree of progressivity, in Italy, appears mildly positive [25]. Italy's health care system has been reformed several times, particularly after the introduction in 1996 of fiscal federalism in healthcare financing and with legislative decree n.56/2000. There is evidence that this process introduced an increase in horizontal income-related inequities in health and health care utilization, both between countries at European level [24] and within Italy, between regions [16],[8]. Today, the system appears to be heavily decentralized at a regional level, with varying financing rules across regions, particularly in terms of co-payments on public health care services for drugs, specialist and diagnostic care [2]. Wagstaff et al [25] estimated concentration indices and progressivity indices, based on the Kakwani [12] methodology at country level in Europe. Regarding direct taxes, they found that Italy is the country with the lowest degree of progressivity. Regarding indirect taxation,

instead, Italy was one of the few progressive countries. Wagstaff et al [25] found that out-of-pocket payments tend to be highly regressive in general. Along the line of these works, we wanted to estimate the concentration index and Kakwani index for Italian regions. In Italy, the central question is that the principle of equity was not on the agenda of policy-makers when the regional reorganization of the national health system started. The complex mechanism resulting from the combined provisions of Legislative Decree 56/2000 (abolition of the national health fund) and of the Constitutional Law 3/2001 (reform of Title V of the Constitution) only marginally took into account funding according to the real needs of the population. Italian funding at the regional level was based on different sources, whose real distributional effect was not a matter of concern: such sources were partly redistributed among regions by using a sharing mechanism, such as for VAT revenue (value-added tax) and excise duty on petrol (later eliminated) and partly handed directly to regions were the amount were cashed, such as the regional additional surcharge on the personal income tax, and IRAP (regional tax on productive activities).

For these reasons the second paper, to be submitted to the review European Journal of Health Economics with G. Citoni and M. Giannoni, analyses the progressivity of healthcare financing in the Italian system and focuses on Italian regions, performing a comparison of progressivity of the healthcare financing across regional systems. Until now, there was no such evidence for Italian regions [25],[26], and it is important to fill this gap as the Italian health financing system has changed during the last years. This paper presents the first comprehensive and consistent analysis of the distribution of healthcare financing contributions in relation to ability to pay in the 20 Italian regions. The analysis of the progressivity of the Italian regional health care systems is conducted in three steps. In the first step, the progressivity of each source of finance: direct taxes (IRAP and additional IRPEF), indirect taxes (VAT), out of pocket and private health insurance is estimated. In the second step, in order to define the financing mix, for each region the relative weight of each source of financing is calculated. In the final step, the overall progressivity for each region is estimated by using the financing mix. In this way, it is possible to compare the indices between regions [19]. Two types of data are required: 1) survey data, in order to establish the distribution of payments across households; 2) aggregate data, in order to estimate the macro-weights for each financing source. The most suitable source of survey data is usually based on household income and expenditure survey, which contains data on our two central variables, namely payments for health care and ability to pay [19]. Unfortunately, no such comprehensive survey is available for Italy. Therefore, we were forced to perform a matching of two datasets. We matched microdata from the 2015 wave of the Italian households' budget survey (HBS, n=15013 households) with the Eurostat EU-SILC (European Statistics on Income and Living Conditions) cross-sectional wave for 2015 (n= 42987 individuals/ 17985 households). HBS dataset contains information on household expenditures for goods and services according to their main social, economic and territorial characteristics. The matching procedure between HBS and EU-SILC is based on a mixed strategy. We first utilized exact matching with hot ranking [3]. As matching variables, we used the following grouping characteristics of the head of the household: age group (4 classes), gender (2), educational level (5), employment condition

(3), activity (2), main geographical areas (4) and whether the second member of the household earns any income (2). We coupled in such a way 12647 HBS households, out of 15013 with "similar" households from the EU-SILC. The unmatched 2366 households of HBS, were imputed income and tax variables from EU-SILC, by using propensity score matching [23]. At the end of the two-stage procedure, all HBS households had the required variables. The final dataset contained 15,013 records. In order to measure equity in financing, we used the Kakwani index [12] as described in their application to vertical equity in healthcare financing by O'Donnell et al. 2008; Wagstaff et al. 1992 and Wagstaff et al. 1999. This is the most widely used summary measure of progressivity in both taxation and Public health finance literature. The Kakwani index (KI) is twice the area between a payment concentration curve and the Lorenz curve for income and it is calculated as:

KI= C – G

where C is the concentration index for health payments and G is the Gini coefficient of the income variable. The value of KI ranges from –2 to 1. A negative number indicates regressivity. A positive number indicates progressivity, the value 0 indicates a proportionality. The Kakwani index is based on the fact that a tax system can deviate from proportionality. The coefficient of Gini (G) is always positive by construction and varies between 0 and 1. The concentration index (C) varies between -1 and +1, depending on whether the total amount of tax seriously affects the poorer or the richer tax payers relatively more [19]. Results show that there are regional inequalities in healthcare financing. Kakwani are reported by region and by main health financing sources. VAT and Out-of-Pocket index are negative in all regions, but they are relatively more regressive in the regions of Southern Italy. IRAP and additional IRPEF always show progressivity. Private insurance plays a relatively minor role in most regions, and the results are far from reliable. Its index is progressive at a national level, but at a regional level the results are mixed. Today, the Italian system appears to be heavily decentralized. This heterogeneity derives from differences in the ability to pay, in out-of-pocket share on public health care services (like, e.g., in copayments for drugs, specialist and diagnostic treatments), and in the use of private insurance. Previous evidence showed increasing regional horizontal inequities in health care utilization [16],[9] with the health care system failing to comply with Article 32 of the Italian Constitution, asserting the irrelevance of geographic location as discriminant for health care utilization. From this work, it appears that there are problems also in the progressivity of healthcare financing, particularly for Southern regions, confirming the existence of the "questione meridionale" [6].

The third paper has been published together with Alessio Ishizaka (AI) and Giuliano Resce (GR), in "Socio-Economic Planning Sciences" [5]. This work aims to measure inequalities in access to public health care services between regions that are due to differences in co-payments. According to Waters [28], an appropriate indicator for estimating the equity of the health system is access to services. The term access is defined in Mooney [17] as an opportunity and, more specifically, 'the use of this

opportunity'. Le Grand [14] defines access as costs incurred in receiving health care services. The cost must be interpreted in terms of money and time that individuals may incur using services. However, Klomp and De Haan [13] suggest that multidimensionality is intrinsic in the definition of health provided by the World Health Organization. Therefore, we propose to deal with inequality in access to health care by means of a Multi-Criteria Decision Analysis approach. We propose measuring the inequality of opportunities by evaluating only the barriers to accessing public health care services. Regardless of the unknown real needs and use, we assume that inequality of access to public health care is related to cost. Therefore, in our model, the index of inequality of opportunities is given by the sum (weighted by the uncertainty) of co-payment prices. From a methodological standpoint, we use the idea of Greco et al. [11], where the SMAA approach is used to take into account a large sample of randomly extracted vectors of weights to rank regions. Italy is well suited for this measurement, as the level of co-payments varies among regions. This work aims to measure inequality in access to public health care services between regions due to differences in co-payments. This problem has been analysed with a Multi-Criteria Decision Making approach. From a methodological perspective, a recent new development of the Stochastic Multiobjective Acceptability Analysis (SMAA) was introduced. We used the model proposed in Angilella et al. [1], hereafter Hierarchy Stochastic Multiobjective Acceptability Analysis (HSMAA). The HSMAA method allows to take into account both the uncertainty with respect to the weights assigned to the considered criteria as well as the uncertainty with respect to the weights assigned to the considered sub-criteria. This innovative approach allowed to estimate a new index of inequality of access in regional public health care in the absence of information about people's real health care needs. Results show that, regardless of real needs, there is evidence that differences in co-payments create a pervasive territorial segregation among citizens living in different Italian regions. Applying for the first time HSMAA in measuring inequality allows us to estimate a unique index for each region and to rank them. Our analysis is conducted using secondary data collected from four different sources: official website of the regions, the National Agency for Health Care Services (AGENAS), the National Federation of Pharmacists (FEDERFARMA), and the online newspaper for the Italian health care sector (Quotidiano Sanità). From these surveys, we derived the level of existing co-payments in Italian regions. We estimate territorial inequalities in access to public health care in 21 Italian regions.

Results show that Campania in Southern Italy is by far the worst-performing region, being the only region with its mode and median on the first rank. Campania exhibits the highest level of co-payments for public health care and, therefore the highest inequality in access. The Province of Bozen, Calabria, Piedmont, and Lombardy follow the Campania disaster, with a certain distance. Indeed, these four regions can achieve the first rank, and they have the mode and median above the fourth rank. On the top of the ranking, Friuli Venezia Giulia exhibits the highest level of equity of access, with the lowest co-payments. At some distance, Aosta Valley, Abruzzo and Molise follow, proving to be cheaper in public health care provision in terms of co-payments. There are different levels of co-payments for the same health services among different regions, and this is associated

with strong spatial inequalities. This challenges the National Health Service (NHS) target aiming at guaranteeing the same standard in healthcare to all citizens, wherever they live by providing the basket of the so-called "Essential Levels of health care" (Livelli Essenziali di Assistenza) uniformly across Italy. This work showed that regionally varying co-payments are associated with territorial inequalities in access to health care across the country. In Italy, deep interregional differences in health care expenditure aggravated the existing socioeconomic inequalities in health care among regions [8],[10]. One of the major consequences is that part of the population cannot afford higher quality health care, and this undermines the fundamental principle of universality of health care. Despite limitations, from our three papers it seems possible to conclude that the overall equity of the Italian NHS is nowadays challenged regarding vertical equity in financing. Increasing autonomy in health financing is associated to high regional inequities in financing. Moreover, it appears that the regional variability in the levels of co-payments is a source of inequalities in access to public health care. Overall, the "questione meridionale" is still central for the health care sector. Therefore, it seems important to intervene in the sources of finance that are regressive, and to reduce regional differences. There is the need of reforming Italian healthcare financing system, because VAT and out-of-pocket are always regressive and this makes the system inequitable.

The SSN is a sub-system of the welfare state, which aims for the same standard health care of the citizens of a country, wherever they live. The main problem is that, since 2002, regional co-payment revenues are used to finance spending. This is shown by the fact that regions with financial stability plans have higher copayments (see Piedmont, Lazio, Campania, and Calabria for specialist visits).

The analysis done showed that there is a problem of regional variation in copayments. In addition, the tariffs applied in some regions are likely to violate the universality principle of the National Health Service laid down in Article 32 of the Italian Constitution, accentuating the risk of serious inequalities in accessing the essential levels of care. To draw further policy implications from the work on vertical equity in Italian regions is rather tentative, because there are at least two big caveats on private insurance incidence and on IRAP. The first one is that private insurance has KI (Kakwani indices) that are never significant. Inferring something for specific regions is worthless. Regarding IRAP, we had a procedure of calculation that is the only one apparently viable with households' and individuals' surveys, being the tax base (Value Added) calculated at the firm level. Moreover, we had to perform further approximations because of the widespread exemptions accorded to professional and self-employed. Let us assume that our results do make sense. Being the KI indices regressive both at national and at regional level for the overall financing, we guess that it could be useful to reduce such regressivity. Now, IRAP is a progressive source of finance: in the current policy debate, there is a discussion about abolishing such a source. We believe it is not a sound idea, unless it is replaced by a more progressive source, such as IRPEF. The second implication of our work is that it affects the discussion about the "second pillar" (that, in fact, is a third pillar) of the Italian health care system, i.e. the Supplementary Health Care Funds (*Fondi Sanitari Integrativi*) [20]. Looking at the work of Marenzi et al. [15] we see that the enrolment in such Funds is heavily concentrated among the rich and that the distribution of tax-benefits for the Funds are heavily pro-

rich too. Suppose then there were two possible strategies of expansion of Funds: 1) eroding SSN stance as all-purpose third payer; 2) forcing for a replacement of out-of-pocket expenditure by Supplementary Funds either compulsory or obtained through unfair competition. The first option has been on the agenda in the past years. However, now it seems more difficult to be pursued. This both because of a change of politicians' perspective, as well as because trade unions are starting to realize that even if Supplementary Funds financed by firms can help, in the short run, in finding an agreement on new contracts, in the long run, they can undermine the SSN stability and performance. If pursued, this option would worsen regional disparities, both because of the unequal geographical distribution of Supplementary Funds and because they are concentrated on richer and healthier individuals [4]. Moreover, a slimmer SSN would also entail a lower amount of redistribution of resources from the richest Northern regions to the poorest Southern regions: given our result on the incidence of VAT in different regions, the lower redistribution would imply a lower reduction of Kakwani index for Italy. Instead, the second option is fully pursued by private actors, interested in widening the market for Supplementary Funds. The "mantra" is that there is a high level of inappropriate utilization concealed in out-of-pocket expenditure, while in health care financed by Supplementary Funds such inappropriate consumption is avoided. Discussing this issue goes beyond the scope of this work. However, as suggested by health economics theory, ex-post moral hazard (one source of inappropriate consumption) is not there if there is out-of-pocket payment, and it is higher the lower is the co-payment required by a third party payer [21]. Finally, even if Supplementary Funds would replace out-of-pocket payments a worsening of the regressivity in health financing may reasonably occur. This would be due to tax exemptions for Supplementary Funds, as premia are deducted by income, at progressive tax rates, thereby favoring the rich people. A further negative effect can be expected if one would choose, in order to discourage out-of-pocket consumption, to abolish existing 19% tax-allowances, while keeping instead income deductions for Supplementary Funds.

Table 1- The PhD Thesis in a snapshot

	Chapter 1: Vertical Equity in healthcare financing: a systematic review of methods and evidence	**Chapter 2: Vertical equity in healthcare financing in Italian regions**	**Chapter3: Inequality of access to Italian Public Health analysed with the Hierarchy Stochastic Multiobjective Acceptability Analysis**
Research questions	Who pays for health care? Is financing progressive in OECD and non-OECD health systems?	Who pays for health care in Italy? Are Regional health care System progressive in Italy?	There is a pervasive spatial inequality of access to public health care in Italy? Are there systematic differences among regions in co-payments?
Data	English language studies published between January 1977 and November 2019 in Econlit, Pubmed, ideas, Ssnr and Google Scholar.	1- survey cross-sectional data from the Italian National Institute of Statistics household budget survey for the year 2015 2- households income at micro level, from households pre and post-tax income Eurostat EU SILC microdata for 2015.	The value of existing co-payment prices in Italian regions in various form.
Methodology	Systematic review following the PRISMA methodology adapted for equity issues.	The Kakwani index considers that a tax system can deviate from proportionality. The index is measured as twice the area between a payment concentration curve and the Lorenz curve for income and it is calculated as: KI= $C - G$ C is concentration index for health payments and G is the Gini coefficient of the income variable.	The Hierarchy Stochastic Multiobjective Acceptability Analysis (HSMAA), which takes into account the uncertainty with respect to the weights assigned to the considered criteria and the uncertainty with respect to the weights assigned to the considered sub-criteria.
Contribution	This study reviewed and updated the state of the art of scientific literature on the measurement of equity in healthcare financing in OECD and non-OECD countries. Regressivity appears a relevant issue across both OECD and non-OECD countries.	This study showed that Italian health system appears characterized by a high interregional variability in financing. This heterogeneity derives from differences in the contributive capacity of citizens, in their share of out-of-pocket expenditure for public health care services (co-payments for drugs, specialists and diagnostic treatments), and in the use of private insurance.	This paper analyses the regional differences in the application of the co-payment in the Italian National Health Care Service and measures the inequality in access to public health care among regions, due to the difference in co-payments.
Authors	Margherita Giannoni, Domenico De Matteis, Guido Citoni	Guido Citoni, Domenico De Matteis, Margherita Giannoni	Domenico De Matteis, Alessio Ishizaka, Giuliano Resce
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Vertical Equity in healthcare financing: a systematic review of methods and evidence

Abstract

There is growing evidence on equity in healthcare financing at the international level. We conducted a systematic review of the evidence on vertical equity in healthcare financing with the aim of: 1) identifying the main methods used; 2) compare evidence across countries and drawing lessons particularly looking at regionally decentralized systems. Based on PRISMA methodology extended with a focus on health equity, we searched EconLit, Ideas, Google Scholar, PubMed and SSRN databases (time frame: 1977-2019). Of all the articles found (893), 32 were eligible for inclusion. We reviewed the evidence for the two main groups of OECD and non-OECD countries.

Results: 1-The most frequently used and effective methodology is the Kakwani index 2- Overall, equity in healthcare financing seems to have worsened over time. There are similar progressivity levels by specific source of financing within the two main groups of countries. However, the average levels of equity vary across countries, given the high variability in the relative shares of the different sources of financing. Direct payments are the most regressive source of financing. OECD economies show comparatively higher levels of equity. However, equity in tax-based decentralized health care systems appears undermined by direct payments increases due to cost containment. It is important to monitor vertical equity both between and within countries.

1. Introduction

Fair financing is a key objective of health care systems [49]. There is increasing evidence showing inequities in healthcare financing [51]. However, there is a lack of updated studies systematically reviewing evidence on this topic by looking at both OECD and non-OECD countries. This paper presents the results from a systematic review of the evidence on vertical equity in healthcare financing with the aim of updating knowledge on vertical equity in financing for both Non-OECD and OECD countries. A previous study reviewed evidence for middle-income countries up to the years 2016 and found that the insurance system (individual and social) is the most equitable method of financing, whereas out-of-pocket (OOP) were the most inequitable source of financing [37]. Our work adds by adding more recent years to the analysis and by taking into considerations both OECD and non-OECD countries excluding any income limitation. In addition, recently compared to previous tests, we have reported the results in a world map that makes the interpretation of the results more intuitive. Vertical inequities in health financing can be intended as the violations of the principle according to which an individual should pay more for health care the richer she is and this implies that contributions to health financing should be based on person's ability to pay/income [49],[51]. The objective of vertical equity measurement is therefore to assess the progressivity/ regressivity of the main health financing sources [51]. Health systems are typically financed through different types of sources. On one hand, general taxation and social insurance are based on state-financing; on the other hand, OOP and private insurance are private sources falling on the responsibility of the users. In the lack of financial protection often catastrophic payments may result [51]. The importance of equity in healthcare financial contribution and of protecting households against catastrophic payments becomes evident especially when OOP represent a main source of health financing and there are high income inequalities in a country [51]. This appears particularly relevant given the ongoing economic recession and global COVID-19 pandemics. In particular, we aim at drawing lessons for countries, such as Italy, were healthcare financing is heavily decentralized and there is evidence of horizontal inequities in the delivery of health care [28]. The paper is organized as follows. Section 2 describes the methodology used. Section 3 shows the results from the review of the evidence on: the methods used (section 3.1); OECD countries (section 3.2) and Non-OECD countries (section 3.3). Section 4 is a discussion. Section 5 concludes.

2. Methods

A systematic review of the literature was conducted and reported adapting the Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) with a focus on health equity [53]. Preliminary search terms were identified and pre-tested on Google Scholar. The results were used

to refine the search terms. The following terms were finally used: Vertical equity health OR equity healthcare financing OR progressivity health OR vertical out-of-pocket equity health.

The following electronic databases were searched: EconLit, Ideas, SSRN, PubMed, and Google Scholar. Moreover, the reference lists of the selected articles were manually searched in order to identify relevant publications for inclusion. The search was limited to English written peer-reviewed studies.

Our literature search was carried out in two separate phases. Following PRISMA approach, we firstly identified the main literature containing methods and evidence on measuring equity in healthcare financing. Initially, the literature needed to begin the study were searched for and found[33],[44],[48],[50]. From this, it appears that the mainstream, in the measurement of vertical inequities in financing is to use the Kakwani index of progressivity (KI). This methodology is further described in Appendix 1. We then searched for further methods and evidence by conducting an extended review of literature. The following electronic databases were searched:

- Pubmed

- Econlit-EBSCO

- Ideas

- Google Scholar

- SSRN

Based on the eligibility criteria, studies were selected through systematic screening made up of the following processes: exclusion of duplicates; screening based on titles; scrutiny of abstracts and final review of full articles. This process was conducted by a single reviewer and repeated by a second reviewer to ensure reliability. Each article was independently reviewed and for each article the methodology was critically examined. Disagreement was resolved through a discussion between the two reviewers and where the disagreement persisted, a third reviewer refereed the decision. Key study characteristics that were extracted include: author(s) and dates of publications, objectives of the study, country where study was carried out, study design, how equity was measured and key findings and conclusions.

Original studies that assessed equity in healthcare financing were eligible for inclusion. Studies were considered eligible according to the following criteria:

1. The studies examined health vertical equity financing through data collected for the general population.

2. The studies analysed vertical equity of the overall country health financing system. When this was not available, at least two main types of source of healthcare financing. Particularly, articles analysing the progressivity of OOP component were included only in a context of the overall health financing vertical equity assessment. We made two exceptions for two countries: China and India. For China, we reported evidence available at regional level, given the relative lack of country-wide studies and the fact that there are important differences among areas. For India, we reported the

available evidence even if it was mainly based only on OOP, as this was the most important health financing component at that time.

The quality of articles was assessed according to the following stages. After searching the databases, all duplicates were eliminated. The remaining articles were investigated based on titles and abstracts, and irrelevant papers (based on the inclusion criteria) were deleted. We assessed the full-text of remaining articles according to the inclusion criteria and the discrepancy between them resolved through discussion. Moreover, reference lists of selected articles were manually searched in order to identify relevant publications for inclusion. The search was limited to English written peer-reviewed studies. The articles that met all the criteria for inclusion in the review were 32. The time frame of the articles included ranges from January 1977 to November 2019. For each article, we critically reviewed and compared methods. We reviewed the main methods used and the evidence for both Non-OECD and OECD countries, particularly drawing lessons for countries where healthcare financing is heavily decentralized. Figure 1 illustrates the selection process and the main results. The search strategy keywords and results are detailed in Appendix 2.

Figure 1: search for papers for systematic review


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┌─────────────────────────────┐          ┌─────────────────────────────┐
│ Potentially relevant        │  ──────> │ Duplicates removed.         │
│ publications identified     │          │ N=272                       │
│ through search strategy.    │          └─────────────────────────────┘
│ N=893                       │
└─────────────────────────────┘
            │
            ▼
┌─────────────────────────────┐          ┌─────────────────────────────┐
│ Titles examined for         │  ──────> │ Excluded publications, not  │
│ potential relevance.        │          │ relevant. N=432             │
│ N=621                       │          └─────────────────────────────┘
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┌─────────────────────────────┐          ┌─────────────────────────────┐
│ Abstracts examined for      │  ──────> │ Excluded publications, not  │
│ potential relevance. N=189  │          │ relevant. N=116             │
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            ▼
┌─────────────────────────────┐          ┌─────────────────────────────┐
│ Full text of potentially    │  ──────> │ Partly reviewed and         │
│ relevant publications       │          │ excluded. N=38              │
│ located and reviewed. N=73  │          └─────────────────────────────┘
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│ Additional papers located   │          │ 5 paper were found with     │
│ and reviewed. N=35          │          │ Google Schoolar             │
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┌─────────────────────────────┐          ┌─────────────────────────────┐
│ Included for final review.  │  ──────> │ Excluded for not meeting    │
│ N=40                        │          │ inclusion criteria. N=8     │
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│ Met all inclusion criteria. │
│ N=32                        │
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│ 19 studies   │     │ 10 studies   │     │ 3 paper      │
│ based only   │     │ based on     │     │ based on     │
│ on Kakwani   │     │ Concentration│     │ other        │
│ index(KI)    │     │ index and KI │     │ methods      │
└──────────────┘     └──────────────┘     └──────────────┘
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Source: *Authors*

3. Results

Of all the papers found (893), 189 papers were selected based on the abstract (Figure 1). We included all articles measuring vertical equity in healthcare financing in both OECD and Non-OECD countries, the main topic of our work (n=73).

Articles dealing only with measuring horizontal equity were excluded, while works dealing with both vertical and horizontal equity were included. Most of the selected works were based on the Kakwani index (KI) method for measuring vertical equity. Therefore, all articles based on KI methodology have been included. Following this criterion, out of the 73 texts analysed, 40 were selected as relevant for research purposes and fully examined. After the analysis, 32 articles were selected: 19 papers are based on KI; 10 are based on KI in combination with the concentration index and/or other inequity indices; 3 are based on other methods than KI (Figure 1).

Table 1 shows a taxonomy of the reviewed articles categorizing results according to the methodology used and the country analysed, the type of data used and the level of analysis, the design type, the methods used, the years of analysis, the type of publication. In order to grasp the differences between health financing structures, results are reported by distinguishing between OECD and Non- OECD countries. A group of seminal studies compared vertical equity in health financing in OECD countries, considering the various sources of financing, generally divided into: out-of-pocket, private insurance, direct and indirect taxation and social security contributions (first six cases described in Table 1).

Table 1: Reviewed studies on vertical equity in healthcare financing: evidence from OECD and non-OECD countries

	Country	Data	Level	Methods	Years
OECD countries:					
Wagstaff and van Doorslaer. 1992	OECD1	CR	HOU	KI	from 1980 to 1987, different for each country
Lairson et al. 1995	*Australia*	CR	HOU	KI	1988-1999
Klavus. 1998	*Finland*	CR	HOU	KI/OT	1990
Wagstaff et al. 1999 (a)	OECD2	CR	HOU	KI	from 1981 to 1993, different for each country
De Graeve and Van Ourti. 2003 (b)	OECD3	CR	HOU	KI	1987-1997
Smith and Normand. 2009	*Ireland*	CR	HOU	OT	2004
Vork et al. 2009	*Estonia*	PAN	HOU	KI/OT	2000-2007
Smith. 2010	Ireland	RCR	HOU	KI	1987-1988; 1999-2000; 2004-2005
Crivelli and Salari. 2014	*Switzerland*	RCR	HOU	KI	1998-2005
Hajizadeh et al. 2014	*Australia*	RCR	IND	KI	1973-2010
Ketsche et al. 2015	*United States*	CR	HOU	KI	2004
Quintal and Lopes. 2016	*Portugal*	CR	HOU	KI	2010-2011
Non-OECD countries:					
Yi et al. 2005	*China*	RCR	IND	KI	1993-1999
Roy and Howard. 2007	*India*	CR	HOU	OT	1995-1996
Yu et al. 2008	*Malaysia*	CR	HOU	KI	1998-1999
O'Donnell, Wagstaff et al. 2008	*Egypt*	CR	HOU	KI	1997
O'Donnell et al. 2008 (c)	ASI1	CR	HOU	KI	from 1995 to 2001, different for each country
Mataria et al. 2009	*Palestine*	CR	HOU	KI/OT	2004
Connelly et al. 2010	*Iran*	RCR	HOU	KI	1995-1996; 2006-2007
Yu et al. 2011	Malaysia	CR	HOU	KI	1998-1999
Akazili et al. 2012	*Ghana*	CR	HOU	KI/OT	2005-2006; 2008
Ataguba. 2012	*South Africa*	CR	HOU	KI/OT	2005-2006
Chen et al. 2012	*China*	RCR	HOU	KI	2003; 2008
Mills et al. 2012	*AFR*	PAN	HOU	KI/OT	2008
Munge and Briggs. 2013	*Kenya*	CR	HOU	KI	2007
Almasianka et al. 2015	*Iran*	CR	HOU	KI/OT	2012
Kwesiga et al. 2015	*Uganda*	CR	HOU	KI/OT	2009-2010
Homaie Rad and Khodaparast. 2016	*Iran*	CR	HOU	KI	2012
Ali Molla and Chili. 2017	*Bangladesh*	CR	HOU	KI	2010
Chen et al. 2017	*China*	CR	HOU	KI/OT	2013
Mulenga and Ataguba. 2017	*Zambia*	CR	HOU	OT	2010
Qin el al. 2017	*China*	RCR	HOU	KI/OT	2009; 2013

a) Including results from v. Doorslaer et al (1999) [12] (b) Including results from Wagstaff et al. (1999) [9]; Jansen and van Doorslaer (2002) [21]; Klavus and Hakkinen (1998) [25]; Van Camp and Van Ourti (2003) [41]; (c) Including results from previous studies van Doorslaer, O'Donnell, Rannan-Eliya, et al. [42], Wagstaff [47].

Data source: international literature databases (Pubmed, Econlit, Google Scholar, SSRN, Ideas)

Legend: AFR= Ghana, South Africa, Tanzania; ASI1=Bangladesh, China, Hong Kong, Indonesia, Japan, Korea Rep., Kyrgyz Rep., Nepal, Philippines, Punjab, Sri Lanka, Taiwan, Thailand; ASI2=Hong Kong, Japan, Korea, Singapore, Taiwan; OECD1= Denmark, France, Ireland, Italy, Netherlands, Portugal, Spain, UK, US; OECD2= Denmark, Finland, France, Germany, Ireland, Italy, Netherlands, Portugal, Spain, Sweden, Switzerland, UK, US; OECD3= Belgium, Denmark, Finland, France, Germany, Italy, Portugal, Spain, Sweden, Switzerland, The Netherlands, United Kingdom and USA

Data type: PAN = panel data; CR = cross-sectional data; RCR = repeated Cross-sectional data

Level of analysis: AGG = aggregate; HOU = household; IN = individual.

Analysis method: KI= Kakwani index; OT = other

Publication type: PA= peer-reviewed article.

Design: all reported studies are observational

Since then, based on these seminal studies and on the World Bank's diffusion of the methodology and related tools, evidence has grown also for Non-OECD countries (twenty cases described in Table 1). Twelve articles analyse OECD countries, four compare the progressivity indices of health financing between some European countries and the United States. Twenty articles deal with Non-OECD countries or countries without a National Health System/Social Security (Table 1). We found evidence for many OECD countries, namely Australia, Belgium, Denmark, Estonia, Finland, France, Germany, Ireland, Ireland, Italy, Japan, Korea, The Netherlands, Portugal, Spain, Sweden, Switzerland, the UK and the US (Table 1). Figure 2 shows the results by country in a world map where we report results for those countries for which an assessment of the overall progressivity level was available. It appears that in most European countries, in Australia and Japan the health systems were progressive, whereas in others like, e.g., the US and Switzerland the health system was regressive (Figure 2). However, it is important to stress that the evidence for most OECD countries is not recent, whereas for the non-OECD countries the evidence is more recent (Figure 3).

Among the non-OECD countries, we found evidence for several Asian countries (Bangladesh, India, Malaysia, China, Hong Kong, Indonesia, Kyrgyz Rep., Nepal, Philippines, Punjab, Sri Lanka, Taiwan, Thailand, Japan, South Korea, Singapore) [2],[8],[9],[33],[38]; for middle-Eastern countries/areas (Iran, Palestine) and for some African countries (Ghana, Kenya, Uganda, Zambia, South Africa, Tanzania) (Table 1, Figure 3) [19],[26],[29],[30],[31],[32]. The analysed African systems were mostly progressive, whereas in Asian and the Middle-Eastern there is a majority of regressive systems (Figure 2). Regarding China the evidence is mixed and often relative to specific areas of the country (Table 1). Overall, as further described hereinafter, most recent results for the areas of China indicate regressivity. From this it appears that most analysed health systems had vertical equity issues. Regressivity was present in several OECD countries, in Asia in the Middle East and in Africa. It seems, however, worth noting that the data are relative to different years and that most results obtained for the OECD countries were obtained from data recorded during the 1990s and the early 2000s, whereas in most non-OECD countries there is more recent evidence (Table 1). Despite limitations, this is a rather new way of showing results as having an overall big picture is more intuitive and useful to summarize results.
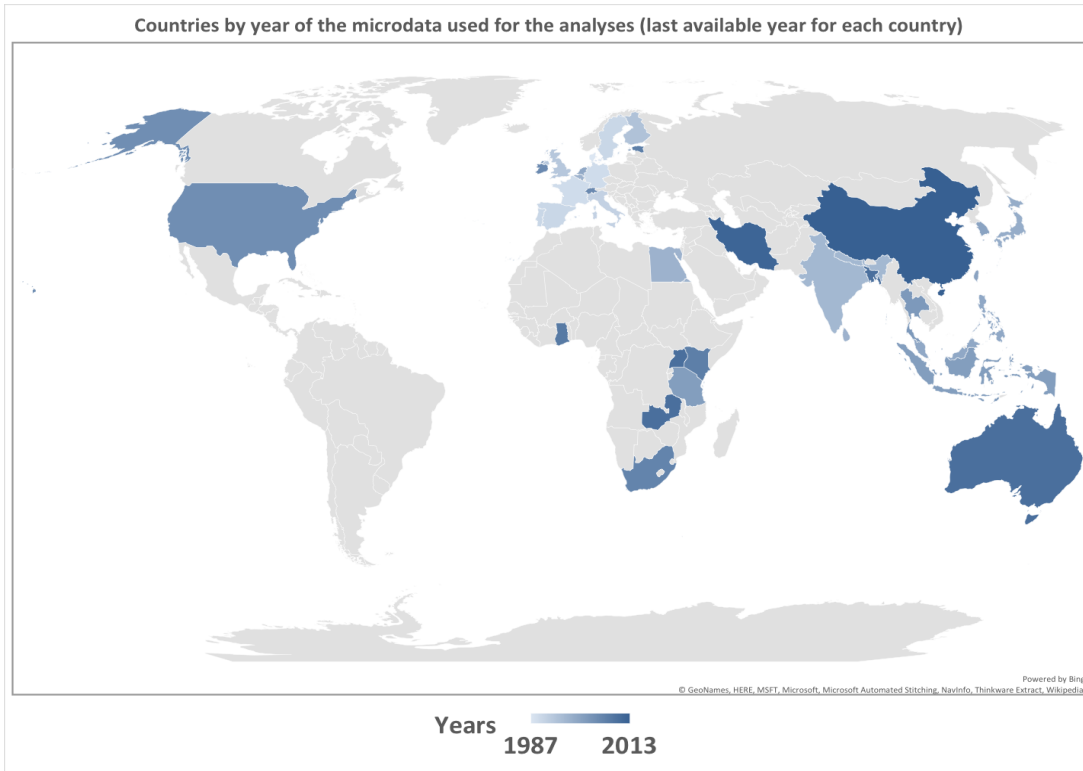
Figure 2: Vertical equity by country.
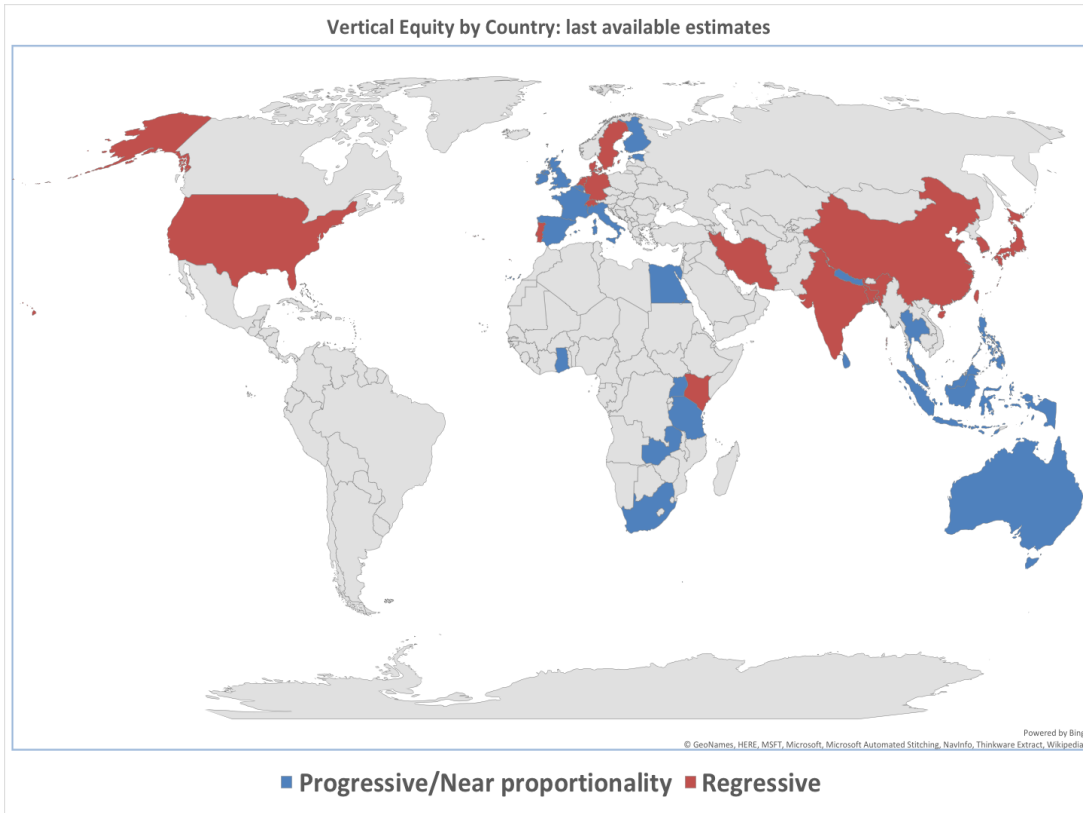
Data Source: last available estimates from the literature reported in Table 1.

Figure 3: Year of the last available estimates by country

Data source: last available estimates from the literature reported in Table 1.

The following sections describe the results. Section 3.1 surveys on the main methods used for measuring vertical equity. Section 3.2 and 3.3 discuss on the evidence found at country level by distinguishing between OECD and Non-OECD countries.

3.1 Methods for measuring vertical equity in health

The analysis of Lorenz dominance is the most general method for measuring progressivity [50]. However, it does not provide a measure of the magnitude of progressivity, which can be useful when comparing equity across countries or, within a country, across regions [33]. This is why the Kakwani index is the most used measure of progressivity in both tax literature and health financing [22]. The method estimates how the distributional effect of taxation is influenced by changes in tax rates while progressivity is held constant, and vice versa. Furthermore, the method allows to estimate the relative contribution of individual taxes and expenditure items to the overall progressivity of the system [22]. The first estimates available in the literature were comparative analysis at European level based on various sources of national microdata, predominantly surveys on household consumption. The progressivity indices were estimated at the national level based on the Kakwani methodology [43],[49]. This was further updated in terms of both methodology and data [45],[50].The methodology was improved by considering households of different sizes and structures, as well as by obtaining a greater comparability of the variables representing income and healthcare financing sources [12]. Furthermore, a better classification of the different types of health care payments was adopted and data on the financing mix of the various countries were updated [12].

In more recent years, there has been growing evidence for Non-OECD countries [33]. Financing of health care in low-income countries is characterized by the dominance of direct payments, given the relative lack of advanced payment mechanisms, such as tax-based systems and health insurance. Therefore, unlike with the case of OECD countries, many studies focus on the incidence of catastrophic out-of-pocket expenditure [54]. Households without complete health insurance coverage run the risk of incurring huge medical costs if they get sick. This uninsured risk reduces well-being. In addition, if a family member becomes ill, the direct purchase of medical care could compromise the material standard of family life. If health costs are high compared to the resources available to the family, this worsening of living standards can be considered catastrophic. In this sense, the concept of equity in healthcare financing implies that households should be protected against such catastrophic medical expenditures [38],[54]. As the target of this analysis is to collect evidence on vertical equity, studies analysing catastrophic health care expenditures were included in the survey only when they were part of an assessment of the vertical equity of the overall health financing system. Finally, one paper we scrutinized for inclusion in the review is based on the Atkinson method [52]. An alternative way of measuring equity is based on the Atkinson [52] methodology aiming at: (1) measuring fairness in the accessibility to health services; and (2)

measuring the impact of health insurance programmes on equity. As this method is not strictly linked to the progressivity of health services financing sources, we decided to exclude it, but we chose to mention its methodology here briefly as it could be used for linking both the use of health care services and its financing. Appendix 1 provides details on the surveyed methods.

3.2 Evidence on vertical equity in OECD countries

The first inter-country comparison based on the method developed by Kakwani is an application of the analysis of tax progressivity in four OECD countries: Australia, Canada, the UK and the US [22]. Results show that there were relatively small differences in the degrees of income inequality both before and after tax with the exception of the US showing markedly higher levels [22]. The degree of tax progressivity was variable across countries. The results clearly showed an appreciable decline in the degree of tax progressivity in all countries, the fall being greatest in the UK [22]. Based on KI methodology, Wagstaff, van Doorslaer [49] in their first work compare healthcare financing systems and their progressivity characteristics in 10 OECD countries.

This work distinguishes among three types of health systems: those mainly financed through general taxation such as Denmark, Portugal and the UK; those mainly based on social insurance (France, The Netherlands and Spain); those that are predominantly private (Switzerland and the US). Results show that the first financing method tends to be proportional or moderately progressive, while the second appears moderately regressive; finally, the third type of financing is mostly regressive. Overall, the study shows that in most countries the out-of-pocket component of health financing is highly regressive [49]. Wagstaff et al. [50] extends in a number of directions for the years between 1987-1993, on the progressivity of healthcare financing systems. This paper improves on the methodology used, obtains a greater degree of comparability between countries in the definitions of the variables and include two more countries in the analysis. Progressivity is still measured by using KI. The results confirm previous findings, with the difference that in Denmark and Spain direct taxes appear more progressive than in previous studies [50]. In contrast, direct taxes in Sweden and Switzerland appear to be less progressive than before. Indirect taxes in Denmark, the Netherlands and Sweden appeared to be less regressive than before, while they become more regressive in Switzerland [50]. In Spain indirect taxes become regressive as a result of value added tax among sources of financing, while in previous results they appeared as progressive [50]. Overall, in all countries except one (Spain), the KI for private insurance decreased. In all countries except Sweden, the KI for out-of-pocket payments had fallen in size [50]. In a companion paper published on the same issue of JHE, van Doorslaer and Wagstaff [45], starting from the total redistributive effect calculated from KI obtained in the previous work [50], decomposed with the AJL method [4], the overall effect in vertical, horizontal and reranking components. Results show that the vertical effect (unequal treatment of unequals) is far more important, in terms of redistributive effect, than differential treatment, but for private sorces of financing.

Lairson et al. [27] analyse the equity in healthcare financing in Australia and compare it with Europe and the United States. Vertical equity is measured via a concentration index estimated for both income and health care payments using data for the period 1998-1999. The financing system appears to be slightly progressive, despite about 30% of the payments coming from regressive private sources [27]. The equity levels are similar to those of many European countries and higher than in the US. Ketsche et al. [23] use the Annual Social and Economic Supplement to the Current Population Survey (CPS) from March 2005 and 2006 to estimate Kakwani measures of progressivity for 2004 and compare progressivity overall and across payment sources (e.g. federal versus state, public versus private) to previous results for the US system [50]. The overall incidence of US healthcare financing was still regressive but with a lower KI (ranging from -0.0 to -0.06 in 2004 vs -0.13 in 1987). The reason for this according to the Authors was that the share of total financing that is public has grown between 1987 and 2004 and at the same time there has been a marked decline in the OOP share of funding. The public sector component of financing was progressive (0.15) because of the dominance of federal spending (0.20) over state spending (0.03). Oppositely, PHI (-0.12) and OOP (-0.40) burden was higher for low income populations and represented 42% of all spending being responsible for the overall system regressivity trend. At the state level the KIs appear different from the measures for the overall burden of the system. The lowest quintile of the population in California and New York showed a higher absolute financial burden than in Florida and Texas. The authors stress the need of monitoring state variations in vertical equity after the introduction of the Patient Protection and Affordable Care Act (PPACA) of 2010 revising on the light of the new types of taxes, the subsidies for private premia and OOP, and the changes in coverage levels created through the reform.

Oppositely to the US case, healthcare financing in Finland in the early 1990s was distributed progressively [24]. This result is due to the dominance of the two progressive sources: direct taxation and sickness insurance contributions over the regressive (OOP and indirect taxation).

Hajizedeh et al. [18] analyse the distribution of healthcare financing in Australia for nearly four decades using data from Australian Taxation Statistics and Household Expenditure Surveys for the period between 1973-2010. The authors estimate the KIs for four sources of healthcare financing: general taxes, family payments for the Medicare programme, additional payments to Medicare and direct payments from consumers; and estimate the effects of major policy changes on them. The results show that the first three of these sources of healthcare financing are progressive, while the distribution of direct payments is regressive [18]. Furthermore, neither the introduction of "Medicare" in Australia in 1984 nor the "Extended Medicare Safety Net" in 2004 had significant effects on the progressivity of healthcare financing in Australia [18]. Instead, the Lifetime Cover-introduced in 2000 to encourage people to buy and hold private health insurance - has had a progressive effect on healthcare financing [18].

De Graeve and Van Ourti [15] review the distributional implications of alternative healthcare financing arrangements in European countries and the US by using KI methodology, at the household level. The period of analysis ranges from 1987 to 1997. In most European OECD countries,

near-universal coverage and extensive risk pooling results widespread. However, in The Netherlands and Germany social security payments become regressive. As expected, in Switzerland and the US, the relatively higher importance of private payments of total financing impacts negatively on vertical equity [15].

Two studies deal with the Irish situation. Smith and Normand [40] have raised concerns that existing methods for analysing equity in healthcare financing based on progressivity indexes are adequate. This work follows a new direction in the literature asserting that equity in financing and utilization of health care need to be analysed together. A flow of funds approach is developed for the analysis of the sources of financing of the Irish health system in 2004 [40]. The paper traces the flow of public and private health resources from people to financial intermediaries, from financial intermediaries to health workers, and from health workers to individuals. Individuals are classified according to their entitlements to health care [40]. The results indicate that broad progressive patterns in aggregate resource flows hide less equitable patterns that require further attention. Moreover, there are complex interactions between public and private resources.

Smith [39] employs analytical techniques widely used to measure equity in healthcare financing, updating previous analyses based on data from the late 1980s for Ireland; estimating KI using data from household surveys to 1987/88, 1999/2000and 2004/05 [39]. Results show a marginally progressive financing system.

Crivelli e Salari [14], reconsider the Swiss health system financing, after previous analyses showed it to be regressive [49],[50]. They look at differences in the level of equity of health system financing between Swiss cantons and their evolution over time. The KI are calculated for each canton and for each health financing source. The data used are the Swiss Household Income and Expenditure Survey (SHIES) for the years 1998-2005. The results confirm that the financing of health care in Switzerland remained regressive even after the great reform of 1996 and show significant differences in equity at cantonal level, with the difference between the more and the less regressive canton being more or less the same as between two extremely different financing systems like the United States and Sweden [14]. On the other hand, they find no evidence of an increase over time in regressivity [14]. Vork et al. [46] analyse the trend of household OOP spending (size, distribution by socio-economic groups, and impact on impoverishment) and the overall distribution of financial burdens in Estonia from 2000 to 2007, by using cross-sectional data from surveys on balance sheets of Estonian families, a special module of the 2006 survey on the utilization of health care and health expenditure, as well as data from national health accounts 2000-2007 and tax revenues from 2000 to 2007. The results from the estimation of KI for direct and indirect taxation, social tax and OOP show that, due to the growing share of OOP there had been a decline in the progressivity of overall healthcare financing [46]. Quintal and Lopes [35] analysed vertical equity in Portugal with KIs estimated by using the Household Budget Survey for 2010/2011 at both national and regional level for OOP and voluntary health insurance. Results show that payments for OOP are regressive, particularly for pharmaceuticals, and were progressive for VHI. Moreover, there were marked variations in KIs for OOP between the different areas of the country. Using survey data (n= 9489

households) the estimates OOP payments KI were regressive (KI= -0,074) and Private insurance KI was progressive (KI= 0,098) [35].

O'Donnell et al. [33] estimate the distribution of healthcare financing in 13 Asian countries representing 55% of the Asian population during 1995-2000. The authors use synthetic indexes (concentration index, KI and Gini coefficient). For the two high income territories with universal social insurance (Japan and South Korea), healthcare financing is slightly regressive [47].

3.3 Evidence for the Non-OECD countries

Roy and Howard [38] examine the extent to which the Indian health system protects households with different living standards. Through ordinary least squares (OLS), they estimate the relationship between household consumption as a measure of ability to pay (ATP) - and OOP payments for hospital admissions. They also estimate the relationship between consumption and the share of OOP on consumption. Results show that both utilization (payments) and its resulting financial burden (payment share) increase with increasing ATP. Comparisons across social groups indicate horizontal inequities and differences in both the degree of progressivity and the redistributive effect. According to the authors, this could be due to two factors: (1) the lack of insurance, which implies that the better-off must pay from OOP to secure quality health care; (2) the absence of risk-pooling or pre-payment mechanisms, which creates financial barriers to access health care for the poor [38].

Chai Ping Yu et al. [8] analyse the case of Malaysia. The progressivity of each financing source and the entire financing system is measured by the KI method by using cross-section data on the Malaysian household spending survey for 1998-1999. They find that the two-tier health system in Malaysia – a heavily subsidized public sector and a marginal private sector charging the users - produced a progressive health financing system [8]. A later study on Malaysia evaluate vertical equity of the current tax-based financing system, as compared to a new National Health Insurance (NHI) system based on contributions (from the employed and self-employed) and government funding from the Ministry of Finance. KI were estimated by using data from the Malaysia Household Expenditure Survey (HES) from July 1998 to June 1999 (n= 9198 households) [9]. The results show that new flat rate NHI scheme system would reduce the progressivity of the current tax financed system, with a reduction of KI from 0.217 to 0.168 [9].

Several studies analysed the situation in China. Yi et al. [56] use multi-year data at individual level to assess the effects of the current health insurance reform on equity in healthcare financing. Looking at households living in Chinese urban areas, they show that both the new Urban Employee Basic Health Insurance Scheme financed by personal medical savings accounts (MSA) and the Social-Risk Pooling Account (SPA) were both regressive. However, contributions to SPA, although slightly regressive, play an important role in balancing the financial burden of health care, with payments from the SPA favouring low-income insured employees.

Chen et al. [10] studied the transition from a planned economy to a market-oriented economy in China, when state financing for health care declined and while traditional coverage plans have

plummeted, leaving China's poor exposed to potentially ruinous healthcare costs. The analysis of the degree of progressivity of health care contributions based on income is based on KI for each of the four healthcare financing components: income taxation, public health insurance, private health insurance and out-of-pocket. Using two rounds of surveys for 2003 and 2008 with microdata on households socio-economic, health and utilization, the authors compare equity while KI at two different points in time, public health insurance plays a significant role in the healthcare financing system. In 2002, both in cities and the country, tax financing was regressive, while private health insurance and OOP payments were progressive [10]. KI close to zero, or negative and slightly regressive in both urban and rural areas in 2002 and 2007 [10]. Compared to OECD countries, where direct taxes represent the biggest component of general taxation, in China the dominant part of general taxes are indirect taxes. In 2010, value added tax, sales tax and excise duties on specific products such as alcohol, tobacco and petrol accounted for 52.35% of the financing. High dependency on indirect taxes leads to a regressive model. However, a slight increase in progressivity was in rural areas from 2002 to 2007 in the general taxation component. This could be attributed to tax reforms that lowered taxes in rural areas since 2005 [10].

Xianjing Qin et al. [55] stress that health policy makers have for long worried about protecting people from the possibility that bad health leads to catastrophic financial payments and subsequent impoverishment. They use data for Guangxi two cycles of household surveys conducted in 2009 (4,634 respondents) and in 2013 (3,951 respondents). CI, KI and Gini coefficient were estimated for different sources of healthcare financing: indirect taxes, out-of-pocket payments and social contributions [55]. The general healthcare financing system appears regressive. Catastrophic payments fell dramatically between 2009 and 2013. Using total expenditure (from 7.3% to 1.2%) or non-food expenditure (from 26.1% to 7.5%) as an indicator of the families' ability to pay. This study shows an unequal distribution of government subsidies for health care in China from 2009 to 2013, but also that inequity has been reduced, especially in rural areas. They conclude that health care reforms in China should not only focus on expanding coverage, but also on improving equity [55].

Chen et al. [11] analyse vertical equity while China is reforming healthcare financing by progressing towards Universal Health Coverage (UHC) after the failure of market-oriented mechanisms for health care. Using survey data (n= 8854 individuals in 3008 households) the estimates of overall KI of China's healthcare financing system is 0.0444. General taxation KI was regressive (KI= −0.0241), due to the high reliance on indirect taxes in China OOP payments appeared progressive KI= 0.0896 while representing the main financing source in China. Public health insurance schemes (Urban Employee Basic Medical Insurance, Urban Resident's Basic Medical Insurance, New Rural Cooperative Medical Scheme) showed different patterns, being the first progressive (KI= 0.1301) and the other two regressive (KI= −0.1737 and −0.5598). They authors conclude that the system is still inequitable and that while moving towards UHC indirect taxes relative weight should be reduced in order to improve equity [11].

Mataria et al. [29] analyse the redistributive effect and progressivity associated with current healthcare financing schemes in the occupied Palestinian territories, using data from the first survey

available on household health expenditure for 2004. The paper goes beyond the commonly used approach that estimates a total index of aggregated equity, applying a more disaggregated approach, borrowed from the general economic literature of health financing on taxation that examines the redistributive and vertical effects on specific parts of the income distribution, by using dominance testing [29]. The analysis is conducted for three main healthcare financing schemes of the Palestinian context, which has recently experienced sudden and severe impoverishment effects imposed by chronic political crises. While both aggregate and disaggregated approaches confirm the regressivity of direct payments, the disaggregated approach significantly reveals a progressive aspect, for over half of the population, of the public health insurance scheme [29].

Connelly et al. [13] examine the progressivity of health financing by calculating KI for Iran, using data from the annual national surveys on households between 1995/96 and 2006/07. Both hospital insurance scheme for urban displaced persons and the rural health insurance scheme, extended health insurance coverage in urban and rural areas (respectively in 2000 and 2005). Unexpectedly, the results suggest that both of these initiatives had regressive effects on the distribution of healthcare financing in Iran, which could be explained by the activity of the public sector that has displaced the charitable activities of the private sector. Although this study does not explicitly address changes in the distribution of health care utilization, the above healthcare financing outcomes suggest the need for caution in implementing these programmes in low-income and middle-income countries. If charitable actors are already involved in the provision of health care to the poor at zero or low prices, public intervention may not improve the progressivity of healthcare financing [13].

Homaie Rad and Khodaparast [19] use 2012 household expenditure survey and the KI to evaluate progressivity showing that Government health insurance appears to be progressive, while social insurance was regressive [19]. Almasianka et al [3] estimated KI for Iran's health system financing in rural and urban areas between 2001 and 2010. By using data on annual household expenditures and an income survey from the Statistical Center of Iran (SCI), they estimated KI for OOP and PHI payments; OOP were regressive among both rural and urban households (-0.168 in 2001 to -0.197 to 2010, and 0.104 in 2001 to 0.156 in 2010, respectively), with a varying trend over time; KI was positive (progressive) for PHI in rural areas and regressive in urban areas between 2001 and 2006, but positive afterwards [3]. The overall regressivity of the Iran health system was also confirmed at local level by a more recent study focusing on Shiraz area and based on 2018 data [20].

Bangladesh high reliance on OOP affects negatively households standard of living and cause the system to be regressive [2]. Estimates of CI and KI for the overall financing system were obtained by using data from the 2010 Bangladesh Household Income and Expenditure Survey (KI= -0.192 CI= 0.123). Taxation is moderately regressive (KI= -0.07), all other sources of financing appear highly regressive (social insurance KI= -0.21, private insurance KI= -0.43, OOP KI= -0.20) [39].

O'Donnell et al. [33] report estimates for the distribution of healthcare financing in 13 Asian countries representing 55% of the Asian population during 1995-2000. The authors use synthetic indexes (CI, KI and Gini coefficient). For the three high income territories with universal social

insurance (Japan, South Korea and Taiwan), healthcare financing is slightly regressive. In Hong Kong, another high-income territory, health financing is supported more by general taxation and appeared progressive. These results for high-income Asian economies are consistent with those in Europe, where social insurance systems tend to be proportional or regressive, while systems based on general taxation are mostly progressive. There seems to be a tendency to reduce the burden of healthcare financing on the less well-off in more developed economies. In part, this is due to differences in the financing structure. As the economy grows, less reliance is placed on OOP financing and social insurance is established. The latter tends to be proportional because the contributions are perceived as a fixed percentage of wages. Furthermore, economic growth widens the tax base, allowing greater dependency on tax financing and changes its composition from direct taxes to indirect taxes [33]. Direct taxation is the most progressive source of finance, mostly in the poorest economies. In universalistic systems, social insurance is proportional. In high-income economies, out-of-pocket are proportional or regressive, while in low-income economies, higher incomes spend relatively more OOP. Finally, in most low and middle-income countries, the wealthier not only pay more, but also receive more health care [33].

Looking at African countries, a study on South-Africa used the 2005/2006 Income and Expenditure Survey (IES) data (n= 21144 households) linked with the national (SACBIA) survey on health service utilization to assess progressivity with the KI methodology [6]. General taxation are marginally progressive, due to the combined regressivity of excise tax, fuel levy and VAT; overall, healthcare financing in South-Africa appear progressive (KI ranging from 0.071 to 0.051 depending on different scenarios of corporate income tax allocation between shareholders and consumers); personal income tax (KI= 0.22) and corporate income tax (excluding the case where 100% of the burden is borne by consumers) are progressive; private health insurance contributions were overall progressive (KI= 0.14), but regressive within the insured group (KI= 0.227) [6].

Mills et al. [30] perform an analysis of the fairness of the entire system - which integrates both the public and private sectors - with the financing of health care and the utilization of services in Ghana, South Africa and Tanzania. They used primary and secondary data (2008) to calculate the progressivity of each healthcare financing mechanism through the KI, catastrophic spending on health care and the distribution of health services. Qualitative data were also collected to support the interpretation of quantitative results. Overall healthcare financing is progressive in all three countries, as are direct taxes; indirect taxes are regressive in South Africa but progressive in Ghana and Tanzania; OOP are regressive in all three countries [30]. The private health insurance contributions of those not in the formal sector a regressive in both Ghana and Tanzania. The overall distribution of health services in all three countries favoured richer people, while the burden of disease was greater for low-income groups [30].

Another study on Ghana is by Akazili et al. [1]. The National Health Insurance (NHI) scheme was introduced in Ghana in 2004 as a pro-poor financing strategy aimed at removing financial barriers to health care and protecting all citizens from catastrophic health expenditures, which currently arise due to user fees and other direct payments. KI are estimated on data from the Ghana Living

Standards Survey (2005/2006) and from an additional household survey which collected data in 2008 in six districts covering the three main ecological zones of Ghana. Ghana's healthcare financing system is generally progressive, driven largely by the progressivity of taxes; contributions by the informal sector are regressive; the distribution of total benefits from both public and private health services is pro-rich; however, public sector district-level hospital inpatient care is pro-poor and primary care services are relatively pro-poor distributed [1].

O' Donnell et al. [33] analyse healthcare financing in Egypt where OOP payments contributed the greatest share of revenue (52%), followed by public revenues (33%), social (7%) and private (5%) health insurance and an earmarked health tax on cigarette sales (3%). They assess progressivity using data from the 1997 Egypt Integrated Household Survey. The overall system was progressive. Direct and indirect taxes were progressive in Egypt. Social insurance premiums were regressive, but only at the top of the distribution. The KIs for Cigarette tax, private insurance, and OOP payments, were not significantly different from zero [33].

Kakwani indices applied to Kenya data on "Health Household Utilization and Expenditure Survey 2007" were estimated for the main sources of healthcare financing: direct and indirect taxes, out-of-pocket payments, private insurance contributions and contributions to the National Hospital Insurance Fund [32]. A significant step forward in the study of progressivity has been made thanks to this work, by using bootstrapping in conducting a sensitivity analysis of the Kakwani index to changes in the equivalence scale or in the use of an alternative measure of ability to pay. The general healthcare financing system appears regressive as OOP. The Authors conclude that reforms are needed in Kenya to reduce dependency on out-of-pocket payments [32].

The health financing in Zambia appears progressive [31]. Based on Duclos et al. [16] model to assess the redistributive effect of health financing in Zambia KI are calculated for general taxation, a health levy and OOP spending using data from the 2010 nationally representative Zambian Living Conditions and Monitoring Survey (n= 19,397 households) [31].

Health financing in Uganda appeared marginally progressive [26]. Concentration and Kakwani indices were estimated using data from the National Household Survey 2009-10 for different taxes (direct, indirect) and for OOP. KI for personal income tax was 0.195 and for OOP for 0.064. Among indirect taxes, VAT was the least progressive (KI=0.064). The implication was that increasing the share of general taxation for health financing would increase progressivity of the health system in Uganda [26].

4. Discussion

This systematic review assessed the evidence of vertical equity in healthcare financing mechanisms. An health financing system is found to be unfair when households do not contribute based on their abilities to pay and incomes, and it does not cover the poor population. It was found that in several countries OOP still represent a main source of inequity. There are various reasons for the widespread use of OOP. In OECD countries, the pressure for decreasing the public share of costs of

general healthcare services through an increase in direct payments for medications and medical services has resulted in an increase in OOP and has imposed a considerable burden on the poor population. In non-OECD countries, lack of coverage and support for families against health costs is another reason for OOP payments by families.

We also found that the tax system can increase the risk of inequity, if taxes are set without considering people's ability to pay. On the other hand, some reforms aiming to decrease public health expenditures have led to an increase in co-payments for pharmaceutical and medical services, resulting in inequities in official costs of health sectors.

Predominantly tax-financed systems are on average only slightly progressive in the poorest countries. This is due to the dominance of direct payments in the majority of low-income countries. Increasing inequities derive from this phenomenon [17]. In OECD countries, direct payments are often regressive, but occupy a less substantial part of total financing. Systems funded mainly through general taxation continue to be proportional or moderately progressive, while social insurance systems appear moderately regressive. As from the past, systems predominantly based on private financing are the most regressive.

Aggregate results very often portray the average progressivity and therefore conceal different results at the disaggregated level, like the Italian case as health financing is regulated on a regional basis. Furthermore, any regional inequities could lead to major problems for the National Health System. We should then understand what are the intolerable regional differences that can be hidden by a national index and the causes behind these differences.

In heavily decentralized health care systems, like e.g. in Italy, the reliance on regressive sources of financing such as VAT, and the shift from direct to indirect taxes could lead to overall public financing to become regressive, whereas previously they appeared progressive. Moreover in countries like Italy, where redistribution of resources from richer regions to poorer regions is done through VAT, which could have different regional levels of regressivity, the increase or decrease of regressivity due to redistribution should also be detected.

5. Conclusions

This study can contribute both to advancing the knowledge on methodologies aimed at measuring vertical equity in healthcare financing and to illustrating the great variability in progressivity levels both within and between countries. We found that the most widespread method used is the Kakwani index. Studies that analyse equity at both national and decentralized levels seem more precise and give a more detailed equity picture useful for policy making. Aggregate results very often portray the average progressivity and therefore can conceal different results at the disaggregated level. Therefore, it would be important to have more evidence for decentralized health care systems. Most studies are based on survey data and we noticed a lack of studies using administrative data. This calls for further work in this direction. There are similar progressivity levels by specific source of financing within the two main groups of countries. However, at the

overall health care system level, progressivity varies across countries. This could reflect the high variability in the relative shares of the different sources of financing. Equity in healthcare financing seems to have worsened over time in advanced economies together with the increasingly inequitable distribution of incomes and assets that started after the 1980s [34]. From our analysis it appears that for most Non-OECD countries, the main persisting source of equity concerns are out-of-pocket expenses. Moreover, personal medical savings accounts and the social-risk pooling account were shown to be regressive in China. Direct payments are regressive even in Non-OECD countries, although representing a less substantial portion of total financing. The overall financing systems appear here more equitable because of the dominance of other less regressive sources, such as general progressive income taxation. Vertical inequities at the overall health financing system level indicate the need for these systems to be urgently reformed in order to achieve the equity and reach the United Nations Sustainable Development Goals. This appears particularly relevant nowadays, as the COVID-19 pandemics is challenging even more societies where there is no universal care provision.

Few limitations still remain. Firstly, the linguistic restriction has excluded several national publications; secondly, the research data sets were limited to PubMed, Econlit-EBSCO, Ideas, Google Scholar and Ssrn; and thirdly, the grey literature has been excluded.

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Appendix 1– Measuring Vertical Equity with the Kakwani Progressivity Index

We refer here to previous studies on measuring vertical equity in healthcare financing [33],[49],[50]. The Kakwani Index (KI) is twice the area between a health care payment's concentration curve and the Lorenz curve for income and is calculated as:

$$(1) \quad KI = C - G$$

Where C is the concentration index for health payments and G is the Gini coefficient of the income variable. The value of KI varies from -2 to 1. A negative number indicates regressivity. A positive number indicates progressivity, 0 indicates a proportionality. The Kakwani index is based on the fact that a tax system can deviate from proportionality. The coefficient of Gini (G) is always positive by construction and varies between 0 and 1. The concentration index (C) varies between -1 and +1, depending on whether the total amount of tax seriously affects the taxpayers who are poorer or those who are richer.

The progressivity of a country's (or region's) total health financing, can be measured by a weighted average of the Kakwani indices of financing sources, where the weights are equal to the proportion of total payments accounted for by each source. Therefore, the overall progressivity depends both on the progressivity of the various sources of financing and on the percentage of revenue collected by each of these sources. It is unlikely, however, that all the sources of financing identified at aggregate level can also be identified at the disaggregated level (for example, at the geographical level and/or of households, individuals, businesses, etc.). In such cases it is necessary to formulate hypotheses on the distribution of financing sources that cannot be directly assessed. It could be assumed that their distribution burden resembles that of another source of payment, like, e.g., that corporate taxes are distributed as income taxes. Alternatively, we could simply assume that the missing payment is distributed as a weighted average of all the revenues that have been identified. The best practice is to make these hypotheses explicit and to conduct an in-depth sensitivity analysis [42].

Some papers have used another approach, trying to calculate the total redistributive effect (RE) of health care payments. This effect can be defined as the effect of (in) equality associated with a transition from pre-payment income distribution to post-payment income [36]. Thus, if Gx and Gy are, respectively, the Gini coefficients pre and post-payment, the redistributive effect (RE) can be calculated as:

$$(2) \quad RE = Gx - Gy.$$

A positive (negative) value of the redistributive effect indicates that health payments tend to reduce (increase) income inequality; and thus, the payment scheme is qualified as "pro-poor" ("pro-rich"). The decomposition of the redistributive effect [4],[5] in vertical equity (VE), horizontal equity (HE) and re-ranking (RR) necessitates the estimation of a set of concentration coefficients for post-payment income distribution, Cy, each calculated, for each group of income considered, made up of similar or equal individuals. As a result, the RE can be decomposed as follows:

$$(3) \quad RE = VE - HE - RR.$$

The VE component, which measures the change in counterfactual inequality that would occur if horizontal equity in payments prevailed, can be assessed as follows:

$$(4) \quad VE = G_x - C_y$$

Where C_y is the concentration coefficient of post-payment income.
Horizontal inequity HE is measured by the weighted sum of the group (j) specific post-payment Gini coefficients, G_j^{X-P}, where weights are given by the product of the group's population share and its post-payment income share, α_j.

$$(5) \quad HE = \sum_j \alpha_j \cdot G_j^{X-P}$$

Note that because the Gini coefficient for each group of pre-payments is nonnegative, HE is also nonnegative. Because it is subtracted in equation 3, horizontal inequity HE can only reduce redistribution, not increase it. This simply implies that any horizontal inequity will always make a post-payment distribution of incomes more unequal than it would have been in its absence.
Finally, RR captures the extent of reranking of households that occurs in the move from the pre-payment to the post-payment distribution of income:

$$(6) \quad RR = G^{X-P} - C^{X-P}$$

Where:

C $^{X-P}$ is a post-payment income concentration index that is obtained by first ranking households by their pre-payment incomes and then, within each group of pre-payments "equals," by their post-payment income.

Note again that R cannot be negative, because the concentration curve of post-payment income cannot lie below the Lorenz curve of post-payment income. The two curves coincide (and the two indices are equal) if no re-ranking occurs.

A popular approach for measurement of vertical equity in Non-OECD countries is based on catastrophic expenditures. Medical expenditures are defined as "catastrophic" if they exceed a fraction of household income or total spending over a given period, usually a year [7],[51].

The two key variables underlying the approach are out-of-pocket expenses (OOP) for health care and a measure of household resources. Income or consumption could be used for the latter. However, income does not match the means available to finance health care and this can be considered a disadvantage. In addition to income, savings and inherited resources must also be taken into account, otherwise we may have distorted results. Consider two families with the same income and health payments. We say that a family has savings and pays for medical treatment with its own savings, while the other has no savings and must reduce current consumption to pay for health care. This difference is not reflected in the relationship between health care payments and income, which is the same for both families. But the relationship between health care payments and total household spending will be greater for the family without savings. If total family spending is used as a denominator, catastrophic payments are defined in relation to the budget share for health payments. For these reasons, most of the studies focus on out-of-pocket expenditures, since there is not yet a National Health System or a private/social insurance system in many of these countries [38].

Appendix 2 – The search strategy keywords.

PubMed search:

1.	Vertical Equity Health	RESULTS:	171
2.	Equity healthcare financing	RESULTS:	428
3.	Progressivity health	RESULTS:	99
4.	Vertical out-of-pocket equity health	RESULTS:	16

Econlit-EBSCO search:

1.	Vertical Equity Health	RESULTS:	47
2.	Equity healthcare financing	RESULTS:	56
3.	Progressivity health	RESULTS:	71
4.	Vertical out-of-pocket equity health	RESULTS:	5

IDEAS search:

1.	Vertical Equity Health	RESULTS:	35
2.	Equity healthcare financing	RESULTS:	10
3.	Progressivity health	RESULTS:	47
4.	Vertical out-of-pocket equity health	RESULTS:	7

SSRN search:

1.	Vertical Equity Health	RESULTS:	15
2.	Equity healthcare financing	RESULTS:	5
3.	Progressivity health	RESULTS:	45
4.	Vertical equity health out-of-pocket	RESULTS:	7
Total search		RESULTS:	**893**

Vertical equity in healthcare financing in Italian regions

Abstract

At the beginning of this Millenium, the Italian system was one of the most equitable in the world in both healthcare delivery and financing. After the introduction of fiscal federalism and the increase in regional decentralization during the 90s, there has been growing evidence on socioeconomic inequalities and inequities in both access and use of health care. However, no studies analysed equity in health financing at a regional level in Italy. The aim of this paper is to measure the progressivity of healthcare financing systems at the regional level in Italy by using the Kakwani index (KI). This is the most widely used summary measure of progressivity in both the tax and the health finance literatures.

Results:

There are vertical inequities in healthcare financing. OOP (out-of-pocket) and VAT (Value-Added-Tax) are slightly regressive; income taxation on firms and households is progressive. Regional health care systems are all regressive. However, regressivity is higher in the South (Basilicata and Campania), lower in the North, with Lombardy and Trentino Alto close to proportionality. The interregional equalisation mechanism in financing, based on redistribution of VAT from Northern to Southern Regions, reduces the overall health financing regressivity.

Conclusions:

After regional decentralization, the healthcare financing system became regressive at both the National and the Regional level. Relying on regressive sources, such as indirect taxation and OOP, undermines overall system equity. The relative weight of direct household payments' source of financing increased during the last global economic crisis. With Italy entering another economic recession after the Covid-19 pandemic, it is urgent to reduce inequities by reforming the health financing system.

1. Introduction

Vertical equity in healthcare financing in European countries has been considered a growing concern starting from the early 90s [30]. Previous comparative analyses at European level, estimated vertical equity in healthcare financing as a weighted average of the Kakwani indices [17] of financing sources, where the weights are equal to the proportion of total payments accounted for by each source [20],[26]. Evidence for Italy obtained by using 1987-1992 cross-sectional data, showed that it was the European country with the lowest degree of progressivity [8],[29],[30]. Italy was one of the few European countries in which indirect taxes were progressive; social security contributions played an important role in the financing of public health care at that time and were moderately progressive; private insurance was not widespread and largely complementary to public coverage. On the other hand, out-of-pocket payments (OOP) were regressive. Another comparative study by Wagstaff et al. [31] at the European level was based on cross-section data for the period 1987-1993. Again, direct taxes and social security contributions were the most progressive sources of financing in Italy. In line with other countries, the most regressive sources were direct payments and indirect taxes. Compared to the previous analyses, the general healthcare financing system, revealed a higher degree of progressivity [31].

The Italian health care system has been reformed several times, showing though a sluggish adjustment in the financing sources. Social security contributions were still a main source of financing during the late eighties, even after the introduction of National Health System (SSN-*Servizio Sanitario Nazionale*) in 1978, that ideally would have required a general taxation financing. After the introduction in 1996 of fiscal federalism in healthcare financing and the last SSN reform of occurred in 1999-2000 [3],[11],[13], the system became heavily decentralized at the regional level, with varying financing rules across regions, particularly in terms of co-payments on public health care services utilization, such as, e.g. drugs, specialist and diagnostic care [1]. Rafaniello and Spandonaro [22] estimated the redistributive effects of the reforms that introduced regional decentralization in health services financing system during the 1990s [22]. They used the method proposed by Aronson et al. [2] and decomposed the redistributive effects of the Italian health service financing system into three components: one related to the progressivity of the system (VE); the other to horizontal equity (HE) and the last to re-ranking (RR). Results showed that out-of-pocket spending was significantly regressive. Among the sources of public health financing VAT was highly regressive. Both direct taxation and social contributions appeared progressive. The latter were replaced in 1996 by Regional corporate taxation (IRAP), which was shown to be progressive as well. Differently from previous analyses, Italy showed a slightly regressive healthcare financing system. There is evidence that regional decentralization in health care delivery and financing introduced an increase in horizontal income-related inequities in health and health care utilization at regional level within Italy [12],[18].

However, there is no evidence on vertical equity at the regional level for Italy as the main previous analyses were focused only at the national level. This work fills that gap with the first comprehensive

and consistent analysis of the distribution of healthcare financing contributions in relation to ability to pay in Italian regions. Throughout, we measure progressivity through departures from proportionality in the relationship between payments toward the provision of health care and ATP (Ability To Pay) [16]. Our research questions are the following: to what extent are payments toward health care related to ability to pay in Italy? Is the relationship proportional or is it progressive/regressive? Are there significant differences in the degree of progressivity/regressivity between Italian regions? Are differences across regions related mainly to the financing mix or rather to the different degree of progressivity/regressivity of each source? These points are important not only from a health care system perspective, but also at a macroeconomic level.

The paper is structured as follows. Section 2 describes the healthcare financing mix in Italian regions. The data and methods used are discussed in Section 3. Results of the Kakwani index estimation at both national and regional level are reported and discussed in Section 4. Section 5 concludes.

2. Sources of healthcare financing Italy

There are four main sources of healthcare financing in Italy to be considered: regional direct taxes, indirect taxes (VAT- Value Added Taxation- Iva, set at National level), private insurance and out-of-pocket (OOP) payments [32]. Regional direct taxes are: 1- corporate tax (IRAP- Imposta Regionale sulle Attività produttive, a tax on the value of net production deriving from the usual exercise of activities aimed at the production or exchange of goods and services, roughly corresponding to the sum of wages and profits); and 2- personal income tax (Additional surcharge on income tax, called Addizionale IRPEF- Imposta sui Redditi delle Persone Fisiche). The biggest shares are from general government revenues: VAT (52,3%), IRPEF (6.3%) and IRAP (14.8%) while OOP payments contribute by 24% (Table 1).

Initially, excise duties on petrol were also present in the original approach of federalism (Legislative Decree 56/00); subsequently, in 2013, they were cancelled with the new fiscal federalism.

The institutional structure is accompanied by the interregional tax equalization mechanism, based on a redistribution of VAT revenues among regions that may change the global progressivity/regressivity level of public financing. The annual quota of resources that belongs to each region to provide essential levels of care (LEA) had to be determined with a mixed system, partly based on a capitation formula adjusted for regional needs. The actual mechanism of resource allocation is quite different from that envisaged at the beginning of the regionalization process, being based on contractual agreements rather than on the fixed allocation formula that was initially devised (compensating fully for different needs, partially for different fiscal capacity and targeted to neutralize the higher costs of policy-makingthat smaller Regions face). Regional shares of health financing sources are variable among regions. Table 1 shows the shares of the main sources of health care expenditure financing in 2015. These figures are derived from official health accounts estimates [7],[21].

Table 1: Financing mixes.

Regions	Regional Corporate income tax (IRAP)	Regional Additional surcharge on income tax (Addizionale IRPEF)	VAT	Out-Of-Pocket	Private Insurance
Piedmont	15.4%	7%	50%	25.5%	2.1%
Aosta Valley	20.9%	7.1%	40.6%	31.3%	0.1%
Lombardy	21.8%	7.6%	41.0%	20.40%	9.20%
Trentino Alto Adige	24.1%	7.7%	41.3%	25.9%	1.0%
Veneto	17.3%	6.6%	46.0%	26.5%	3.6%
Friuli Venezia Giulia	18.3%	7.4%	48.6%	25.6%	0.1%
Liguria	14.0%	7.2%	52.1%	26.6%	0.1%
Emilia Romagna	19.2%	7.5%	46.4%	23.6%	3.3%
Tuscany	17.0%	7.0%	52.1%	22.6%	1.3%
Umbria	12.0%	6.7%	61.0%	19.7%	0.6%
Marche	14.4%	6.5%	55.8%	21.6%	1.7%
Lazio	20.3%	6.8%	46.6%	21.2%	5.1%
Abruzzi	10.0%	5.6%	62.0%	21.4%	1.0%
Molise	1.4%	5.2%	74.2%	18.0%	1.2%
Campania	7.0%	4.5%	70.6%	17.3%	0.6%
Apulia	6.6%	4.6%	65.8%	22.2%	0.8%
Basilicata	0.9%	5.0%	76.0%	17.3%	0.8%
Calabria	0.1%	4.4%	77.0%	18.1%	0.4%
Sicily	10.4%	4.4%	65.2%	19.2%	0.8%
Sardinia	13.8%	5.6%	61.7%	18.3%	0.6%
North West	18.0%	7.2%	46.0%	26.0%	2.8%
North East	19.7%	7.3%	45.5%	25.5%	2.0%
Center	16.0%	6.7%	53.9%	21.3%	2.1%
South	6.3%	4.9%	69.0%	19.0%	0.8%
ITALY	14.80%	6.30%	52.30%	24.00%	2.60%

Data Source: Presidenza del Consiglio dei Ministri for 2015 [21], Censis 2016 [7] and Corte dei Conti 2016 [10].

Lot of financing comes from indirect taxes, over 50% on average. In some Southern regions it exceeds 70%. The latter figure vividly represents the divide between regions of the North and the South. The healthcare financing of the richest and more productive Northern regions is more based on direct taxation with respect to the Southern regions. The latter rely mostly on the redistribution of public funds, based on receipts from VAT. Later on, we shall discuss the direction of such redistribution, arguing that it acts (consciously) the right way, by reducing the overall level of regressivity of

financing. Another distinguishing feature of the health financing systems is the balance between public pre-payments and out-of-pocket (OOP) payments, in a context of high inter-regional variations. For example, Aosta Valley Region obtains about one-third of its funding for health care from OOP payments, while Campania only 18% (Table 1). Private insurance plays a relatively minor role in most regions, with an average share of 2.6%. Its contribution is non-negligible only in Lombardy (9.2%), Lazio (5.1%), and Veneto (3.6%) (Table 1).

3. Data and Methodology

Two types of data are required for our analysis: 1- survey data in order to establish the distribution of payments across households; and 2- aggregate data in order to determine the macro-weights to be assigned to each financing source. The most suitable source of survey data is a household income and expenditure survey, which should contain good data on the two central variables: payments toward health care and ability to pay [20]. Unfortunately, no such comprehensive survey is available for Italy, so we were forced to perform a statistical matching between two datasets: 1- survey data to establish the distribution of private expenditures for health care and other goods across households, by using cross-sectional data from the Italian National Institute of Statistics (ISTAT) household budget survey for the year 2015 [15] and: 2- households income at micro level, by using pre and post-tax income Eurostat EU-SILC microdata [14].

OOP expenditures were directly calculated from 2015 household budget survey (HBS, n=15013 households). HBS dataset contains information on households' expenditures for goods and services according to their main social, economic and territorial characteristics [15]. For the analysis of direct and indirect taxation, we used microdata both from the 2015 wave of the Italian household budget survey (HBS)and from EU-SILC cross sectional wave for 2015 (SILC, n= 42987 individuals/ n= 17985 households). In order to estimate the indirect taxation component of financing, we applied a set of VAT tax rates to households' yearly consumption levels of goods and services subject to VAT. No attempt to correct for households' underreporting of expenditures was performed, as we relied on adjustments already performed by ISTAT. The obtained revenues were then aggregated by regions. The general taxation component was estimated as such. EU-SILC contains detailed information on households' income sources as well as on total income taxation: the last information though, was useless being we interested on Regional income tax surcharge (regional additional IRPEF) that is only a component of total income taxation and on IRAP, whose tax base is Value Added at firm level. Our estimation strategy started then from EU-SILC individual records: using regional tax rates we imputed to individuals the Regional income tax surcharge. No correction for income underreporting was explicitly performed, except the one adopted by ISTAT. The assumptions underlying IRAP imputation to individuals was that of perfect forward translation. We hypothesized that IRAP paid by firms would be shifted fully as increased wages to workers had the tax not been there. IRAP was then proxied by a pay-as-you-go scheme and considered as a social security contribution paid fully by wage-earners and by independent workers (though, for them,

the payment is only partial because of widespread exemptions). IRAP tax base includes also corporate profits, but our survey has profits that are not representative of the whole corporate profits (underreported). It is a limitation of the data. Furthermore, even if we could have reliable estimates of profits we would not know which IRAP rate to apply to them. In fact, recorded profits could be obtained (and taxed) in sectors other than the main job of the income percipient (the only one we know). So, we disregarded profits because they are not representative, and because we do not know the sector where they are produced. Macroeconomic coherence between our estimates, obtained assuming no fiscal evasion, and collected revenues by the Ministry of Finances, is as follows, showing an acceptable overlap:

Table 2: Macroeconomic coherence IRAP, Additional IRPEF and VAT – year 2015

IRAP	Tax base	Net tax	Estimated tax base	Estimated net tax
ITALY	605,799,341	30,025,499	610,000,000	29,100,000
Additional IRPEF	**Tax base**	**Net tax**	**Estimated tax base**	**Estimated net tax**
ITALY	725,618,386	11,383,548	820,000,000	12,900,000
VAT	**Tax base**	**Net tax**	**Estimated tax base**	**Estimated net tax**
ITALY	764,156,969	89,641,651	834,000,000	91,400,000

Source: elaboration Citoni, De Matteis and Giannoni 2019, on data Ministry of Finance, 2015 [19].

Once imputed to EU-SILC at individual level, we aggregated IRAP and Additional IRPEF by households and we reported them in EU-SILC at household level. Finally, as income information, needed to measure ability to pay, was missing in HBS, this could be imputed directly from EU-SILC. The matching procedure between HBS and EU-SILC followed (Table 3). We used a mixed strategy. We first utilized exact matching with hot ranking [4]. As matching variables, we used the following grouping characteristics of household head: age group (3 classes), gender (2), educational level (5), employment condition (3), activity (2), main geographical areas (4) and whether the second member of the household earns any income (2). In theory we could get about 1920 cells (as missing values were identified by a 0 code, and as there is a number of them in the employment condition grouping, the number of cells is higher): in practice the groups that were not empty in the sample were, respectively 211 (HBS) and 233 (EU-SILC). We ranked households, inside each cell, by total expenditure (HBS) and by disposable income (EU-SILC). We coupled in such a way 12647 HBS households out of 15013 with "similar" households of EU-SILC. The unmatched 2366 households of HBS received income and tax variables by EU-SILC, using propensity score matching, based on household heads' variables: age group (3 classes), gender (2), educational level (5), employment condition (3), activity (2), regions (20), size of the family (6) and marital status (6) [23]. At the end of

the two-stage procedure, all HBS households had the required variables: the final dataset contained 15013 records and all income and taxation variables needed [24].

Table 3: Frequencies of matching variables

Survey		HBS (n=15013)		SILC (n=17985)	
Variable	**Description**	**Frequencies**	**%**	**Frequencies**	**%**
Age1	1= >18 and <=34 years	995	6.63	964	5.36
	2= >34 and <=64 years	8336	55.53	10099	56.15
	3= >65 years	5682	37.85	6922	38.49
Gender1	1=male	10193	67.89	11926	66.31
	2=female	4820	32.11	6059	33.69
Rip1(area)	1= North West	3284	21.87	4460	24.80
	2= North East	3382	22.53	4462	24.81
	3=Center	2791	18.59	4223	23.48
	4=South	5556	37.01	4840	26.91
Region	1=Piedmont	1112	7.41	1319	7.33
	2=Aosta Valley	480	3.20	316	1.76
	3=Lombardy	1085	7.23	1829	10.17
	4=Trentino Alto Adige	443	2.95	621	3.45
	5=Veneto	1157	7.71	1410	7.84
	6=Friuli Venezia Giulia	827	5.51	1100	6.12
	7=Liguria	607	4.04	996	5.54
	8=Emilia Romagna	955	6.36	1331	7.40
	9=Tuscany	571	3.80	1196	6.65
	10=Umbria	335	2.23	585	3.25
	11=Marche	841	5.60	1024	5.69
	12=Lazio	1044	6.95	1418	7.88
	13=Abruzzi	553	3.68	434	2.41
	14=Molise	477	3.18	260	1.45
	15=Campania	1141	7.60	1032	5.74
	16=Apulia	935	6.23	855	4.75
	17=Basilicata	555	3.70	329	1.83
	18=Calabria	724	4.82	604	3.36
	19=Sicily	753	5.02	889	4.94
	20=Sardinia	418	2.78	437	2.43
Activity1	0=Missing			183	1.02
	1=employed	7307	48.67	8782	48.83
	2=in another condition	7706	51.33	9020	50.15
Employ1	0= Missing	1282	8.54	718	3.99
	1=Family worker and employee	10419	69.40	12801	71.18
	2=Self-employed with employees	953	6.35	1102	6.13
	3=Self-employed without employees	2359	15.71	3364	18.70
Edu1	1= Less than primary education	540	3.60	504	2.80

Survey		HBS (n=15013)		SILC (n=17985)	
Variable	**Description**	**Frequencies**	**%**	**Frequencies**	**%**
	2= Primary education	2902	19.33	3157	17.55
	3= Lower secondary education	4276	28.48	4680	26.02
	4= Upper secondary education	5398	35.96	6637	36.90
	5= Bachelor or equivalent	1897	12.64	3007	16.72
Staciv1	1=unmarried	2551	16.99	3055	16.99
	2=married	8252	54.97	9832	54.67
	3=separated	355	2.36	523	2.91
	4=legally separated	625	4.16	810	4.50
	5=divorced	698	4.65	798	4.44
	6=widower/widow	2532	16.87	2967	16.50
Hsize	1=one person	4448	29.63	5244	29.16
	2=two people	4675	31.14	5390	29.97
	3=three people	2769	18.44	3552	19.75
	4=four people	2394	15.95	2919	16.23
	5=five people	546	3.64	703	3.91
	6=six or more people	181	1.21	177	0.98

Source: Italian National Institute of Statistics (ISTAT) household budget survey and Eurostat EU-SILC [14],[15].

There are three distinct stages for an analysis of progressivity [20]. First, to establish the progressivity of each source of finance: direct taxes, indirect taxes, out-of-pocket and private health insurance. Second, to define, for each region the weight of each source of financing, in order to define the financing mix. Third, to establish overall progressivity for each region using the financing mix. In this way we can compare the indices for all regions [20].

Lorenz dominance analysis is the most general way of detecting departures from proportionality and identifying their location in the ATP distribution (Figure 1) [25]. But it does not provide a measure of the magnitude of progressivity, which may be useful when making comparisons across time or countries/regions. Summary indices of progressivity meet this deficiency but require the imposition of value judgments about the weight given to departures from proportionality at different points in the distribution. The Kakwani index [17] is the most widely used summary measure of progressivity in both the tax and the healthcare financing literature [20],[30],[31]. The Kakwani index (KI) considers that a tax system can deviate from proportionality. The index is measured as twice the area between a payment concentration curve and the Lorenz curve for income and it is calculated as:

$$KI = C - G \qquad (1)$$

Where C is the concentration index for health payments and G is the Gini coefficient of the income variable. The coefficient of Gini (G) is always positive by construction and varies between 0 and 1. The concentration index C varies between -1 and +1, depending on whether the tax seriously affects

the taxpayers who are poorer or those who are richer, the value of KI varies from -2 to 1. A negative value indicates regressivity, while a positive value indicates progressivity and 0 proportionality [17]. The progressivity of a country's (or region's) total healthcare financing, can be measured by a weighted average of the Kakwani indices of financing sources, where the weights are equal to the proportion of total payments accounted for by each source. Therefore, the overall progressivity depends both on the progressivity of the various sources of financing and on the percentage of revenue collected by each of these sources. It is unlikely, however, that all the sources of financing identified at aggregate level can also be identified at the disaggregated level (for example, at the geographical level) and/or for households, individuals, businesses, etc.

In such cases it is necessary to formulate hypotheses on the distribution of financing sources that cannot be directly assessed. It could be assumed that their distribution burden resembles that of another source of payment, like, e.g., that corporate taxes are distributed as income taxes. Alternatively, we could simply assume that the missing payment is distributed as a weighted average of all the revenues that have been identified. The best practice is to make these hypotheses explicit and to conduct an in-depth sensitivity analysis [20]. In our case we assumed that:

1. the specific contribution – i.e. in excess to the amount collected by IRAP and additional IRPEF – that regions with a special autonomy give to the financing of their regional expenditure is paid out by VAT;

2. the distribution of co-payments for public services and of the other revenues directly collected by local health authorities of SSN is proxied by out-of-pocket expenditures for health care.

There is a further consideration about the meaning of a Kakwani index as applied to private expenditures for health care. Being the taxation compulsory, it is paid without any association between the benefits that individuals can derive from the use of services provided thanks to the yield collected. Out-of-pocket expenditures for health care, though, are closely associated to benefits received by using the services: progressivity, then, represents both a cost and a benefit greater for the richest. Assuming a perfect assessment by private insurances of individual risk of illness, and risk related premiums, the same considerations apply for private insurance payments.

As there is not an established theoretical development for such a big difference, we stick to the usual approach of encompassing private payments in global progressivity measurement. We discuss some implications in the last part of the article.

In Figure 1 we show the concentration curves for each source of financing in Italy, as well as the Lorenz curve for incomes. The concentration curves for IRAP and additional IRPEF appear to lie outside the Lorenz curve, suggesting that these are progressive sources of financing. Instead VAT and Out-of-pocket appear to lie inside the Lorenz curve, therefore they are regressive sources of finance. The formal tests reported in Table 4 confirm these results. The curve for private insurance appears to lie outside the Lorenz curve at lower ATP but inside it at very high ATP: such crossing, if authentic, between the concentration curve and Lorenz curve can hide different levels of risk aversion and different preferences between the richest and the poorest.

Figure 1: Lorenz curves of main Italian sources of healthcare financing**.**
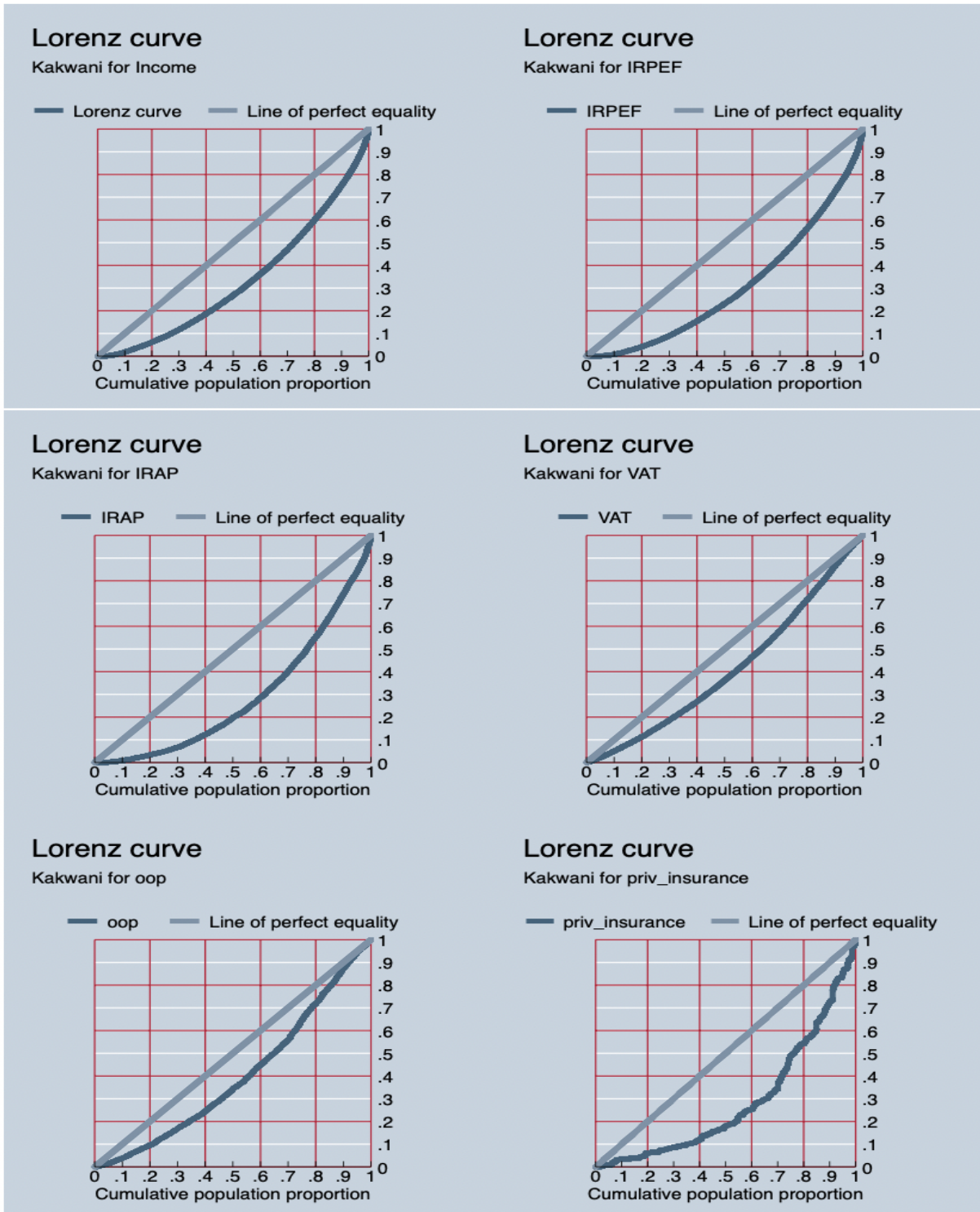
We used households' gross income as a proxy for ATP. We believe that income gross of taxes is a good benchmark for measuring the impact of health financing on the distribution of income in line

with O'Donnell et al. [20]: any inference about the distributional impact of health financing [32], should measure ATP gross of all health care, tax, and employees' social insurance payments. Adjustments to ATP should also be made for the size and age structure of the household: we made such an adjustment taking into account the size and age structure of households through application of an equivalence scale [5]. The final measure of ATP was then gross equivalent income.

4. Results

Results show that there are regional inequalities in healthcare financing. Table 4 shows the regional estimates of Kakwani Indexes (KI) for the main sources of financing, together with their standard errors. VAT and Out-of-Pocket (including co-payments) KIs are negative in all regions, but they are more regressive in the regions of South Italy. IRAP and additional IRPEF are always progressive. Private insurance (PI) is progressive at national level, but with marked regional differences: moreover, KIs estimates are nearly always not significant. KI for PI does not incorporate supplementary group insurances, but only individual private insurance. In fact there are not specific questions on supplementary funds in the consumption survey so that we cannot estimate who is utilizing them. Though, the resources of funds are in the national accounts and they are possibly included in the financing mix of private insurances: for this reason, we have decided to use just individual private insurance KI to proxy the mix between private insurance and supplementary funds KIs. IRAP is always progressive. We recall that IRAP was treated as a social contribution because we only had households' data and we would need firms' data for a more precise estimate.

Table 4: Regional Progressivity indices – Kakwani Index by source of health financing.

| Regions	IRAP	Kse IRAP	IRPEF	Kse IRPEF	VAT	Kse VAT	OOP	Kse OOP	PRIVATE INSURANCE	Kse INSURANCE
Piedmont	0.089	0.024	0.041	0.012	-0.135	0.022	-0.102	0.044	0.114	0.153
Aosta Valley	0.117	0.037	0.054	0.016	-0.067	0.030	-0.039	0.074	-0.099	0.145
Lombardy	0.093	0.025	0.016	0.011	-0.098	0.020	-0.086	0.033	-0.040	0.275
Trentino Alto Adige	0.079	0.044	0.028	0.019	-0.087	0.035	-0.039	0.072	-0.054	0.157
Veneto	0.072	0.024	0.025	0.009	-0.152	0.018	-0.153	0.028	-0.032	0.117
Friuli Venezia Giulia	0.057	0.030	0.020	0.012	-0.116	0.018	-0.114	0.040	-0.006	0.137
Liguria	0.141	0.042	0.064	0.023	-0.138	0.027	-0.161	0.045	0.093	0.228
Emilia Romagna	0.053	0.026	0.044	0.013	-0.158	0.018	-0.135	0.034	-0.019	0.095
Tuscany	0.040	0.036	0.040	0.016	-0.162	0.021	-0.132	0.044	0.110	0.141
Umbria	0.091	0.059	0.047	0.028	-0.163	0.032	-0.157	0.052	0.487	0.365
Marche	0.070	0.031	0.052	0.017	-0.193	0.023	-0.195	0.038	-0.243	0.120
Lazio	0.065	0.031	0.044	0.017	-0.171	0.027	-0.162	0.044	-0.096	0.097
Abruzzi	0.140	0.054	0.046	0.018	-0.213	0.025	-0.185	0.047	0.158	0.304
Molise	0.022	0.050	0.027	0.023	-0.208	0.037	-0.163	0.050	0.118	0.461
Campania	0.107	0.042	0.037	0.014	-0.251	0.019	-0.297	0.029	-0.158	0.212
Apulia	0.073	0.056	0.049	0.013	-0.192	0.021	-0.178	0.029	0.188	0.247
Basilicata	0.100	0.055	0.076	0.020	-0.243	0.027	-0.281	0.049	0.232	0.425
Calabria	0.098	0.065	0.057	0.015	-0.211	0.024	-0.142	0.057	0.501	0.671
Sicily	0.102	0.052	0.068	0.017	-0.225	0.025	-0.212	0.040	0.043	0.262
Sardinia	0.103	0.116	0.062	0.022	-0.179	0.036	-0.138	0.063	-0.435	0.398
North-West	0.089	0.024	0.041	0.012	-0.135	0.022	-0.102	0.044	0.114	0.153
North-East	0.064	0.015	0.032	0.007	-0.146	0.011	-0.134	0.020	-0.010	0.064
Center	0.059	0.020	0.044	0.011	-0.172	0.016	-0.156	0.027	-0.002	0.076
South	0.098	0.024	0.052	0.007	-0.218	0.010	-0.207	0.016	0.050	0.130
ITALY	0.077	0.010	0.035	0.004	-0.153	0.007	-0.137	0.012	0.017	0.060

Source: Authors estimation based on Italian National Institute of Statistics (ISTAT) household budget survey and Eurostat EU-SILC [14],[15].

We also estimated KIs by four main geographical macro areas. IRAP and IRPEF additional are always progressive, while VAT is always regressive (Table 4). OOP is always regressive, but in South Italy it appears much more regressive than in the North-West and North-East. PI is progressive, with the exception of the North-East area where it appears slightly regressive.

After having estimated the progressivity of each source of finance for each region, we calculated the overall progressivity of the Italian health care system as well, at regional and geographical area level by weighting the progressivity for each source.

Figure 2 - Overall progressivity at National and Regional level - Italy - 2015 (regional weighted Kakwani Index) (*)
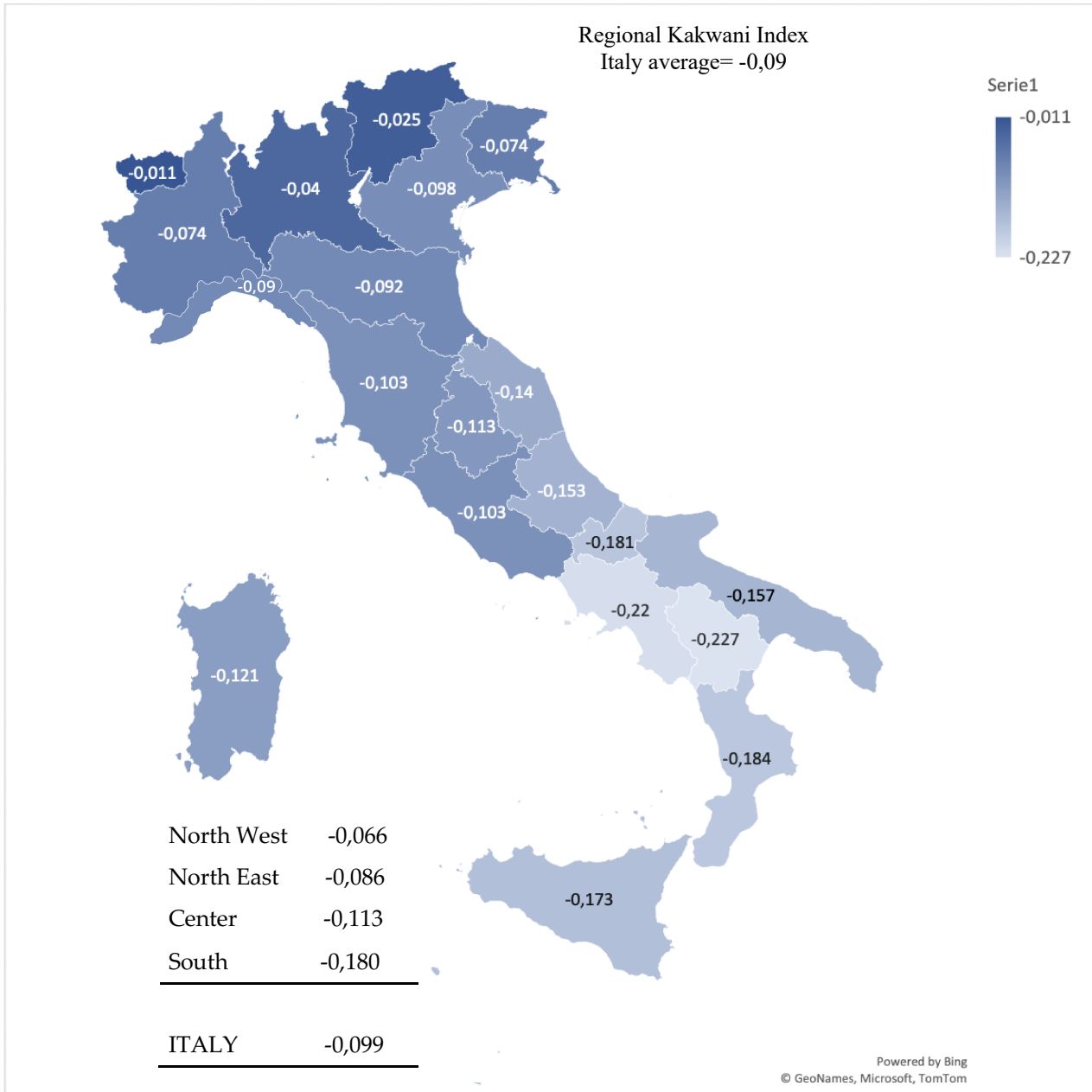
North West	-0,066
North East	-0,086
Center	-0,113
South	-0,180
ITALY	-0,099

Source: Authors estimation based on Italian National Institute of Statistics (ISTAT) household budget survey and Eurostat EU-SILC [14],[15].

(*) All results are statistically different from zero at the 5% level of significance.

KI in 2015 is always regressive in all regions (Figure 2). In Italy the overall KI is -0.099; two Southern Italy Regions, show the highest regressivity: Basilicata (-0.22) and Campania (-0.22); KI is less

regressive in Aosta Valley (-0.011) and Trentino Alto Adige (-0.025), very close to a proportional index (figure 2). KI in higher in the Southern area (-0.180), and a twice less regressive in the Northern area, particularly in the North West (-0.066) (Figure 2).

We also estimated the progressivity of three public financing sources after their redistribution, in order to understand if the interregional tax equalization mechanism - based on a redistribution of VAT revenues among regions - may change the global regressivity level of public financing (Table 5). The yearly amount of public resources going to each region, is determined with a mixed system based on historical expenditure and on a regional capitation rule; the latter should be proportional to the resident population, corrected in order to reduce differences in fiscal capacity, to offset differences in health needs (measured by age of inhabitants) and to neutralize the higher costs that regions with smaller geographical dimension encounter. In practice, needs assessment has been mainly replaced by contractual arrangements between regions. VAT shares are estimated as those needed by a region to provide essential levels of care, net of resources already collected by IRAP and additional IRPEF. An interregional solidarity mechanism allows the regions with needs higher than their own fiscal revenues, to draw the difference from a special equalization fund, which is fed by the regions with VAT surplus.

In Table 5 aggregate KI goes from -0.09 before equalization (ex-ante), to a close to proportionality -0.024, after equalization (ex-post). This result is due to redistribution from the Northern regions VAT (less regressive) revenues, to the Southern regions (more regressive). The average level of regressivity of regions that face an outflow of VAT for equalization purposes, replaces the regressivity of each region experimenting an inflow of VAT. We can say that the KI calculation, before equalization, can overestimate the regressive effect. Moreover, the redistribution of VAT reduces regressivity, but does not cancel it. By applying the public redistribution effect through VAT to the overall shares of public and private financing, the overall level of KI goes down from -0.099 to -0.050 and the Italian system appears less regressive (Figure 2).

Table 5: Progressivity indices by main public sources of health financing[2].

Regions	Public Sources						KAKWANI INDEX
	IRAP	**%**	**IRPEF Add.**	**%**	**VAT**	**%**	
Piedmont	0.089	21.20%	0.041	9.70%	-0.135	69.10%	-0.070
Aosta Valley	0.117	30.50%	0.054	10.40%	-0.067	59.10%	0.002
Lombardy	0.093	30.90%	0.016	10.90%	-0.098	58.20%	-0.027
Trentino Alto Adige	0.079	33.00%	0.028	10.50%	-0.087	56.50%	-0.020
Veneto	0.072	24.70%	0.025	9.50%	-0.152	65.80%	-0.080
Friuli Venezia Giulia	0.057	24.70%	0.020	9.90%	-0.116	65.40%	-0.060
Liguria	0.141	19.00%	0.064	9.80%	-0.138	71.20%	-0.065
Emilia Romagna	0.053	26.20%	0.044	10.20%	-0.158	63.60%	-0.082
Tuscany	0.040	22.30%	0.040	9.30%	-0.162	68.40%	-0.098
Umbria	0.091	15.00%	0.047	8.40%	-0.163	76.60%	-0.107
Marche	0.070	18.80%	0.052	8.50%	-0.193	72.70%	-0.123
Lazio	0.065	27.60%	0.044	9.30%	-0.171	63.10%	-0.086
Abruzzi	0.140	12.80%	0.046	7.20%	-0.213	80.00%	-0.149
Molise	0.022	1.80%	0.027	6.50%	-0.208	91.70%	-0.189
Campania	0.107	8.40%	0.037	5.50%	-0.251	86.10%	-0.205
Apulia	0.073	8.60%	0.049	6.00%	-0.192	85.40%	-0.155
Basilicata	0.100	1.10%	0.076	6.10%	-0.243	92.80%	-0.220
Calabria	0.098	0.10%	0.057	5.30%	-0.211	94.60%	-0.197
Sicily	0.102	13.00%	0.068	5.50%	-0.225	81.50%	-0.166
Sardinia	0.103	17.00%	0.062	6.90%	-0.179	76.10%	-0.115
North West	0.089	25.40%	0.041	10.20%	-0.135	64.40%	-0.060
North East	0.064	27.20%	0.032	10.00%	-0.146	62.80%	-0.071
Center	0.059	20.90%	0.044	8.90%	-0.172	70.20%	-0.104
South	0.098	7.80%	0.052	6.10%	-0.218	86.00%	-0.176
ITALY	0.077	20.20%	0.035	8.50%	-0.153	71.30%	-0.090
Ex Ante	0.077	20.20%	0.035	8.50%	-0.153	71.30%	-0.090
Ex Post	0.077	20.20%	0.035	8.50%	-0.060	71.30%	-0.024

Source: Authors estimation based on Italian National Institute of Statistics (ISTAT) household budget survey and Eurostat EU-SILC [14],[15].

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[2] Percentage share on total public funding.

5. Discussion

The Italian system appears to be heavily decentralized at the regional level, with high interregional variability in financing [6]. This heterogeneity derives from differences in tax rates, in the contributory capacity of citizens, in their share of out-of-pocket expenditure both for private care and for public health care services (co-payments for drugs, specialists and diagnostic treatments), and in the use of private insurance. Moreover last studies date back to early 2000 and are at Country level: aggregate results very often portray the average progressivity and therefore conceal different results at the disaggregated level. For these reasons, an updated analysis of the progressivity of total healthcare financing at the regional level and of the various sources of financing appeared necessary. Furthermore, health financing is regulated on a regional basis. and Article 32 of the Italian Constitution, asserts the irrelevance of geographic location to discriminate health care use. We should then understand what are the main regional differences that can be hidden by a national index and what are the causes of such differences.

In our study we merged two datasets. The usual checks for goodness of merging procedure were applied: the bias for merged cases has been attenuated significantly. Though, there are a relevant number of cases in which total family expenditure exceeds the estimated income: we preferred not to correct the results, as there is general agreement that the degree of underestimation of expenditures is lower than that of income and because of the importance of family wealth in consumption, especially in recession years. The only source of financing that has Kakwani indexes never significant is private insurance, except in the case of one region (Marche). We decided, though, to use their values in the calculation of the aggregate Kakwani index: the choice leaves the index substantially unaffected given the negligible share of insurance payments in the financing mix.

A full analysis of the causes of differences in financing is beyond the scope of our work. Though, among the social, cultural, organizational and economic factors leading to inequities, at least three require a tentative screening. Is there a bias in the progressivity of healthcare financing in Southern regions, confirming the existence of the so called: "*questione meridionale*", i.e. the North-South divide issue? Or are the differences based on the size of the regions and the number of its inhabitants? Could these differences depend on other features such as, e.g., the special autonomy of given regions?

In our study we have a very regressive Kakwani index particularly for the Southern regions. This result is mainly driven by their specific casemix heavily concentrated on the most regressive source of financing, namely VAT. It should also be noted that, in Italy, redistribution of resources from richest regions of the North to poorest regions of the South is also done through VAT: the specific regressivity of the source is then mitigated by the fact that VAT regressivity has a North to South gradient.

We found no systematic effect of the size of regions: regions with less inhabitants are therefore sufficiently similar to bigger regions in the overall degree of progressivity.

Just a feeling of the importance of special autonomy of regions can be guessed from the fact that Aosta Valley and Trentino Alto Adige show the lowest levels of regressivity among the Northern regions. Similarly, the two Islands (Sicily and Sardinia) show the lowest levels of regressivity among the Southern regions: the problem, though, deserves more careful scrutiny.

We already made a point for the meaning of progressivity for out-of-pocket expenditures. Progressivity and regressivity have been used in tax analysis, where the amount of services received is not linked to the amount paid for them, while in out-of-pocket that link is always embedded in the registered expenditures. Progressivity, then, means that both the richest pay more and get more. This is the market logic and progressivity as a synonym of equity is not viable. What would be an equitable approach to out-of-pocket payments for health services? Vertical equity, i.e. the unequal treatment of unequal, can apparently be reached in two different ways: 1) taking into account ability to pay, the poorest should pay the same amount of out-of-pocket services less than the richest does, because there is either a price discrimination in favour of the poor, or because the poor get a partial exemption from payments (or a subsidy by a third payer lowering the average cost of services); 2) taking into account the population's needs, given that the rich and the poor face the same market prices and that the need is concentrated towards the poor, the most needy should be able to pay a greater share of their income for health services, and that could be obtained only with an income transfer to them. Vertical equity, then, should measure either the price subsidy needed by the poor, or the income transfer necessary to them. Both are difficult to measure in systems with different sources of income, transfers, taxation and different needs, and are made more difficult in multi-pillar third-payers arrangements. We stuck, then, to the usual progressivity measure.

We are concerned both for public/private financing mix and for the specific regressivity of public sources of financing. The share of private financing in the financing mix has increased in recent years; global economic crisis and lack of support for public health care spending - coupled with incentives to group private insurances either supplementary or complementary - increased the relative weight of direct household payments' source of financing both out-of-pocket and intermediated. With Italy entering another economic recession because of the Covid-19 pandemic, and looking at geographical distribution of privately insured people, we fear that the relative disadvantage of southern regions could increase and we urge not to postpone the health financing reform towards restoring vertical equity.

Vertical equity, though, cannot be attained if we do not change the composition of financing sources in the public system. Being VAT regressive, rather than increasing its share, as we did in last years of crisis, we should reduce it, relying more on progressive sources such as IRAP and IRPEF. Unfortunately, the discussion underway about canceling IRAP, may be sound from the point of view of support to the productive agents, risks to endanger the goal of increasing equity in healthcare financing.

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Appendix 1 – Kakwani Indexes using total consumption as a proxy for ability to pay[3]

Table A1

Regions	Kakwani Index (based on Total Households Expenditures)										KAKWANI INDEX
	VAT		OOP		PRIVATE INSURANCE		IRAP		Additional IRPEF		
Piedmont	0.05	50%	0.12	25.5%	0.48	2.1%	-0.03	15.4%	-0.07	7%	0.056
Aosta Valley	0.02	40.6%	0.02	31.3%	0.15	0.1%	-0.1	20.9%	-0.09	7.1%	-0.012
Lombardy	0.07	41.0%	0.11	20.4%	0.34	9.2.%	-0.05	21.8%	-0.07	7.6%	0.066
Trentino Alto Adige	0.02	41.3%	0.1	25.9%	-0.04	1.0%	-0.13	24.1%	-0.11	7.7%	-0.006
Veneto	0.01	46.0%	0	26.5%	0.24	3.6%	-0.07	17.3%	-0.07	6.6%	-0.003
Friuli Venezia Giulia	0.01	48.6%	0.02	25.6%	0.13	0.1%	-0.06	18.3%	-0.09	7.4%	-0.007
Liguria	0.02	52.1%	0.03	26.6%	0.42	0.1%	-0.1	14.0%	-0.12	7.2%	-0.003
Emilia Romagna	0.01	46.4%	0.06	23.6%	0.27	3.3%	-0.17	19.2%	-0.13	7.5%	-0.014
Tuscany	0.01	52.1%	0.04	22.6%	0.41	1.3%	-0.14	17.0%	-0.13	7.0%	-0.013
Umbria	0.02	61.0%	0.03	19.7%	0.44	0.6%	0	12.0%	-0.002	6.7%	0.02
Marche	0.03	55.8%	0.05	21.6%	0.09	1.7%	-0.04	14.4%	-0.08	6.5%	0.018
Lazio	-0.01	46.6%	0.04	21.2%	0.22	5.1%	-0.06	20.3%	-0.06	6.8%	-0.001
Abruzzi	0.02	62.0%	-0.01	21.4%	0.31	1.0%	0.06	10.0%	-0.006	5.6%	0.019
Molise	0.03	74.2%	0.04	18.0%	0.24	1.2%	-0.07	1.4%	-0.06	5.2%	0.028
Campania	-0.02	70.6%	-0.12	17.3%	0.09	0.6%	0.04	7.0%	0.01	4.5%	-0.031
Apulia	0.003	65.8%	-0.01	22.2%	0.35	0.8%	-0.07	6.6%	-0.07	4.6%	-0.005
Basilicata	0.04	76.0%	0.03	17.3%	0.35	0.8%	-0.03	0.9%	-0.07	5.0%	0.034
Calabria	0.01	77.0%	0.01	18.1%	0.61	0.4%	0.08	0.1%	0.02	4.4%	0.013
Sicily	0.02	65.2%	0.01	19.2%	0.36	0.8%	0.02	10.4%	-0.02	4.4%	0.019
Sardinia	0.03	61.7%	0.002	18.3%	0.24	0.6%	0.01	13.8%	-0.05	5.6%	0.018
North West	0.06	46.0%	0.11	26.0%	0.38	2.8%	-0.05	18.0%	-0.07	7.2%	0.052
North East	0.008	45.5%	0.03	25.5%	0.23	2.0%	-0.1	19.7%	-0.1	7.3%	-0.011
Center	0.001	53.9%	0.04	21.3%	0.3	2.1%	-0.08	16.0%	-0.08	6.7%	-0.003
South	0.006	69.0%	-0.02	19.0%	0.3	0.8%	0.01	6.3%	-0.02	4.9%	0.002
ITALY	0.01	52.30%	0.38	24.0%	0.34	2.6%	-0.08	14.8%	-0.1	6.3%	0.087

Source: Authors estimation based on Italian National Institute of Statistics (ISTAT) household budget survey and Eurostat EU-SILC [14],[15].

In this Appendix we show the results obtained by using, as a measure of ability to pay, household equivalent total expenditure. First descriptive results show that there are more regional inequalities in healthcare financing. Table A1 shows the Kakwani Index (KI) regional estimates for the main sources of financing. VAT and Out-of-Pocket Kis are almost always positive in all regions, but they are more progressive in the regions of North Italy. VAT is regressive only in Lazio and Campania.

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[3] Percentage share on total funding.

Out-of-Pocket is negative only in Abruzzi, Campania and Apulia. IRAP is almost always regressive, only in some regions of South Italy and in the Islands it is progressive. Additional IRPEF is always regressive, only in Campania and Calabria it is mildly progressive. Private insurance is always progressive, only in Trentino Alto Adige it is regressive. We have completely different results than income-like Ability to Pay.

In Italy the KI is progressive (0.087) and only IRAP and Additional IRPEF are regressive (table A1). The regions where the overall KI appeared more progressive are Piedmont and Lombardy, two regions of the North West. The regions where it was less progressive was Calabria, very close to a proportional index. But in some regions the KI was still regressive, keeping the same sign as for income representing ability to pay. Aosta Valley is the most regressive (-0.012). Lazio, Apulia, Tuscany, Emilia Romagna, Veneto and Trentino Alto Adige are regressive, too. Regarding geographical distribution we have a regressive KI for the Center and North East (-0.01). South and North West (0.052) are progressive.

Making a reason of such results is quite easy. The usual result that VAT is progressive with respect to the expenditure and regressive with respect to income seems to be confirmed. The above stems from the finding that the consumption share in income is bigger for lower income households, leading, if luxury goods face higher tax rates than necessities, to a progressive taxation with respect to consumption and to a regressive one with respect to income. The results are reversed for Additional IRPEF and IRAP, probably because their degree of progressivity with respect to income is low. In fact, their income progressivity was not so important to compensate for the increasing share of consumption as incomes decrease. The sign inversion for out-of-pocket is as expected. In fact, private health services (PHS) are luxury goods, in that their elasticity with respect to income (E_i) is greater than 1. This entails that even if $PHS_r /EXP_r > PHS_p /EXP_p$ (subscripts r and p stay for the rich and the poor respectively, and EXP is the expenditure), if we add savings (SAV) to expenditure, assuming that they are positive for the rich and 0 or negative for the poor, we end up, generally, with $PHS_r/(EXP_r+SAV_r) < PHS_p/(EXP_p+0)$. Out-of pocket expenditure becomes progressive, showing the typical pattern of developing countries, where public coverage is lacking in some way: that pattern conveys that the declining public coverage in Italy, due to persisting economic crises, can be overcome only by richer individuals and regions by using more private resources.

Inequality of access to Italian Public Health analysed with the Hierarchy Stochastic Multiobjective Acceptability Analysis

Abstract

Over the last two decades, due to strong decentralization and widespread budget constraints, the Italian co-payment for health care has become a way to finance public health. This phenomenon has provoked a continuous increase of private costs of public health and an evident regional heterogeneity. As a result, a pervasive spatial inequality of access to public health care is becoming increasingly clear. The aim of this paper is to measure this inequality, mainly determined by the differences among regional co-payment prices. Access, equity, and needs are all part of the phenomenon 'inequality of access', and they are difficult to define and measure in health care. For this reason, most of the previously proposed measurement methods have inherent limitations and have prompted us to use an innovative approach focused exclusively on the supply side. In particular, we focus only on the cost of health benefits (co-payment). From a methodological perspective, we use a recent new version of the Stochastic Multiobjective Acceptability Analysis (SMAA), which is a methodology mainly used to build composite indicators of multidimensional phenomena out of the market. In order to deal with the hierarchical structure of the Italian health care system, we use the Hierarchy Stochastic Multiobjective Acceptability Analysis (HSMAA), which takes into account the uncertainty with respect to the weights assigned to the considered criteria, as in the standard SMAA, but also the uncertainty with respect to the weights assigned to the considered sub-criteria. Applying for the first time HSMAA to measure inequality allows us to create a unique index for each region and then to make a classification among them. The results show that, since there are different prices for the same health benefits among different regions, there are strong spatial inequalities in the cost of the Essential Levels of health care in Italy.

1. Introduction*[4]

Equity in health is a widespread, shared goal in the most industrialized countries [66]. In recent years, given accentuated inequalities due to the economic crisis, equity in health has become one of the most pervasive priorities, even in the European Union [72]. The general aim stated by policy makers is to achieve equitable access to health care across different social groups and to reduce or not to aggravate the existing health inequalities.[5] There are evidences that the most vulnerable people who most need health care do not always receive the care they deserve.[6]

Different population groups, such as the poor, elderly, immigrants, people with disabilities, and ethnic minorities, may have different health care needs [27]. A health care system should be designed to meet the different needs of the population in a fair, efficient, and responsive way [10, 33].

Among other concerns, the payment for health care is one of the higher concerns for groups socially and economically most vulnerable. For this reason, the health care systems with universal access to health care services do not always eliminate health inequalities. Indeed, in many countries with universal access to health care, there are still financial barriers, especially for access, and one of these is certainly the co-payment [47].

Continued growth of public health spending [5, 34, 70] often pushes the debate about co-payment. In the context of scarce resources and growing demand for health care, its governance has to combine the adequacy of health services and equity of care, with the objective of financial stability. Among the instruments rationing the demand side, one of the preferred tools is the co-payment. Indeed, if properly applied, the co-payment can fulfil the role of protection and expansion of public health service. However, at the same time, if the co-payment is not used well, it can create or increase unequal access among users of health care [58].

In the specific case of Italy, the co-payment is managed at the regional level. This peculiarity of the Italian Health Care Service has transformed the co-payment into a tool to finance public health care. As a result, there is strong heterogeneity among the prices for the same public service in different regions, which often may lead to spatial inequality of opportunities of access to public health care. For this reason, this paper investigates the regional Italian differences in the co-payment prices in

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[4] Authors' Contribution: All the authors were involved in the design of this study. DDM and GR wrote the manuscript, which was critically revised by AI. DDM analysed the data with support of GR. All authors contributed to the data interpretation. All authors read and approved the final version of the manuscript.

[5] Fundamental policy goal within the EU, as expressed in many European policy documents (Report on health inequalities in the European Union, Brussels, September 2013)

[6] Among others, this has been reported in the Launch of the World Health Report 2013: Research for universal health coverage, World Health Organization, 2013, China.

order to measure the consequent inequality of opportunities in the access of the health care system [18].

For the first time, this problem has been analysed with a Multi-Criteria Decision Making approach [24, 32]. From a methodological perspective, we use a recent new development of the Stochastic Multiobjective Acceptability Analysis (SMAA) [35, 37]. In order to take into account the hierarchical structure of the Italian co-payment system, we use the model proposed in Angilella et al. [4], hereafter Hierarchy Stochastic Multiobjective Acceptability Analysis (HSMAA). The HSMAA method allows taking into account both the uncertainty with respect to the weights assigned to the considered criteria (as in the standard SMAA) and the uncertainty with respect to the weights assigned to the considered sub-criteria. This innovative application allows us to estimate a new index of inequality of opportunities in public health in absence of information about the real health care needs of people. Our results show that, regardless of real needs, there are evidences that differences in the co-payment prices create a pervasive territorial segregation among citizens living in different Italian regions.

The rest of the paper is organized as follows. In the second section, the economic reasons for co-payment and the problem of measuring inequality of access to health services are presented. The third section describes the data. The fourth section presents the HSMAA to estimate the equity of access to health care, starting from the co-payment data. The fifth section shows the results of the inequality analysis. The sixth section contains policy implications. The last section discusses the conclusions and draws the main policy advices for the Italian case.

2. The reasons for co-payment, the issues of health inequality, and the need for a multi-criteria approach

2.1 Co-payment

As shown in the seminal work of Buchanan [9], the main problem of national health systems is that the demand is made by private or individual choices, and supply is a public or a collective choice. On the demand side, the individual pushes its demand to the point where its marginal utility is equal to the price, i.e., to zero. It follows that the demand from citizens, as patients, tends to be unlimited. On the supply side, the community decides the range and quantity of services through political representatives, taking into account cost [23]. As the government budget is limited, an unlimited demand of health services is not sustainable.

One of the most applied instruments to rationalize demand is the co-payment. The co-payment allows keeping the health service in public supply, in a sustainable way and at a lower price than the free market supply. Indeed, empirical evidences have shown that the co-payment restricts the phenomena of the moral hazard [52], which leads to over-consumption of health goods and services in the presence of the comprehensive insurance coverage [47]. However, the co-payment can be a

protection and an expansion of the National Health Service, only if it does not constitute a financial barrier to access of health care services for low-income groups [31].

2.2 The Italian co-payments system

In Italy, Law no. 537 introduced a comprehensive framework of co-payment in 1993. The first health co-payment in Italy involved specialist visits and pharmaceutical assistance (prescribed drug services). After almost a decade, however, the Finance Act for 2001 abolished the national co-payment. This resulted in a big increase in national health expenditure, which forced the government to reintroduce the co-payment by Law no. 405/2001, starting from 2002. Different from the previous co-payment framework (1993-2001), the co-payment introduced in 2002 was a national tool of regional public spending restraint.

Law no. 405/2001 was a turning point in the use of the co-payment, because since 2002, the regional co-payment has been used mainly for covering regional health deficits and no longer limiting over-consumption of health care services. The latter law, in fact, explicitly states that the regions cover any management deficits are covered with cost-sharing health spending, including the co-payment. The co-payment then becomes a tool for making money and contributing to covering the budget deficits of the regions [58].

The Finance Act of 2007 introduced an additional co-payment to the previous specialist visits and a new co-payment for emergency services. The first was the 'super-ticket', a new private cost only for accessing public health facilities for specialized services, and the second was a new co-payment for emergency services (white codes).[7] The 'super-ticket' has been applied since 2011 (D.M. no. 98/2011).

As a result, there are now three main types of co-payments in Italy: for emergency services, for specialist visits, and for prescribed drugs. In the application of co-payments, regions have acted differently. These differences, together with the above-mentioned continuous increase of co-payments, provoked a strong regional heterogeneity in the private cost of public health. This widespread diversity creates cost differences for the same service among different regions [48]. There are evidences that this process increases the horizontal income-related inequities in health care [22]. This heterogeneity clearly creates a pervasive spatial inequality of access to public health care.

2.3 Health inequality definitions

According to the work of Roemer [55], inequalities in outcomes are the result of two sources: inequalities due to factors for which people can be held responsible and inequalities due to circumstances beyond individual control. The first source may be considered acceptable; the second, however, is unfair. Health care is certainly one of the sectors in which individual outcome is strongly related to factors beyond individual control.

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[7]Not in the case of urgent cases, where the patient is in critical condition.

There is a large consensus about the relevance of equity in the health sector, but there is little agreement on how to measure equity or even how to define what the term means. One of the main reasons for increasing attention on this issue is that health inequality systematically increases the segregation of people who are already socially disadvantaged.

As far as the definition is concerned, Braveman and Gruskin [7] define equity in health as the absence of disparities, both in health and in its key social determinants, which are associated with social advantage/disadvantage. According to Waters [67], an appropriate indicator for estimating equity of the health system is access to services. This is the reason why many studies have focused on the equity of access to health care and the consequent inequality [15, 16, 20]. Access can be defined as the use of health services conditional to the need for care [67], but while the use of health services can be observed, information about personal need is difficult to be extracted.

2.4 Measuring access

According to the works of Allin and Mossialos [1] and Lindeboom and Van Doorslaer [40], equity of access to health care has been measured in three different ways: equal health outcomes, same utilization of health care services for equal needs, and equal access to health care for equal needs.

In many works, utilization of health care services is considered a good proxy to measure access to health care [6, 44]. This approach leads to estimating the production of the health care sector, and the consequent inequality in the outcomes is taken as proxy of inequality of access. However, utilization of health care is influenced by needs, and needs differ between people. Different population groups, such as the poor, seniors, immigrants, the disabled, and ethnic minorities may have different health care needs [27]. Consequently, if people in different socioeconomic groups report the same health care use, this does not mean that access is equitable. On the contrary, this situation may even be unfair, since poor people often need more health care. Therefore, measuring the outcome is not enough to understand the equity in access to health care. It is necessary to take into account needs of health care services [54].

There is no consensus on the definition of needs for health care, but there is a crucial component to the needs, which is the individual state of health [46]. The main issue in measuring the state of health is data collection. The surveys on health needs are generally based on self-assessments; therefore, they are subjective, prone to bias of formulation of the questions and to psychosocial and cultural factors.

Even when the needs are well defined, comparing needs and utilization leads to the intrinsic problem of measuring utilization. Indeed, as in all economic sectors, utilization of health care is influenced by both the supply and demand of services. The main problem, in this case, is that demand for health services is affected by many exogenous factors, such as: different individuals' perceptions, different information among individuals, and different risk aversions; above all, cultural and religious aspects affect the demand for health care [50]. In other words, since some

people may refuse treatment for various reasons (religious, cultural, different preferences), utilization cannot be used when equity of access is evaluated. Equity of access to health care can, therefore, only be defined and measured as equal access for equal needs [26, 67].

The term access is defined in Mooney [43] as an opportunity and, more specifically, 'the use of this opportunity'. Some authors [69] have defined this as the ability to guarantee a series of health care services at a certain quality-level subject to a specified maximum level of personal inconvenience and cost while in possession of a specified level of information. Le Grand [39] defines access as costs incurred in receiving health care services. The cost must be interpreted in terms of money and time that individuals may incur using services. Measuring the cost that individuals may incur using services means that there is uncertainty about the real needs and, consequently, the real use of the service. In other words, in the inequality of opportunities definition, it is fundamental to consider the 'veil of ignorance', as proposed by Rawls [53] about health needs.

2.5 Measuring inequality

Waters [67] proposes two indicators to measure equity in the distribution of access to health care: (1) a modified version of the Gini coefficient, also called a concentration coefficient, and (2) the Atkinson distributional measure. These two indicators have been used in three main works [45, 49, 62].

Morris et al. [45] investigate the inequality in use of GPs, outpatient visits, day cases, and inpatient stays in England. From a data perspective, they use a linked data set, which combines information on health status and socio-economic circumstances of individuals, with information on local supply conditions. They find that utilization of care is linked to income, ethnicity, economic status and education. On average, low-income individuals and ethnic minorities tend to have lower use of secondary care and higher use of primary care. Wagstaff and Van Doorslaer [62] estimate concentration indices and progressivity indices, based on the Kakwani [29] methodology at country level in Europe. Regarding direct taxes, they find that Italy is the country with the lowest degree of progressivity. Regarding indirect taxes, instead, Italy is one of the few progressive countries. As expected, Wagstaff and Van Doorslaer [62] find that out-of-pocket payments tend to be highly regressive in general. O'Donnell et al. [49] provide a systematic practical guide to the measurement of a variety of aspects of health equity. One of the most important chapters is dedicated to the concentration index.

However, Klomp and De Haan [30] suggest that multidimensionality is intrinsic in the definition of health provided in the Constitution of the World Health Organization [71]. Therefore, we propose dealing with inequality in health by means of a Multi-Criteria Decision Analysis approach. By linking the concepts of cost from Le Grand [39], opportunity from Mooney [43], and uncertainness from Rawls [53], we propose measuring the inequality of opportunities by evaluating only the barriers to accessing public health care services. Regardless of the unknown real needs and use, we

assume that inequality of access to public health care is related to cost. Therefore, in our model, the index of inequality of opportunities is given by the sum (weighted by the uncertainty) of co-payment prices. From a methodological standpoint, we use the idea of Greco et al. [25], where the SMAA approach is used to take into account a large sample of randomly extracted vectors of weight to rank regions. Italy is well suited for this measurement, as the level of cost (co-payments) varies from region to region.

3. The data

Our analysis is conducted using secondary data collected from four different sources: official website of the regions, the National Agency for Health Care Services (AGENAS), the National Federation of Pharmacists (FEDERFARMA), and the online newspaper for the Italian health care sector (quotidianosanità). These surveys report the value of existing co-payment prices in Italian regions in various forms. In this paper, we use this data to estimate the territorial inequality of opportunities to access public health in all 21 Italian regions.

Table 1 indicates the minimum and maximum prices for each co-payment type. The dispersion is quite large, as also indicated by the standard deviation. This is the first evidence of heterogeneity in prices paid by citizens for the same public health care service in different regions.

Table 1. Descriptive statistics

Service	Min.	Max.	Average	S. Dev.
Emergency	8	50	26.57	8.62
Specialist visits	36.15	66.15	48.26	7.85
Prescribed drugs*	0	8.5	3.08	2.12

Sources: agenas.it, federfarma.it. Notes: Update to 2015; values in euros; *one prescription and one pack of drugs

Regarding prescribed drugs and emergency services, the regions applied co-payment with highly differentiated frameworks.

By analysing the specific cases, the co-payment of emergency emerges as quite homogeneous: almost all regions apply 25 euros for the 'white codes'.[8] The higher level of emergency co-payment is in Campania and Bozen, with 50-euro cost sharing, while the lower level is in Friuli Venezia Giulia.[9] Regarding the specialist services, the situation is more heterogeneous, mainly because of the 'super ticket' effect. Nine regions apply the national legislation (Friuli Venezia Giulia, Liguria, Molise, Apulia, Marche, Lazio, Campania, Calabria, and Sicily). Five regions have modulated cost

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[8] Some regions (Calabria, Bozen, and Sardinia) apply co-payment also to 'justified cases' called green codes, but we did not consider this.

[9] In Friuli V.G., there is a tariff for other specialist services in emergency.

sharing based on the income of citizens (Emilia-Romagna, Abruzzi, Veneto, Tuscany, and Umbria). Two regions have modulated the co-payment based on the cost of health care service (Lombardy and Piedmont). Five regions do not apply the 'super-ticket' (Aosta Valley, Sardinia, Bozen, Basilicata, and Trento apply only three euros for super-ticket). The lower level of co-payment for specialist services is in Aosta Valley, Abruzzi, Basilicata, and Bozen, with 36.15 euros per visit. Lombardy and Piedmont[10] have the highest prices, because in these regions, co-payment prices are based on the service price. In those regions, co-payment can reach 66.15 euros. In the prescribed drug cost sharing, Sardinia, Marche, and Friuli V.G. do not apply any co-payment, while in Apulia, it can reach 8.5 euros for one pack of drugs. High cost sharing for prescribed drugs can also be found in Lombardy, Piedmont, Veneto, and Tuscany. It is worth mentioning that Emilia-Romagna, Tuscany, Abruzzi, Veneto, and Umbria modulate the specialist visits and the prescribed drug co-payment based on income. For these regions, in our estimates, we use the median regional income from ISTAT [28] in order to estimate the private cost and consequent inequality.

4. Methodology

In the Multi-Criteria Decision Analysis (MCDA) problem [24, 32], there is a set of alternatives:

(1) $A = \{a_1, \dots, a_m\}$

is evaluated on a set of criteria:

(2) $G = \{g_1, \dots, g_n\}$

In this study, we assume that the inequality of access is related to user cost of public health care. Thus, our alternatives are the 21 Italian regions, and the criteria are the three categories, with respect to which those regions choose the three service co-payment prices: price of emergency service, price of specialist services, and price of prescribed drug service.

Since we consider the inequality of access equal to the user cost of public health care, the index can be seen as the sum of the co-payment prices of the services used. In this case, the value function that aggregates the user costs is given by the number of times the citizen uses each of the three services, multiplied by the relative co-payment price. For each region, $a_k \in A$, we can estimate the following inequality of access:

(3) $u(a_k, w) = \sum_{i=1}^{n} \ w_i g_i(a_k)$

where w_i is the number of times a citizen uses the service i. The problem is that the demand is unknown. Therefore, we do not know how many times a citizen will use each service i.

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[10]For Lombardy and Piedmont, we considered all the possible cost sharing based on the price of services.

If we assume that each citizen uses health care services the same number of times, our inequality of access index can be obtained by the simple arithmetic mean where, in (3), we have $w_1=w_2=w_3=w_i$. However, in this case, we assume that each citizen has exactly the same number and same kind of health problems, and we believe in an abstract and unrealistic 'representative agent' consuming health care.

Our research question is: How does the inequality of access ranking of the regions change when the number of times a citizen needs each service is different for each person? In other words, we want to know what happens to the ranking when there is uncertainty about health needs as proposed in the 'veil of ignorance' concept introduced by Rawls [53].

In the MCDA literature, this question is addressed with the Stochastic Multiobjective Acceptability Analysis. Introduced by the seminal work of Lahdelma et al. [35], SMAA is a method able to take into account the uncertainty with respect to the weights assigned to the considered criteria. After the original SMAA, which estimates acceptability index for each alternative measuring volume of weights that give each alternative the best ranking position, several modifications to the basic model are proposed in the literature. Lahdelma and Salminen [37] introduce SMAA-2, which extends SMAA by considering all ranks. Lahdelma et al. [36] develop SMAA-O, which is a method dealing with problems with ordinal criteria information. Lahdelma and Salminen [38] propose the combination of SMAA-2 and Data Envelopment Analysis [11]. Tervonen and Lahdelma [59] present methods for computations through Monte Carlo simulation. Corrente et al. [12] combine SMAA with PROMETHEE methods in order to explore the parameters compatible with preference information of the decision maker. Angilella et al. [3, 4] combine the Choquet integral with SMAA and obtain robust recommendations and robust ordinal regression.

In order to take into account the uncertainty with respect to the weights assigned to the considered criteria and to the imprecision of the evaluation completed on considered criteria, SMAA-2 considers two probability distributions, $f_W(w)$ and $f_\chi(\xi)$ on W and χ, respectively, where:

(4) $W = \{(w_1, \ldots, w_n) \in R_+^n, \ w_1 + \ldots + w_n = 1\}$

and χ is the evaluation space, i.e., the space of the value that can be taken by the criteria (co-payment prices) $g_i \in G$.

SMAA-2 introduces a ranking function relative to the alternative a_k:

(5) $rank(k, \xi, w) = 1 + \sum_{h \neq k} \quad \rho\big(u(\xi_h, w) > u(\xi_k, w)\big)$

where $\rho(true) = 1$, and $\rho(false) = 0$.

Then, for each alternative a_k, for each value that can be taken by criteria $\xi \in \chi$, and for each rank $r = 1, \ldots, l$, SMAA-2 computes the set of weights of criteria for which alternative a_k assumes rank r:

(6) $W_k^r(\xi) = \{w \in W : rank(k, \xi, w) = r\}$

The SMAA-2 evaluation is based on the computation of the rank acceptability index, which is the relative measure of the set of weight vectors and evaluations on considered criteria for which the region a_k gets rank r:

(7) $b_k^r = \int_{\xi \in \chi} \quad f_\chi(\xi) \int_{w \in W_k^r(\xi)} \quad f_W(w) dw d\xi$

where b_k^r is the probability that alternative a_k has the r-th position in the preference ranking.

As explained in Section 3, some Italian regions modulate the co-payment price on the basis of services price. It follows that sometimes there is a differentiation among typology prices of the same service (criterion) in the same region (alternative). In other words, in some regions, we have differentiations within the criteria, and therefore sub-criteria are introduced. A graphical representation of an example of our problem is given in Figure 1. The structure of the problem is hierarchical, because, depending on the region, services are sub-divided by different typologies with different associated costs. Since this problem cannot be solved with the standard SMAA, a Hierarchy SMAA has been developed for solving this particular problem.
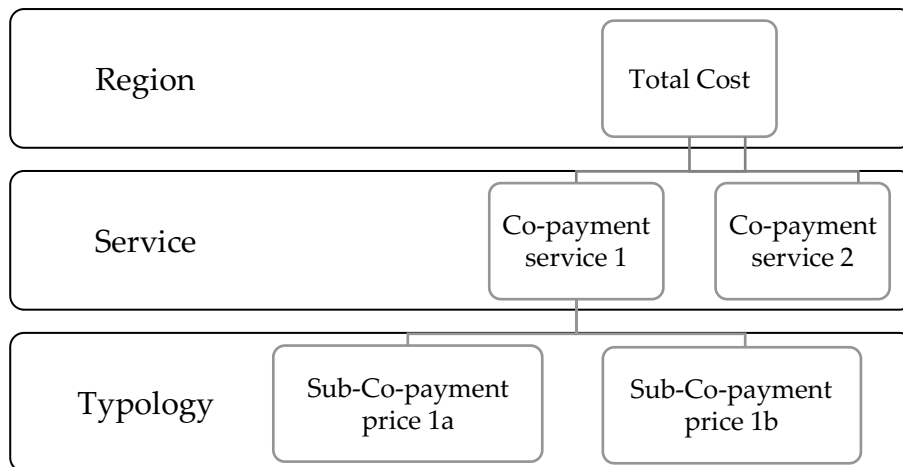
Figure 1. Problem structure

In the MCDA literature, Saaty [56] first proposed the hierarchical structure of decision problems in the Analytic Hierarchy Process (AHP). Thereafter, it appeared also in the Multi-Criteria Hierarchy Process (MCHP) of Corrente et al. [14]. Angilella et al. [4] proposed the inclusion of hierarchical structure to SMAA, and it extended to ELECTRE III in Corrente et al. [13]. In what follows, we present the implementation of the Hierarchy SMAA proposed in Angilella et al. [4] for our health care study.

In our problem, each criterion (co-payment price) $g_i \in G$ is given by the weighted sum of sub-criteria $q_{ij} \in Q_i$:

(8) $\quad g_i = \sum_{j=1}^{s} \quad v_{ij} q_{ij}$

In this case, the inequality of access estimated as the user cost of public health care becomes the sum of co-payment prices, which are the sum of sub-co-payment prices. The new value function to aggregate the evaluations of a region, from A with respect to the g_i co-payments from G, with respect to the typology from Q_i, is a double weighted sum. For each region $a_k \in A$, we can estimate the following inequality of access evaluation:

(9) $\quad u(a_k, w, v_k) = \sum_{i=1}^{n} \quad w_i \sum_{j=1}^{s} \quad v_{ij} q_{ij}(a_k)$

where w_i is the number of times a citizen uses the service i, and v_{ij} is the number of times a citizen uses the specific typology j.

In order to consider the hierarchy of this problem, we use HSMAA. This approach allows us to take into account: (1) the uncertainty with respect to the weights assigned to the criteria (as in the standard SMAA) and (2) the uncertainty with respect to the weights assigned to the sub-criteria.

The HSMAA considers three probability distributions: $f_W(w)$, $f_V(v)$; $f_\chi(\xi)$ on W, V; and χ, respectively, where:

(10) $\quad W = \{(w_1, \ldots, w_n) \in R_+^n, \; w_1 + \ldots + w_n = 1\}$

$V = \{(v_{i1}, \ldots, v_{is}) \in R_+^s, \; v_{i1} + \ldots + v_{is} = 1, \; i = 1, \ldots n\}$

and χ is the space of the value that can be taken by the sub-criteria $q_{ij} \in Q_i (i = 1, \ldots, n)$.

We introduce a ranking function relative to the alternative a_k:

(11) $\quad rank(k, \xi, w, v) = 1 + \sum_{h \neq k} \quad \rho\big(u(\xi_h, w, v_h) > u(\xi_k, w, v_k)\big)$

where $\rho(true) = 1$, and $\rho(false) = 0$.

Then, for each alternative a_k, for each evaluation of alternatives $\xi \in \chi$, and for each rank $r = 1, \ldots, l$, HSMAA computes the set of weights of criteria for which alternative a_k assumes rank r:

(12) $\quad W_k^r(\xi, v) = \{w \in W : rank(k, \xi, w, v) = r\}$

HSMAA evaluation is based on the computation of the rank acceptability index, which is the relative measure of the set of weight vectors and evaluations on considered criteria for which the region a_k gets rank r:

(13) $\quad b_k^r = \int_{w \in W_k^r(\xi)} \quad fW(w) \int_{\xi \in \chi} \quad f\chi(\xi) \int_{v \in V} \quad fV(v) dv d\xi dw$

b_k^r is the probability that alternative a_k gets the r-th position in the preference ranking.

As Angilella et al. [4] suggest, the rank acceptability indices in (13) can be used to estimate the upward and downward cumulative acceptability indices proposed by Angilella et al. [2]. Formally, the downward cumulative rank acceptability index for the rank l is given by:

(14) $b_k^{\leq l} = \sum_{s=1}^{l} b_k^s$

In words, $b_k^{\leq l}$ is the frequency that the region a_k gets a position not greater than l. With the same rationale, the upward cumulative acceptability index for the rank l can be estimated as:

(15) $b_k^{\geq l} = \sum_{s=l}^{m} b_k^s$

where $b_k^{\geq l}$ is the frequency that the region a_k gets a position greater than l.

From a computational perspective, the multidimensional integrals defining the considered index are estimated by using Monte Carlo simulations.

In our application, in absence of information about the demand, we consider uniform probability distributions fW(w) on W and fV(v) on V, while we do not consider the probability distribution fχ(ξ), because we know the value of the considered criteria. To rank the Italian regions (spatial alternatives), we apply the HSMAA technique to 360,000 extractions of w and v vectors.

5. Results

As we have 360,000 extractions and therefore 360,000 rankings, a descriptive statistic gives a general understanding. The higher and lower rank (obtained at least on one ranking) and the mode and median rank are given in Table 2. Our ranks are in terms of expensiveness of the public health bill. Therefore, the higher the rank of the region, the higher the final bill will be for public health users, and the higher inequality of access will be. From Table 2, it is clear that Campania is by far the worst place for health costs. Indeed, Campania is the only region with its mode and median on the first rank. This means that, by taking a uniform distribution of health needs, more than 50 per cent of the time (97 per cent, see Table in the appendices), Campania exhibit a higher level of co-payments for public health care and therefore a higher inequality of access. The Bozen, Calabria, Piedmont, and Lombardy indexes follow the Campania disaster, with certain distance. Indeed, these four regions can achieve the first rank, and they have the mode and median above the fourth rank. In practice, it means that, with more than 50 per cent of cases, living in those regions results in at least the fourth most expensive public health bill.
On the top of the ranking, Friuli Venezia Giulia has the least expensive public health bill. Then, at some distance, Aosta Valley, Abruzzi, and Molise also prove to be cheap in public health care services.

Bozen and Abruzzi are two interesting cases, because their cost systems can be either the worst or the best, depending on the probability of getting a specific health problem. In the Bozen case, this

phenomenon can be explained by its highest emergency co-payment and its lower specialist co-payment price. In the case of Abruzzi, the results are related to the fact that its prices are always close to the average price.

Table 2. Descriptive statistic of the ranking of Inequality of Access in Public Health Care

Regions	Higher	Mode	Median	Lower
Piedmont	1	3	4	17
Aosta Valley	9	18	18	19
Lombardy	1	3	4	18
Bozen	1	2	3	21
Trento	16	17	17	20
Friuli Venezia Giulia	12	21	21	21
Veneto	1	6	6	9
Liguria	1	6	6	9
Emilia-Romagna	9	14	14	15
Tuscany	1	13	14	14
Umbria	9	14	14	15
Marche	8	12	13	20
Lazio	4	5	6	17
Abruzzi	1	20	18	21
Molise	8	11	12	18
Campania	1	1	1	8
Apulia	1	10	8	14
Basilicata	14	19	19	20
Calabria	1	3	3	11
Sardinia	6	12	11	19
Sicily	5	9	8	14

In figure 2, we present a graphical representation of the Ranking Acceptability index of Inequality of access in health care. The regions are ranked according to the median acceptability index. It is interesting to note that two of the three most accessible regions (Friuli Venezia Giulia and Aosta Valley) are Northern regions, while two of the three least accessible (Campania and Calabria) are Southern regions. However, Italy has a long history of persistent dualism, North-South, in which the North outperforms the South in economic performances and well-being, a phenomenon well known as "questione meridionale" [25, 42, 57, 61]; our results show that this dualism does not involve the public health expenditure.
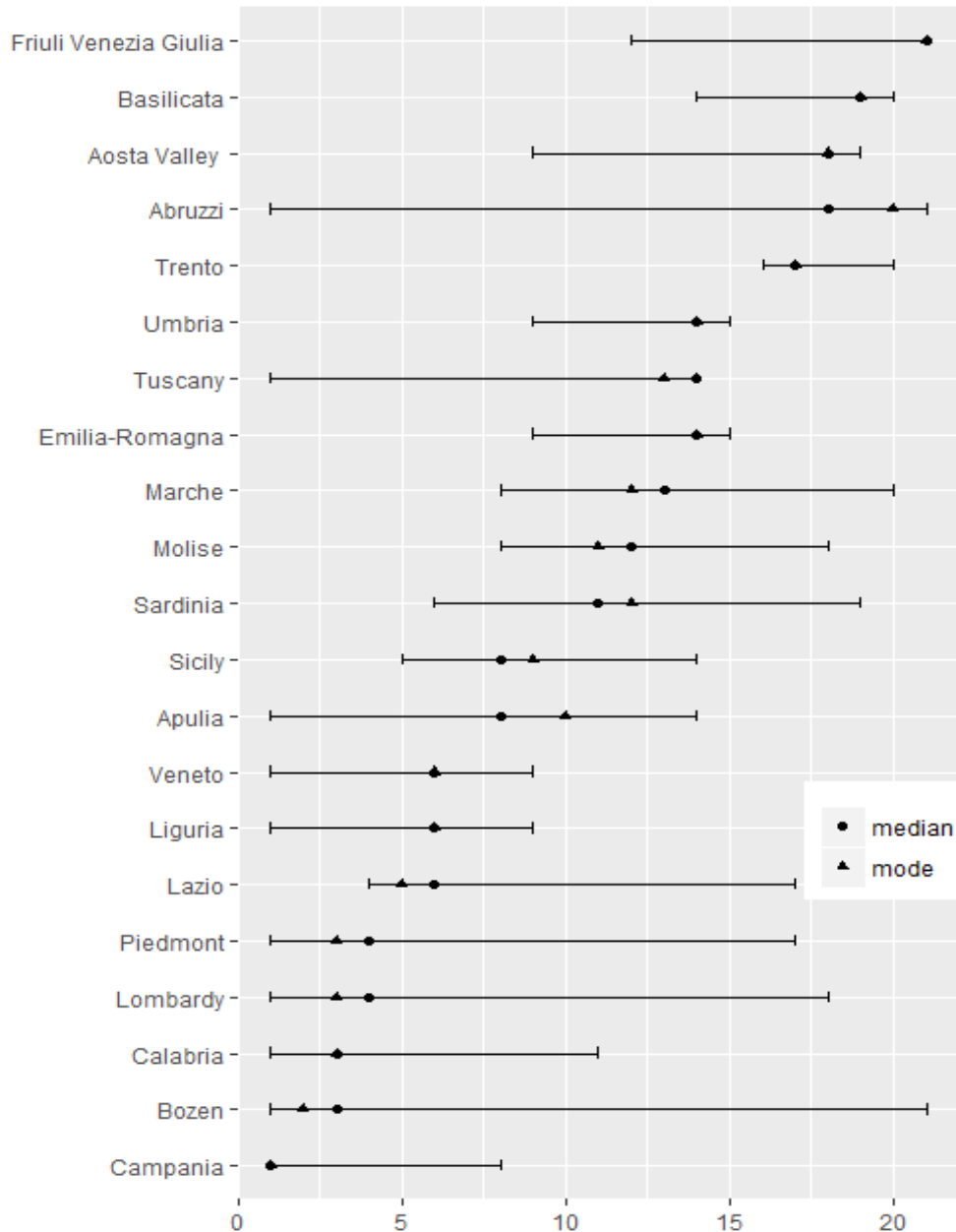
Figure 2. Rank acceptability indices by median

Figure 3 shows a map of the regional probability in the three highest (left part of Figure 3) and in the three lowest (right part of Figure 3) rank positions, according to the sum of the bills of public health expenditure. Technically, in Figure 3, we report the downward (14) and upward (15) rank acceptability indices [2, 4] for the 3rd and 18th rank, respectively.

Looking at the left side, it emerges that the higher probabilities are in the big Northern and Southern regions, while the central regions and the Islands have less probability of being the top three most expensive regions. The North–South divide, which is striking in the ranking based on per capita GDP, is not present in terms of public health expenditure. In addition, it emerges that the smallest

regions (in particular Aosta Valley, Friuli Venezia Giulia, Molise, and Basilicata) are better for keeping the price of public health low compared with the biggest regions (Campania, Lombardy, and Piedmont). Considering that Patrizii and Resce [51] found that the smallest regions outperform the big ones in terms of efficiency of health care in Italy, the low cost of public health care services in the smallest regions may be due to their lower costs of production.
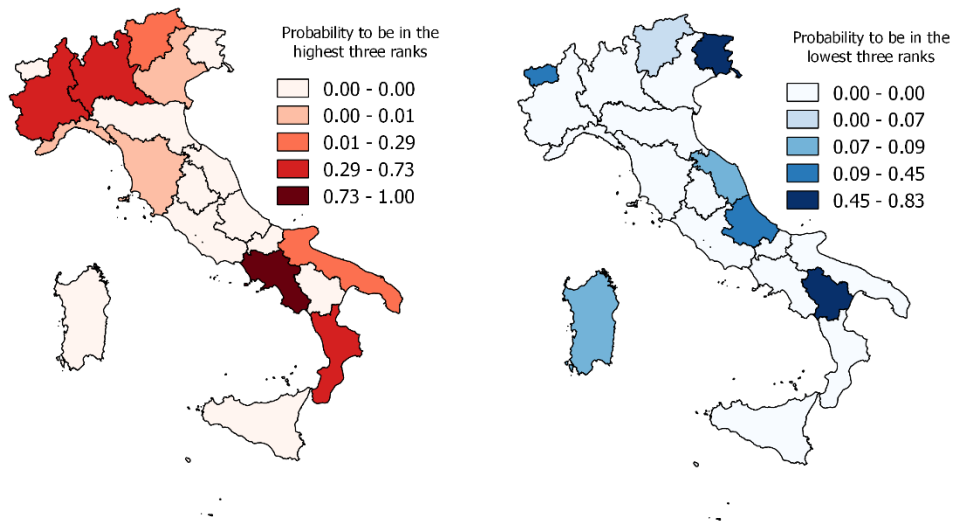

Figure 3. Probability of being in the Highest (left) and Lowest (right) three rank positions[11]

To summarize, the results make clear that, since there are different co-payments for the same public health care services accross regions, there are strong spatial inequalities in the cost of the Essential Levels of health care in Italy. Regardless of real needs of health care, differences in the co-payment prices create a pervasive territorial segregation among citizens living in different Italian regions. This is a paradox in a country with a National Public Health System [17].

6. Policy implications

From a policy perspective, our results suggest taking into account the regional disparities when decisions are made in public health care decentralization. Moreover, our results clearly show the damages provoked when the co-payment becomes a tool to finance public health as an alternative to general contributions. National Health Service (NHS) is a system of the welfare state, which aims for the same standard health care of the citizens of a country, wherever they live. In Italy, profound interregional differences in health care expenditure may aggravate the already-existing inequalities among regions [21, 48]. The main problem is that, since 2002, regional co-payment revenues are used to finance spending. This is proven by the fact that regions with financial stability plans have higher

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[11] The Trentino Alto Adige values are estimated based on the Trento and Bozen average.

co-payment prices (see Piedmont, Lazio, Campania, and Calabria for specialist visits). One of the most controversial parts of the Italian co-payment is definitely the 'super-ticket', introduced in 2007 – the tariff that serves as a ticket to the NHS. The 'super-ticket' has the stated objective of improving the economic and financial equilibrium of the regions, but it creates three serious health problems: (1) the outflow of some benefits from the public system; (2) the renunciation of expensive care for a part of the population; and (3) a paradoxical decline in public revenue. Referring to the last point, the 'super ticket' raises the cost of some performances beyond their value, creating distorting effects on consumer choices for which it might be cheaper to pay the full price of the private market.

From a distributional perspective, the worst situation lies in regions where co-payment prices are modulated according to the service value. In these cases, market mechanisms are introduced in a sector where market failure is the reason for justifying public intervention. One of the major consequences is that a part of the population renounces more expansive health care, endangering the universality of health care [21].

The reason for the co-payment is to empower users regarding the cost of healthcare. The Italian system fails in this objective. In addition, the tariffs applied in some regions are likely to violate the universality principle of the National Health Service laid down in Article 32 of the Italian Constitution, accentuating the risk of serious inequalities in accessing the essential levels of assistance.

To restore a coherent sharing scheme in Italy, the ticket should return to its original role in reducing over-consumption. It is therefore necessary to remove from the regions the perverse incentive to use co-payment as an alternative to taxes: a solution might be to disconnect co-payment revenue from financing health expenditure.

7. Conclusions

This paper analyses the regional differences in the application of the co-payment in the Italian National Health Care Service. In particular, it measures the inequality of opportunities in accessing public health care among the regions, due to the difference in co-payment prices.

Following the previous literature focused on inequality of opportunities in health care service, we propose measuring the inequality of access to public health care through the cost of services, regardless of unknown health needs and use. In our study, the index of inequality is given by the sum (weighted by the uncertainty) of the co-payment prices. From a methodological perspective, we use the Hierarchy Stochastic Multiobjective Acceptability Analysis. This new modification of the standard SMAA allows dealing with Multi-Criteria Decision Making problems with a hierarchical structure, as in the case of the Italian health care co-payment system. In our case, HSMAA measures the inequality, allowing us to create a unique index for each region and then rank them. Indeed, by aggregating the data of prices of public health care services with HSMAA, we estimate a new index of inequality of opportunities in public health care [21].

Our results show that, under the 'veil of ignorance' about health needs, the Campania (a Southern region) is by far the worst region. On the contrary, we found that Friuli Venezia Giulia (a Northern region) exhibits the highest level of equity of access, applying the lowest co-payments. These evidences make clear that Italy, with these circumstances, will never have a convergence path, either in economic performances in well-being or in civil rights. Indeed, the price of access to public health changes within the country, region by region. This paradox causes a territorial inequality of access in the same country, even if there is a National Public Health System. Such difference has been described as a 'postcode lottery' that contributes to social and spatial disparities, because people's access to public services is determined by the postcode area in which they live [60]. These differences should not exist, since the Italian Constitution provides the right for the Essential Levels of Care in equal measure on all national territories.

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LIST OF ABBREVATIONS

AGENAS – Agenzia Nazionale per i Servizi Sanitari Regionali

ATP – Ability to pay

CI – Concentration Index

EU SILC – Statistics on Income and Living Conditions

FEDERFARMA – Federazione nazionale unitaria titolari Farmacia

HSMAA - Hierarchy Stochastic Multiobjective Acceptability Analysis

IRAP - Regional tax on productive activities

IRPEF - Additional surcharge on income tax

ISTAT – Istituto Nazionale di Statistica

KI – Kakwani Index

NHS – National Health Service

PHI – Protected Health Information

PI – Private Insurance

PRISMA - Preferred Reporting Items for Systematic Reviews and Meta-Analysis

OECD – Organization for Economic Co-operation and Development

OOP – Out of pocket

SMAA - Stochastic Multiobjective Acceptability Analysis

SSN – Servizio Sanitario Nazionale

VAT – Value added tax

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