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How does fiscal decentralization affect within-regional disparities in well-being? Evidence from health inequalities in Italy

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Abstract

This paper aims at investigating empirically the impact of fiscal decentralization reforms on inequality in well-being. In particular, we look at the effects on health inequalities following the assignment of larger tax power to the Italian Regions for financing their health expenditure, starting from the end of the Nineties. Exploiting large differences in the size of the tax base across Regions, we find that fiscal decentralization processes that attribute a greater tax power to lower government tiers, besides reducing inefficiencies of healthcare policies, seem to be effective in reducing also within-regional disparities in health outcomes. However, the degree of economic development – on which depends the actual fiscal autonomy from Central government – significantly affects the effectiveness of these reforms and highlights the importance to take properly into account the specific features of the context where the decentralization of power is implemented.

JEL codes: H75, I14, I18, R50.

Keywords: fiscal decentralization, regional governments, healthcare policy, health inequalities.

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1. Introduction

Over the last 40 years a decentralization wave has swept the world (e.g., Rodriguez-Pose and Ezcurra, 2010) and, nowadays, devolution still ranks high in the policy agenda of many developed (e.g., OECD, 1997; Joumard and Kongsrud, 2003) and developing countries (e.g., World Bank, 1997; Bird et al., 1997), involving many different policies which directly affects individual well-being. While the transfer of powers and resources to sub-national tiers of government can also be justified on identity grounds (e.g., De Winter and Tursan, 1998; Moreno, 2001), the more recent wave of decentralization has been vindicated on the grounds of a supposed greater capacity of sub-national governments to overcome the failures of the centralized state (e.g., Bardhan, 2002) and to deliver improved economic efficiency (e.g., Tiebout, 1956; Oates, 1972; Keating, 1998; Morgan, 2002; Weingast, 2009). On the downside, however, decentralization can lead to an increase in the size of administrative structures (Reverte-Cejudo and Sánchez-Bayle, 1999; Repullo, 2007) and to an uneven geographical distribution of its benefits (Martınez-Vazquez and McNab, 2003).

As for the distributional issue, results are mixed. Some studies claim that decentralization is associated with a general reduction in territorial disparities (e.g., McKinnon, 1997; Qian and Weingast, 1997; Shankar and Shah, 2003; Gil et al., 2004), while others point to an increase in geographical disparities (e.g., Cheshire and Gordon, 1998). More important, a recent empirical work by Rodriguez-Poze and Ezcurra (2010) shows that the influence of decentralization on regional disparities cannot be predicted a priori, but depends on country-specific factors, such as the level of economic development, the existing level of territorial inequalities and the fiscal redistributive capacity of countries.

Among local public services influencing individual well-being, decentralization of health care policies has become common throughout the world (e.g.; Costa-Font and Greer, 2013; Anton et al., 2014). To this regard, deep reforms have also taken place in the Italian National Health Service (NHS). The NHS was established in 1978 in order to replace the previous system based on insurance funds, with the declared goal of providing uniform and comprehensive healthcare services across the country. However, as healthcare expenditure increased steadily over time, the Central government repeatedly introduced reforms aimed at controlling spending growth. In particular, in the last twenty years, these reforms have progressively shifted the responsibility of policy management and service funding from Central government to regional jurisdictions (e.g., Bordignon and Turati, 2009; Ferrario and Zanardi, 2011; Piacenza and Turati, 2014). The declared aim of these reforms was to improve spending efficiency, by reducing Vertical Fiscal Imbalances, thus increasing regional governments' accountability. However, some scholars and policy makers doubt on the consequences of decentralization reforms in Italy, which – despite improving efficiency – might have increased inequalities in access to health care services, deteriorated overall health indicators and population well-being, and sharpened the existing difference in the quality of care across Regions.

The objective of this paper is to estimate the effect of decentralization of health care funding on within region dispersion in self-assessed health outcomes, an important dimension of individual well-being. For this purpose, we make use of the shock on Vertical Fiscal Imbalance following the introduction in 1998 of a new regional tax on productive activities to be paid by firms and of a regional surcharge on the Personal Income Tax. The regional setting of the Italian NHS and the wide variation in the size of the tax base offer a unique opportunity to this end. Our main finding, obtained exploiting the different intensity with which the different regions were affected by the fiscal decentralization reforms, suggests that decentralization not only improved efficiency in more fiscally autonomous Regions, but it also reduced health disparities more in those same regions. In particular, according to our estimates, the inequality index has been reduced from about 2 to 4 times the standard deviation depending on the level of regional per capita GDP, with stronger effects in the richer (Northern) Regions compared to the poorer (Southern) ones. This calls for a prominent role of regional governments in promoting both efficiency and equity.

Our work is related to the scant literature studying the impact of health care decentralization on a variety of health outcomes, which provides empirical results often mixed and inconclusive (e.g., Jepsson and Okuonzi, 2000; Tang and Bloom, 2000; Bossert et al., 2003; Akin et al., 2005; Arreondo et al., 2005; Kolehmainen-Aitken, 2005; Saltman et al., 2007). As far as the Italian NHS is concerned, most works have focused on the relationship between decentralization and the efficiency of health policies (e.g., Bordignon and Turati, 2009; Piacenza and Turati, 2014; Francese et al., 2014). This literature provides support to modern fiscal federalism theories according to which fiscal decentralization makes local governments more accountable and efficient. As for the impact on inequalities, studies available so far have discussed the *between-regional* dimension of disparities, finding mixed evidence on the impact of decentralization (e.g., De Belvis, 2012; Toth, 2014; Costa-Font and Turati, 2015). However, to the best of our knowledge, there are no studies about the effects of decentralization on *within-regional* health inequalities, neither for Italy nor for other countries.

The remainder of the paper is organized as follows. Section 2 provides essential background information on the Italian NHS and decentralization reforms. Section 3 describes the empirical strategy adopted for the analysis, while Section 4 presents data and the variables. Estimation results are discussed in section 5, while section 6 provides brief concluding remarks.

2. Institutional background: health care in Italy

According to independent reviewers, the Italian health care system is one of the best performers at the global level. For instance, considering the most recent evaluation by Bloomberg in 2014, it is ranked 3rd in terms of efficiency out of about fifty countries. [1] This good performance is due to the fact that life expectancy is high, while health spending over GDP is relatively low. Compared to U.S., the country that devotes the highest share of income to health care (more than 17% of GDP), Italians are in good health, and increasingly so, by spending a mere 9% of GDP in health services. Looking at OECD Health Statistics, life expectancy at birth was about 73 years in both U.S. and Italy in 1978, when the Italian National Health Service (the publicly funded component of the system, which represents more than ¾ of total spending) was created; it is slightly less than 79 years in the U.S. against more than 82 in Italy in 2011.[2] Even more remarkable improvements in health emerge when looking at infant mortality rate (IMR), another indicator commonly considered for evaluating the level of a population health. In 1978, IMR was 17.1 (out of 1,000 live births) in Italy vs. 13.8 in the U.S.; it is 2.9 vs. 6.1 in 2011.

This good performance at the national level hides important differences across Regions[3], the level of government in charge of managing health care according to the Republican Constitution (e.g., Turati, 2014). For instance, considering ISTAT-*Health for All*

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[1] See http://www.bloomberg.com/infographics/2014-09-15/most-efficient-health-care-around-the-world.html.

[2] See http://www.oecd.org/els/health-systems/oecd-health-statistics-2014-frequently-requested-data.htm.

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

data, IMR ranged from 1.5 in the Aosta Valley to 4.9 in Sicily in the most recent available year (2009), with a clear gradient moving from the North to the South of the country. This gradient is also apparent along at least one other dimension, namely the share of regional GDP devoted to public health spending, ranging from about 5% in the North to about 10% in the South. Given the role of the Central government's equalization grants to guarantee all citizens the same level of care, as established again by the Republican Constitution, these differences are mostly due to the differences in per-capita GDP, with the Northern Regions being richer than the Southern ones (see Table 1 below), and not to differences in the level of spending.[4]

The uneven distribution of income across Regions had dramatic consequences when – during the Nineties – the Central government reformed NHS funding. The main idea behind the reforms was to improve efficiency in spending in order to meet the Maastricht criteria. To pursue this aim, the Central government introduced in 1998 a new regional tax, IRAP (literally a Tax on Regional Firms' Value Added), together with a regional surcharge on the Personal Income Tax (IRPEF), cutting transfers correspondingly. In this way, the Vertical Fiscal Imbalance (i.e., the ratio between the Central government's transfers and regional health care spending) was strongly reduced, and – according to modern fiscal federalism theories – accountability correspondingly increased. But the tax bases of both IRAP and IRPEF surcharge, are clearly positively related to per-capita GDP. Hence, given the uneven distribution of income, the impact on Vertical Fiscal Imbalance following the introduction of new regional taxes was also uneven. In particular, Northern Regions experienced a large reduction of transfers, while Southern Regions continued to rely on equalization grants from the centre. To get a clue of the differences, IRAP, IRPEF surcharge and other own taxes represents about half of revenues in Centre-Northern Regions, while they are a mere 15% in Southern ones (e.g., Turati, 2014). Piacenza and Turati (2014) have shown that consequences on the efficiency in managing health spending were also differentiated across Regions, with Northern Regions becoming more efficient than Southern ones. What we do in this paper is to explore the impact stemming from the reduction in Vertical Fiscal Imbalance on a second important dimension of health policy outcomes, namely inequalities within Regions.

[4] Coefficient of variation of per capita spending actually decreased after tax decentralization reforms have been implemented. See Di Novi et al. (2012) and Costa-Font and Turati (2015) for additional details.

3. Empirical strategy

In order to investigate the impact of fiscal decentralization on within-regional health inequalities, we exploit the differences in the level of income across the Italian Regions. Following the fiscal decentralization reform, these differences originate differences in the treatment intensity, since Regions characterized by a higher per-capita income (hence, a higher tax base) have become more fiscally autonomous than Regions with a lower per-capita income. The goal of the analysis is understanding – in a Difference-in-Differences (DiD) fashion – whether Regions where the "treatment" has been more powerful experienced a differential change in the outcome variable after the decentralization reform. Our test is based on the following general model specification:

$$ISAH_{it} = R_i + T_t + \beta GDP_{it} \times DECENTR_t + \delta X_{it} + \varepsilon_{it} \quad [1]$$

where $ISAH_{it}$ is our outcome variable, an index of absolute inequality in self-assessed health in Region i at time t; R_i denotes a full set of region-specific effects, T_t denotes a full set of year-specific effects, X_{it} is a vector of other controls, and ε_{it} is a disturbance term. Throughout the paper all standard errors are robust, clustered at regional level, to capture potential serial correlation in the residual error term (Bertrand et al., 2004).

The regressor of main interest is $GDP_{it} \times DECENTR_t$. The estimate of the impact of fiscal decentralization reform (expected to be different according to the level of income) is captured by the coefficient β on this interaction term. Our treatment is $DECENTR_t$, a dummy equal to 0 in the pre-reform period (1994-1997) and equal to 1 in the post-reform period (1998-2007). As discussed in the institutional section above, since 1998 all the Italian Regions – already fully independent from Central government as far as spending decisions are concerned – were endowed with greater tax power for financing their own health expenditure, thanks to the introduction of IRAP and IRPEF surcharge. Since the tax bases of both IRAP and IRPEF surcharge are linked to regional per-capita GDP, this variable allows us to distinguish Regions where the fiscal decentralization reform might have had substantial effects (i.e., the "treated" group) from those where decentralization is not expected to change the degree of Vertical Fiscal Imbalance much (i.e., the "control" group). Indeed, for the former group of Regions, the availability of a conspicuous tax base enable them to rely on a significant amount of own tax revenues to be allocated to healthcare policies (with potential effects also on health inequalities), characterizing these regions with a significant reduction of Vertical Fiscal Imbalance when the decentralization reform kicks in.

A key assumption for our strategy is that the outcome in treated and control groups follows the same time trend in the absence of the treatment. The common trends assumption is difficult to verify, due to other policies that may change differently across groups at the same time, but one often uses pre-treatment data to show that the trends are the same. Including anticipatory effects (or *leads*) of the treatment into the model is an easy way to analyze pre-trends. Even if pre-trends are the same, one still has to worry about possible delays or changes over time of the treatment effect; this is especially true when analysing outcome variables for which it takes a bit of time before the impact of a policy change is really perceived, as in the case of health status and the relative distribution across individuals. Post-treatment effects (or *lags*) can be included into the model to test whether the effect of the policy change is delayed and/or it accumulates over time.[5] For these reasons, following Acemoglu et al. (2011), we also augment equation [1] including *leads* and *lags* of the treatment. This allows us to test whether:

1) a common trend in *ISAH* existed before the introduction of IRAP and IRPEF surcharge;
2) the new taxes were effective already in the first year after the introduction, or dispatched their effects in the following years.

4. Data and variables definition

4.1. Dependent variable

We use individual-level data to calculate inequalities in health within Italian Regions. These data are drawn from the 1994–2007 cross-sectional survey "*Indagine Multiscopo sulle Famiglie – Aspetti della Vita Quotidiana*" carried out yearly by the Italian Institute of Statistics (ISTAT).[6] The survey encompasses a representative sample of 20,000 Italian households (60,000 individuals) living all over Italy.[7] Only data from the sample of adult subjects are used in the analyses (>16 years old). Data from Aosta Valley and Piedmont have been collapsed

[5] A well-known example of this DiD approach is the paper by Autor and Duggan (2003), that includes both *leads* and *lags* in a model analyzing the effect of increased employment protection on the firm's use of temporary help workers in US.
[6] Data concerning 2004 are not included in the analysis since the Multiscopo survey did not take place in 2004.
[7] Individual weights provided by ISTAT were applied in all computations, in order to make the results representative of the Italian population.

into a unique regional unit. Therefore, in our analysis we deal with 19 Regions only. We use self-assessed health (SAH) as an indicator for general health. SAH has been widely used in the literature examining the relationship between health, socio-economic status and life-styles (e.g., Kenkel, 1994; Contoyannis and Jones, 2004; Balia and Jones, 2008). Moreover, SAH has been shown to be a good predictor of mortality or morbidity (e.g., Idler and Beyamini, 1997; Kennedy et al., 1998) and to have a strong correlation with more complex health and well-being indices (e.g., Unden and Elofosson, 2006).

As in other similar surveys around the world, respondents have been asked the following question: "Would you say that in general your health is: very good, good, fair, bad, very bad".[8] Since self-assessed health is measured through an ordinal and categorical variable, we make use of the innovative inequality index developed by Kobus and Milos (2012). The index allows us to deal with ordinal variables without transforming them into cardinal ones. As shown by Allison and Foster (2004), ideal measures of dispersion for ordinal data are not mean-based: mean-based measures require imposing a cardinal scale on the values taken by variables which are inherently ordinal. In order to tackle this issue, Allison and Foster (2004) illustrate that, under fairly general conditions, the cumulative distribution function (cdf) of an ordinal variable X shows more inequality than the cdf of Y if X can be obtained from Y through a series of median preserving spreads (i.e., if Y first order dominates X below the median and X first order dominates Y above the median). Let us assume that X and Y represent two distributions of a variable with c ordered categories and median denoted by m, and X_j and Y_j are the cumulative proportions of the population in each category j ($j = 1, \ldots, c$), in each distribution. Then X is characterized by less inequality than Y if for all categories $j < m$, $X_j \leq Y_j$ and for all $j > m$, $X_j \geq Y_j$. This principle

[8] It is worth noticing that when individuals are faced with an instrument comprising ordinal response categories, their interpretation of response categories may systematically differ across populations or populations sub-groups, also depending on their preferences and norms (Bago d'Uva et al., 2008; Rice et al., 2012). In such cases a given level of health is unlikely to be rated equally by all respondents. This phenomenon has been termed "reporting heterogeneity". In order to check that reporting heterogeneity is not a relevant issue for our analysis, we have computed the level of correlation between self-reported health and a more objective indicator of health, constructed through responses to fairly precise questions about specific health conditions. To build this summary measure, we use the number of health conditions reported by the respondents during the interview (heart problems, high blood pressure, high cholesterol, stroke, diabetes, lung disease, asthma, arthritis, osteoporosis, cancer, ulcer, Parkinson disease, cataracts, hip or femoral fracture, psychological problems). For each year, we run an ordered probit regression model in which the independent variable is SAH and the dependent variable is the summary indicator of health conditions. The adjusted R^2 included in this study tends to be constant and equal to about 15% for all years. Hence, SAH appears as strongly predictive of the summary health index. Moreover, the results of a chi-square test shows a statistically significant correlation between the two variables, since, for each year, their correlation coefficients tend to be constant and equal to about 60%.

provides a partial inequality ordering which is used by Abul Naga and Yalcin (2008) to propose a parametric family of inequality indices for ordinal data. The index of Kobus and Milos (2012) is a generalization of the Abul Naga and Yalcin (2008) index.

For an ordered variable with c response categories and median denoted by m, let P_i be the cumulative proportion of the population in each category i. The Kobus-Milos inequality index is then defined as:

$$I_{a,b} = [\, a \sum_{i<m} P_i - b \sum_{i \geq m} P_i + b(c + 1 - m)] / [a(m - 1) + b(c - m)]/2 \qquad [2]$$

This index lies in the interval [0, 1]. With $a = b$ inequality is at a minimum when everyone is in the same category and at a maximum when half of the population lies in the lowest category and half in the highest category. Different calibrations of the parameters a and b allow the researcher to give different weights to inequalities above and below the median of the responsiveness distribution – for higher values of a (b), less weight is given to inequalities below (above) the median. We apply the index [2] in the case of symmetry, where both a and b are equal to 1, considering $ISAH_{1,1}$ as dependent variable in equation [1].

Table 1. Average Kobus-Milos' health inequality index and GDP per-capita (1994-2007)

Region	Inequality Index	GDP_per_capita
Abruzzo	.400	17538.41
Basilicata	.403	14407.12
Calabria	.424	12941.55
Campania	.355	13353.31
Emilia-Romagna	.404	26042.01
Friuli-Venezia Giulia	.409	23205.04
Lazio	.405	23784.51
Liguria	.415	21558.55
Lombardia	.399	27002.67
Marche	.418	20872.76
Molise	.373	15682.13
Piemonte	.396	23488.52
Puglia	.342	13654
Sardegna	.408	15764.19
Sicilia	.369	13600.23
Toscana	.419	22657.48
Trentino-Alto Adige	.373	26616.09
Umbria	.428	19856.03
Veneto	.399	24182.14

Table 1 reports the average Kobus-Milos' inequality index and the average GDP per-capita, by Region over the period 1994-2007. Inequality in health records the highest average value for Umbria (0.428) and the lowest for Puglia (0.342). The richest Region is Lombardia (the GDP per-capita is about 27,000 euro) while the poorest is Calabria (the GDP per-capita is about 13,000 euros). Notice that the correlation coefficient between the means of the inequality index and the GDP per-capita at regional level is about 0.4. Therefore, the richest Regions seems to be those characterized by a higher level of within-inequality in health status.

The average value of *ISAH* across Regions and years is about 0.4 (Table 2). This is relatively high in comparison to other European countries studied in the still limited literature providing empirical examples on the use of median-based inequality indexes. Abul Nagal and Yalcin (2008) present results for a measure of self-assessed health (based on a five point categorical variable ranging from very poor to very good health like the ISTAT survey used here) across seven areas of Switzerland. The average level of inequality across the seven Regions is 0.208, half of the one recorded for Italian regions. Madden (2010) considers the evolution of inequality in self-assessed health in Ireland over the years 2003–2006 by using the Abul Nagal and Yalcin (2008)'s index. Also in this study, the self-assessed health indicator is a five-category ordered variable (ranging from very poor to very good health). The reported inequality index ranges from 0.356 in 2003 to 0.333 in 2006, with a mean value across the four years of 0.344.

Figure 1 and 2 illustrate the trend of the inequality index in health over the period 1994-2007 for two groups of regions: those with GDP per-capita below the median (Figure 1) and those with GDP per-capita above the median (Figure 2). While health inequality in the first group of Regions (the Southern ones) seems to have increased after the fiscal decentralization reform kicks in at the end of the Nineties, inequality in the second group of Regions (the Northern ones) seems to be pretty stable across the whole period.

Figure 1. Health inequality index in low-GDP Regions, by Region and year

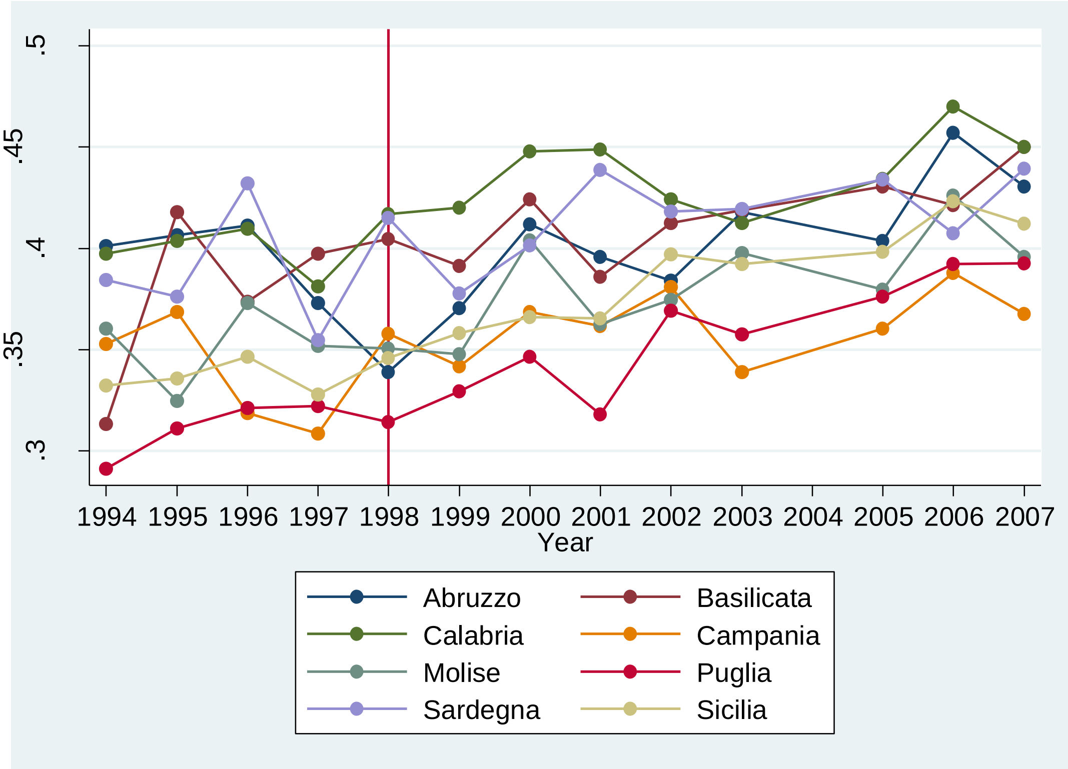

Figure 2: Health inequality index in high-GDP Regions, by Region and year

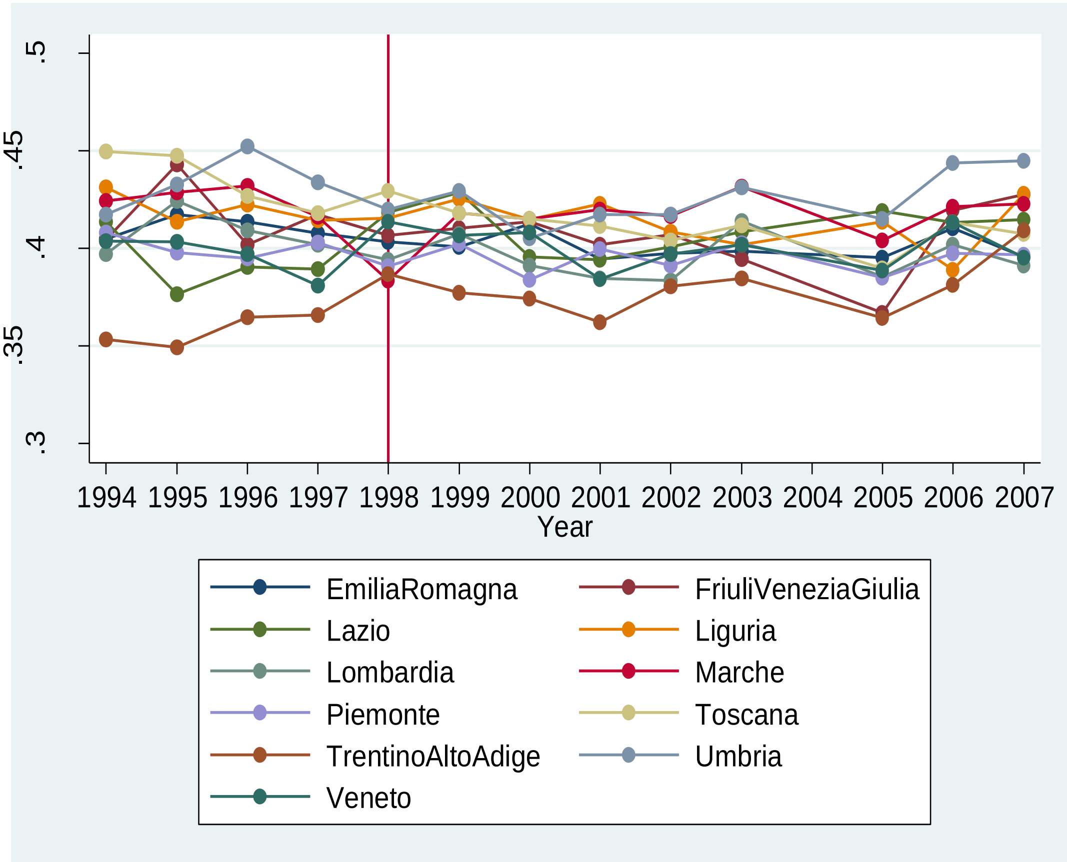

Table 2. Summary statistics of the variables used in model [1]

Variable	Mean	Std. Dev.	Min	Max
ISAH	0.397	0.031	0.291	0.470
GDP (10^6 €)	0.020	0.006	0.009	0.033
DECENTR	0.615	0.487	0.000	1.000
*GDP*x*DECENTR*	0.013	0.012	0.000	0.033
inequality_home_care	-0.009	0.014	-0.054	0.054
inequality_emergency_care	-0.011	0.021	-0.078	0.062
inequality_contacts_LHA	0.033	0.057	-0.121	0.297
inequality_inpatient_care	-0.011	0.015	-0.054	0.030
inequality_diet	-0.017	0.046	-0.143	0.138
inequality_smoke	-0.014	0.028	-0.130	0.064
population_over65 (%)	18.969	3.085	12.090	26.740
population_foreign (%)	2.247	1.758	0.280	7.590
population_primaryedu (%)	27.896	16.180	0.363	46.930
population_employment (%)	42.908	6.390	31.590	54.870
drug_consumption (%)	34.199	4.779	24.750	45.320
health_spending (€)	1503.447	306.153	882.992	2318.526
Nr. Observations	247			

4.2. Independent variables

The vector of controls X_{it} in equation [1] includes several confounding factors which may vary both across Regions and over time. In particular, this vector considers two main groups of variables:

a) indexes of within-regional inequality in healthcare utilization and in healthy lifestyles;

b) demographic and socio-economic characteristics and summary information on regional health policies.

As for the role of inequalities in both healthcare utilization and lifestyles, these have been recognized as important in determining inequality in health (e.g., Mackenbach, 2012, 2014). To build suitable inequality indexes we use individual data from the survey "*Indagine Multiscopo sulle Famiglie – Aspetti della Vita Quotidiana*" provided by ISTAT. Looking firstly at inequality in healthcare utilization, four different indexes are considered: inequality in home care (*inequality_home_care*), inequality in emergency care (*inequality_emergency_care*), inequality in inpatient care (*inequality_inpatient_care*), and inequality in contacts with Local

Health Authority to schedule appointments for outpatient visits, blood tests or other laboratory tests (*inequality_contacts_LHA*). To measure inequality in healthcare utilization within Italian Regions we consider the concentration index *C*(*y*) proposed by Wagstaff et al. (1991) and Wagstaff and Van Doorslaer (2000):

$$C(y) = \frac{2}{n\mu}\sum_{i=1}^{n} y_i R_i - 1 = \frac{2}{\mu}\operatorname{cov}(y_i, R_i) \qquad [3]$$

where μ is the average access to healthcare services in the sample, n is the sample size, y_i is an indicator of access to healthcare services by individual i, and R_i designates the i^{th} individual´s rank within the wealth index distribution.[9] However, since the variables measuring healthcare access are dummies indicating whether or not the respondent had any healthcare utilization during the year of the interview, as suggested by Erreygers (2009), we use a corrected version of the concentration index, which is defined as:

$$E(y) = \frac{4\mu}{(b_n - a_n)} C(y) \qquad [4]$$

where b_n and a_n represent the maximum and the minimum value, respectively, of healthcare access variable y (in our case 0 and 1) and *C*(*y*) represents the standard concentration index specified in [3][10]. The range of the Erreygers concentration index *E*(*y*) is from −1 to 1. A negative value indicates a pro-poor inequality, meaning that healthcare access is concentrated more among the most disadvantaged person; a positive value indicates a pro-rich inequality, meaning that healthcare access is more concentrated among the better-off. A value of 0 indicates that healthcare access is perfectly equally distributed among the population. Since we are interested in the magnitude of need-adjusted horizontal inequality in healthcare access, regardless of whether the healthcare access is concentrated among rich

[9] Since straightforward numeric measures of wealth such as household income in the survey "*Indagine Multiscopo sulle Famiglie – Aspetti della Vita Quotidiana*" are not available, we have to deal with other proxies for the household wealth. In particular, we exploit information about assets ownership and living standards collected during the interviews to build a one-dimensional index of wealth using the Principal Component Analysis (PCA), under the assumption that wealth is reflected in the assets owned and in the living conditions within a household. For a detailed discussion of how to construct asset indices see Vyas and Kumaranayake (2006).

[10] Notice that, differently from *C*(*y*), the Erreygers index does not depend on the mean of health, healthcare and health-related behavior variables. This makes it possible to compare regions with different average values for health, healthcare and health-related variables. Moreover, while the standard concentration index may give conflicting information when applied separately to health and ill-health, the Erreygers index satisfies the so called ''mirror property'', namely inequalities in health ''mirrors'' those in ill-health (Erreygers et al., 2012; Costa-Font et al., 2014).

or poor, in the regression model [1] we employ the absolute value of all inequality indexes in healthcare access.

In order to capture the determinants of healthcare access for each Region and for each year survey before computing $E(y)$, we perform a probit regression categorizing the explicative variables used to predict the demand for healthcare services into three main dimensions:

1) need factors related to individuals' health status (age, gender, self-assessed health, health conditions)[11];
2) predisposing factors linked to social characteristics (education and marital status);
3) enabling factors (private health insurance, employment status, wealth).

The probit model also includes a dummy variable that captures whether the respondents experienced difficulties in accessing healthcare services (due to distance, monetary costs, or waiting times on the day of the appointment or in making an appointment).[12]

All healthcare access variables y have been then standardized for healthcare need proxied by age, gender, self-assessed health and health conditions, so as to obtain an estimate of potentially avoidable inequality (see also O'Donnell et al., 2008). The standardization provides the possibility of understanding whether higher wealth groups are more likely to access health services than lower wealth groups, holding needs and demographics constant. After standardization, any residual inequality in utilization may be interpreted as horizontal inequality (which could be pro-rich or pro-poor).[13] Indirectly standardized healthcare access $\hat{y}_i^{IS}$ can then be obtained by calculating the difference between actual healthcare access (y_i) and standardized healthcare access ($\hat{y}_i^X$), plus the sample mean ($\bar{y}$):

$$\hat{y}_i^{IS} = y_i - \hat{y}_i^X + \bar{y} \qquad [5]$$

[11]Self-assessed health is widely employed among the measures of need for healthcare (see O'Donnell et al., 2008). However it is a very subjective measure of health, with a tendency for being under-reported among the poor (Cutler et al., 2011). Hence, together with self-reported health, we proxy need for healthcare with a more objective indicator of health, based on the number of health conditions reported by the respondents during the interview. We also carried out a sensitivity analysis, by re-running the model without self-assessed health among the controls. This alternative specification of the probit model does not significantly affect the results: the inequality indexes are similar to those presented in the paper. For the sake of brevity, the results of the sensitivity analysis are not included but they are available on request.

[12] Details about all these explicative variables are available on request.

[13] The horizontal equality principle has been defined in the literature as "equal treatment for equal medical need, irrespective of other characteristics such as income, race, place of residence, etc." (e.g., van Doorslaer et al., 2000; Wagstaff and van Doorslaer, 2000).

Equation (5) shows that standardization will subtract the variation in healthcare access driven by need and demographic factors from actual healthcare utilization. Therefore, the distribution of $\hat{y}_i^{IS}$ across wealth can be interpreted as the healthcare access we expect to observe, irrespective of differences in the distribution of healthcare needs and demographic characteristics.

Although the role of the access to healthcare services in addressing health inequality is widely recognized and still remains one of the focus for health inequality reduction, there is an additional concern about the rising inequalities in lifestyles (e.g., Costa-Font et al, 2014; Mackenbach, 2014; Vallejo-Torres et al., 2014). While there exists a substantial literature that shows that a healthier life-style is one of the driving factor for good health (e.g., Contoyannis and Jones, 2004; Balia and Jones, 2008; Di Novi, 2010), little is known about the potential influence that health-related behavior inequalities may have on health inequality. The indicators for individual behavior are selected a priori based on the variables for which information is available in every year of the survey. Two lifestyle-related indicators – diet and smoking – are taken into consideration to measure inequalities in lifestyles; therefore, we include in equation [1] an index for inequality in diet (*inequality_diet*) and an index for inequality in smoking (*inequality_smoke*). As measure of diet, we use a binary variable that takes value one if respondent does not eat breakfast nearly every day and zero otherwise.[14] To measure smoking behavior we also employ a binary variable that takes value one if respondent is current smoker and zero if she is former smoker or non-smoker. Following Costa-Font et al. (2014), to account for the bounded nature of the health-related behavior variables (between 0 and 1), we apply again the correction proposed by Erreygers (2009). In order to have a measure of lifestyle inequalities reflecting only non-demographic differences, we use again the indirect method of standardization discussed above. Finally, since we are interested in the magnitude of inequality in unhealthy habits only, regardless of the sign (pro-poor or pro-rich), in the final regression model we include again the absolute value of the two horizontal inequality indexes in unhealthy lifestyles.

Table 2 shows that inequality in healthcare access are pro-poor and close to zero, excepting inequality in contacts with Local Health Authority to schedule appointments for outpatient visits, blood tests or other laboratory tests, which tends to be pro-rich. Looking at

[14] Belloc and Breslow (1972) in their epidemiological study based on the Alameda County survey carried out in California in 1965, found that people who eat breakfast almost every day reported better overall physical health status than breakfast skippers.

the dynamics of the indexes during the observed period,[15] inequalities tend to increase over time, especially for Regions with GDP per-capita below the median, which generally present greater inequality in healthcare access even when pro-poor. Consistently with previous literature, also inequalities in unhealthy lifestyle appear to be concentrated among the poor and tend to be higher in poorer Regions over time.

Demographic and socio-economic characteristics at the regional level and summary information on regional health policies are other important variables which may influence the inequality in health status and have been therefore included in X_{it}. To control for these factors, we use data at the regional level from the ISTAT panel database "*Health for All - Italy*" for the period 1994-2007. This database, which is part of a program managed by World Health Organization, includes more than 4000 indicators concerning the individuals' demographic and socio-economic characteristics, causes of death, disease prevention, health facilities, hospital discharges by diagnosis, healthcare consumption and health expenditure. In particular, in our econometric model we control for regional features such as the percentage of individuals older than 65 (*population_over65*), the percentage of foreign people (*population_foreign*), the percentage of individuals with low education (*population_primaryedu*, the share of population with no educational certificates or only primary school certificate according to ISCED classification), the employment rate (*population_employment,* the share of individuals older than 15 who supplied labor during the year of the interview), the consumption rate of drugs (*drug_consumption*, the share of individuals who used drugs in the two days before the interview), and health expenditure per-capita (*health_spending*).

Summary statistics for all the variables included in the estimated models are shown in Table 2. The majority of the individuals in the sample appears to be young or middle age (the elderly people in the sample are only about 20%) and they are locals (the foreigners living in Italy are only about the 2% of the sample). Also the percentage of people with a very low level of education is pretty small (about 28%), while more than 40% of individuals was occupied during the year of the interview. Finally, the consumption of drugs is quite diffused (34%) and the average health expenditure per-capita is around 1500 euro, with a marked variability between minimum (about 883 euro) and maximum (about 2319 euro), which mainly reflects spending growth across the years.

[15] Descriptive statistics for inequality indexes disaggregated by years and Regions are not reported for sake of brevity but are available on request.

5. Estimation results

Table 3 shows the estimated impact of fiscal decentralization on health inequalities under alternative specifications of equation [1]. These specifications include all the set of possible confounding factors X_{it}, regional fixed effects R_i, and year fixed effects T_t, so as to take into account the role of specific characteristics of each Region not captured by the regressors in vector X as well as the presence of common time trends.

Table 3. Estimated impact of fiscal decentralization on health inequalities including anticipatory effects (*leads*) and post-treatment effects (*lags*) [a]

Regressors	MODEL 1		MODEL 2		MODEL 3		MODEL 4		MODEL 5	
GDP	-2.185	(2.948)	0.604	(3.528)	4.547	(4.104)	4.143	(4.347)	4.339	(4.817)
GDP×DECENTR	-1.290	(0.961)	-		-		-		-	
GDP× 3 Years Prior	-		-1.591	(1.872)	-2.036	(1.891)	-1.987	(1.902)	-2.014	(1.974)
GDP× 2 Yeas Prior	-		-1.672	(1.519)	-2.270	(1.648)	-2.201	(1.685)	-2.241	(1.795)
GDP× 1 Year Prior	-		-0.484	(1.896)	-1.222	(1.968)	-1.142	(1.985)	-1.178	(2.103)
GDP× Year of Adoption	-		-1.485	(1.670)	-2.332	(1.807)	-2.247	(1.835)	-2.290	(1.956)
GDP× 1 or More Years After	-		-2.760	(1.822)	-2.730	(1.627)	-1.643	(1.651)	-1.699	(1.809)
GDP× 2 or More Years After	-		-		-4.495**	(2.140)	-4.683**	(2.113)	-4.746**	(2.287)
GDP× 3 or More Years After	-		-		-		-4.243*	(2.243)	-4.156**	(2.030)
GDP× 4 or More Years After	-		-		-		-		-4.381*	(2.698)
Vector of controls X	Yes		Yes		Yes		Yes		Yes	
Regional fixed effects	Yes		Yes		Yes		Yes		Yes	
Year fixed effects	Yes		Yes		Yes		Yes		Yes	
Within R^2	0.50		0.51		0.53		0.53		0.53	
Nr. of observations	247		247		247		247		247	

[a] The dependent variable is the index of inequality in self-assessed health (*ISAH*). Cluster–robust standard errors at the Region level are reported in round brackets. MODEL 2-5 extend the baseline specification to include *leads* (*GDP×1 Year Prior* = 1997, *GDP×2 Years Prior* = 1996, *GDP×3 Years Prior* = 1995) and *lags* (*GDP×1 or More Years After* refers to time period 1999-2007 in MODEL 2 and only to year 1999 in MODELS 3-5; *GDP×2 or More Years After* refers to time period 2000-2007 in MODEL 3 and only to year 2000 in MODELS 4-5; *GDP×3 or More Years After* refers to time period 2001-2007 in MODEL 4 and only to year 2001 in MODEL 5; *GDP×4 or More Years After* refers to time period 2002-2007). *GDP×Year of Adoption* refers only to the effect of decentralization observed in year 1998.

** statistically significant at 5%; * statistically significant at 10%.

MODEL 1 refers to the baseline specification of equation [1], where the simplest version of the variable capturing differences in the intensity of the treatment is considered (*GDP×DECENTR*), without any control for possible anticipatory effects (*leads*) and post-treatment effects (*lags*). MODELS 2-5 extend MODEL 1 and test the robustness of the baseline results by including *q* leads and *m* lags of the treatment effect. More precisely, all the models account for three anticipatory effects ($GDP\times 1$ *Year Prior* = 1997, $GDP\times 2$ *Years Prior* = 1996, $GDP\times 3$ *Years Prior* = 1995). As for the lags, MODEL 2, MODEL 3, MODEL 4 and MODEL 5 include 1, 2, 3 and 4 post-treatment effects, respectively: $GDP\times 1$ *or More Years After* refers to time period 1999-2007 in MODEL 2 and only to year 1999 in MODELS 3-5; $GDP\times 2$ *or More Years After* refers to time period 2000-2007 in MODEL 3 and only to year 2000 in MODELS 4-5; $GDP\times 3$ *or More Years After* refers to time period 2001-2007 in MODEL 4 and only to year 2001 in MODEL 5; $GDP\times 4$ *or More Years After* refers to time period 2002-2007. Finally, in all the models *GDP×Year of Adoption* refers only to the effect of tax decentralization observed in 1998 (the year of adoption of the new tax policy).

Focusing firstly on the impact of fiscal decentralization, the results provide a consistent picture across the different specifications. The treatment effect coefficient (*GDP×DECENTR*) is negative but not statistically significant in MODEL 1. According to the discussion above, this result may be due to differences in pre-trends and/or some post-treatment effects that are not controlled in the baseline model. Looking at the extended specifications (MODELS 2-5), the first important finding is that the coefficients for the three leads are always statistically insignificant. Thus, there is no evidence of any anticipatory effects. This supports the common trends assumption underlying our empirical strategy. Second, in all the models the estimated coefficient for the year of adoption of the new policy (*GDP×Year of Adoption*) is negative, but still not statistically significant, implying that the treatment effect does not occur immediately, but is (probably) delayed. Finally, the estimates for the lags reveal that the effect of the new tax policy begins to emerge only after two years from its adoption – being the coefficient for $GDP\times 1$ *or More Years After* not statistically significant in all models – and then remains relatively constant over time: the coefficients for $GDP\times 2$ *or More Years After*, $GDP\times 3$ *or More Years After* and $GDP\times 4$ *or More Years After* are all statistically significant and similar in magnitude, pointing out a reduction in *ISAH* computed at the sample mean value of GDP of around 3 times the standard deviation. More importantly, the impact of fiscal decentralization on health inequalities differs according to the level of economic development of each region (as measured by per capita GDP, a proxy for local tax bases), with stronger effects in the richer (Northern) Regions compared to the poorer (Southern) ones. Looking for instance at MODEL 5, the most complete specification with 3 leads and 4 lags, the average estimated effect of the new tax policy after four years since its introduction (time period 2002-2007) consists of a reduction in *ISAH* which varies from about 2 times the standard deviation for the region with the lowest per capita GDP (Calabria) to about 4 times the standard deviation for the region with the highest per capita GDP (Lombardy). Hence, decentralization reform had more pronounced effects in the Regions that experienced a substantial reduction in the degree of Vertical Fiscal Imbalance following the introduction of new regional taxes. Indeed, the availability of a conspicuous tax base enabled these Regions to rely on a significant amount of own revenues, which have been probably allocated to better targeted healthcare policies, with beneficial effects also on health inequalities.

As for the role played by the controls included in the vector X_{it}, the results are consistent across the different estimated models and show that most variables do not exert a significant influence on *ISAH*.[16] Among the six inequality indexes, only inequality in home care (*inequality_home_care*) is positively correlated – as expected – with *ISAH*, while for the remaining variables we do not find evidence of statistically significant effects. Looking at demographic and socio-economic characteristics and health policy variables, estimates show that *ISAH* reduces with increasing percentage of foreign people (*population_foreign*), while it increases with the consumption rate of drugs (*drug_consumption*) and health expenditure per-capita (*health_spending*). The first two results may capture the fact that the assessments of own health conditions are likely to be more homogeneous within the group of foreign people (mainly composed of immigrants with similar health conditions), but more heterogeneous within the group of drug consumers (in which there are both people who use drugs for minor ailments and people with serious diseases). On the other hand, the interpretation of the positive correlation with health spending per-capita is not so straightforward, since one would expect *a priori* to find a reduction in health inequality when more resources are devoted to healthcare. However, bearing in mind that more spending per-capita is often the signal of a greater inefficiency of health policy and not of better outputs (e.g., Piacenza and Turati, 2014), our finding can be read in terms of a positive relationship between spending inefficiency and inequality in health outcomes [17].

[16] The coefficients for this set of controls are not included for brevity but they are available on request.

[17] This interpretation is also supported by a robustness estimation – carried out on a subsample of 15 regions over the time period 1994-2006 – in which model [1] has been estimated by replacing the variable of health expenditure per-capita with an indicator of spending inefficiency as computed in Piacenza and Turati (2014),

Considering that previous literature has pointed out that fiscal decentralization tends to reduce inefficient health spending (e.g., Francese et al., 2014), by making local governments more accountable towards citizens, this result provides further support to the argument that – besides the important impact exerted on inefficiency – the attribution of a greater tax power to lower government tiers endowed with substantial tax base seems to be effective in reducing also health inequalities.

6. Concluding remarks

Our paper aims at investigating the impact of fiscal decentralization implemented in the Italian NHS during the Nineties on within-regional health inequalities. In particular, we exploit the introduction in 1998 of a new regional tax on productive activities to be paid by firms (IRAP) and a surcharge on the Personal Income Tax to analyze the impact on inequalities in health outcomes (measured as self-reported health) within Regions. Our empirical evidence shows that, controlling for inequalities in healthcare utilization and in healthy lifestyles, observed and unobserved differences in regional characteristics, year fixed effects, and possible leads and lags of the treatment effect, the fiscal decentralization reform started in 1998 has led to a significant reduction in health inequalities. The magnitude of the impact, however, differs according to the level of economic development of each region, with stronger effects in the richer regions compared to the poorer ones.

An important implication of our results is that, besides reducing inefficiencies of health policies (i.e., lowering spending for given services provided to citizens), fiscal decentralization processes that attribute a greater tax power to lower government tiers seem to be effective in reducing also inequalities in health outcomes. However, the degree of economic development – which determines the actual fiscal autonomy of each Region from Central government, thus its ability to define targeted policies – significantly affects the effectiveness of these reforms and highlights the importance to take properly into account the specific features of the context where the decentralization of power is implemented (e.g., Bardhan, 2002). In the Italian case, the evidence discussed in this study tends to support the institutional design of a "two-way" fiscal federalism, where for the richer areas of the country one can successfully pursue a strengthening of fiscal decentralization in health policies (as in the other policies attributed to lower government tiers), while for the less

getting a negative coefficient for the inefficiency and results in line with those discussed above regarding the impact of fiscal decentralization. Also this set of results is available upon request from the authors.

developed regions of the south it is desirable that central government first of all intervenes with policies aiming at correcting the structural factors that impede the proper functioning of decentralized fiscal powers.

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