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L. Crivelli, P. Salari

**Fiscal federalism and income redistribution
through healthcare financing : an empirical
analysis for the Swiss cantons**

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Fiscal federalism and income redistribution through healthcare financing: An empirical analysis for the Swiss cantons

Luca Crivelli * Paola Salari[†]

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Abstract

Previous studies have viewed Swiss health-care financing as particularly regressive. However, as the OECD Review of the Swiss Health System (2011) stated, the income-related inequities and the inter cantonal variations are still unexplored due to a lack of available information. The present paper aims to fill this information gap concerning the Swiss health system by exploring the differences in the level of regressivity of health-care system financing across cantons and over time using household data. The empirical evidence confirms that the Swiss health-care system financing has remained quite regressive since the major reform of 1996 and that the variations in equity across cantons are quite significant. The results are an interesting contribution towards re-thinking a new possible reform of the Swiss health-care system, as well as for other federal states (such as the U.S.) that use regulation and subsidies to ensure universal coverage.

Keywords: Equity, health care system financing, fiscal federalism.

JEL classification: D63, H24, H51.

*Department of Economics, Università della Svizzera Italiana, Switzerland.

[†]Department of Economics, Università della Svizzera Italiana, Switzerland. Corresponding author.
Tel.: +41 058 666 4688; E-mail address: paola.salari@usi.ch

1 Introduction

The idea that health-care services should be paid according to the ability to pay rather than according to the actual use of the health-care system has its roots in the egalitarian concept of social justice and is generally accepted in Switzerland, as it is in most of the OECD countries. It is common in the economic literature to indicate this idea using the concept of *equity in financing*.

The relevance of this topic has also been highlighted by the World Health Organization and the OECD. The World Health Report 2000 focused on the general concept of fair financing in the health systems, arguing that the degree of fairness in the financing system has an important impact on social value (McIntyre 2010). This principle implies that solidarity between the sick and the healthy, which is implicit in any health insurance system, determines that the economic burden of health care shifts among the population according to their ability to pay, regardless of their health status or utilization of health services. Even if out-of-pocket expenditures, deductibles, and co-payments are generally excluded from this sort of "solidarity fund", this principle holds for at least the majority of total health expenditures.

When the new Health Insurance Act (HIA) came into force in 1996, many things changed in the Swiss health-care system. The main objectives of the act were to guarantee universal coverage and to equip the political system with better cost containment tools. Moreover, it also increased the importance of the financing equity aim: one of the objectives of the reform was to provide monetary assistance to low-income people in order to increase equity in the financing system. The federal draft bill issued in 1991 (and approved some years later after many amendments as HIA) reads: "The main priority of the project is undoubtedly the strengthening of the solidarity. The current law provides for individual premiums to be paid without taking into account the economic situation of the people insured".

All of the empirical studies on this topic measure the equity of a financing source in terms of progressivity; that is, the extent to which higher-income people pay more in proportion to lower-income people. Some studies have demonstrated that the general level of health system financing is regressive in Switzerland, both before and after the reform (Wagstaff et al.1999, Bilger 2008). This means that lower-income people pay proportionally more than higher-income people. Nevertheless, these studies consider only the whole of Switzerland and no research has monitored the regressivity issue at the cantonal level. Due to the Swiss federal setting, each canton differs in the economic strategy it has adopted to finance the health care system; this leads to different levels of equity among them. This particular aspect of fiscal federalism has not yet been studied in-depth in the health economics literature.

This lack of information is also highlighted by the OECD Reviews of Health Systems (2011, p. 12). The report presents the following as one of the Swiss policy challenges for

the future: "Inter-cantonal variations in health financing and access (...) may also mask inequities. Information currently available does not allow monitoring income-related inequities in financing health care."

This paper aims to fill this information gap about the Swiss health-care system. The goal is to analyze the level of equity in the financing of the Swiss health-care system and the differences between cantons in order to help orient future health financing policies. The results found in this work may have important policy implications and may help institutions shape future development towards policies that more explicitly address the equity issue. In fact, the present political debate about the Swiss health system financing is driven by misleading information and there is a widely held perception that the subsidies distributed to low-income families are enough to smooth the regressivity nature of the compulsory community rating premiums. However, as the analysis shows, this is not the case.

In this context, there are two measures of equity. The first is horizontal equity, which claims *equal treatments for equals*; that is, that people with the same income have to contribute the same amount of money to the total expenditures. The second measure is vertical equity, which states that people with different income must contribute appropriate amounts to the total expenditure. The present study has only considered vertical equity; we have used the methodology suggested by Wagstaff et al. (1992) to compute the regressivity level of each canton through the Kakwani index (as explained in detail in section 5).

The paper is organized as follows. The next section presents a review of the most relevant literature in this field. We have collected and summarized similar studies conducted for other countries, as well as for all of Switzerland. Section 3 provides a brief explanation of Swiss health system financing. Section 4 introduces the dataset and section 5 explains the technique used and the results obtained. Section 6 discusses the results more in detail and outlines the limitations of the study. Finally, section 7 offers some conclusions.

2 Literature review

This work finds its place among the studies about the progressivity of health-care system financing. The most widespread and commonly used technique in this field of research is the computation of the Kakwani index, which measures the progressivity of a source in terms of shifting from proportionality. Given the nature of the Kakwani index, which is an extremely summary measure, many of these studies also add other statistical techniques in order to obtain more detailed results (such as dominance tests of the concentration curves).

Many studies have analyzed the progressivity of health system financing at the national level, while very few studies have explore this issue at the subnational level.

Table 1 includes the main papers that have been published on this topic and summarizes the techniques that each has adopted and the results obtained. Some of these studies have focused on a single country - namely Australia, Iran, Finland, Italy, the Netherlands, Malaysia, Palestine, Ireland, Tanzania, Ghana, Sweden, and Switzerland. Two papers present an international comparison, based on 13 Asian countries and 13 OECD countries, respectively.

Table 1: *Main papers about the equity in the health-care financing system*

Country	Author(s) and year	Technique	Results in terms of overall financing progressivity
Italy	Paci P., Wagstaff A. (1993)	Kakwani and Suits index for the different sources of financing.	Regressive
Australia	Lairson DR., Hindson P. et al. (1995)	Kakwani index for the four financing sources and for the whole financing system.	Slightly progressive
The Netherlands	Wagstaff and Van Doorslaer (1997)	AJL method (from a paper by Aronson,1994), which decomposes the redistributive effect into three parts: progressivity, horizontal, and reranking component.	Regressive
Finland	Klavus J. (1998)	Kakwani index for the different sources of financing. The paper computes a significance test for the progressivity index and corrects for the serial correlation in the error terms. Dominance test of the concentration curves.	Slightly progressive
Sweden	Gerdtham U., Sundberg G. (1998)	Kakwani index for the four financing sources and for the whole financing system. The redistributive effect is decomposed into vertical, horizontal and reranking effect. Two different periods (1980 and 1990) are considered.	Weakly progressive system for both the periods considered
Malaysia	Ping Yu C., Whynes D., Sachs T.H (2008)	Kakwani index for the five financing sources and for the whole financing system.	Slightly progressive

Table 1: Continued on next page

Table 1: Continued from previous page

Country	Authors and year	Technique	Results in terms of overall financing progressivity
Switzerland	Bilger (2008)	Application of the DJA index (from a paper by Duclos et al. 2003) to compute the redistributive effect in three parts: vertical, horizontal and reranking effect.	The system is very regressive even after the reform of 1996
Palestine	Abu-Zaineh M., Mataria A., Luchini S., Moatti J. (2008)	Kakwani index and disaggregated approach (dominance criterion) for each financing source and for the whole financing system. The two regions of the Occupied Palestinian territory are included in the study (the West Bank and the Gaza Strip). Bootstrap procedure used to assess the reliability of the standard errors.	The whole system is regressive. The regressivity of the out-of-pocket payments is more pronounced among the worst-off.
Ireland	Smith S. (2010)	Kakwani index for the different financing sources. Interpretation also of the concentration curves and dominance tests.	Income tax and social insurance contributions are progressive, indirectly tax regressive. Private insurance is progressive at lower incomes, regressive at higher incomes.
Tanzania	Mtei G., Borghi J. (2010)	Kakwani index for each financing source and for the whole financing system.	Marginally progressive system.
Iran	Alireza M. (2011)	Kakwani index for both urban and rural areas.	Rural areas are regressive; urban areas are mildly regressive.
Ghana	Akazili J. et al. (2011)	Kakwani index and dominance test for each financing source and for the whole financing system.	Generally progressive

Table 1: Continued on next page

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Country	Authors and year	Technique	Results in terms of overall financing progressivity
13 OECD countries 10 OECD countries	Wagstaff A. et al. (1999) Wagstaff A. et al. (1992)	For each country: Kakwani index for each financing source and then for the whole financing system.	The Netherlands, Germany, Portugal, Sweden, Switzerland and USA are regressive. Finland, Italy, and UK are progressive. France, Denmark, and Spain seem to be close to proportionality, but the authors did not conduct a test to check for it. Note: Finland, Germany, and Sweden are analyzed only in the 1999 paper.
13 Asian countries	O'Donnell O. et al. (2008)	Kakwani index for the different financing sources and concentration indices for health care utilization. (Standard errors are corrected for serial correlation and heteroscedasticity.)	In Japan, South Korea and Taiwan, the health system is slightly regressive, while in the other countries considered it is progressive.

Table 1: Concluded from previous pages

As Table 1 clearly shows, the most common approach is to compute the Kakwani index for the different sources of financing and then aggregate them into a measure for the whole financing system. Nevertheless, there are some differences in the approaches that some of the authors have chosen.

Smith (2010), Klavus (1998), Akazili et al. (2011), and Abu-Zaineh et al. (2008) analyzed the inequity in financing through the Kakwani index as well as through a "disaggregated approach"; unlike the aggregate summary index approach, this approach provides summary measures over specific income groups. This approach applies the dominance test to assess the level of progressivity for different decile-levels of income distribution. The reason for performing this test is that the financing system could be progressive at a certain decile level and regressive at some others. Abu-Zaineh et al. (2008) found evidence of similar shapes for both approaches. With the disaggregated approach, however, it is possible to identify that the regressivity of the out-of-pocket payments is higher for the worst-off groups.

Abu-Zaineh et al.'s (2008) paper pays particular attention to the statistical significance of the inequality measures and applies a Bootstrap method rather than the more common asymptotic method. Another difference in the method is the choice of separating the redistributive effect into three parts: vertical, horizontal, and reranking effect. The works by Lairson et al. (1995) for Australia and Gerdtham and Sundberg (2008) for Sweden concentrate on this approach. Bilger (2008) adopted the same approach in the case of Switzerland. As mentioned, all of the papers presented in the table focus on a single coun-

try or on a comparison among different countries. Abu-Zaineh et al. (2008) and Alireza (2011), however, went a step further and extended the analysis by computing the Kakwani index for different regions of the country (Palestine and Iran, respectively). Alireza (2001) applied the Kakwani index technique to Iran for 1997-2007. He separated the urban and rural areas for the equity analysis and found that the former (Kakwani=-0.022) are less regressive than the latter (Kakwani=-0.107). The study by Abu-Zaineh et al. (2008) included the two regions of the Occupied Palestinian territory (that is, the West Bank and the Gaza Strip) and found similar regressive results for both regions (Kakwani=-0.067 and Kakwani=-0.047, respectively).

As far as Switzerland is concerned, the issue of the health-care system financing has been explored by Wagstaff et al. (1992 and 1999) and Bilger (2008). All three papers, which explore the equity of Swiss health-care financing, provide evidence in favor of highly regressive financing.

Given that these three works are the most important for the goal of this paper, we present them in greater detail here.

Wagstaff et al. (1992) presented an international comparison of health-care financing across 10 countries. Most of these countries are predominantly publicly financed, but each situation differs according to the share of public financing derived from taxes and the share raised through social insurance. On this basis, the authors divided the countries into different groups. The first group of countries includes Denmark, Portugal, Ireland, and the U.K. - all of which are mostly tax-financed systems - while Spain¹, the Netherlands, and France are mostly social insurance systems. Italy is situated in the middle of the two groups since the data is relative to a transition period from a social insurance-based system to a tax-financed system (which came into force in 1978). Finally, the USA and Switzerland are mostly financed through a private insurance scheme.

For each country, the authors considered the different sources of financing; that is, the general taxation (separated into direct and indirect), the social insurance contributions, the premiums of voluntary private insurance, and the out-of-pocket payments. The importance of each financing source varies significantly across countries. For each considered country, the authors computed two different indices to assess the level of progressivity (or regressivity) of each financing source: the Kakwani index and the Suits index. The authors then computed a total Suits index and a total Kakwani index for each country, according to the weighting of each financing source in the total financing.

To perform the analysis, Wagstaff et al.(1992) used micro-data from different national surveys: in the case of Switzerland, they use the SOMIPOPS and SEVS surveys, which were conducted in 1981 and included data from 3853 households for that year.

The general results demonstrate that only four of the 10 countries (Ireland, Italy, Por-

¹Spain left the social insurance scheme in 1989, opting for tax financing. The data used in Wagstaff et al. (1992) refers to 1980, before this change took place.

tugal, and the U.K.) have a progressive financing system, while all the others present a negative Kakwani index. In particular, it is quite evident that tax-financed systems tend to be more progressive than the other two groups of countries. The result highlighted for Switzerland is a negative value of both total indexes (-0.117 for the Kakwani index and -0.112 for the Suits index), which means that the overall financing is regressive. Moreover, the Swiss healthcare financing was the second most regressive, after the U.S. (Kakwani index of -0.145).

In 1999, the same authors, along with some others, updated their previous paper with more recent data. The paper adds some new countries to the international comparison (Finland, Germany, and Sweden), to present the trends in the financing mix and progressivity and improve the methodology adopted in the previous paper. For Switzerland they also used a new survey, the Living Conditions Survey, which includes a sample of 5981 Swiss households interviewed in 1992. In line with their previous work, they computed the Kakwani index for each source of financing and a total weighted Kakwani index, using as weightings the proportion of each financing source in the total financing. Apart from some minor exceptions, the general results confirm those obtained in the 1992 paper. In particular, the analysis for Switzerland shows that the new Kakwani index, based on the data of 1992, is -0.1402. The conclusion is that in 10 years, the inequity level of financing grew even worse.

Bilger (2008) provided another important contribution to the analysis of financing equity in Switzerland. This work is important because it is the first to focus on the equity in the Swiss health-care system financing after the major reform of 1996.

Bilger's (2008) main contribution to the economic literature is that, for the first time, he applied the index proposed by Duclos et al. (2003), obtaining a more efficient decomposition of the redistributive effect. This effect can be divided in three parts: horizontal inequity, vertical inequity, and re-ranking.

For his analysis, Bilger used the Swiss Household Income and Expenditure Survey (SHIES) of 1998, which contains data from 9295 Swiss households (this is the same survey used in the present paper).

Bilger computed the share of each source of financing for all of Switzerland and then decomposed the redistributive effect for each of the sources. He found evidence that health system financing in post-reform Switzerland remains very regressive. In particular, the conclusions state that the reform failed to reduce vertical inequity.

Starting from this strand of literature, the current paper aims to go even further. All of the previous studies have concentrated on equity at the national level. Apart from the two previously noted exceptions (regarding Iran and Palestine), this is the first time that a systematic analysis of the health-care financing equity has carried out at the level of the single entities of a federal state (in this case, Switzerland at the cantonal level). The goal of the present paper is to analyze the differences in the progressivity of the financing

system at a sub-national level. Switzerland is an ideal country in which to add this new piece of evidence, as it can be set in a context of fiscal federalism, where the sub-national levels of governments (the cantons) have large freedom to decide on the financing sources for health care and in the design of the tax system.

3 Swiss health system financing

The Swiss health-care system is financed through a mixed "private-social" scheme. Health insurance has been mandatory since 1996, when the Health Insurance Act (HIA) came into force. Each resident must pay a monthly premium that does not depend on the level of income, while the Confederation and the cantons jointly provide public contributions (as earmarked subsidies) to cover part of the premium for lower-income people.

As Figure 1 shows, all the contributions to the total financing of the health-care system can be reduced to three main final direct actors: the households, the state, and the social insurances.

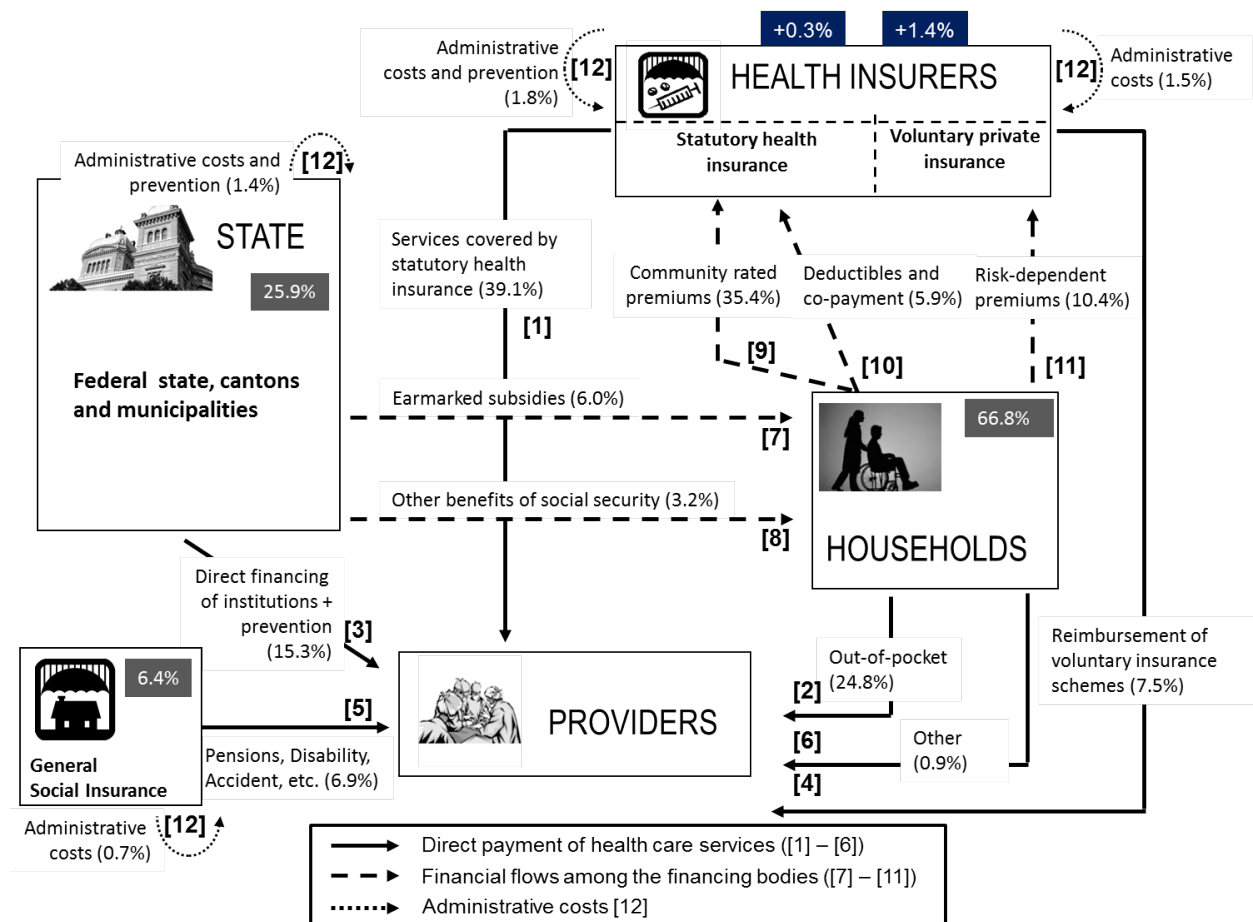


Figure 1: The Swiss health system financing scheme.

Approximately two-thirds of the total financing is collected from the households in an income-independent way, while one-third is collected according to the households' ability to pay through the general taxation and general social insurance. The part of expenditure that is directly financed by the household includes four components. Firstly, it is mainly composed of the monthly community rated premium (social health insurance, or SHI) that is compulsory for everyone and does not depend on income [9]. The second component is the expenditures that correspond to the deductible and the co-payment [10]. Thirdly, people can choose to have voluntary supplementary private health insurance (PHI) to cover some health-care services that are not included in the basic contract, corresponding to a premium [11]. The final component is out-of-pocket expenditures [2]. Since none of these four components depends on income, the part directly financed by the households can be considered as a regressive financing source.

The second part of expenditure is financed by the state, intended to be a combination of the confederation, the cantons and the local jurisdictions. Part of the taxes at all these levels are used to directly finance the health-care system, especially through hospital expenses, nursing homes, and home care institutions' subsidies, to fund prevention activities for the earmarked subsidies for people with income under a certain threshold (different in each canton) and other benefits of social security. This financing source includes direct and indirect taxes. The former depends on income and is supposed to be progressive, while the second is independent of income (TVA) and is supposed to be regressive. Depending on the proportion of the two taxes, the overall impact of this source could be regressive, progressive, or even proportional. Finally, the third actor is the general social insurance, which contributes in the case of pensions, disability, and accident. As the social contribution rate paid by citizens is the same for everyone, regardless of level of income, this third financing source is expected to be proportional.

In sum, the Swiss system combines three forms of health-care financing, one of which is likely to be regressive, one progressive, and one proportional. Some of the financing strategy rules are decided at the federal level. However, Swiss federalism allows cantons to make their own decision regarding which aspects of the financing policy they want to adopt. According to cantons' choices, different equity (or inequity) levels are determined in each canton.

Firstly, a different mixture of the three financing sources chosen by each canton determines a different level of regressivity: cantons that rely more on the SHI than on public expenditure are more likely to be regressive than those that choose to finance the system more through general taxation.

Secondly, cantonal autonomy due to fiscal federalism allows significant leeway in deciding the subsidies policy for the worse-off (Balthasar et al. 2008, Gilardi and Füglistner 2008, Kägi et al. 2012).

As mentioned, for people earning an income under a certain threshold, the confederation (for two-thirds) and the cantons (for one third) fund earmarked subsidies that cover part

(or the total) of the monthly premium. The federalism allows cantons to make their own decisions regarding the eligibility criteria for receiving benefits, which creates differences and disparities in their distribution. The choice of the subsidies' policy brings differences to the level of regressivity among cantons.

Thirdly, each canton can choose a different scale of tax rate that determines a different level of progressivity. The same is also true at the municipal level; indeed, each municipality can choose a tax multiplier that is a percentage of the cantonal tax, creating other differences in the regressivity level. Fourthly, the major reform of 1996 (HIA) adopted more binding financing rules for the subsidies to be given to hospitals of "public interest" (for the in-patient health care). Until 2011, it was compulsory for each canton to contribute at least 50 percent to the finance of the in-patient treatments in public hospitals. For private hospitals, cantonal participation was voluntary. Starting in 2012, the new hospital financing requires a 55 percent public share in the DRG payment, irrespective of hospital ownership. Therefore, the choice of which part of inpatient costs to cover, specifically how many hospitals may be considered as serving the public interest, is a cantonal decision and it is another determinant of different equity levels in the financing system. Indeed, the amount of choice left open by this law has an impact on the equity of the system: the larger the part financed by the tax system, the higher the redistribution and the lower the inequity.

So, the fiscal federalism in Switzerland provides the cantons with a wide scope of action to the cantons: different policies can lead to different equity levels. The aim of the present study is to explore this aspect of Swiss federalism, shedding light on the impact that different policies have on the financing equity. We have been forced to focus our analysis on *socialized* health expenditure because the data availability did not allow us to have a reliable proxy for the out-of-pocket and co-payment component. The socialized health expenditure includes the public health expenditures and expenses that are covered by the basic health and general insurance that aims to finance the compulsory basket of health care.²

²The socialized health expenditure represents approximately 60 percent of the total health expenditure and it includes the part financed by the state, the part financed by the general social insurance, and the social health insurance. The private households' expenditure (that is, out-of-pocket payments, deductibles, co-payment, and voluntary private health insurance) are not included in this definition.

Table 2: Socialized health expenditure - Absolute value (2005) and share of each financing source (average 1998-2005).

	Total health expenditure (CHF per capita) - Year 2005	Sources of financing- Average values for the years 1998 and 2000-2005			
		<i>Federal taxes (direct + VAT)</i>	<i>Cantonal and municipal taxes</i>	<i>General social insurance</i>	<i>Social health insurance (net premiums)</i>
Zurich (ZH)	4198	10%	29%	13%	48%
Bern (BE)	4297	11%	30%	13%	46%
Luzern (LU)	3461	13%	25%	16%	46%
Uri (UR)	3379	13%	26%	16%	45%
Schwyz (SZ)	3581	13%	25%	15%	47%
Obwalden (OW)	3155	14%	27%	16%	43%
Nidwalden (NW)	3385	13%	27%	16%	44%
Glarus (GL)	3541	12%	30%	14%	44%
Zug (ZG)	3885	12%	30%	14%	44%
Fribourg (FR)	3876	12%	28%	14%	46%
Solothurn (SO)	4002	11%	26%	14%	49%
Basel-Stadt (BS)	5854	8%	39%	9%	44%
Basel-Landschaft (BL)	4197	11%	27%	13%	49%
Schaffhausen (SH)	4070	11%	31%	13%	45%
Appenzell a Rh. (AR)	3505	13%	27%	16%	44%
Appenzell i Rh. (AI)	2988	16%	20%	19%	45%
St. Gallen (SG)	3465	13%	24%	15%	48%
Graubünden (GR)	3837	12%	29%	14%	45%
Aargau (AG)	3575	13%	20%	15%	52%
Thurgau (TG)	3204	14%	19%	16%	51%
Ticino (TI)	4852	10%	29%	12%	49%
Vaud (VD)	4858	9%	30%	11%	50%
Wallis (VS)	3732	12%	30%	14%	44%
Neuchâtel (NE)	5017	9%	33%	11%	47%
Geneva (GE)	6578	7%	43%	8%	42%
Jura (JU)	4381	10%	30%	12%	48%
Switzerland (CH)	4243	11%	29%	13%	47%

The first column in Table 2 considers the amount of the socialized health expenditure for each canton and for the whole Switzerland in absolute per capita values for 2005. In Table 2, and in the following analysis, the socialized health expenditure has been divided into four financing sources: *federal taxes* (including direct and VAT), cantonal and municipal taxes together (henceforth we will refer to this second group of tax simply as *cantonal*

tax), *social health insurance* (net premiums), and *general social insurance*.

The available data does not provide any information about the direct federal health expenditure given to each canton or the amount of health expenditure from the social insurance (AVS-AI) spent in each canton. To compute these two values, we took the total amount of expenditure and simply imputed the same average spending for each Swiss inhabitant, regardless of the canton in which he or she lived. In the expenditure of the confederation and the cantons, we also accounted for the amount of the subsidies distributed.

The last four columns of Table 2 represent the proportion of the expenditure financed by each source. We computed an average for the considered period (1998 and from 2000 to 2005) of the weight of each financing source.

The first evidence from the table relates to the absolute level of expenditure and differs greatly between cantons. With respect to the Swiss average of 4243 CHF (registered in 2005, the most recent considered in the analysis), canton Geneva and Basel city present the highest value of expenditures, with 6578 and 5854 CHF, respectively. Cantons Appenzell Inner Rhodes and Obwalden register the smallest expenditure values (with 2988 CHF and 3155 CHF, respectively).

However, the differences do not only concern the total amount of expenditure: another evident difference between cantons is the proportion of each of the single financing sources. The table also shows that, in cantons where the total expenditure is higher, the share of the cantonal part is also higher. This is because, where the total expenditure is higher, the level of premium is also higher (Basel City and Geneva have the highest levels of average premiums), which means that there is greater need for subsidies. This leads cantons to spend more to finance subsidies for the worse-off. The values in the table show that the most important part is financed health insurers (net premiums). This accounts, on average, for 47 percent of the socialized expenditure. The second source derives from the cantonal taxes that cover 30 percent of the socialized expenditures, followed by the social insurance and federal taxes that account for 13 percent and 11 percent, respectively. It is worth noting the differences among cantons. There are two cantons for which the part financed by cantonal taxes is considerably larger: Geneva (43 percent) and Basel City (39 percent). If we then compare Geneva with Appenzhell Inner Rhodes, for example, the differences are significant: the former chooses to finance 44 percent of the expenditures with cantonal taxes and 42 percent by premiums, while the weightings in the latter are 20 percent and 45 percent, respectively.

4 The dataset

The micro dataset is the Swiss Household Income and Expenditure Survey (SHIES), which allows computation of household income at a very detailed level, including all the taxes and social contributions paid, as well as the health revenues (subsidies and reimbursements)

and expenditures (premiums paid and, to some extent, out-of-pocket expenditures).

This survey is available from 1998 to 2005 (excluding 1999) and is based on a sample of the Swiss population (approximately 3500 households observed for each of the years between 2000 and 2005, and 9295 observations for 1998).

The original idea of this work was to distinguish between both the variation across Swiss cantons (between variation) and over time (within variation); unfortunately, however, this dataset does not allow this to be done. The SHIES does not guarantee that the households sample is representative of all the cantons for each year, but only for seven macro regions, each of which groups cantons together according to their geographical position.³ As the focus of this work is to control for the differences due to the federal setting, it seemed important to maintain the cantonal dimension. For this reason, we decided to merge the dataset of each year to obtain a representative sample at the cantonal level. This has been possible because different people were interviewed each year for each canton⁴.

The gain in the robustness of results reached in this way is balanced by the loss of the ability to analyze the time variation dimension; in this way, it is not possible to account for the variation over time for each canton. Ultimately, this study concentrates on the between-variation for each canton and on the within-variation only for the whole Switzerland and the seven macro regions.

The SHIES presents some differences in the questionnaires, especially for 1998 with respect to the other years. Only in the wave of interviews taken in 1998 were people asked to report all the medical expenses (greater than 150 CHF) they had incurred during the year preceding the month of the survey, and not only all the medical expenses they had during the month of the interview (as it is in the other waves of the survey). Moreover, for 1998 the reimbursements received by the insurance companies during the whole year are registered, as this ensures a correspondence between the expenditures and their reimbursements. The collection of this data makes it possible to compute the out-pocket expenditures for each households and, consequently, to have a robust proxy for the yearly out-of-pocket financing and at least for 1998.

³Macroregion 1 includes Vaud, Wallis, and Geneva; macroregion 2 includes Bern, Fribourg, Solothurn, Neuchâtel, and Jura; macroregion 3 includes Basel Stadt, Basel Land, and Aargau; macroregion 4 includes Zurich; macroregion 5 includes Glarus, Schaffhausen, Appenzell a. Rh., Appenzell i. Rh., St. Gallen, Graubünden, and Thurgau; macroregion 6 includes Luzern, Uri, Schwyz, Nidwalden, Obwalden, and Zug; macroregion 7 includes Ticino.

⁴To check whether the aggregation of data for each canton brought to a reliable sample representation, we compared the simple Gini coefficient on the basis of the gross income with the same Gini coefficient computed for each canton in the study *Regionale Einkommens und Vermögensverteilung in der Schweiz*. In this study the authors used the official tax data declared by the Swiss population. In this work they considered the entire population, not just a statistical sample. From this comparison, it is evident that the results for some cantons are similar, but not for all. Nevertheless, the computation based on this other dataset also presents some methodological shortcomings that do not allow us to determine which of the two is more reliable.

5 The measures of equity in health-care finance

5.1 Kakwani index

In order to measure the regressivity of each financing source, we used the procedure proposed by Wagstaff et al. (1999). We started by computing the Kakwani index for each financing source and then aggregated these results with a weighted average, using as weights the proportion of each financing source with respect to the total financing, as shown in section 3. This procedure has been applied to 23 cantons⁵, to the seven macro-regions, and to Switzerland as a whole.

This index is computed as the difference between the concentration index of the financing source and the Gini index calculated on the (equivalent disposable) household income before considering any health-related expenditures (we refer to this as *pre-health* income). The formula is as follows:

$$K_{ip} = CI_{ip} - Gini_pre_i \quad \text{Range : } [-2 : +1] \quad (1)$$

where i indicates the geographical unit of analysis (23 cantons, seven macro-regions, and Switzerland as a whole) and p the different financing sources available in the dataset: federal taxes, cantonal (and municipal) taxes, social health insurance (net premiums), and general social contributions.

CI_{ip} is the concentration index of each financing source p . CI is twice the area between the concentration curve of the source p and the 45-degree line. It indicates whether the variable of interest is more concentrated among the poor (the concentration curve lies above the equality line and the index has a negative value) or among the rich (the curve lies below the equality line and the index has a positive value).

$Gini_pre_i$ is the Gini index for the equivalent disposable income before considering health financing. This means that the amount spent on financing health care has not been subtracted from this measure of income.

Since the Swiss fiscal system does not rely on earmarked taxes for health care, we had to impute the amount of taxes that each individual household used to finance the health care system. We simply computed the share of health expenditure financed by each source and then attributed that share to the amount of taxes paid by each household. We did this for federal tax, cantonal tax, and general social insurance.

$Gini_pre_i$ is computed according to the following formula:

⁵Canton Uri, canton Appenzell Inner Rhodes, and canton Appenzell Ausser Rhodes have not been considered because the small number of observations in the dataset did not allow for any robust computation.

$$Y_pre_h = \sum_{k=1}^N y_{hk} - \sum_{s=1}^m (1 - \mu_s) sc_{hs} - \sum_{v=1}^p (1 - \tau_v) t_{hv} \quad (2)$$

where:

- $\sum_{k=1}^N y_{hk}$ is the gross income for the household h , which, according to the definition given in Bilger (2008), consists of the sum of all income earned from work and self-employment, interest, house rental, social insurance benefits, revenues from other insurances, and other indemnities.
- $\sum_{s=1}^m (1 - \mu_s) sc_{hs}$ is the part of the general social contributions (pensions and survivors insurance, disability insurance, accident insurance⁶) paid by the household h and not directed towards financing health care. In particular, μ_s is the share of health care services funded out of the budget of the social insurance. In 2005, μ_s was 3.3 percent for the pension and survivors insurance, and 24.5 percent for each of accident and disability insurance.
- $\sum_{v=1}^p (1 - \tau_v) t_{hv}$ is the taxes (federal, cantonal and communal) paid by the household h and not directed towards financing the healthcare system. As in Bilger (2008), federal indirect taxes were proxied with VAT, which accounts for two-thirds of total indirect taxes. VAT has been computed from the data on consumptions that household declared in the survey. As in the case of social contribution, τ_v is the part used to finance the health care system for each type of tax (v), so $1 - \tau_v$ the residual part that is not used within the health sector.

To give an idea of the dimension of these coefficients, in 2005 τ_v was 5.4 percent for federal tax, 28.5 percent (on average) for cantonal tax and 4.3 percent (on average) for communal tax.

Disposable income before health-care financing has been corrected using an equivalence scale in order to make households with a different number of members comparable.⁷

Moreover, as different years are pooled together, the values have been deflated through the consumer price index (CPI) for Switzerland.

Table 3 presents the results of the Kakwani index over time for all of Switzerland and the seven macro-regions.

The most notable result from Table 3 is that the total value of Kakwani index is always negative, which means that the Swiss health-care system financing remains quite regressive, even after the major reform of 1996; this result is in line with the previous

⁶The Swiss acronyms of these social insurances are AHV/AVS, IV/AI, and UVG/LAA/LAINF, respectively.

⁷The scale chosen is the OECD modified equivalence scale, which assigns a value of 1 to the household head, of 0.5 to each additional adult member and of 0.3 to each child no older than 13.

Table 3: Kakwani index over time

	1998	2000	2001	2002	2003	2004	2005
Macroregion 1	-0.1365**	-0.0915**	-0.0691**	-0.0652**	-0.0990**	-0.0901**	-0.0749**
Macroregion 2	-0.1064**	-0.0813**	-0.0815**	-0.1093**	-0.1052**	-0.0856**	-0.1093**
Macroregion 3	-0.1030**	-0.0995**	-0.0440*	-0.0621**	-0.0653**	-0.0767**	-0.0845**
Macroregion 4	-0.1302**	-0.1387**	-0.0921**	-0.0947**	-0.1043**	-0.1115**	-0.1127**
Macroregion 5	-0.1305**	-0.1160**	-0.1259**	-0.1197**	-0.0847**	-0.1371**	-0.1479**
Macroregion 6	-0.1367**	-0.1351**	-0.0804*	-0.0899**	-0.1086**	-0.1259**	-0.0759**
Macroregion 7	-0.0877**	-0.0746**	-0.0778**	-0.0348	-0.0271	-0.0833**	-0.0163

literature. The other notable point is that the results do not seem to vary widely in the years considered, either for all of Switzerland or for any of the macro-regions. The most regressive year appears to be 1998, although the data does provides no evidence of any clear temporal trend.

Macroregion 7 (Ticino) seems to reach the best value in terms of equity, for all the years considered, being proportional in 2002, 2003 and 2005. Macroregion 4 (Zurich) is in line with the Swiss average, and macro-region 3 is, after Ticino, the least regressive group of cantons.

The weighted Kakwani index for the socialized health expenditure in Switzerland is bounded between -0.084, reached in 2001, and -0.13 in 1998.⁸

Table 4 presents the Kakwani indexes for the Swiss cantons and helps shed light on how fiscal federalism allows cantons to choose their preferred financing policy. Results include the effects of the political choices of cantons and municipalities (tax rate scale, entitlement policy for earmarked allowances), but also of the individual choices that are allowed by the Swiss health system setting (premium and deductible level).

It is evident from the table that there are important differences in the regressivity of the financing system among cantons.

The differences in the *federal taxes* are not impressive. The Kakwani index for this financing source is not statistically different from zero for all the cantons apart from canton Basel Land (BL), which has a slightly progressive value. This means that federal taxes are concentrated quite proportionally among the population. These results could be explained by saying that the value considered here is the sum of the federal direct tax (based on income) that is progressive, and an indirect tax (VAT) that is normally regressive, as the rate is the same for everyone, regardless of income, and savings are concentrated in higher income classes. Canton Basel is the only one in which the effect of the progressive

⁸As explained, data for 1998 was collected in a different manner that makes it possible to compute the Kakwani index for the total health expenditure, including the out-of-pocket payment for each household as well as the complementary insurance premiums. We did this for all of Switzerland and found that, when considering the total expenditure, the equity results are even worse (Kakwani -0.14).

Table 4: Kakwani index across cantons

	<i>Federal taxes</i>	<i>Cantonal and municipal taxes</i>	<i>General social insurance</i>	<i>Social health insurance (net premiums)</i>	<i>Weighted Kakwani index</i>
ZH	0.0088	0.0389	0.0074	-0.2548**	-0.1085**
BE	-0.0052	-0.0121	0.0330**	-0.2086**	-0.0947**
LU	-0.0069	0.0181	0.0560**	-0.2298**	-0.0936**
SZ	-0.0578	-0.0417	0.0025	-0.2508**	-0.1344**
OW	0.0387	0.0744	0.0999**	-0.2323**	-0.0567**
NW	0.0236	0.1256	0.0594	-0.2738 **	-0.0729**
GL	0.0063	0.0135	0.0366	-0.2304 **	-0.0913**
ZG	0.1093	0.0540	-0.0230	-0.2603 **	-0.0871**
FR	-0.0159	-0.0121	0.0246	-0.1863 **	-0.0874**
SO	-0.0311	0.0473**	0.0536 **	-0.2109**	-0.0868**
BS	0.0485	0.0835	-0.0001	-0.2149 **	-0.0582**
BL	0.0557*	0.0933**	-0.0042	-0.2191**	-0.0774**
SH	-0.0963	-0.1310	-0.0059	-0.2239 **	-0.1535**
SG	0.0011	0.0407	0.0369*	-0.2571 **	-0.1066**
GR	-0.0481	-0.0327	0.0231	-0.2605**	-0.1285**
AG	0.0200	0.0308	0.0147	-0.2250 **	-0.1065**
TG	0.0251	-0.0372	0.0406*	-0.2281 **	-0.1131**
TI	0.0122	0.0850**	0.0310 *	-0.1800**	-0.0592**
VD	-0.0148	0.0131	-0.0099	-0.2050 **	-0.1004**
VS	-0.0464	-0.0435	-0.0006	-0.2123 **	-0.1114**
NE	-0.0526	0.0306	-0.0035	-0.2009 **	-0.0904**
GE	0.0277	0.0976	-0.0673**	-0.2482**	-0.0643*
JU	-0.0076	0.0799	0.0549	-0.1809 **	-0.0566**
CH	0.0074	0.0153	0.0090*	-0.2271 **	-0.0999**

direct tax more than offsets the effect of the regressive VAT.

The Kakwani indexes for the *cantonal and municipal taxes* are more difficult to explain. While we would expect a highly progressive value, most of them are not statistically different from zero, which suggests proportionality. Only Solothurn (SO), Ticino (TI), and Basel (BL) present a slightly positive value of the Kakwani index, which means a slightly progressive tax. These values are smaller than the results expected, but there are at least two reasons that could explain them.

First of all, this financing source includes both cantonal and municipal tax. Very rich households may choose to live in jurisdictions that have a lower local (municipal) taxation. Therefore, a richer household may have to pay the same cantonal tax, but a different (lower) municipal tax than a poorer household that lives in a municipality with higher taxation. This could bias the progressivity results in favor of proportionality.

A second reason could be the fact that there is a mismatching between household income that refers to the year of the interview and household taxes that are paid on income earned the year prior to the interview. There could be situations in which a person has reduced his or her revenues or did not have an income at all (perhaps because they have

temporarily lost their job or have retired), but have to pay taxes because they earned a "regular" income in the previous year. This could worsen the situation of regressivity because the Kakwani index is computed as if tax paid and income earned referred to the same year; that is the case for the majority of the interviewees, but not all.⁹

As expected, the Kakwani indexes for the *general social insurance* are mostly near to proportionality, because the tax rate is the same for every wage earned, regardless of its level. Nevertheless, there are some exceptions. Four cantons (Bern, Luzern, Obwalden, and Solothurn) present a progressive value, while canton Geneva is the only one that has a regressive index for this financing source. This could be because the capital income rate over the total income in that canton is higher than in the other cantons: the fact that the payment for the social insurance is only based on wage income could induce a regressive effect in the results.

The most interesting results are those of the Kakwani index for the *net social health insurance*. They are all significant for each canton and range from a value of -0.18 for canton Ticino to -0.27 for canton Nidwalden.

It is quite notable that the values can be so different, even in neighboring cantons: the value of the index in canton Graubunden is 0.08 less than that of its neighbor, Ticino (-0.26). This value probably hides a different choice in the subsidy policy that is freely chosen by cantonal authorities. It is likely that the subsidy policy is more generous in the cantons where the premiums are less regressive than in the others. This intuition is also confirmed, at least for Ticino, by Crivelli et al. (2008), who explained that subsidy policy in Ticino is 34.5 percent more generous than the Swiss average.

With respect to this financing source, however, the value of Kakwani includes something more than the effects of the earmarked subsidies chosen by the cantons. Also, the individual choices (premium and deductible) allowed by the competitive setting of the Swiss health insurance have a significant impact on equity. The Swiss system encourages competition between insurance companies, which is based totally on the level of the premium; twice per year, people have the option to switch to another insurance company (with lower premiums, for example). It could be the case that richer people, who generally have greater access to the information, will decide to insure themselves with the most convenient companies, paying lower premiums. The consequence of this, of course, is that rich people pay lower premiums compared to worse-off people, which may create regressivity in the general system, despite the subsidy policy. Moreover, citizens are allowed to obtain a discount on the monthly premiums by choosing a higher deductible; by assuming

⁹There is another factor to consider: the tax reform. In 1990, a new federal law came into force regarding the fiscal harmonization of direct taxes. According to this law, all the cantons had to change the procedure for paying and collecting taxes: the passage was from a system in which taxes were paid for the income earned during the two preceding years, to a system in which taxes were paid for the income earned in only one year - precisely, the same year in which taxes are paid. From 1990 until 2003, all cantons had to adopt their taxation systems to the new law. A consequence of this was that in each canton there were two years of "tax holes"; that is, the income earned in those two years has never been taxed. This may have created some asymmetries in our computations as well.

some of the risk of getting sick themselves, they can pay a smaller monthly premium. Similarly, people who choose to be part of a managed care plan can also get a discount on premiums. These two choices are not constrained to a certain level of income, so everyone can choose them. In this case, the economic burden for financing the health care system may be shifted from the good risk people to the bad risk people. This may also have some consequences on the equity level. It is easier to choose a contract with a higher deductible only if people have access to the information, which is normally the case for people who are richer (or better educated), but not rich enough not to have interest in a discounted premium. Therefore, it may be the case that good risk people belonging to the upper-middle income class may have an incentive to make this decision, provoking an increase in the level of regressivity. Another scenario may be that people who are in the low-middle income class (but not low enough to receive subsidies) may opt for a higher deductible, which moves the economic burden from the lower-middle class to the upper-middle class. Depending on which of the two effects offsets the other, the regressivity level may be increased or reduced.

Therefore, this value of the Kakwani index also includes these possible effects.

Finally, the last results to comment on are those that are relative to the *total* Kakwani: they are all statistically significant¹⁰ and all are negative.

The cantons that appear to be the most regressive ones are canton Schaffhausen and Schwyz, with a Kakwani equal to -0.15 and -0.13, respectively. The cantons that reach the best results in terms of equity are Jura, Obwalden and Ticino, all of which have a Kakwani value of around -0.05. It is worth noting that the difference between the least and the most regressive canton (approximately 0.10) is considerable; it is the same difference we get comparing in the Wagstaff et al.'s (1999) study USA (-0.13) and Sweden (0.015), countries that have two completely different health-care financing systems.

5.2 Concentration curves and dominance test

The Kakwani index is an extremely synthetic measure of regressivity that is useful for providing summary information about the level of progressivity. However, this information can be sometimes misleading if the distribution underlying the Kakwani index is not also considered. When curves cross, the result of the Kakwani index is no more clear: a value equal to zero could indicate proportionality, but it could also be the result of a concentration curve that is progressive for half of the population and regressive for the other half. In order to consider the distribution of the progressivity for the whole population,

¹⁰The standard error for the total Kakwani index has been obtained summing the standard errors for the single components (*i*) according to the formula:

$$se = \sqrt{\sum_i (w_i se_i)^2 + 2 \sum_{ij} (w_i w_j cov_{ij})} \quad \forall i \neq j \quad (3)$$

it is necessary to look at the concentration curves and the relative dominance test. The dominance test aims to define statistically whether one curve dominates another. The null hypothesis indicates that there is no significant difference between the two concentration curves considered. The choice criterion used here is the *multiple comparison approach*. In the comparison between the two curves, the null is rejected if there is at least one significant difference between them in one direction and no significant difference in the other direction. The ordinates are compared in 19 different quintiles, as suggested by O'Donnel et al. (2008).

A general summary comment, based only on the visual inspection of the concentration curves, would suggest that their order follows a similar pattern for all the cantons. Firstly, starting from the 45-degree line and going down, the net premium curve is always the first one, very close to the 45-degree line and not crossing with the others. Secondly, the social contribution curve is generally the next one, always very near to the Lorenz curve, which indicates proportionality. Thirdly, the federal tax line is also quite near to the Lorenz curve and, finally, the cantonal tax curve is always the most distant and lies under the Lorenz, indicating progressivity. Nevertheless, the two curves for taxes and the one relative to the social insurance often cross among them and with the Lorenz, which indicates an alternation between regressivity among the poorer and progressivity among the richer.

We have chosen to show the concentration curves and the relative dominance tests for some of the cantons that presented the most interesting results in terms of Kakwani index. These were cantons Geneva, which is among the least regressive, and canton Zurich, because it presents values of the Kakwani that are close to the Swiss average and because it is one of the seven macro-regions upon which the SHIES sample is yearly-based, so it should provide very robust results.

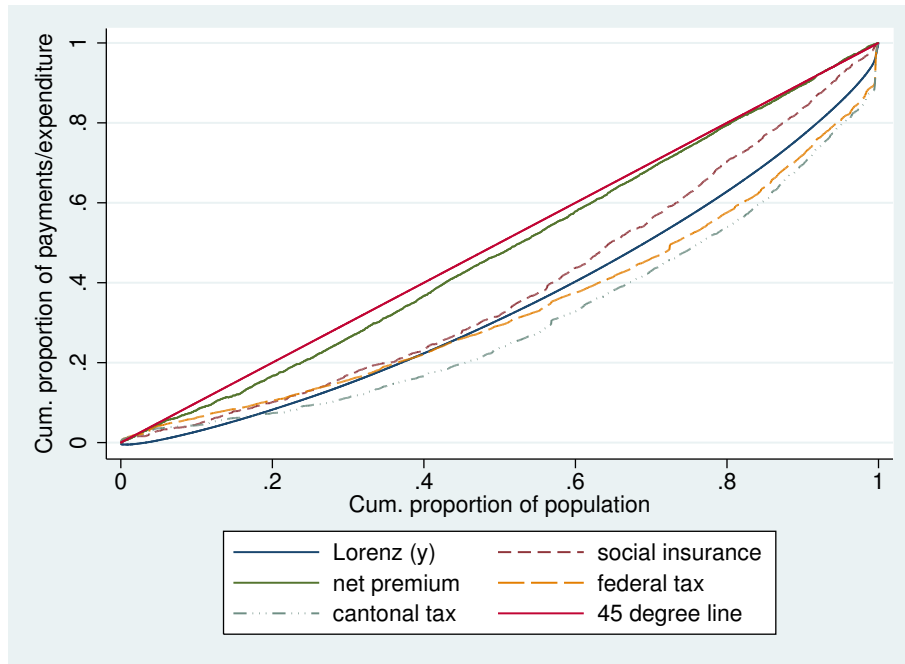


Figure 2: Concentration curves for each financing source, canton Geneva

Table 5: Geneva

		Federal		Cantonal		Social insurance		Premiums	
Quantile	Cum. share of y	Cum. share	Diff. from income share (p -value)	Cum. share	Diff. from income share (p -value)	Cum. share	Diff. from income share (p -value)	Cum. share	Diff. from income share (p -value)
q10	2.78%	6.26%	0.0013	4.32%	0.1920	4.57%	0.1796	8.08%	0.0000
q20	8.24%	10.55%	0.0473	7.40%	0.5075	10.06%	0.1856	16.62%	0.0000
q30	14.75%	15.61%	0.4948	11.21%	0.0124	16.87%	0.1379	26.16%	0.0000
q40	22.35%	22.04%	0.8278	16.60%	0.0002	23.15%	0.5847	36.71%	0.0000
q50	30.82%	29.29%	0.3568	23.69%	0.0000	31.75%	0.5389	47.10%	0.0000
q60	40.31%	37.41%	0.1384	32.80%	0.0003	43.70%	0.0300	57.73%	0.0000
q70	50.92%	46.08%	0.0328	42.95%	0.0008	55.78%	0.0021	68.60%	0.0000
q80	62.85%	57.53%	0.0477	53.94%	0.0012	70.27%	0.0000	79.40%	0.0000
q90	76.98%	71.94%	0.1137	69.61%	0.0275	83.72%	0.0000	89.47%	0.0000

Figures 2 and 3 represent the concentration curves of each financing source for canton Geneva and canton Zurich, respectively. Relying on visual inspection alone, the differences in the curve's trends are not great between the two cantons. The dominance test presents different results, however. In both cantons, the concentration curves for the net premiums are very close to the 45-degree line, indicating quite strong regressivity, and they dominate the Lorenz curve. The level of regressivity for this source is more or less the same in the two cantons. For example, the poorer 30 percent of the population owns

about the 15 percent of the total income in both cantons, and it pays 26 percent of the net premiums in canton Geneva, and 27 percent in canton Zurich (see Table 5 and Table 6).

In canton Zurich, all the curves for the other sources cross and the test does not give evidence for dominance. Instead, for canton Geneva there is dominance of the social contributions curve on the Lorenz curve and dominance of the Lorenz curve on the cantonal tax curve. These two last results tell us two important things. Firstly, the dominance for the social contribution curve confirms the result of the Kakwani index: the social contributions are regressive in Geneva, while the situation is different for the cantonal tax. This financing source seems to be progressive, but only starting from the second decile of the ranked population (that is, for the richest 80 percent). For the poorest 20 percent of the ranked population, it may be considered proportional (as the difference between the two curves is not statistically significant).

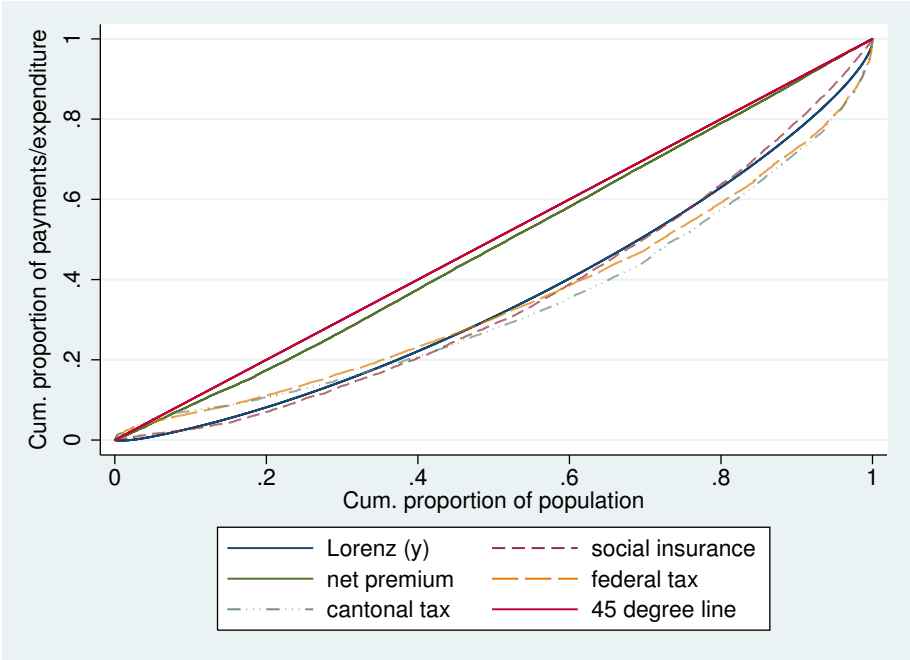


Figure 3: Concentration curves for each financing source, canton Zurich

Table 6: Zurich

<i>Quantile</i>	<i>Cum. share of y</i>	Federal		Cantonal		Social insurance		Premiums	
		<i>Cum. share</i>	<i>Diff. from income share (p-value)</i>	<i>Cum. share</i>	<i>Diff. from income share (p-value)</i>	<i>Cum. share</i>	<i>Diff. from income share (p-value)</i>	<i>Cum. share</i>	<i>Diff. from income share (p-value)</i>
q10	2.93%	6.62%	0.0000	7.29%	0.0004	2.72%	0.4227	8.68%	0.0000
q20	8.16%	11.17%	0.0000	10.66%	0.0385	7.00%	0.0008	17.43%	0.0000
q30	14.61%	16.74%	0.0004	15.17%	0.6327	13.50%	0.0087	27.08%	0.0000
q40	22.15%	23.18%	0.0979	20.74%	0.2234	20.43%	0.0003	37.53%	0.0000
q50	30.70%	30.34%	0.5794	27.66%	0.0073	28.80%	0.0004	47.91%	0.0000
q60	40.24%	38.54%	0.0136	35.44%	0.0000	38.88%	0.0205	58.12%	0.0000
q70	50.92%	47.40%	0.0000	44.61%	0.0000	50.33%	0.3527	68.68%	0.0000
q80	62.99%	59.14%	0.0000	57.45%	0.0000	63.68%	0.3063	78.99%	0.0000
q90	77.17%	72.76%	0.0000	71.79%	0.0000	79.37%	0.0019	89.34%	0.0000

6 Discussion

As we have seen, the leeway of fiscal federalism makes it possible to reach very different results in terms of regressivity across cantons. Indeed, the policy chosen by the cantons has a direct effect on the regressivity level and also an indirect (or endogenous) one, as it may affect individual choices. If a canton (or a municipality) opts for a less progressive taxation, this decision has a direct impact on the level of equity: with respect to a canton in which the tax rates are more progressive, this will of course be less equitable. This has also an endogenous effect, however, in that very rich people may decide to live there to pay less taxes and this may also have an impact on the regressivity level.¹¹ When reading these results in a federal context, it is important to keep in mind that there are some effects that are not evident with a simple Kakwani index. Although it is a useful index, it has some limitations and is not able to capture all the effects that may have a role in determining such level of regressivity. In this regard, another consideration needs to be specified. The present study has only considered the level of regressivity of the cantons, regardless of their average income level. The Kakwani index considers only the relative value of income and financing burden, not the absolute one. There can be two different cantons, one of which (canton A) adopts a more progressive policy than the other (canton B). Let us assume that the distribution of income in relative terms is precisely the same, so that the better-off of the two cantons own the same share of the total income and the worse-off people have the same economic situation in the two cantons. This does not imply that the worse-off in canton A pay less in absolute value than those in canton B; we can only infer that the worse-off in canton A pay less in relative terms, (that is, they pay less compared to the rich than what would be the case in canton B). However, it could be

¹¹If this effect increases or decreases, the regressivity depends on the distribution of income among the population.

that the poor in canton A have to pay more in absolute value than the poor in canton B. Moreover, section 3 has shown the difference in the levels of health-care expenditure. The premium level is normally related to health-care expenditure, which means that where expenditure is higher, premiums are also higher. Even if health-care financing in one canton is less regressive than in another (for example, if Ticino is less regressive than Graubunden), the worse-off would have to pay a higher premium in Ticino than in Graubunden. This would ultimately mean that it is more convenient for such individuals to live in a place where they carry a comparatively higher economic burden than better-off people. To check for this, we computed the *incidence* of health expenditure on the total income for different income classes. This provided a measure that considers the absolute value of the effort of lower-income individuals (as well as for higher-income individuals). We found that there is a similar general trend for all cantons; specifically, the incidence for the lower-income classes is heavy and decreases for the richer classes. To exemplify this, the graphic representations for the incidence of the financing burden for the cantons of Zug and Geneva are reported below (Figure 4).

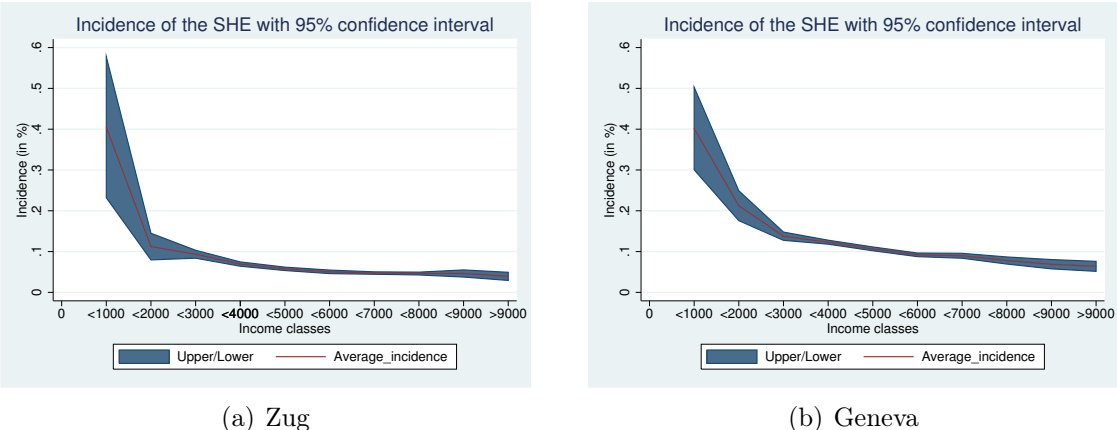


Figure 4: Average incidence of the socialized health expenditure on income, Zug and Geneva

The red line represents the average incidence for each of the income classes considered, while the blue-shadow area indicates the confidence intervals. Interestingly, the two red lines have a similar shape, although the line for Geneva is shifted upwards with respect to the other. With an exception for the first income class, the level of incidence is quite different: the share of income that people in Geneva pay is almost double that of those in Zug. This means that people in Geneva (one of the least inequitable cantons) pay more, not only in absolute value, but also as a percentage on their income than in Zug (one of the most inequitable cantons). In other words, the burden of health-care financing may be equally distributed, but may be too heavy to be affordable for lower- and middle-income people.

The reason for such a result can easily be found by simply looking again at the abso-

lute level of expenditure (Table 2): Geneva registers one of the highest levels (6578 CHF per capita), while Zug has one of the lowest ones (3885 CHF per capita). This example clearly shows that, to have a clear understanding of the equity issue, the importance of the absolute expenditure levels cannot be neglected.

The subsidy policy adopted by the cantons also has an essential impact on the regressivity level. It is the most important tool that cantons have in deciding the extent to which their financing policy is able to mitigate the regressive nature of the community-rated premiums. The analysis shows that the subsidy policy does not succeed in making the total financing proportional or progressive as the concentration curve for the net premiums is always far above the Lorenz curve, which represents strong regressivity.

7 Conclusions

This study represents the first attempt to investigate the impact of federalism on the financing of a universal health insurance system in terms of equity. The results contained in this work shed light on some of the aspects that cannot be neglected in re-thinking a new possible reform of the Swiss health-care system, but important lessons can also be drawn for other federal states (like the U.S.) that use regulation and subsidies to ensure universal coverage.

We have analyzed the financing of the Swiss health-care system from an equity point of view, with particular attention on the differences across cantons. We used the Kakwani progressivity index for each financing source to see how each of them shifts from proportionality. The Kakwani index used in the analysis is a useful way to measure the magnitude of the regressivity of the system, but it does have some limitations. The dominance test for the concentration curves has also been performed to exploit more the available information.

The general results suggest that Swiss health-care system financing is regressive in all cantons, although there are differences among them. The reason for this lies in the federal setting, which allows cantons to have some freedom in certain areas, such as how to design subsidy policies for lower-income people, the choice of tax rates, and the choice of how much of the total expenditure has to be financed through taxation and how much through mandatory health insurance. These factors, together with the peculiarities of the Swiss health-care system based on competition among insurance companies and on the supply of premium discounts for people opting for higher deductibles and managed care contracts, bring different levels of inequity. The results highlight the fact that the most regressive financing source is the social health insurance, followed by federal taxes and general social insurance (both of which turn out to be near to proportionality), and finally the cantonal tax, which is progressive in the majority of the cantons. Moreover,

the results for all of Switzerland do not highlight significant differences over the temporal interval from 1998 to 2005.

With regard to the equity issue, one possible criticism is the potential trade-off between equity and efficiency, according to what Okun theorized in 1975. To check for this, we considered the efficiency results found in a study by Widmer and Zweifel (2012) in which they performed a data envelopment analysis for the Swiss cantons for six categories of public goods, including health, using data relative to the years 2000-2004. We ranked the cantons first according to our equity results and then according to the efficiency results found by the two authors. We compared the two ranking lists through a Spearman test and a Kendall test of rank correlation, but the results do not reject the null hypothesis of independence. This leads to the conclusion that there is no direct link between equity and efficiency.¹²

As already highlighted, the methods generally used in the health economics literature to measure the equity of financing can only be considered a valid policy instrument if read together with the others. The level of progressivity in a canton is not enough to be taken as a benchmark of the level of well-being of lower-income and middle-income people. It is also necessary to control for the absolute level of expenditure that lower- and middle-income people have to afford. In other words, from a policy point of view it is essential to bear in mind that equity and affordability are two different measures that are not necessarily correlated.

For the analysis, we considered so-called socialized health expenditures, due to the information availability and characteristics of the dataset. A suggestion for future research would be to extend the study to the whole expenditure in order to also monitor the impact of out-of-pocket expenditures, deductibles, and co-payments. Nevertheless, the values we found can be taken as baseline inequity that could only become worse once these other financing sources were added to the analysis.

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¹²Thanks to Peter Zweifel for suggesting this additional check.

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