

FISCAL FEDERALISM AND SOFT BUDGET CONSTRAINTS  
IN THE ITALIAN NATIONAL HEALTH SERVICE

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pubblicazione internet realizzata con contributo della



# Fiscal federalism and Soft budget constraints in the Italian National Health Service\*

(Preliminary version)

July 2002

by

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**Abstract** In this paper we study a simple model of bailing out and we review theoretical literature on the “soft budget constraint” in order to interpret the evolution of regional spending, funding and deficits during the ‘90s in the Italian National Health System. We focus on the health care sector mainly because bailing out of regional deficits has been a structural characteristic of intergovernmental relationships. We propose a first empirical test of the main theoretical implications, building a data set on regional health expenditure, financing, and deficits during the ‘90s. Our main finding suggests that expenditure growth is more related to control of the central government than to a virtuous behaviour of Italian regions. Moreover, structural reforms (e.g. the change in the electoral rules for national elections) had probably the effect of increasing the commitment technology of the central government. Regional spending and financing seems to be related to some of the “soft budget constraint” proxies, suggesting that a removal of these features may indeed help to strengthen regional budgets. Finally, we argue that the new Constitution can spread the “soft budget constraint” disease to other parts of the public sector and this may threaten financial stability.

JEL classification: H51, H77

Keywords: health care expenditure, intergovernmental relationships

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\* An earlier version of this paper was included in a work we presented at the January 2002 ISAE Meeting “Monitoring Italy”. We wish to thank all participants at that workshop for the very lively discussion and, in particular, Michele Boldrin, Giacomo Vaciago, Fiorella Padoa Schioppa and an anonymous referee for very useful comments. Gianni Amisano, Lorenzo Cappellari, Franco Peracchi, and Federico Revelli suggested detailed remarks on the econometric techniques used in the empirical section of the paper. Floriana Cerniglia, Nicoletta Emiliani, Daniele Franco, Stefania Gabriele helped us collecting the data. All residual mistakes are the authors' own responsibility.

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## 1. Introduction

Italy is at the edge of a deep revolution. In October 2001, a Constitutional reform was approved which deeply altered the balance of power between central and local governments, transferring to the latter a large number of previously centrally held governmental functions. In turn, this Constitutional change is just the last step of a on-going process which in less of a decade has dramatically modified the Italian intergovernmental system, transforming one of the most centralised country of the world in a *de-facto* decentralised one. Deep economic and political causes were at the root of this decentralisation process. But economic ideas have been very influential too. In the last ten years, several Italian economists, both in and out government institutions have argued and worked in favour of decentralisation, seeing the process as an unique opportunity to increase accountability and efficiency of local governments<sup>1</sup>. Of course, potential dangers from the process of decentralisation have long been recognised too, especially in terms of increased territorial inequity in an already divided country. However, it has always been thought that a strong interregional redistribution mechanism could provide the key to solve this problem, allowing Italy to reap the efficiency gains from decentralisation while at the same time avoiding the costs of an increase in inequality (e.g. Bordignon et al., 1997, 2001).

This simple view may have overlooked a fundamental problem in vertical intergovernmental relationships (Pisauro, 2001). The efficiency gains from decentralisation crucially depend on local governments to carry out the full financial responsibility of their actions. If this is not the case, decentralisation may create perverse incentives. In particular, if local governments perceive they can externalise the cost of providing local services to other jurisdictions or higher levels of government, they will have an incentive to do so, expecting others to foot the bill. Excessive and inefficient spending at local level, waste and distortions in local public goods supply, up to the point of undermining the soundness of national finances, may then be the result. An increasing literature, mainly originated by applied economists working in international organisations (Tanzi, 1996; Prud'homme, 1995; Bird et al., 1995) suggests that this moral hazard phenomenon<sup>2</sup> (known as the "soft budget constraint", e.g. Kornai, 1972) may indeed be at the root of the inability of decentralisation to fulfil its promises in many countries around the world<sup>3</sup>.

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<sup>1</sup> See Bordignon and Volpi, 1995, for a discussion of the early Italian literature on decentralisation, and the special issue of the *Rivista Italiana degli Economisti*, 2001 (forthcoming) for a discussion of the most recent developments.

<sup>2</sup> The fiscal federalism literature has insisted more on two other potential negative effects of decentralisation: tax competition and vertical tax externalities (see Keen, 1998 and Wilson, 1999). These two aspects are linked but conceptually distinct phenomena.

<sup>3</sup> Although well studied (e.g. Maskin, 1999 for a recent survey) in general, soft budget constraint problems in intergovernmental relationship have received scarce attention in the academic literature so far. Only very recently, systematic work on the subject has started to appear (Wildasin, 1997; Pisauro, 2001; Inman, 2001; Carlsen, 1999, Coate, 1995). Recent comparative institutional analysis, again largely made under the headings of international

In Italy, there is little doubt this problem is going to be crucial. Local governments have already a long tradition of bailing-out by the central government (Emiliani et al., 1997). Decentralisation, by dismantling the hierarchical control system on local government behaviour that the Italian central government built in the years, may worsen the problem. Furthermore, decentralisation occurs in Italy in a situation of still unsettled conditions for the national public finance. The potential threat that decentralisation imposes on national public finance is accordingly more serious.

Does the new Constitution shield the country from these risks? Is the new political and economic equilibrium among different levels of governments envisaged by the new Constitution robust enough to avoid these problems? To answer these questions, in this paper we focus on the public health sector in Italy. We choose this sector for a number of reasons. First, if the practice of bailing out of local governments in Italy has been widespread, nowhere it has been as serious as in the public health sector. Bailing-out of regional deficits in health expenditure has been a structural characteristic of the Italian system of intergovernmental relationship since the '70s, when regions were formed. Second, health expenditure is by far the most important item of actual expenditure for Italian regions and the one where the expected rate of growth is the largest. Hence, the political and economic viability of the Italian version of fiscal federalism will largely depend on its ability to control the evolution of health expenditure in the future. Third, behind the financial problems of the health sector in Italy, there was essentially a "constitutional failure". The 1948 Italian Constitution considered access to health services as one of the fundamental right of citizenship, thus making the central government responsible for guaranteeing this right, while at the same time assigning to regions the responsibility for managing the health system. There was then a built-in problem of shared responsibility which has reduced political accountability and made it easier for regions to rely upon central government intervention. Not only the 2001 Constitutional amendment did not solve this problem, but it has made it potentially worse by extending intergovernmental shared responsibility to other functions as well, mainly education. There is then the serious risk that the new Constitution will spread the "soft budget constraint disease" to other sectors. Finally, and most important, the '90s have seen radical reforms in the financing of the health sector. These same reforms have been used by the new Constitution as a model to define the new financial equilibrium for the entire set of new and old functions assigned to local governments (see Bordignon et al., 2002). Hence, by inquiring on the effects of these reforms on regions' behaviour in the health sector in the '90s, we may expect to learn something about the future for the entire set of regional functions.

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organisations (Rodden et al, 2001), suggests the problem to be a very serious one in many countries around the world,

To reach our aims, we first review the soft budget constraint literature to help us make sense of what happened in Italy during the last decade and to derive testable empirical implications. Then we build a data set on regional health expenditure, financing and deficits in the '90s to study the effect of several variables to understand what happened in the past, and therefore what may be likely to happen in the future. Third, we perform our empirical analysis. Our analysis strongly supports the idea that behind the evolution of health expenditure in Italy in the '90s there were essentially political factors at work. Not surprisingly, the external constraints induced by the Maastricht treaty go a long way in explaining what happened. But, more fundamentally and even controlling for these external constraints, structural changes in the national political system, such as the move to an electoral system based on the majority rule and the resulting lengthening of the governments' duration, turn out to have had a very important effect in reducing health expenditure and deficits at regional level. Concerning the variance of regional health deficits, our empirical analysis first proves that there were indeed problems in the way health care has been financed in Italy. The NHS financing rule did not take enough into account the structural differences existing among regions in the provision of health services, thus inducing a systematic tendency for some regions to overcome the planned financing level. However, our analysis also proves that this is only a part of the story. Political variables, such as the political affinity between central and regional governments, also turn out to have an effect on health expenditure and deficit levels. *Coeteris paribus*, regional governments controlled by the same majority of central government spend and run less deficits than governments with a different majority. Finally, our analysis also suggests that the reduction in vertical imbalance at regional level did not affect the propensity of regions to run health deficits. The sharp reduction in health expenditure occurred in the mid '90s was more the result of central government interventions than the result of policies set up by regions to control for expenditure. Although provided with extra resources, regions preferred to use these resources in other, more politically rewarding sectors, than to finance deficits in the health sector. This raises considerably worries on the future evolution of regional finance, as the implicit assumption of new Constitution seems to be that by eliminating the vertical imbalance would automatically solve the soft budget constraint problem. Patently, this is not the case. We will come back to this in the concluding section.

The remainder of the paper is structured as follows. Section 2 summarises the recent institutional developments in Italy. Section 3 develops a simple model of bailing out and provide a unified framework for the soft-budget constraint literature which is further surveyed in section 4. Section 5 presents our data set and our empirical analysis. Section 6 briefly concludes the paper.

## **2. The Evolution of Regional Finance during the '90s**

Health expenditure in Italy in the last 20 years has been financed through two separate channels. The first was through central government grants to the NHS, topping up regional earmarked taxes so as to reach the prescribed level of regional funding. The second was through the bailing out of regional deficits. It would be probably wrong to read all these regional health deficits as evidence of soft budget constraint problems; to some extent, they belong more to the category of “creative” public accounting. Furthermore, focusing on deficits and on the bailing out of regional debts as the only evidence of soft budget constraint problems would be wrong for another, although opposite, reason. Given the highly discretionary way formulas for the apportionment of the NHS to regions were used, it may well be true that soft budget constraint problems surfaced for some regions not in the form of a bailing out of previous deficits but through increased transfers. Indeed, it seems more appropriate to think to soft budget problems generally as phenomena which occur when residents in a region manage to shift the burden to pay for local services to national residents (both present and future), and this may well happen through increased transfers rather than by the bailing out of previous debts (Inman, 2001). Still, an analysis of the health deficits run by the Italian regions in the last ten years is instructive for a number of reasons. First, pressed by Maastricht, the Italian central government did actually try to control for health expenditure in the '90s with various degrees of success. We want to understand which interventions were successful and why. Second, under the same pressure, a number of very important reforms were passed in the same years. Some of them regarded the financing and the organisation of regions and were introduced precisely as an attempt to make regional governments more financially accountable. As the same features are also very likely to characterise Italy in the future, it is important to ask if they succeeded somehow in reducing soft budget problems. Third, in the same period, many things happened in Italy in the political arena. Old political parties disappeared (at least for a while), and new ones took their place, some with a very strong local constituency. Electoral rules were modified, both at local and at central level, moving from pure proportional systems to ones which have at least some of the characteristics of the majority rule based systems. In 2000, a Presidential system was actually introduced for regions. As an effect, governments became more stable. Furthermore, for the first time in 50 years, the country has known a true change in the ruling majority, moving first from a centre-right government to centre-left one (in 1995) and then back again to a centre-right government (in 2001). The theoretical literature, as summarised by Persson and Tabellini (2000), suggests that these changes should have predictable effects on local governments incentives to

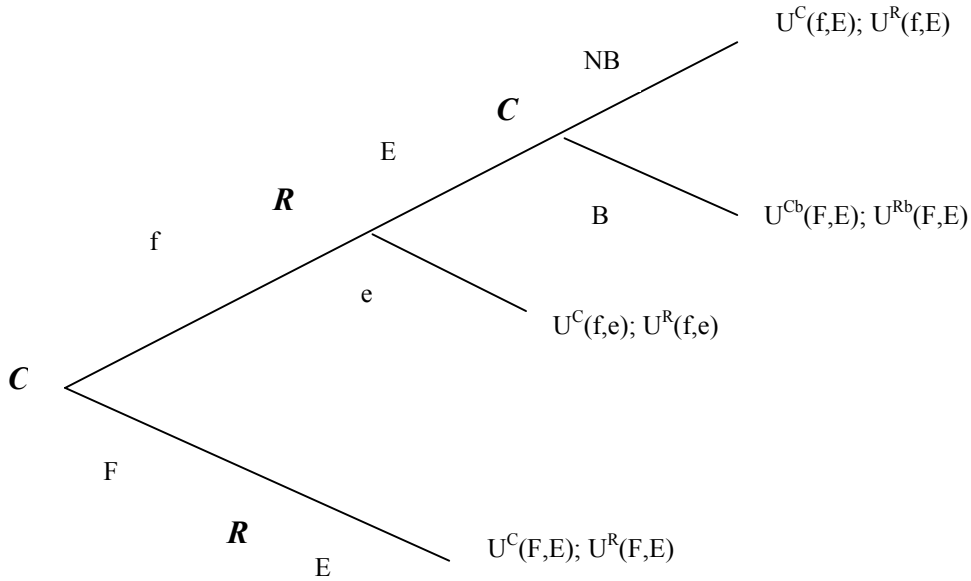
spend and on national government incentives to resist, thus offering us an opportunity to test these theories and come at some conclusions regarding the future.

### 3. A Simple Model of Bailing Out

To fix ideas, it is useful to begin by discussing a simple model of bailing out behaviour (see figure 1). Consider an economy with two governments, a central government and a regional one. Central government moves first and sets the financing level to be given to the region for the next period,  $f$ . For simplicity, central government can only decide between two levels of financing, low or high,  $f=\{f, F\}$ , where  $F>f>0$ . It is then region's turn to move by choosing an expenditure level,  $e$ . The region too can only choose between two levels of expenditure, low or high,  $e=\{e, E\}$ , where  $E>e>0$ . These levels are such that if the region responds with the appropriate level of expenditure to the financing set by the central government, the regional budget is in equilibrium:  $(F-E)=(f-e)=0$ . If the central government sets  $F$  at the beginning of the game, we assume that the region can only answer by setting  $E$  (i.e. the regional government cannot cash the difference between expenditure and financing). Hence, if the central government sets  $F$  to begin with, regional expenditure is  $E$ , and central government and regional government payoffs are respectively  $U^C(F,E)$  and  $U^R(F,E)$ .

Suppose instead central government sets  $f$  at the first stage of the game. If the region reacts by setting  $e$ , the game is over and the two agents receive respectively  $U^C(f,e)$  and  $U^R(f,e)$ . However, the region may also choose to select  $E$  and run a deficit. In this case, it is again central government's turn to move. It can do two things. It can refuse to accommodate the increased expenditure by region, letting the region itself take care of the deficit: in this case the utility levels of the two agents are respectively  $U^C(f,E)$  and  $U^R(f,E)$ . Or it can accommodate, partly or fully, this increased regional expenditure by increasing transfers, in which case the utility levels of the two agents become  $U^{Cb}(F,E)$  and  $U^{Rb}(F,E)$  (suffix b is a mnemonic for "bailing out"). We make the obvious assumptions that  $U^C(f,e) > U^C(F,E)$  and  $U^C(f,e) > U^{Cb}(F,E)$ , and that  $U^R(F,E) \geq U^{Rb}(F,E) > U^R(f,e) > U^R(f,E)$ . We also assume that  $(U^C(f,e) + U^R(f,e)) > \max(U^C(F,E) + U^R(F,E); U^{Cb}(F,E) + U^{Rb}(F,E))$  so that it is indeed Pareto efficient to constrain financing and expenditure at the low level.

The equilibrium of this game depends on the assumptions we make on the payoffs of the central government. If  $U^C(f,E) > U^{Cb}(F,E)$  central government would not accommodate the increased expenditure of region. Knowing this, and given our assumptions above, region will then choose to select  $e$  if central government selects  $f$  in the first period, and expecting this, central government will actually choose  $f$  in the first period. The Pareto efficient equilibrium can then be enforced.



**Figure 1: A simple model of bailing out**

On the other hand, if  $U^C(f,E) < U^{Cb}(F,E)$  the central government cannot commit to enforce a low level of financing at local level; if the region runs a deficit, the centre will find it convenient to step in and rescue the region. Expecting this, the regional government will certainly select  $E$  if the central government sets  $f$  in the first period. Which equilibrium occurs, it again depends on the payoffs of central government.

If  $U^C(F,E) > U^{Cb}(F,E)$ , the central government, expecting to end up with utility level  $U^{Cb}(F,E)$  if it attempts to set a low level of financing in the first period, prefers to give in immediately and sets  $F$  in the first place. In this case, there is no official bailing out, although there is a soft budget problem. Since it cannot enforce  $e$ , the central government simply gives up any attempt to control the regional expenditure, setting up for an inefficiently high level of regional expenditure in the first stage. Soft budget constraints problems here appear in the form of excessive financing and excessive expenditure.

On the other hand, if  $U^{Cb}(F,E) > U^C(F,E)$  the central government may actually find it convenient to set things so as to end up with a bailing out. Central government may still suffer from the bailing out in the long run (say, in a dynamic version of this model with incomplete information, because of reputation losses), but if there are short time gains from setting  $f$  in the first period, these gains may overcome the losses. As we argued above, this may well capture the situation in Italy for at least quite a long period of time. Notice that there are still soft-budget problems, in the sense that if central government could commit not to bail out regional expenditure, it would still prefer to reach an equilibrium with low expenditure and low financing. On the other hand, central



government is not really trying to enforce a hard budget constraint at local level; bailing out of regional deficit is simply a more convenient way of financing local expenditure than setting up a high level of transfer in the first place. Notice that this equilibrium may well be a third-best equilibrium; if the region itself suffers from the bailing out (because the bailing out is incomplete or because the time elapsing between the setting up of a higher expenditure and the increased transfer puts the region in financial stress), it may well happen that this loss overcomes the advantage to the central government from playing the bailing out strategy:  $U^C(F,E) + U^R(F,E) > U^{Cb}(F,E) + U^{Rb}(F,E)$ .

Clearly, to understand the effect that the Italian reforms of the '90s may have had on the behaviour of the actors involved, one has to come out with some arguments linking these reforms with the payoffs of the different levels of government in the different situations. In the next paragraph, we refer to the economic literature and to sheer common sense to derive plausible implications. However, notice that the above model may be too simple to explain what happened in Italy in the '90s, as it assumes that regions have perfect knowledge of the willingness of the central government to bail them out. Expectations of bailing out are of course grounded in history, and on these grounds the Italian regions certainly had good reasons to expect a bailing out by the central government. However, it may also be the case that structural changes, such as the financial crisis of 1992, the need to meet the Maastricht parameters in 1997, the reform in the national electoral system in 1994, may have induced a change of "regime", affecting government's ability to commit, and therefore regions' expectations on the willingness of central government to bail them out. This may have offered the central government an opportunity to harden the regional budget constraint.

To see this argument formally, consider the following variation of the previous model. Let the payoff function of the region remains unaltered, but suppose now that as a result of one of the structural phenomena mentioned above, region now expects the central government to be "tough" with probability  $p$ . A "tough" central government is one which prefers not to bail out the region in the event of a deficit:  $U^{CT}(f,E) > U^{CbT}(F,E)$ , where the suffix T indexes the tough government. As this government also prefers low expenditure and low financing to high expenditure and high financing ( $U^{CT}(f,e) > U^{CT}(F,E)$ ) and it is ready to pay a price to enforce low level of financing ( $U^{CT}(f,E) > U^{CT}(F,E)$ ), a tough government will certainly play  $f$  in the first stage of the game. With probability  $(1-p)$  region instead expects central government to be "weak"; a weak government too prefers low to high expenditure ( $U^{CW}(f,e) > U^{CW}(F,E)$ ), but if faced with a regional deficit, it does not have the strength to say no to the region:  $U^{CW}(f,E) < U^{CbW}(F,E)$ .

How the game evolves under these different scenarios depends on the assumption we make on the payoff functions of the weak government. If it still holds true, as in the last example above,

that  $U^{CbW}(F,E) > U^{CW}(F,E)$ , the best strategy for the weak government is still to play  $f$  in the first period. As  $f$  is also the dominant strategy for the tough government, the region will learn nothing on the type of government by observing  $f$  in the first period; it will still assume that this move comes from a tough government with probability  $p$ . Hence, the region will choose  $E$  if  $pU^R(f,E) + (1-p)U^{Rb}(F, E) > U^R(f, e)$  and  $e$  otherwise. That is, if the perceptions that the structural changes may have modified central government's commitment technology are strong enough, the region may now decide to oblige the strict financing rule, although nothing is really changed in (weak) government payoffs.

More interestingly, if  $U^{CbW}(F,E) < U^{CW}(F,E)$ , incomplete information offers the weak government the possibility to try to emulate a tough one. While under complete information this government would certainly play  $F$  in the first period, it may now try to exploit region's uncertainty to get to the first best equilibrium. To see this, suppose the region expects the weak government to play  $f$  in the first period with probability  $q$ . Then, by Bayes rule, upon observing  $f$  in the first period, the region will conclude that with probability  $p^\circ(q) \equiv (p/(p+(1-p)q))$  the government is tough. The region will then be indifferent between playing  $e$  or  $E$  upon observing  $f$  if  $p^\circ(q^*)U^R(f, E) + (1-p^\circ(q^*))U^{Rb}(F, E) = U^R(f, e)$ , where  $q^* = \{p(U^R(f, e) - U^R(f, E)) / (1-p)(U^{Rb}(F, E) - U^R(f, e))\}^4$ . In turn, for the weak government to be willing to randomise between playing  $f$  and  $F$  in the first period, it must also be indifferent in expected terms between the two strategies. This occurs if the region upon observing  $f$  in the first period, plays  $e$  with probability  $s^*$ , where  $s^*$  is implicitly defined by the equation:  $U^{CW}(F,E) = (1-s^*)U^{CbW}(F,E) + s^*U^{CW}(f,e)$ .

In this second case, with appropriate restrictions on out of equilibrium beliefs, we then obtain a (mixed strategy) perfect Bayesian equilibrium. At this equilibrium, the weak government imitates the tough government by playing  $f$  with probability  $q^*$  and the region optimally responds by respecting the budget constraint with probability  $s^*$ . Hence, it is now possible for the weak government to reach, in some cases at least, the first best equilibrium. Note that  $q^*$  is increasing in  $p$  and  $U^R(f, e)$ ; hence, if the events of the '90s raised both the importance of controlling regional expenditure for the central government and the regional perception that government may be tough, we should expect to observe an hardening of regional budget constraint. Note that  $q^*$  is also decreasing in  $U^R(f, E)$  and  $U^{Rb}(F, E)$ ; the higher the costs for the region if it deviates from the first best financing rule, the higher is the probability that the weak government imitates the tough one. On the other hand, the lower are  $U^{CbW}(F,E)$  and  $U^{CW}(f,e)$ , the higher the probability that the region plays  $e$ . That is, interestingly, this simple model predicts contrasting effects on the likelihood of a region to comply to the strict financing rule if the changed situation of '90s increased, as it seems

likely, both the importance of reaching low level of expenditure and the costs of a bailing out for the central government.

Thus, one may think that the events of the '90s, by modifying regions' expectations, may have offered the weak Italian governments an important opportunity to strengthen regions' budget constraints. To be sure, in the above model, if the region chooses a high level of expenditure, the weak government always find it convenient to bail out the region. But this feature is simply the result of having analysed a single shot of the game only. If we repeated the game (a finite number of times), then we would find equilibria where even the weak government may find convenient not to bail out the region in the early repetitions of the game, so as to build a reputation of being tough in later periods (Kreps and Wilson, 1982). In more extended version of the model, to analyse the Italian case, one would also want to consider that central government has actually two choices to bail out the region: it might either give it more money in the form of a bailing out of previous deficits, or it can raise the financing level for the next period. For this to make a difference, truly dynamic considerations - such as the level of financing (expenditure) in one period affect the cost for the government (region) of reducing financing (expenditure) in the next period -, and not simple repetitions of the same game, should be introduced in the model.

#### 4. The Literature and its Implications for the Italian Case

How should then we expect that the '90s reforms affected the ability of the central government to commit and the incentives for regions to overspend (that is, in terms of our model above, affected  $U^C(.)$  and  $U^R(.)$  in the various possible cases)? Summing up the suggestions of a rather scarce literature we get the following clues.

First, soft budget constraints problems may be originated by *constitutional causes*. An improper assignments of functions to the different levels of government may lead to an overlapping of functions and to a loss of accountability (i.e. Rodden et al., 2001). Indeed, the basic reason why in Italy we had  $U^C(f, E) < U^{Cb}(F, E)$  is because the central government itself would have been held responsible for the failure of a regional health system. As discussed above, this problem has not changed during the '90s and it is unlikely to change much in the future ("devolution" left aside). However, some of its consequences, such as the strict central control on the organisation of health services by regions, were progressively reduced in the '90s. Indeed, the regional health system in Lombardia now looks very different from that of Emilia Romagna. This may have increased regional accountability and may have therefore reduced central government's incentives to step in.

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<sup>4</sup> For the equilibrium probability to be lower than 1, it must hold that if  $p U^R(f, E) + (1-p) U^{Rb}(F, E) > U^R(f, e)$ , that is p must be larger enough.

Second, there may be problems in the *design of the financial relationship* between different level of governments. The literature stresses mainly three of these problems. First, *vertical imbalance* (Eichengreen and Von Hagen, 1996). If local governments do not have enough tax resources of their own to meet unexpected shocks in cost or demand conditions, and local expenditure can not be reduced because of national regulations, they do not have any way to adjust their resources so as to keep their budget in equilibrium. Hence, any budget constraint set up *ex ante* is *a-fortiori* not credible. The likelihood to run in budget problems should then be an increasing function of the mismatch between local resources and local expenditure. In Italy this argument does not seem to work. Vertical imbalance was dramatically reduced during the '90s, but regions never used their increased tax resources to finance health deficits. However, in an empirical analysis one may still want to control for this phenomenon, as the refusal of regions to use their tax resources may be caused by other variables. On these grounds, note that although all (ordinary) regions received the same tax bases and tax shares in the '90s, the reduction in the vertical imbalance was very different across regions, because of the large difference in the distribution of tax bases across the national territory. Second, *transparent and objective rules for determining transfers* to local authorities may help central government to commit not to give extra money to regions (e.g. Pisauro, 2001). On these grounds Italy has always been a disaster. Not only there may have been a general problem of underfunding of health expenditure, but also some regions may have been unduly penalised by the inability of the appropriation rule of NHF to take adequately into account structural differences in their needs or costs. As the formula to define transfers to the regional health systems changed several times during the period, we can check if these changes affected regional behaviour. Third, *lack of debt regulations and of bankruptcy rules* may also increase the likelihood of a bailing out (Rodden et al., 2001). In Italy, strict regulations are in force for regional debts; the problem is that regions always managed to bypass these regulations through their regional LHU's. However, since 1995, Italian regions started to borrow by issuing bonds, and have therefore been checked by international rating agencies. One may then expect that this form of market control, if efficient, might have had the effect to harden the budget constraint of regions, by making it more costly for them to run in financial trouble (i.e. it might have reduced  $U^{Rb}(F, E)$ ). Accordingly, we want to control for these financial variables.

Third, there may be *structural phenomena which affect regions' or government's willingness to run a bailing out*. The phenomenon which is stressed most in the literature is the *size* of a region, although its effects are controversial. Wildasin (1997) refers to the usual "too big too fail" argument to argue that larger regions should more easily run in trouble. In his model, because of the large negative externalities that this would produce on the rest of the community, a central government

cannot afford to let a large region "fail" (i.e. giving up the supply of services for lack of funding), while it could do it with a smaller region (i.e.  $U^C(f, E)$  is smaller for larger region). Expecting this, large regions should be inclined to spend more and being more easily bailed out. The *common pool* argument (e.g. Weingast et al., 1981, and Persson and Tabellini, 2000) points to the opposite effect. Bailing out is advantageous for regional residents, because the benefits of higher expenditure are concentrated in their territory, while the costs are spread across the population at large. Clearly, the smaller is the region, the lower is the perceived costs for the residents of a region from a bail out in terms of an increase in the national taxes (present or future) needed to finance the bailing-out; therefore, the more willing should be the regional government to run a deficit. Regional size here matters because it affects the incentives of a region (i.e.  $U^{Rb}(F, E)$  is larger for smaller regions). This argument can be made more precise. As the tax system is progressive in Italy, so that residents in a rich region pay a more than proportional share of national revenues, we should expect the common pool effect to be more pronounced for small and *poor* regions than small and rich ones<sup>5</sup>.

Fourth, the *characteristics of the political regime at local and national level* may also be important. First, the (*expected*) *length of national government* (and/or of legislature) may matter. If the short life span of national governments in Italy had the effect of increasing the short term gains from underfunding, the increased stability of national coalitions in the '90s may have reduced it (i.e. decreasing  $U^{Cb}(F, E)$ ). Second, *the change in the electoral rule* for national elections, from proportional to majoritarian in 1994, may also have had a separate effect in the same direction<sup>6</sup>. If we believe the argument that under a majoritarian electoral rule the ruling parties need to please a smaller number of voters than under a proportional rule (Persson and Tabellini, 2000), and that majoritarian parliamentary regimes are less characterised by inefficient log rolling from regional representatives sitting in the national parliament (Roubini and Sachs, 1989), we should expect under the new electoral regime more resistance to requests coming from regions at large (i.e. a reduction in  $U^{Cb}(F, E)$ ). Interestingly, this may be compatible with more financial help to be given to *some* regions, the ones where the national government has its main constituency. Third, *political affinity* between regional and national government may also matter. However, how this matter is not clear. On the one hand, regional governments may expect more help from a "friendly" government. Hence, we should expect to observe higher level of expenditure and eventually more financing or

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<sup>5</sup> To be more precise, this effect does not depend only on the average per capita income of a region, but also by the distribution of income in the different regions and by the political importance that the different classes of income recipients may have on regional governments. Unfortunately, we do not have information on the shape of the income distribution function in the different regions.

<sup>6</sup> Regions too changed their electoral system in the '90s, but it is difficult to come up with a-priori's on the likely effect of this change on their financial behaviour. Possibly, the increased autonomy of regional governments from national parties may have induced them to defend more the interests of their constituency, which in this context would mean a greater incentive to try to shift regional costs to the national residents (see e.g. Chari et al., 1997).

more bailing out in regions ruled by similar majorities of that of the central government. On the other hand, regions may be unwilling to create financial difficulties to a friendly government. On these grounds, note that the Italian Presidents of regions have necessarily national ambitions; the binding term rule does not allow them to be re-elected more than twice in a row<sup>7</sup>. Fourth, the *electoral cycle* for both regions and the central government must also be considered. Given the way health care responsibility is shared in Italy between the two levels of government, we should expect an increase in health expenditure in the years both before regional and central elections, and perhaps an increase in health financing and in the bailing out of health deficits in the years before a *national* election.

Finally, *external constraints*, such as those deriving from international treaties, may matter a lot in forcing the central government to commit (increasing  $U^C(f,e)$  and reducing both  $U^{Cb}(F,E)$  and  $U^C(F,E)$ ). In Italy, during the '90s, this element was of course fundamental. In the following, we will capture it with variables related to the financial situation of Italy before and after 1997 (the "Maastricht year").

## 5 The Empirical Analysis

In this section of the paper we provide empirical evidence on the determinants of regional health care expenditure and financing. We divide the analysis in two distinct parts. First, we investigate how structural variables - that previous analyses (e.g. Mapelli, 1999) deem to be important - affect regional health expenditure and financing. The age composition of the population, the number of physicians, the average beds per hospital are examples of these structural variables. We also consider regional GDP per capita among these variables, since previous empirical papers evidence income per capita as one of the main determinants of health expenditure. Next, we introduce a set of variables which are meant to proxy the soft budget constraints variables detailed above. The analysis is preliminary: our main goal here is simply to describe how, beyond the structural parameters, these variables were important in determining regional health care expenditure and financing.

### 5.1 A Brief Description of the Main Structural Variables

Our empirical analysis is based on Italian regional public health care expenditure, financing and deficits for the years 1990-1999; data sources are described in details in appendix A. Financing is here as determined from the NHF in any given year, taking into account adjustments made along

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<sup>7</sup> It is interesting to note that among the six ordinary regions that increased tax rates in 2002 to finance past health

the same year. In other words, we do not consider the additional funds that the regions receive through the bailing out of previous health deficits. Expenditure data comes from the “*Relazione Generale*” and measure “planned expenditure” for any year (i.e. “*dati di competenza*”); they are more stable and more able to represent “true” yearly regional health care expenditure than cash flow data. To facilitate comparison, all financial data are expressed in per capita and real 2000 terms.

To begin with, figure 2 presents the evolution during the ‘90s of average (public) health care financing and expenditure in per capita real terms considering all the regions. It is easy to detect the specific effort of the national governments to control health expenditure, in the context of the more general effort to adjust public finances at large. From a peak in 1991-92, both health care financing and expenditure started decelerating in the subsequent years. Average financing dropped abruptly in 1993 by almost 10% (in real terms) and remained at this lower level up to 1997. Expenditure followed this reduction at lower pace initially, to eventually converge at the financing level in 1995. In that year, regional health deficits were practically nil. However, immediately after 1995, health expenditure started again to increase, first at quick pace and then at more moderate rate. Financing did not follow the increase pace of expenditure until 1998, thus inducing again an accumulation of health deficits. In the final two years of the sample period, financing too has increased, closing up partly the gap with expenditure, but it has always remained at a lower level. Hence, deficits have continued to accumulate. However, as can be seen from the figure, health deficits at the end of the period, both in absolute and in relative terms, were considerably smaller than at the beginning of the period. Reflecting the happy attitude of governments in the pre-financial crisis Italy, in 1990 health deficits run at 25% of total expenditure or a third of total financing. The figure also clearly allows us to distinguish three neat phases in the health financing / expenditure cycles: from 1990 to 1992, characterized by the old legacy of government misbehaviour; from 1993 to 1997, the race towards Maastricht; and from 1998 to 1999, the relaxation of public budget tightness.

Table 1 describes the evolution of the same variables at the level of the single regions, comparing initial and final periods. Health care expenditure per capita averaged 1.986 million lire in 1990 and 2.127 million lire in 1999, recording only a 7% increase during the sample period. It is worth noting that Italy still scores pretty well on these grounds: (public) health expenditure was below 6% of GDP in 1999, one of the lowest figure among the EU countries. Financing per capita

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deficits, four are ruled by centre right Presidents, all of which at their second and last term in office.

raised by 31% in real terms along the period, from 1.505 million lire in 1990 to 1.974 million lire in 1999. This was the effect of the attempt of central government to raise financing of the NHF at a more reasonable level. As an effect, a huge decrease was recorded by deficit per capita that declined on average from 480.000 lire in 1990 to 153.000 lire at the end of the period. As a share of health care funding, deficit decreased on average from 31.91% to 7.74%.

These average variables hide considerable differences across regions. As table 1 shows, expenditure and financing in per capita terms did not greatly vary across regions; the coefficient of variations for both variables is below 10%, with variance in financing being constantly lower than that of expenditure, indicating the continuous effort by central government to equalise health care expenditure across the country through the appropriation rule of the NHF. However, health care deficits varied tremendously across Italian regions and along the sample period. The dispersion also increased along the period. The coefficient of variation relative to deficit moved from 0.28 in 1990 to 1.38 in 1999. The highest deficit in 1990 was recorded in Marche with 752.000 lire per capita, while the lowest was in Calabria with 221.000 lire. In 1999, the situation had changed dramatically: leaving aside the two special regions (Valle d'Aosta and Trentino Alto Adige), the highest deficit was recorded in Lazio (288.000 lire) and the lowest in Toscana, with just 37.000 lire per capita. On the contrary, regional dispersion changed only marginally for expenditure and funding. In 1990, regions located in the centre received the highest funding (1.603 mln lire) and recorded the highest expenditure (2.202 mln lire), whereas Southern regions received the lowest financing but also recorded the lowest expenditure. In 1999, North-Western regions received the highest funding (2.072 mln lire) while North-Eastern regions recorded the highest per capita expenditure (2.259 mln lire). On the other hand, Southern regions received the lowest funding (1.812 mln lire) and recorded the lowest expenditure (1.948 mln lire).

In GDP percentage, the situation looks completely reversed. As shown in table 2, both at the beginning and at the end of the sample period, Northern regions received the lowest funding and recorded the lowest expenditure, whereas Southern regions received the highest funding and recorded the highest expenditure. Among regions, Lombardia is the one with both the lowest funding (3.52% in 1990 and 4.10% in 1999 of regional GDP) and expenditure (4.56% in 1990 and 4.36% in 1999), Calabria is the one with the highest funding (7.38% in 1990 and 7.54% in 1999) and expenditure (8.61% in 1990 and 8.20% in 1999).



table 2 here

These results are of course mainly driven by differences in regional GDP per capita. As shown in table 3, North-Western regions registered 40.596 mln lire per capita in 1990, compared with only 21.613 mln lire for Southern regions. In 1999, (absolute) difference had further increased: North-Western regions recorded 47.210 mln lire and Southern regions just 25.339 mln lire per capita. Table 3 collects also information about the structure of the population across Italian regions, emphasising the differences across regions. In general, regions located in the South are characterised by the lowest share of elder people (persons aged more than 65) and the highest share of youngsters (persons aged less than 14) out of the total population, with a regional dispersion that has not changed much along the sample period.

table 3 here

Finally, table 4 considers some structural variables useful to describe the supply of health care services across regions, namely the number of public hospitals, beds and physicians. On average, the number of hospitals declined slightly from 0.33 (per 10.000 inhabitants) in 1990 to 0.28 in 1999. Both in 1990 and 1999, the highest number of hospitals is found in regions located in the centre (respectively 0.39 and 0.31), whereas the lowest number is in the North-Western regions (respectively 0.29 and 0.24). On the other hand, the (average) biggest hospitals (i.e. those with the largest number of beds) are located in North-Western regions (249 beds per hospital on average in 1990, 243 beds in 1999), while the smallest ones are in the South (182 beds per hospital both in 1990 and 1999). Centre regions showed the biggest effort to increase the scale of production, recording 195 beds per hospital in 1990 and 208 beds per hospital at the end of the sample period. As there seems to be a consensus in the empirical literature on the presence of scale economies in the production of health services in hospitals, we should expect that the lower the average number of beds per hospitals, the higher the additional (per capita) health care expenditure. Southern regions were also characterised by the lowest number of physicians (1.49 per 1.000 inhabitants in 1990, 1.58 in 1999), whereas the highest number of physician was recorded for regions in the Centre (1.88 and 2.12 respectively).

## 5.2. The Empirical Model

We begin our empirical analysis by defining a very general and “ideal” model. The structural form equations can be represented as in (1):

$$\begin{aligned} F_{i,t} &= \alpha_0 + \sum_{j=1}^J \alpha_j F_{i,t-j} + \sum_{k=0}^K \gamma_k E_{i,t-k} + \sum_{h=1}^H \delta_h X_{i,h,t} + \varepsilon_{i,1,t} \\ E_{i,t} &= \beta_0 + \sum_{j=1}^J \beta_j E_{i,t-j} + \sum_{k=0}^K \phi_k F_{i,t-k} + \sum_{h=1}^H \varphi_h X_{i,h,t} + \varepsilon_{i,2,t} \end{aligned} \quad (1)$$

where  $F$  is health care funding,  $E$  is expenditure,  $\mathbf{X}$  is a vector of explanatory variables (including both structural variables and the proxies for the soft budget constraint variables that we discuss later), and  $\varepsilon$  is a disturbance term. Of course, regional deficits are implicitly determined, as they can simply be computed as the difference between expenditure and funding. Notice that in both the first and the second equation we allow for the presence of lagged dependent variables. These variables may have a number of different explanations in this context. On the one hand, they may simply reflect the presence of hysteresis in the determination of health financing and expenditure, which is not captured enough by the other explanatory variables. Expenditure this year may be heavily conditioned by expenditure in past years, and given the way financing is determined, it is also possible that financing this year depends on past years financing. As financing and expenditure are also correlated, one may also want to check if financing (expenditure) in the past had also a separate effect on expenditure (financing) this year.

However, in the presence of soft budget constraint problems, the link between past and present variables is subtler than that. First, present expenditure depends on expectations of future bailing out, so that we should also add to the RHS of the expenditure function future values of funding as proxies for future bailing outs. Of course, if during the ‘90s there was a shift of "regime" that directly affected these expectations - as we hinted above - estimated parameters may not be stable over the entire sample period. For the time being, to face this problem we simply limit ourselves to introduce in the vector of  $\mathbf{X}$ 's variables that can proxy expectations of future bailing outs (e.g. the percentage of deficits bailed out) or regime shifting (e.g. the expected length of government).

Lagged variables too may have a different interpretation in a soft budget constraint model. On the one hand, in the presence of bailing out, expenditure this year may not only depend on the financing a region receives this year through normal channels, but also by the deficits it has

accumulated in the past (i.e. on the difference between past expenditure and past financing). On the other hand, as we already remarked, if soft budget constraints problems emerged in the form of increased transfers rather than in the form of bailing out, financing today may also depend on past expenditure.

In a fully fledged empirical analysis, we would like to be able to discriminate between these different effects, sorting out soft budget constraint effects from simple hysteresis on the one hand, and identifying the channel which was mostly used to rescue regions, on the other hand. From an econometric point of view, this means that we have to address issues such as the exogeneity of variables and the chain of causality. However, estimating (1) directly raises also a number of other econometric problems, ranging from the detection of serial correlation to the stationarity of health care spending and financing. For the former, the presence of lagged dependent variables (and the possible higher-order autocorrelation) implies the inapplicability of Durbin-Watson statistic. Furthermore, the limited number of observations ( $t=10$ ) rules out the use of the LM test proposed by Breusch and Godfrey and it also makes practically invalid any test on time series stationarity (e.g. Gerdtham and Loethgren, 2000, and the references therein for a general updated discussion, and Giannoni and Hitiris, 1999, using Italian data).

Faced with these difficulties, as a preliminary attempt to explore our data, we then choose to simplify matters radically, by reverting to a **static model** imposing  $\gamma_k = \phi_k = \alpha_j = \beta_j = 0 \forall j, k$ . The result is a mostly descriptive analysis of the main determinants of regional expenditure and financing in Italy. Despite this, the present study offers some interesting insights, to be confirmed in future more structured models.

### 5.3. Regional Health Care Spending and Funding: the Role of Structural Variables

Given the previous simplifications, the structural model in (1) may be rewritten as a couple of two completely separate equations, namely eq. (2) and (3):

$$\mathbf{F} = \mathbf{X}\boldsymbol{\delta} + \boldsymbol{\varepsilon}_1 \quad (2)$$

$$\mathbf{E} = \mathbf{X}\boldsymbol{\varphi} + \boldsymbol{\varepsilon}_2 \quad (3)$$

where  $\mathbf{X}$  represents a vector of structural variables and proxies for the soft budget constraint determinants highlighted above, and  $\boldsymbol{\varepsilon}$  are disturbance terms.

We begin our analysis by considering the structural variables only; as we discussed above, these variables are potentially relevant for both health care expenditure and financing. Clearly, due

to data availability, not all the variables one may think of as being relevant are included here.<sup>8</sup> We focus here on **ordinary regions** only, since determinants of expenditure and financing are reasonably very different for special regions. Three different set of estimates are collected in table 5 (expenditure) and table 6 (financing). We first run OLS on the pooled sample, controlling for general heteroskedasticity by using White corrected standard errors. We then check robustness of our inference by taking into account the “time series-cross section” nature of our data. In particular, we use a 2 Step GLS estimator, considering groupwise heteroskedasticity and panel corrected standard errors. We also add regional dummies to take into account regional fixed effects.<sup>9</sup>

Even controlling for regional fixed effects, expenditure (table 5) turns out to be positively related to the number of physicians (probably highlighting the problem of demand induction) and, unsurprisingly, to GDP per capita. Interestingly, when we interact GDP per capita with the share of the regional population aged more than 65, estimated coefficient turns out to be negative, suggesting a non linear relationship with GDP; once, the direct effect has been accounted for, richer and older regions spend less than poorer and younger regions. All these three coefficients are robust among regressions and to the introduction of a (non linear) time trend, aimed at capturing unexplained variation in the decade. The trend describes the three periods that (as we discussed above) emerges quite naturally by observing figure 2; from 1990 to 1992; from 1993 to 1997; and from 1998 to 1999.<sup>10</sup> On the contrary, note that the average number of beds per hospital and the share of the regional population aged more than 65 in itself are never significant. Fitness of the model is quite high, with adjusted  $R^2=0.77$  in the model without the time trend; however, adding the trend raises the adjusted  $R^2$  to 0.87.

Interestingly, the three periods of the trend correspond almost exactly to variations in the appropriation formula from the NHF. The funding formula included health care needs measured in terms of the age composition of the population in the years 1990-1991 and 1997-1999, while it was

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<sup>8</sup> An important variable not included here is the average number of hospitals' employee per region. This should be relevant, because hospital expenditure is the most important issue in total health expenditure (around 75% on average), wages and salaries are the largest component of hospital expenditure (around 80%), and this variable greatly varies across regions, with southern regions showing a per capita lower endowment both of hospitals and employee per hospital. Furthermore, wages and salary are determined by national contracts decided by the central government, so that a large part of regional health expenditure is determined by this variable. Hopefully, variables such as the number of physicians, the number of hospitals and the number of beds can capture some of this variability across regions.

<sup>9</sup> Recall that in this simple model, GLS estimator reduces to pooled OLS (e.g. Greene, 1997).

mainly based on per capita standards in the intermediate period. Surprisingly, regional funding (table 6) turns out to be significantly and positively related to the age composition of the population in only two out of six regressions, and by adding the time trend. GDP per capita is also positively related to regional funding in the regressions with the time trend, possibly capturing the fact that the appropriation formula is corrected to compensate for interregional mobility of patients from the (poor) Southern regions to the (rich) Northern ones. It might also capture the results of the bargaining process which always characterised the distribution of the NHF to regions. Interaction between GDP per capita and the share of elder people seem to negatively influence funding; however, again this variable is statistically significant only in the regressions including the time trend. On the contrary, a positive statistically significant effect is also played by the average number of beds per hospitals; this is surprising, since the appropriation formula is only linked to demand aspects and does not take into account the supply structure. Finally, the number of physicians is never significant as expected, since the financing formula does not consider the number of physicians in the allocation of funds. It is worth noting that differently from the expenditure equation, the funding equation performs quite poorly without considering the trending variables. In particular, note that the adjusted  $R^2$  increases from 0.46 to 0.75 by simply adding the time trend. Overall, these results hint that funding equation without the time trend is largely misspecified. It is then important to explain the time trend.

Comparing table 6 with table 5 we get a clear feeling that there was (there still is) a structural problem in the way in which public health care was financed through the NHF in Italy; structural variables which consistently affected health expenditure by regions, even netting out fixed effects, do not affect the funding equation, which largely depends on a still-to-be-explained time trend. Indeed, as in this model deficits are just the difference between expenditure and financing, if we run again our regressions using the health deficit as an endogenous variable and controlling for the same exogenous variables, we would find that coefficients in the health deficits equation are simply the difference between the parameters of the two set of regressions. That is, for example, it would turn out that deficits are positively correlated with GDP per capita and the average number of doctors, as the latter variables affect expenditure more than they do with financing, thus inducing higher deficits for the richer regions and the ones with a larger number of physicians.

In a sense, these results are exactly what one should have expected. As the Constitutional mandate to uniformity in the provision of health service across the national territory has been

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<sup>10</sup> In a previous version of the paper we check for parameters stability using a Chow test. As expected, results strongly rejected the null hypothesis.

interpreted by the Italian policy maker as an obligation to equalise per capita health financing across regions, without taking into account (or taking slightly into account through the appropriation formula or the implicit ex ante bargaining) structural differences in regional costs or needs, it is obvious that those regions with higher costs or needs may end up with presenting a higher deficit per capita. Indeed, the ex post bailing out of health deficits probably played a positive role in this context. The strive for absolute per capita uniformity in health expenditure pursued by the central level was too strong to be achieved fully, and the ex post financing through the bailing out of regional deficits may have been a way, although a perverse one, to introduce a bit of necessary flexibility into the system. However, this cannot be the whole story. The importance of the time trend in the financing equation clearly implies that funding – and, therefore, health deficits – is related to something else very important which occurred in the period and it is not captured by our structural variables. To this we now turn.

#### **5.4. The Empirical Analysis Continued: Introducing “Soft Budget Constraints” Variables**

Since the time trend is so significant, specially in the funding equation, the true question is what determines the trend. A first obvious explanation is that Maastricht and the adjustment process in public finances, as suggested by figure 4.2, were among the main reasons for the changed attitude of central government towards health expenditure and finance. To check this hypothesis, we add two new variables to our regressions, a dummy variable for the year 1997 (when European countries were examined to define the first group of EMU participants) and an index of the public budget tightness at large, measured by the ratio between the Italian central government deficit to GDP and the average value of the same variable for the EU countries (the larger this variable the more the budget should have been tight). Both variables aim to capture the effort of Italian governments to squeeze public expenditure in order to respect Maastricht criteria.<sup>11</sup> A second potential explanation for the time trend is that it is related to the changing characteristics of the political system, both at central and regional level, as suggested by the literature surveyed above. To explore this issue, we then introduce five new “political” variables, namely: an index that captures the average length of central government during the years 1990-1999; two dummy variables to pick

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<sup>11</sup> In a previous version of the paper, we showed that the introduction of these two additional variables in the model was largely responsible of the time trend becoming statistically insignificant.

up electoral years, both at central and regional level; two dummy variables to pick up the changes in the electoral rules, both at central and regional level.

These variables are however related to factors which affected all regions at the same time. As a result, they are naturally ill suited to explain the variance of financing and expenditure (and hence deficits) across regions, which is our main concern here. To gain further insights, we then add to our model a number of other variables pertaining to the single regions, following the suggestions of the literature on the “soft budget constraint”. In particular, we control for *political affinity* between central and local government (a dummy which takes value 1 if the same parties are contemporaneously in power at the two level of governments, and zero otherwise), *common pool effects* (considering the size of the regions in terms of total population), and the *expected (implicit) burden* of health care deficits (see below)<sup>12</sup>. We also interact the discrete variable describing the size of the regions with GDP per capita (to account for the progressivity of the tax system), and with the share of elder people on the regional population<sup>13</sup>. Finally, we introduce a variable to take into account changes in the appropriation formula of the NHF.

Table 7 presents our results, distinguishing between expenditure and financing, again showing for each equation the three different set of estimates. Starting with the expenditure equation, the first thing to be worth noting is that previous conclusions on structural variables continue to hold. Health expenditure is positively related to the number of physicians and to GDP per capita, while older and richer regions spend less than younger and poorer ones. However, after controlling for a richer set of variables, health expenditure turns out to be significantly and positively related also to the share of elder people on the regional population.

Both the variables linked to Maastricht and to the adjustment process are significant and with the expected sign in the expenditure equation. In particular, regional expenditure is reduced, the tighter is the public budget; moreover, the dummy for the Maastricht year is negative. In general, all political variables are statistically significant. In line with our previous discussion, even controlling for a list of other variables, the lengthening of the average life of governments induced by the new electoral rules significantly contribute to a lowering of regional health expenditure and financing. There is evidence of a electoral cycle in health expenditure, at least as far as the national government is concerned: expenditure increases in the years when a national ballot is taken. Expenditure is instead not affected by dummies related to regional elections and to the change in the regional electoral system. In general, once controlling for regional fixed effects and regional

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<sup>12</sup> Appendix A provides a full description of the variables employed into the analysis and of the way in which they are built.

structural variables, all political variables related to regional characteristics per se, including dimension and scale effects are not significant, even when interacted with GDP per capita or with the share of elder people. This is consistent with a view where the crucial decisions affecting health expenditure are largely in the hand of the central government and regions' own decisions affect expenditure only at the margin. There is an exception, though. When regional and central government are ruled by coalitions of the same political colour, health expenditure is significantly lower. This effect is robust and significant in all our specifications. This strongly supports a picture where regions perceive their health budget as being truly "soft" and refrain to increase spending, for the part they can control, only to avoid disturbing a "friendly" government. We will come back to this in the conclusions, when discussing the recent increase in regional taxes to finance health expenditure in a number of Italian regions.

Quite different results emerge by looking to the funding equation. First, we obtain a quite puzzling result concerning the structural variables. Indeed, after controlling for a more complete set of variables, the share of the population older than 65, and GDP per capita seem to be *negatively* related with regional health care funding. Since at least the first of the two variables are included in the appropriation formula with a positive sign, this is a quite surprising result. However, recall that in the regressions we control for regional fixed effects, and separately for the dimension of each region and for variations in the financing formula. All this variables turns out to be statistically significant and with the expected sign. Hence, it is quite possible that, after controlling for both the dimension of the regions and the changes in the appropriation formula, older and richer regions (which are on average also larger) obtain less money than younger and poorer ones. In other words, even if the formula considers the age composition of the population, this effect on funding is more than compensated by the other two variables. Notice that the size variable is significant also when interacted with the share of old people. Again, this finding seems to be driven by the attempt to equalise per capita health care funding across regions (see table 2).

Second, most of the additional variables included in the model appear statistically significant and with the expected sign. In particular, both the variables aimed at capturing the adjustment process in public finances, namely the dummy variable for Maastricht and the index of public budget tightness, are negatively and significantly related to health care funding. Notice that the coefficients of these variables have the same sign but are quantitatively much larger than the corresponding ones for expenditure. This means that in its attempt to curb health expenditure to meet the Maastricht requirements, the central government began by cutting financing and only later

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<sup>13</sup> We did not include a variable capturing the vertical imbalance of each single region, in terms of the share of own taxes on total revenue, because we could not find the data.



and to a lesser extent managed to bring down expenditure. This squares quite nicely with the picture reported in figure 2. As in the case of expenditure, both the introduction of a majority rule based voting system and the corresponding lengthening of the average life of national governments contributed to restrain health care funding. Again, as for the expenditure equation, there appears to be an electoral cycle going on; in the electoral years, not only central government relaxes the controls on expenditure but it also increases financing. Finally, and mostly interesting, we find evidence of a direct effect of the change of the electoral rule at regional level on the financing level. After the modification in the regional electoral rules, financing appears to be increased. Of course, this may simply be a spurious effect, due to some unobserved variables which also changed along the period (e.g., a political stance of left-wing governments in the second part of the '90s to put financing more in line with actual expenditure), although we do control for several possible variables of this type. An alternative explanation, to be confirmed by future research, is that the introduction of the majority rule for regional elections increased the bargaining power of regions and contributed in this way to increase health care funding.

Finally, another variable which turns out to be statistically significant in the funding equation while it is not significant in the expenditure equation is what we called the “implicit burden” of the deficit. How this variable is computed is explained in Appendix B. This Appendix shows that all deficits run by regions in the period 87-94 were bailed out by the central government in the final year of the sub sample (1994) in the same proportion for all regions (approximately 70%). However, of the new deficits formed in the period 1994-99, the part already financed by the state in 1999 showed a larger variance across regions. The effect of the “implicit burden” on funding is negative, suggesting that central government adjusted not only ordinary funding, but also the additional funds devoted to bail out past health care deficits.

## **6. Conclusions**

In this paper we build a simple model of bailing out and we review theoretical literature on the “soft budget constraint” in order to get some clues on the evolution of regional spending and funding during the '90s in the Italian National Health System. We then propose a first empirical test of the main theoretical implications. The basic idea behind all the reforms made in the '90s was that by reducing fiscal imbalance and giving regions more autonomy in the organisation of health services would suffice to solve the “soft budget constraint” problem. The same idea was behind the

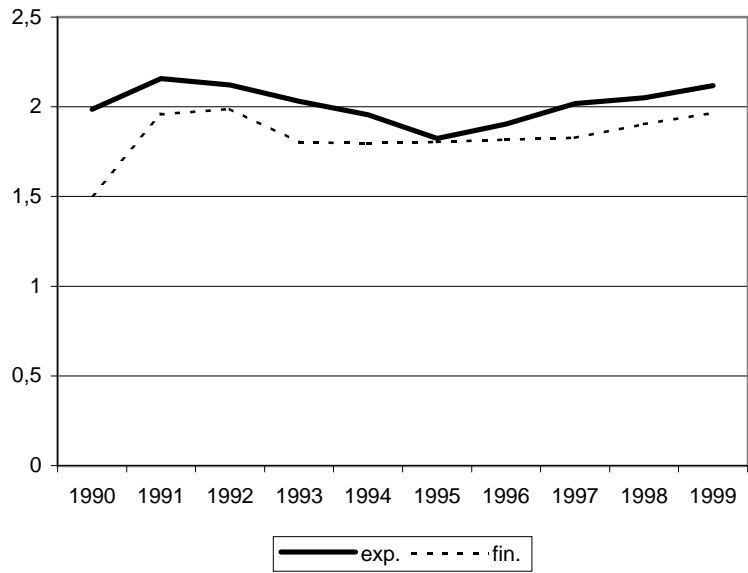
D. Legs. 56/2000 and the new financing system envisaged by the new Constitution. Our empirical analysis strongly suggests that this idea is ill founded. Central government managed to control the growth of public health expenditure in the crucial years before the Maastricht test, more as a result of measures decided by the centre itself than as a virtuous behaviour of Italian regions. The empirical analysis suggests that structural reforms, as for instance the change in the electoral rules for national elections and the resulting increase in governments stability, had probably the effect of increasing the commitment technology of the central government. Furthermore, regional spending and financing seems to be related to some of the “soft budget constraint” variables we introduced, suggesting that a removal of these features may indeed help to strengthen regional budgets. It may also be that, at least for a while, regions' expectations about the likelihood of a bailing out were also curbed, as an effect of the financial crisis of the 1992 and the need to meet the Maastricht criteria. However, the central government failed to fix permanently these expectations in an improved financial equilibrium. As the external constraints relaxed, health expenditure started accelerating again, accumulating more deficits. More managerial autonomy in the organisation of services also proved not to be enough to guarantee a more efficient managing of the health sector. On the contrary, in the absence of a strict budget rule, some regions have exploited their increased autonomy to increase the supply of services, relying on national residents to bear (or share) the costs of these experiments. Since one of the result of the D. Legs. 56/2000 is a further lifting of the hierarchical controls on health expenditure, this evidence is worrying. It implies that unless we manage to eradicate bail out expectations from the system, we may expect to run in even more serious financial troubles in the future. However, this evidence is worrying for another reason. Although there are some positive elements on this respect in the new Constitution, the latter also greatly enlarged the number of functions whose political responsibility is going to be shared between the regions and the State. Coupled with legislative and fiscal autonomy at regional level, this may turn out to be a very dangerous cocktail. There is a serious risk that the new Constitution spreads the “soft budget constraint” disease to other parts of the public sector. Given the amount of the resources transferred to regions as an effect of the new Constitution - more than half than the current expenditure of central government (Bordignon and Cerniglia, 2001) - financial stability of the country may be threatened.

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**Fig. 2: Health care expenditure  
and financing**  
(per capita, mln lire, real 2000 terms, all regions)



**Table 1: Evolution of health care public expenditure, financing and deficit: 1990-1999**

Region	Per capita exp. (\$)	Per capita fin. (\$)	Per capita def. (\$)	Deficit as fin. %	Per capita exp. (\$)	Per capita fin. (\$)	Per capita def. (\$)	Deficit as fin. %
Piemonte	1,888	1,540	0,347	22,55	2,222	2,081	0,141	6,78
Valle d'Aosta	2,087	1,412	0,675	47,81	2,451	1,726	0,726	42,05
Lombardia	1,946	1,504	0,442	29,39	2,166	2,035	0,131	6,45
Trentino A.A.	2,014	1,538	0,476	30,93	2,693	1,814	0,878	48,40
Veneto	2,061	1,528	0,533	34,90	2,189	2,052	0,137	6,69
Friuli Ven. Giulia	2,021	1,731	0,290	16,74	2,183	2,073	0,110	5,32
Liguria	2,276	1,729	0,547	31,63	2,382	2,279	0,103	4,54
Emilia-Romagna	2,361	1,669	0,691	41,42	2,331	2,211	0,120	5,42
Toscana	2,164	1,599	0,565	35,35	2,164	2,127	0,037	1,76
Umbria	2,092	1,610	0,482	29,94	2,207	2,155	0,052	2,41
Marche	2,298	1,546	0,752	48,66	2,110	1,994	0,116	5,82
Lazio	2,156	1,598	0,558	34,93	2,216	1,928	0,288	14,93
Abruzzo	1,963	1,487	0,475	31,96	2,103	1,956	0,146	7,49
Molise	1,841	1,530	0,311	20,36	2,061	1,983	0,077	3,90
Campania	1,831	1,365	0,467	34,18	1,991	1,815	0,177	9,73
Puglia	1,831	1,332	0,499	37,45	1,994	1,824	0,169	9,29
Basilicata	1,626	1,333	0,293	21,97	1,910	1,756	0,154	8,75
Calabria	1,553	1,332	0,221	16,59	1,919	1,766	0,152	8,63
Sicilia	1,847	1,445	0,401	27,76	1,854	1,782	0,072	4,05
Sardegna	1,897	1,403	0,495	35,26	1,999	1,906	0,093	4,89
<b>ITALY</b>	<b>1,986</b>	<b>1,505</b>	<b>0,480</b>	<b>31,91</b>	<b>2,127</b>	<b>1,974</b>	<b>0,153</b>	<b>7,74</b>
North-West	1,968	1,539	0,429	27,84	2,208	2,072	0,136	6,55
North-East	2,047	1,567	0,480	30,64	2,259	2,022	0,237	11,71
Centre	2,202	1,603	0,599	37,36	2,214	2,059	0,154	7,50
South	1,804	1,381	0,424	30,68	1,948	1,812	0,136	7,51
<b>Coeff. Variation</b>	<b>0,10</b>	<b>0,08</b>	<b>0,28</b>	<b>0,27</b>	<b>0,09</b>	<b>0,08</b>	<b>1,38</b>	<b>1,55</b>

Source: our calculations based on ISTAT, Annuario Statistico Italiano and SANITEIA - Min. Tesoro

(§) Data are in mln lire, real 2000 terms.

**Table 2: Evolution of health care public expenditure and financing: 1990-1999**

Region	1990				1999			
	Per capita exp. (\$)	Per capita fin. (\$)	Exp. as % reg. GDP	Fin. as % reg. GDP	Per capita exp. (\$)	Per capita fin. (\$)	Exp. as % reg. GDP	Fin. as % reg. GDP
Piemonte	1,888	1,540	5,00	4,08	2,222	2,081	4,99	4,67
Valle d'Aosta	2,087	1,412	4,85	3,28	2,451	1,726	4,94	3,48
Lombardia	1,946	1,504	4,56	3,52	2,166	2,035	4,36	4,10
Trentino A.A.	2,014	1,538	5,03	3,84	2,693	1,814	5,38	3,63
Veneto	2,061	1,528	5,50	4,08	2,189	2,052	4,90	4,59
Friuli Ven. Giulia	2,021	1,731	5,28	4,53	2,183	2,073	5,10	4,84
Liguria	2,276	1,729	6,15	4,68	2,382	2,279	5,86	5,61
Emilia-Romagna	2,361	1,669	5,74	4,06	2,331	2,211	4,77	4,53
Toscana	2,164	1,599	6,22	4,59	2,164	2,127	5,15	5,06
Umbria	2,092	1,610	6,76	5,20	2,207	2,155	5,98	5,84
Marche	2,298	1,546	6,81	4,58	2,110	1,994	5,41	5,11
Lazio	2,156	1,598	5,93	4,39	2,216	1,928	5,24	4,56
Abruzzo	1,963	1,487	6,84	5,18	2,103	1,956	6,61	6,15
Molise	1,841	1,530	7,63	6,34	2,061	1,983	6,93	6,67
Campania	1,831	1,365	8,44	6,29	1,991	1,815	8,08	7,36
Puglia	1,831	1,332	8,00	5,82	1,994	1,824	7,90	7,22
Basilicata	1,626	1,333	8,19	6,72	1,910	1,756	7,01	6,44
Calabria	1,553	1,332	8,61	7,38	1,919	1,766	8,20	7,54
Sicilia	1,847	1,445	8,67	6,79	1,854	1,782	7,37	7,09
Sardegna	1,897	1,403	7,89	5,83	1,999	1,906	6,80	6,48
<b>ITALY</b>	<b>1,986</b>	<b>1,505</b>	<b>6,11</b>	<b>4,64</b>	<b>2,127</b>	<b>1,974</b>	<b>5,57</b>	<b>5,17</b>
North-West	1,968	1,539	4,85	3,79	2,208	2,072	4,68	4,39
North-East	2,047	1,567	5,39	4,13	2,259	2,022	5,01	4,48
Centre	2,202	1,603	6,10	4,44	2,214	2,059	5,22	4,85
South	1,804	1,381	8,35	6,39	1,948	1,812	7,69	7,15
<b>Coeff. Variation</b>	<b>0,10</b>	<b>0,08</b>	<b>0,22</b>	<b>0,25</b>	<b>0,09</b>	<b>0,08</b>	<b>0,21</b>	<b>0,24</b>

Source: our calculations based on ISTAT, Annuario Statistico Italiano and SANITEIA - Min. Tesoro

(§) Data are in mln lire, real 2000 terms.

**Table 3: Evolution of structural variables: 1990-1999**

Region	1990			1999		
	real GDP per-capita (\$)	pop. aged > 65 (%)	pop. aged < 14 (%)	real GDP per-capita (\$)	pop. aged > 65 (%)	pop. aged < 14 (%)
Piemonte	37,723	16,66	13,34	44,565	20,08	11,87
Valle d'Aosta	43,036	14,57	13,78	49,626	18,45	12,56
Lombardia	42,670	14,03	14,57	49,625	17,08	12,99
Trentino A.A.	40,042	13,90	16,58	50,032	16,46	15,79
Veneto	37,470	14,21	9,60	44,715	17,53	13,22
Friuli Ven. Giulia	38,254	18,19	12,52	42,847	20,97	11,12
Liguria	36,985	20,42	10,93	40,624	24,42	10,30
Emilia-Romagna	41,135	18,32	12,00	48,825	21,85	11,07
Toscana	34,795	18,22	12,92	42,014	21,71	11,49
Umbria	30,967	17,42	14,36	36,919	21,97	12,23
Marche	33,751	16,99	14,78	38,999	21,03	12,93
Lazio	36,395	13,21	16,14	42,279	16,70	14,21
Abruzzo	28,707	15,20	17,12	31,821	19,58	14,51
Molise	24,128	15,89	16,37	29,754	20,27	14,92
Campania	21,699	10,48	22,54	24,644	13,35	19,57
Puglia	22,883	11,34	21,52	25,253	14,77	17,60
Basilicata	19,852	13,49	20,10	27,256	17,31	16,70
Calabria	18,037	12,34	13,51	23,411	15,93	17,78
Sicilia	21,288	12,47	11,83	25,146	15,81	18,34
Sardegna	24,057	11,58	19,24	29,407	14,88	14,92
<b>ITALY</b>	<b>32,472</b>	<b>13,35</b>	<b>15,12</b>	<b>38,164</b>	<b>17,69</b>	<b>14,50</b>
<i>North-West</i>	<i>40,596</i>	<i>15,52</i>	<i>13,79</i>	<i>47,210</i>	<i>18,74</i>	<i>12,38</i>
<i>North-East</i>	<i>37,968</i>	<i>14,91</i>	<i>11,10</i>	<i>45,129</i>	<i>17,99</i>	<i>13,20</i>
<i>Centre</i>	<i>36,078</i>	<i>16,26</i>	<i>14,29</i>	<i>42,425</i>	<i>19,91</i>	<i>12,67</i>
<i>South</i>	<i>21,613</i>	<i>11,66</i>	<i>18,09</i>	<i>25,339</i>	<i>14,93</i>	<i>18,09</i>
<b>Coeff. Variation</b>	<i>0,25</i>	<i>0,19</i>	<i>0,23</i>	<i>0,17</i>	<i>0,26</i>	<i>0,29</i>

Source: our calculations based on ISTAT, Annuario Statistico Italiano

(\$) Data are in mln lire, real 2000 terms.



**Table 4: Evolution of structural variables: 1990-1997**

Regions	1990					1997				
	Per capita exp. (\$)	hospitals (x10.000)	beds (x1.000)	physicians (x1.000)	mean beds x hospitals	Per capita exp. (\$)	hospitals (x10.000)	beds (x1.000)	physicians (x1.000)	mean beds x hospitals
Piemonte	1,888	0,31	6,29	1,56	203,90	2,050	0,26	5,71	1,88	222,74
Valle d'Aosta	2,087	0,09	5,45	1,81	628,00	2,408	0,08	4,36	1,83	520,00
Lombardia	1,946	0,27	7,73	1,62	284,56	2,080	0,24	5,95	1,98	251,29
Trentino A.A.	2,014	0,49	8,42	1,45	173,47	2,372	0,42	7,08	1,16	166,69
Veneto	2,061	0,31	7,47	1,71	242,79	2,077	0,23	5,77	1,84	254,46
Friuli Ven. Giulia	2,021	0,29	9,00	1,89	309,71	2,151	0,21	6,32	1,95	299,96
Liguria	2,276	0,39	7,90	2,06	204,96	2,245	0,24	6,13	2,33	252,95
Emilia-Romagna	2,361	0,40	7,75	1,84	192,81	2,264	0,24	6,04	2,22	250,19
Toscana	2,164	0,32	6,82	1,69	212,02	2,074	0,21	5,66	1,65	265,95
Umbria	2,092	0,29	6,57	1,93	225,29	2,096	0,18	4,79	1,94	265,07
Marche	2,298	0,47	6,33	1,71	135,43	2,102	0,37	6,50	1,82	177,51
Lazio	2,156	0,46	8,46	2,12	185,28	2,154	0,45	7,68	2,59	171,23
Abruzzo	1,963	0,28	8,42	1,70	297,97	1,927	0,28	6,57	1,60	232,61
Molise	1,841	0,27	5,28	1,55	198,33	1,936	0,30	5,15	1,75	170,20
Campania	1,831	0,29	3,78	1,52	132,50	1,930	0,26	4,74	1,52	182,67
Puglia	1,831	0,32	7,53	1,51	234,66	1,814	0,28	5,84	1,70	207,69
Basilicata	1,626	0,24	5,55	1,01	232,87	1,660	0,23	4,66	1,24	202,36
Calabria	1,553	0,33	6,28	1,51	187,48	1,820	0,36	5,13	1,58	143,81
Sicilia	1,847	0,30	5,34	1,52	175,92	1,730	0,28	4,85	1,55	174,15
Sardegna	1,897	0,29	6,07	1,44	206,49	1,928	0,29	5,88	1,69	203,54
<b>ITALY</b>	<b>1,986</b>	<b>0,33</b>	<b>6,84</b>	<b>1,67</b>	<b>208,49</b>	<b>2,021</b>	<b>0,28</b>	<b>5,82</b>	<b>1,86</b>	<b>210,58</b>
<i>North-West</i>	<i>1,968</i>	<i>0,29</i>	<i>7,32</i>	<i>1,66</i>	<i>248,96</i>	<i>2,092</i>	<i>0,24</i>	<i>5,89</i>	<i>1,99</i>	<i>243,56</i>
<i>North-East</i>	<i>2,047</i>	<i>0,33</i>	<i>7,88</i>	<i>1,71</i>	<i>239,79</i>	<i>2,132</i>	<i>0,25</i>	<i>6,05</i>	<i>1,77</i>	<i>240,61</i>
<i>Centre</i>	<i>2,202</i>	<i>0,39</i>	<i>7,64</i>	<i>1,88</i>	<i>194,61</i>	<i>2,138</i>	<i>0,31</i>	<i>6,50</i>	<i>2,12</i>	<i>207,76</i>
<i>South</i>	<i>1,804</i>	<i>0,30</i>	<i>5,50</i>	<i>1,49</i>	<i>182,21</i>	<i>1,834</i>	<i>0,28</i>	<i>5,14</i>	<i>1,58</i>	<i>182,57</i>
<b>Coeff. Var.</b>	<b>0,103</b>	<b>0,26</b>	<b>0,19</b>	<b>0,15</b>	<b>0,49</b>	<b>0,097</b>	<b>0,29</b>	<b>0,14</b>	<b>0,18</b>	<b>0,37</b>

Source: our calculations based on ISTAT, Annuario Statistico Italiano and SANITEIA - Min. Tesoro

(\$) Data are in mln lire, real 2000 terms.

**Table 5: Regional health care expenditure (Ordinary regions only)**

<b>Variables</b>	<b>Pooled OLS (1)</b>		<b>2Step-GLS (2)</b>		<b>2Step-GLS (3)</b>	
Pop. > 65	-0.003 (0.026)	-0.003 (0.034)	0.009 (0.021)	-0.015 (0.028)	-0.003 (0.024)	-0.003 (0.054)
Phys. per 1000	0.113*** (0.042)	0.07** (0.035)	0.08** (0.037)	0.05 (0.031)	0.11** (0.052)	0.07** (0.036)
Av. beds per hosp.	-0.0001 (0.0003)	-0.00003 (0.0003)	-0.0002 (0.0003)	-0.000002 (0.0002)	-0.0001 (0.0003)	-0.00003 (0.0003)
GDP per capita	0.12*** (0.017)	0.09*** (0.016)	0.13*** (0.015)	0.09*** (0.013)	0.12*** (0.021)	0.09*** (0.014)
Pop>65 x GDP	-0.003*** (0.0008)	-0.003*** (0.0006)	-0.004*** (0.0007)	-0.003*** (0.0005)	-0.003*** (0.0005)	-0.003*** (0.0004)
<i>Regional dummies</i>	<i>yes</i>	<i>yes</i>	<i>yes</i>	<i>yes</i>	<i>yes</i>	<i>yes</i>
<i>Time trend</i>	<i>no</i>	<i>yes</i>	<i>no</i>	<i>yes</i>	<i>no</i>	<i>yes</i>
Nr. obs.	150	150	150	150	150	150
Adj. R sq.	0.77	0.87	-	-	-	-
Model F	27.76***	45.46***	-	-	-	-
Log-L	137.64	179.81	147.07	190.75	137.64	179.81
F-test (4)	16.05***	15.42***	-	-	-	-

(1) White heteroskedasticity robust SE in parentheses;

(2) Groupwise heteroskedastic model with nonautocorrelated disturbances; corrected SE in parentheses;

(3) Panel corrected SE in parentheses;

(4) test the joint significance of regional dummies.

Lev. of sign.: (\*\*\*) 1%, (\*\*) 5%, (\*) 10%.

**Table 6: Regional health care financing (Ordinary regions only)**

<i>Variables</i>	<i>Pooled OLS (1)</i>		<i>2Step-GLS (2)</i>		<i>2Step-GLS (3)</i>	
Pop. > 65	0.028 (0.035)	0.08** (0.04)	0.027 (0.031)	0.085** (0.036)	0.028 (0.034)	0.08 (0.077)
Phys. per 1000	-0.01 (0.055)	0.07 (0.042)	-0.013 (0.051)	0.08** (0.037)	-0.01 (0.073)	0.07 (0.043)
Av. beds per hosp.	-0.00006 (0.0005)	0.0007** (0.0003)	-0.00004 (0.0004)	0.0008*** (0.0003)	-0.00006 (0.0004)	0.0007*** (0.0007)
GDP per capita	0.03 (0.023)	0.06*** (0.018)	0.03 (0.021)	0.072*** (0.017)	0.03 (0.033)	0.06*** (0.024)
Pop>65 x GDP	-0.0005 (0.001)	-0.001* (0.0007)	-0.0004 (0.0009)	-0.002** (0.0007)	-0.0005 (0.0008)	-0.001** (0.0007)
<i>Regional dummies</i>	<i>yes</i>	<i>yes</i>	<i>yes</i>	<i>yes</i>	<i>yes</i>	<i>yes</i>
<i>Time trend</i>	<i>no</i>	<i>yes</i>	<i>no</i>	<i>yes</i>	<i>no</i>	<i>yes</i>
Nr. obs.	150	150	150	150	150	150
Adj. R sq.	0.46	0.75	-	-	-	-
Model F	7.69***	21.21***	-	-	-	-
Log-L	96.98	156.15	98.36	160.47	96.98	156.15
F-test (4)	2.74***	3.91***	-	-	-	-

(1) White heteroskedasticity robust SE in parentheses;

(2) Groupwise heteroskedastic model with nonautocorrelated disturbances; corrected SE in parentheses;

(3) Panel corrected SE in parentheses;

(4) test the joint significance of regional dummies.

Lev. of sign.: (\*\*\*) 1%, (\*\*) 5%, (\*) 10%.

**Table 7: Regional health care expenditure and financing (Ordinary regions only)**

<i>Variables</i>	<i>Expenditure</i>			<i>Financing</i>		
	<i>Pool. OLS (1)</i>	<i>2S-GLS (2)</i>	<i>2S-GLS (3)</i>	<i>Pool. OLS (1)</i>	<i>2S-GLS (2)</i>	<i>2S-GLS (3)</i>
Pop. > 65	0.058* (0.033)	0.07*** (0.023)	0.058** (0.028)	-0.2*** (0.028)	-0.22*** (0.021)	-0.2*** (0.028)
Phys. per 1000	0.054* (0.029)	0.024 (0.021)	0.054** (0.027)	-0.03 (0.025)	-0.035* (0.019)	-0.03* (0.018)
Av. beds per hosp.	-0.00007 (0.0002)	0.00016 (0.00017)	-0.00007 (0.0002)	-0.00003 (0.0002)	-0.00009 (0.00015)	-0.00003 (0.0001)
GDP per capita	0.06*** (0.013)	0.059*** (0.0098)	0.06*** (0.0086)	-0.03** (0.011)	-0.025*** (0.0082)	-0.03*** (0.008)
Pop>65 x GDP	-0.002*** (0.0006)	-0.0022*** (0.0004)	-0.002*** (0.0004)	0.0006 (0.0005)	0.0006* (0.0004)	0.0006 (0.00036)
Pop>65 x Scale	-0.00078 (0.007)	-0.0016 (0.005)	-0.00078 (0.004)	-0.02*** (0.0059)	-0.01** (0.004)	-0.02*** (0.0045)
Dummy fin. formula	0.24*** (0.044)	0.21*** (0.029)	0.24*** (0.018)	0.44*** (0.037)	0.45*** (0.028)	0.44*** (0.045)
Dummy 1997	-0.11*** (0.048)	-0.08** (0.03)	-0.11*** (0.02)	-0.45*** (0.041)	-0.45*** (0.031)	-0.45*** (0.049)
Publ. Budget tight.	-0.22** (0.089)	-0.142** (0.06)	-0.22*** (0.04)	-0.82*** (0.075)	-0.83*** (0.057)	-0.82*** (0.087)
Length central govt.	-0.09*** (0.019)	-0.089*** (0.013)	-0.09*** (0.01)	-0.31*** (0.017)	-0.31*** (0.013)	-0.31*** (0.019)
Dummy nat. elect.	0.16*** (0.043)	0.12*** (0.029)	0.16*** (0.015)	0.42*** (0.037)	0.42*** (0.027)	0.42*** (0.044)
Dummy reg. elect.	-0.012 (0.039)	-0.044* (0.026)	-0.012 (0.011)	0.005 (0.033)	-0.0018 (0.025)	0.005 (0.039)
Dummy maj. nat. el.	-0.26*** (0.037)	-0.24*** (0.025)	-0.26*** (0.013)	-0.20*** (0.031)	-0.18*** (0.024)	-0.20*** (0.036)
Dummy maj. reg. el.	0.037 (0.042)	0.035 (0.028)	0.037* (0.021)	0.51*** (0.035)	0.51*** (0.027)	0.51*** (0.045)
Scale	0.066 (0.1)	0.079 (0.072)	0.066 (0.089)	0.34*** (0.085)	0.28*** (0.062)	0.34*** (0.08)
Scale x GDP	-0.002 (0.002)	-0.001 (0.0017)	-0.002 (0.001)	-0.001 (0.002)	-0.001 (0.001)	-0.001 (0.0012)
Dummy govt.	-0.03* (0.018)	-0.029** (0.012)	-0.03** (0.014)	-0.02 (0.015)	-0.016 (0.012)	-0.02** (0.011)
Implicit burden	0.005 (0.022)	0.009 (0.014)	0.005 (0.017)	-0.06*** (0.018)	-0.042*** (0.015)	-0.06*** (0.006)
<i>Regional dummies</i>	<i>yes</i>	<i>yes</i>	<i>yes</i>	<i>yes</i>	<i>yes</i>	<i>yes</i>
Nr. obs.	150	150	150	150	150	150
Adj. R sq.	0.93	-	-	0.93	-	-
Model F	62.21***	-	-	62.23***	-	-
Log-L	232.92	265.94	232.92	257.35	275.57	257.35
F-test (4)	19.64***	-	-	23.3***	-	-

(1) White heteroskedasticity robust SE in parentheses;

(2) Groupwise heteroskedastic model with nonautocorrelated disturbances; corrected SE in parentheses;

(3) Panel corrected SE in parentheses;

(4) test the joint significance of regional dummies.

Lev. of sign.: (\*\*\*) 1%, (\*\*) 5%, (\*) 10%.

## Appendix A. Variables definition

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Expenditure	Regional health care expenditure per capita, mln lire, real 2000 terms SANITEIA - Min. Bilancio e Tesoro
Financing	Regional health care financing per capita, mln lire, real 2000 terms SANITEIA - Min. Bilancio e Tesoro
Deficit	Regional health care deficit per capita, mln lire, real 2000 terms SANITEIA - Min. Bilancio e Tesoro
GDP	Regional GDP per capita, mln lire, real 2000 terms ISTAT - Annuario Statistico
Pop. > 65	Share of persons older than 65 out of the total regional population ISTAT - Annuario Statistico
Phys. per 1000	Nr. of physicians per 1000 inhab. within each region ISTAT - Annuario Statistico
Av. beds per hosp.	Average nr. beds per hospital within each region ISTAT - Annuario Statistico
Dummy South	Dummy = 1 for Molise, Campania, Basilicata, Calabria, Puglia, Sicilia e Sardegna
Dummy fin. formula	Dummy = 1 when financing formula takes into account (at least partially) health care needs of the regional population
Dummy 1997	Dummy = 1 for 1997
Publ. Budget tightness	Italian deficit / Av. Deficit EU (incl. Italy) Banca d'Italia - Supplemento al Bollettino Statistico
Length central govt.	Length of govt. "i" / Av. length of govt. in period 1990-1999 <a href="http://www.governo.it">www.governo.it</a>
Dummy nat. elect.	Dummy = 1 for electoral years (national elections)
Dummy reg. elect.	Dummy = 1 for electoral years (regional elections)
Dummy maj. nat. elect.	Dummy = 1 when national elections based on majority rule
Dummy maj. reg. elect.	Dummy = 1 when regional elections based on majority rule
Scale	Discrete variable based on regional population quantiles
Dummy govt.	Dummy = 1 if parties in power at the regional level and at the central level are the same
Implicit burden	Share of regional deficit not paid off by central govt. Intervention Corte dei Conti

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## Appendix B. Implicit burden of health care deficit: 1990-1999

Regions	Deficit 1987-1994	Residual deficit	Implicit burden	Deficit 1994-1999	Expected residual deficit	Implicit burden
Piemonte	0	0	0,00	2792	1475	0,53
Valle d'Aosta	0	0	0,00	169	169	1,00
Lombardia	718	211	0,29	5024	1959	0,39
Trentino A.A.	0	0	0,00	1157	1157	1,00
<i>TN</i>	<i>0</i>	<i>0</i>	<i>0,00</i>	<i>404</i>	<i>404</i>	<i>1,00</i>
<i>BZ</i>	<i>0</i>	<i>0</i>	<i>0,00</i>	<i>753</i>	<i>753</i>	<i>1,00</i>
Veneto	668	196	0,29	2655	952	0,36
Friuli V. G.	39	12	0,31	509	446	0,88
Liguria	652	193	0,30	1458	542	0,37
Emilia Romagna	1587	468	0,29	4439	2051	0,46
Toscana	842	248	0,29	1983	542	0,27
Umbria	169	50	0,30	125	-91	-0,73
Marche	396	116	0,29	1490	790	0,53
Lazio	2603	767	0,29	7382	3503	0,47
Abruzzo	48	14	0,29	1489	1115	0,75
Molise	23	7	0,30	40	-43	-1,08
Campania	2035	599	0,29	3303	1109	0,34
Puglia	417	123	0,29	2685	1267	0,47
Basilicata	0	0	0,00	144	36	0,25
Calabria	414	122	0,29	1108	315	0,28
Sicilia	930	274	0,29	1532	768	0,50
Sardegna	84	25	0,30	1139	560	0,49
<b>ITALY</b>	<b>11625</b>	<b>3425</b>	<b>0,29</b>	<b>40623</b>	<b>18622</b>	<b>0,46</b>
<i>North-West</i>	<i>1370</i>	<i>404</i>	<i>0,29</i>	<i>9443</i>	<i>4145</i>	<i>0,44</i>
<i>North-East</i>	<i>707</i>	<i>208</i>	<i>0,29</i>	<i>4321</i>	<i>2555</i>	<i>0,59</i>
<i>Centre</i>	<i>5645</i>	<i>1663</i>	<i>0,29</i>	<i>16908</i>	<i>7910</i>	<i>0,47</i>
<i>South</i>	<i>3903</i>	<i>1150</i>	<i>0,29</i>	<i>9951</i>	<i>4012</i>	<i>0,40</i>
Ordinary	10572	3114	0,29	36117	15522	0,43
Special	1053	311	0,30	4506	3100	0,69

Source: Corte dei Conti