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Abstract

We use a "natural experiment", the fiscal adjustment of Italy in the '90s to meet the Maastricht criteria, to test a simple model of soft budget constraint that closely resembles the intergovernmental relationships in the Italian public health care sector. We show that the link between the ex ante financing by the Central government and the health expenditure by regions was stronger when regional expectations of future bailing outs were presumably lower. Confirming previous research, we also prove that more fiscally autonomous regions were more financially responsible and that a political "alignment" effect was present, with "friendly" regional governments controlling more expenditure than unfriendly ones. Our results suggest that, at least in Italy, bailing out expectations by regions may be the missing variable emphasised by Culyer (1988) for empirical models explaining health expenditure. Our results also raise some worries about the outcome of the current decentralization process in Europe.

1. Introduction

What determines health expenditure? This is an important policy question which has been addressed by a large literature. On empirical grounds, the answer is often sought by applying some modern version of Wagner's law to data; e.g. by running regressions considering different countries, or different regions inside a country, and using as explanatory variables income and various indicators of cost and demand factors (e.g. Gerdtham and Jönsson, 2000). The results are often disappointing, however, and it has become a routine to argue for the need of a better theoretical framework to guide the empirical analysis.[1] Following this suggestion, it is somewhat surprising to note that the above literature usually ignores the fact that health services, although financed (partly or totally) at the central level, are often provided at the *local level.* For example, in federal countries such as Canada and Australia, (public) health expenditure is an *exclusive* political responsibility of Regional States, although the Federal Government finances a large part of it through general or specific transfers. In regional countries, such as Spain or Italy, as well as in unitary but largely decentralized countries such as Sweden, health services are a *joint* responsibility of the central and the local level, and they are jointly financed by the two levels of government.

In all these cases, public health policy is then the result of the interaction of several layers of government. And one of the key insight of modern fiscal federalism theory is that the way in which these interactions take place (e.g., how the tasks are

defined at both levels, how they are financed, etc.) might be important in determining the outcome. In particular, a growing literature suggests that if the central government cannot commit not to bail out additional expenditure at the local level, then local governments' budget constraints might become "soft", as local governments might have an incentive to inflate their expenditure if they expect the residents of other jurisdictions to foot the bill[2]. In turn, these problems are likely to be particularly important in sensitive political fields such as health care, as the central government can hardly allow local governments to "fail" in providing essential health care services (e.g., Wildasin, 1997 and 2004; Bordignon, 2006). And this is of course especially true if the central government itself may be blamed for this failure, as it might happen in those countries where political and financial responsibilities on health care across different levels of government are not clearly defined. Hence, attempting to explain the evolution of health expenditure without taking into account these factors may lead to serious misunderstandings of the economic and political forces at play.

The Italian case is a good example at hand. In Italy, there is an ongoing bitter confrontation between the central government and the regions on the matter of health care financing. Regions claim that the central government deliberately under-finances them for the provision of health services which are largely mandated by the central

[1] Gerdtham and Jonsson (2000) emphasise the problem of "the weak theoretical base for aggregate health expenditure, which provide little guidance as to the possible explanatory variables and the causal mechanisms involved".

[2] See Kornai *et al.* (2003) and Maskin (1999) for general surveys on the soft budget constraint literature and Rodden and Eskeland (2003) and Vigneault (2005) for applications on intergovernmental relationships.

government itself. On the contrary, central government claims that regions overspend, wasting money which could easily be saved. As a result, the Italian history is plenty of examples of "bailing out", i.e. ex-post interventions by the central government to finance the past health deficits of regions[3]. However, the fact that ex-post financing of health services is observed it is not by itself a conclusive proof of the existence of soft-budget constraint problems[4]. For crucial to the notion of soft budget constraints is the role of *expectations* (e.g., Kornai *et al.*, 2003); that is, the fact that local governments misbehave today because they *expect* central government's help tomorrow, and that they would not do so otherwise. Thus, to prove the existence of soft budget constraints problems in the health sector in Italy, as well as in any other country or sector, one needs to prove that those expectations actually played a role in determining regions' behaviour. But as expectations cannot be observed, this makes the above task very difficult.

This difficulty should not be taken lightly. While we have plenty of casual empiricism on soft budget problems in intergovernmental relationships (e.g., Inman, 2003), there are very few serious attempts to tackle the expectations problem. As a result, most of the claims made in the soft-budget constraints literature appear seriously

[3] The last episode occurred in 2007, with a transfer of 2.3 billions euro and a guarantee for a huge debt of 5.8 billions euro to cover the 10 billions euro of health debts accumulated in Lazio. Differently from what occurred in the '90s, however, the assistance of central government has been provided only *after* the regional government increased the tax rates on regional taxes and provided a detailed plan to curbe future expenditures. It will have to be seen if these newly introduced procedurals are able to reduce the occurrence of these episodes in the future.

[4] Indeed, ex post financing may have nothing to do with soft budget constraints problems and, on the other hand, there may well be soft-budget constraint problems in place without explicit bailing out interventions: see Inman, 2003 and the model in section 3 for a formal illustration of this result.

flawed (e.g. Bordignon, 2006). To the best of our knowledge, only Rodden (2000) for Germany, Pettersson-Lidbom and Dahlberg (2003) and Pettersson-Lidbom (2008) for Sweden, and Plekhanov (2005) for Russia, make an explicit attempt to model expectations using proxies suggested by the theory[5]. In this paper, we follow a similar empirical strategy, adapting it to the Italian case[6]. But we also make a further attempt to consider explicitly the strategic interaction between levels of government, which is at the heart of the soft budget constraints problem, by modelling central government's behaviour as well.

Our task is facilitated by a "natural experiment" which is offered by the recent Italian history. At the beginning of the '90s, public health expenditure in Italy was clearly out of control. Public health expenditure had reached 6% of GDP, well above the European average, and regions spent 25% more than their pre-determined budget on public health care. Since 1992, however, the situation improved dramatically. The growth of public health expenditure decelerated sharply, health expenditure dropped in *real terms* in 1994, and in 1995 regional health deficits were almost entirely wiped out, *although central government financing in real terms actually dropped in those same years*. All this happened without any remarkable change in the quality or quantity of

[5] See also Rodden (2006) for an interesting attempt to recover these expectations indirectly, by collecting data on the rating of regional state debts by international organizations and professional firms, and connecting them to the institutional characteristics of the federation under analysis. Rodden (2002) and Rodden and Wibbels (2002) are instead more general attempts to connect empirically broad indicators of the fiscal performance of a country to its intergovernmental relationships. An early attempt to test the presence of a flypaper effect and a soft budget constraint in the Italian health care funding system is due to Levaggi and Zanola (2003).

services offered, and with little compensatory increase in private health expenditure. What happened?

In this paper, we offer and test the following explanation. Public health expenditure in Italy is (partly) the result of a *strategic game* being played by regional and central governments alike. By reducing ex-ante health financing and implementing harsh measures on its part, the central government managed to convince regions in the mid '90s that it was going to be "tough" and not allow for ex-post financing of regional health deficits. In spite of the long history of past bailing out, regions believed this announcement because a number of facts which occurred at the beginning of the '90s (a severe financial crisis and the Maastricht constraints for joining the EMU) reduced regions' expectations of a future bail out. Hence, regions introduced severe and successful measures to control health expenditure. Health expenditure started to accelerate again only after Italy had obtained access to the final stage of EMU (from 1997 onwards), with the relaxation of the external constraints.

Following the suggestions of the theoretical literature, we also study the impact of a number of specific regional variables on the formation of bail-out expectations. Confirming previous studies, we show that richer and more autonomous regions had lower expectations of central government intervention (e.g., Rodden, 2000, 2002 and 2004). We also show that political variables played a role. In particular, Regions which were ruled by "friendly" governments (i.e., by governments which had the same

[6] An alternative, of course, would be to directly measure expectations from purpose-built surveys, as in the work by Anderson *et al.* (2000), but this methodology, in addition of presenting problems of its own,

political majority of the Central government in charge) reduced health expenditure more than those run by "unfriendly" ones[7].

Our results are of course specific to the Italian peculiar institutional framework. But they at least suggest that an analysis of intergovernmental relationships may help in explaining the evolution of health expenditure in other countries as well (see in particular the case of Spain; e.g., Lopez-Casasnovas, 1999; Sorribas-Navarro, 2008). Moreover, health care is just an example, although an important one. There are other sensitive political fields where soft budget constraint problems in intergovernmental relationships may be relevant (for example, education and social welfare), and our approach suggests a possible avenue for future work. Finally, as we argue in the conclusions, our results also cast a somewhat worrying perspective on the current decentralization process in Europe.

The remainder of the paper is structured as follows. Section 2 provides some stylised facts about intergovernmental relationships in the Italian National Health Service (NHS). Section 3 develops a simple model of bailing out and derives some testable propositions. Section 4 discusses our empirical strategy and briefly describes our data. Section 5 presents our basic results, and test their robustness by using alternative econometric methodologies. Section 6 concludes.

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it is unavailable to us.

2. Intergovernmental Relationships in the Public Health Care Sector

Health care policy in Italy is the result of a complex net of institutional and political rules, which evolve continuously[8]. The 1948 Italian Constitution[9] gave regions the task of organising and managing health services in their territory[10], while maintaining at the central level the final responsibility to ensure all Italian citizens the access to a comparable set of services. Hence, when the Italian NHS was first introduced in 1978[11], it became natural to structure it so as to recognise a specific role to each level of government[12]. According to this institutional compromise, the central government was in charge of determining the set of mandatory health services which should be provided to all Italian citizens, by enacting framework legislation and by ensuring each region had enough resources to fulfil their obligations. Regions, on the other hand, were free to supply additional health care services, organising the supply of health services in their territory (for instance, by setting the number and specialisation of public hospitals and of other health producers); allocating the resources and appointing the managers of the Local Health Units and regional hospitals; determining the tariffs to be paid to private producers of health services, and so on. Wages and salaries for physicians and nurses

[7] In the theoretical literature, this is known as the "alignment effect". See e.g. Arulampalan *et al.* (2008) and Rodden and Wibbels (2002).
[8] In this section, we only offer a brief introduction to the working of the Italian NHS. For a more complete description and discussion, see Bordignon *et al.* (2002) and France et al. (2005).
[9] Reformed in 2001, by enlarging the role of local governments; see e.g. Bordignon *et al.* (2002) and Giarda (2001).
[10] Indeed, managing health services is the main competence of Italian Regions, covering about 70% of their total expenditure.
[11] The NHS substituted a former system based on publicly mediated private insurance.

working in public hospitals were (and still are) determined at the central level through collective bargaining, but regions could define integrative contracts and were in charge of the management of human resources, defining, for instance, promotion policies.

In fact, this intergovernmental compromise was at the beginning heavily biased in favour of the central government, as regions had few financial resources of their own and central government attempted to force regional governments to follow its prescriptions by enacting very specific legislation in health policy. However, this situation was reversed at the beginning of the '90s, when - as a consequence of the political and financial turmoil at the beginning of the decade - reforms were passed which gave regions more own resources, more tax and tariff autonomy and more managerial rooms in the organisation of the health services[13].

The funding of this peculiar system during the '90s needs some more detailed explanations, as it is at the heart of the analysis of the sections to follow. Funding of the Italian NHS was (and still is, to some extent) guaranteed according to a sort of a three stage process. First, with the December approval of the Budget Law for the following year, the Central government sets the overall size of the National Health Fund, so effectively pre-determining total public health expenditure for the next year. As the

[12] In Italy, most expenditure in health care, directly or indirectly, is mediated by the public sector. On the whole, private health expenditure covers about 25% of total health expenditure in 2000, a share below the average of the OECD countries. See OECD Health Data (2002).

[13] This decentralisation process has gone so far that it is often said in Italy that we now have twenty different health systems, one for each different Italian region, with Emilia-Romagna and Lombardia often quoted as polar examples of these different systems.

NHS is also financed by earmarked regional taxes (and tariffs)[14], what the Central government basically does in December is to set the amount of "topping up"[15] to be given through conditional grants to regions for financing health expenditure in the following year. This determines what is called the *ordinary* (or *ex-ante*) *funding* of the NHS for a given year.

Second, in the following year, the additional transfer from the Central government is distributed across Regions, according to a predetermined formula. Roughly speaking, this formula equalises per capita health financing (standardised regional taxes and government transfers) across regions, with some adjustments being made, according to the period, for the age structure of the population and for interregional patients' mobility. In principle, given that both the formula and the overall central government funding are predetermined, the allocation of the national funds to each region should follow automatically. In practice, some room in "interpreting" the formula is allowed, and the formula itself (with the parameters in the formula) have often been changed (three times during the '90s; see below). As a result, the total amount of ordinary funding each region obtains in a given year involves some bargaining among regions and the central government.

This is not, however, the end of the story. Ordinary funding might involve a portion of "deliberate" under-funding by the Central government, partly for reasons of

[14] In the first part of the '90s payroll taxes and social contributions levied on labour income and, since 1997, Irap, a tax on value added computed at firm level (Bordignon *et al.*, 1999).

"budget dressing" and partly because of the difficulty in computing from the centre - lacking reliable data - a precise estimate of "standardised" or "efficient" health expenditure. Faced with insufficient resources to meet their expenditure needs, regions could react in several ways. In the short run, regions could always finance their past health deficits by diverting other current resources, by raising short term debts, or simply by postponing payments to suppliers of the Regional Health Service (RHS, from now on)[16]. All these strategies were costly, as debt implied interest payments, and suppliers - expecting delays - typically overpriced the RHS. In the medium run, regions could also attempt to cut expenditure by reducing waste in the provision of health services (e.g., by rationalising the hospital network or improving the appropriateness of supplied services), by reducing the non mandatory health services, or they could increase health resources by increasing their own (earmarked) taxes and tariffs[17]. These policies were on political grounds even more costly for regional governments. Hence, the incentive to use any of the above strategies depended on the *expectations* of future interventions by the central government, that is, on the expectations of future bailing out of regional health deficits.

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[15] The amount of this "topping up" varied along the period as earmarked health regional taxes were reformed in 1997. However, funding from the central government was always in the range of 30 to 50% of total funding.

[16] Regions could also raise longer term debts, but these debts has always been strictly regulated for local governments in Italy. In particular, long term debt cannot be used to finance current expenditure.

[17] As already said, in recent years the latest versions of the Internal Stability and Growth Pact for health expenditure have made mandatory for regions to increase rates on earmarked own taxes in the case of ex post intervention by the central government. Furthermore, it has been attempted to make ex ante funding more able to reflect the real underlying needs of the population and to increase the accountability of regions. These are important structural breaks with respect to the '90s , although they have still to prove to be effective.

Table A.1 in the Appendix summarises these bailing out interventions (i.e., *ex-post* financing) during the '90s[18]. The table emphasises two points. First, bailing out of regional health deficits is not an exceptional occurrence in Italy. With an average delay of two-three years, the Central government usually "finds out" that it has made a "mistake" in computing the health needs of regions, and covers (part of) the past health deficits of regions by issuing government bonds and by taking care of Local Health Units debts. Hence, ex-post bailing out can be rightly thought of as a *third stage of financing* for the Italian NHS. Second, both the timing and the extent of this bailing out vary largely across periods and across regions. For example, it took 8 years (and five different governments) to cover 80% of the average regional health deficits accumulated by regions from 1986 up to 1994; in the year 2002, the percentage of up-to-1994 health deficits not bailed out by the central government ranged from 40% for Puglia to 2% for Molise, with three regions that received more funds than their original deficits. On the other hand, 50% of the health deficits accumulated in the period 1995-1997 and in the period 1998-1999 were already bailed out by the central government by 2002.

These data support the following conclusion: at least during the '90s, bailing out of past regional health deficits was endemic to the Italian NHS funding system, which implies that at the time the ordinary funding for each RHS was determined, each region knew for sure that there will be some extra funding from the central government in the future. However, the extent and the timing of this ex post financing were not known *a*

[18] This table is the result of a careful collection and analysis of available data (see Turati, 2003). Still, the information gathered in the table must be taken with care, as it is often difficult to assess the precise

priori, and they were very hard to assess at the time regions took their expenditure decisions. As running short term deficits is however costly for the regions for the reasons explained above, this implies that *current health policy by regions, and therefore, to some extent, current health expenditure, was determined by current regional expectations of the future bailing out behaviour by central government.* The crucial question is then to determine how these expectations were shaped.

3. A Simple Model of Bailing Out

To answer this question and get some testable implications, we revert to a simple dynamic game, which is suggested by the Italian NHS funding mechanism detailed above[19]. Consider a simple economy with two governments, a Central government and a Regional one. Central government moves first and sets the health financing level – the "topping up" transfers - to be given to the region for the next period, f. For simplicity, let us assume that central government can only decide between two levels of financing, low or high, f={*f*, *F*}, where $F>f>0$. Having observed f, Regional government then selects a health expenditure level, e. The region too can only choose between two levels of expenditure, low or high, e={*e, E*}, where $E>e>0$. We assume that these levels are such that if the region responds with the "appropriate" level of expenditure to the

moment when extra-ordinary central funds for health care were effectively given to regions (see below).
[19] Rodden (2000) and Inman (2003) discuss similar models, but consider only the complete information case.

financing set by the Central government, the regional budget is in equilibrium: $(F-E)=(f-e)=0$. Furthermore, if the Central government sets F at the beginning of the game, we assume that the region can only respond by setting E (i.e. the Regional government cannot cash the difference between expenditure and funding). Hence, Central government and Regional government payoffs in this case 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 again over and the two agents receive respectively $U^C(f,e)$ and $U^R(f,e)$. However, the region may also choose E and runs a deficit instead. In this case, it is again Central government's turn to move. It can either 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 giving more money to the region, in which case the utility levels of the two agents become $U^{Cb}(F,E)$ and $U^{Rb}(F,E)$ (b is a mnemonic for "bailing out"). We make the following assumptions on payoffs:

i) $U^C(f,e) > U^C(F,E)$

ii) $U^C(f,e) > U^{Cb}(F,E)$

iii) $U^R(F,E) \geq U^{Rb}(F,E) > U^R(f,e) > U^R(f,E)$

iv) $U^C(f,e) + U^R(f,e) > \max [U^C(F,E) + U^R(F,E);\ U^{Cb}(F,E) + U^{Rb}(F,E)]$.

Assumptions *i)* and *ii)* say that central government prefers low financing and low expenditure to high financing and high expenditure, both when the bailing out occurs and when it does not. Assumption *iii)* asserts that the region prefers high expenditure and high financing (and the sooner the better), but that if it had to finance itself the deficit in the case of low financing, it would prefer to cut expenditure immediately. Assumption *iv)* guarantees that it is indeed Pareto efficient to constrain financing and expenditure at the low level. All these assumptions are reasonable in the light of our previous discussion of the Italian case.

The equilibrium of this simple game relies on the payoffs of the Central government. In particular, it can be easily shown that in the case of perfect information, the only subgame perfect equilibria of this game are: (1) if $U^{C}(f,E) > U^{Cb}(F,E)$, Central government plays *f* in the first period and region selects *e*; (2) if $U^{C}(f,E) < U^{Cb}(F,E) < U^{C}(F,E)$, Central government plays *F* in the first period and region reacts by selecting *E* immediately; (3) if $U^{C}(f,E) < U^{C}(F,E) < U^{Cb}(F,E)$, Central government plays *f* in the first period, region reacts by selecting *E*, and central government bails out the deficit of the region in the third period. Clearly, in this simple game, the first best equilibrium can only be achieved if central government can credibly commit not to bail out regional deficits (case 1). If it cannot, then either it gives in immediately and sets a high financing level (case 2), or it gives in later, by setting up a low level of financing in the first period and then bailing out the regional deficits in the second one (case 3). Both case 2 and 3 are interesting for their own sake. Case 2, because it shows - as we stressed

in the introduction - that soft budget constraint problems may appear in the form of excessive funding and excessive expenditure rather than in the form of a formal bailing out. Case 3, because it shows that central government may actually find it convenient to initially under-fund regions so as to end up with a bailing out.

As it is, the model is however too simple for our aims. In particular, as we argued above, Italian regions are in reality uncertain, at the time they take their expenditure decisions, of both the amount and the timing of the future bailing out by the Central government. To model this feature, consider then the following variation of the previous game. Let the payoff functions of the regions and the timing of the game remain as above, but suppose now that there are two "types" of Central government, one which bails out regions and the other which does not. Also suppose that, while the payoffs in the different outcomes of the game are common knowledge, the information about its type is private to the central government, with the region having only some *a priori* on this type. Formally, suppose that the region now expects the Central government to be "tough" with some probability *p*, and to be "weak" with probability *1-p*. A "tough" Central government is one which prefers not to bail out the region in the event of a deficit: $U^{CT}(f,E) > U^{CbT}(F,E)$. A "weak" central government instead always prefers to bail out the region in the case of a deficit: $U^{CW}(f,E) < U^{CbW}(F,E)$ (superscripts T and W refer to the type of government). Both types of government still prefer low expenditure and low financing to high expenditure and high financing (i.e. $U^{Ck}(f,e) > U^{Ck}(F,E)$, $k=T,W$). Since we now have a dynamic game of incomplete

information, we look for perfect Bayesian equilibria (PBE, from now on) of the game. We solve the game for both case 2 and case 3 above. The next two propositions summarise the equilibria of the ensuing games.

PROPOSITION 1 Suppose it is common knowledge that $U^{CbW}(F,E) > U^{CW}(F,E)$. Then, there is a *pooling* PBE in pure strategies of the game. In this equilibrium, both types of government set *f* in the first period, region's posterior beliefs coincide with *a priori* beliefs, and the region chooses *E* if $p<p'$, and *e* if $p>p'$ (it is indifferent if $p=p'$), where $p' = [(U^{Rb}(F, E) - U^{R}(f,e)) / (U^{Rb}(F, E) - U^{R}(f,E))]<1$.

Proof: see Appendix.

PROPOSITION 2 Suppose it is common knowledge that $U^{CbW}(F,E) < U^{CW}(F,E)$. Then:

i) for $p \geq p'$ there exists a *pooling* PBE in pure strategies, where both the tough and the weak type of government choose *f* in the first period, region's posterior beliefs coincide with *a priori* beliefs, and the region optimally responds with *e*;

ii) for $p<p'$ there exists a unique PBE in mixed strategies. At this equilibrium, in the first period, the tough government always chooses *f*, and the weak government chooses *f* with probability q^*, and *F* with probability $1- q^*$. The region, upon observing *F* chooses *E*, and upon observing *f* selects *e* in the second period with probability s^* and *E* with probability $1- s^*$. Equilibrium beliefs of the region are such that, upon observing *F*, it assigns zero probability to the government being tough, and upon observing *f*, it assigns

probability $p°(q^*) \equiv p/[p+(1-p)q^*]$ to the government being tough. Finally, $q^* = \{p[U^R(f, e) - U^R(f, E)] / (1-p)[U^{Rb}(F, E) - U^R(f, e)]\}$ and $s^* = \{[U^{CW}(F,E) - U^{CbW}(F,E)] / [U^{CW}(f,e) - U^{CbW}(F,E)]\}$.

Proof: see Appendix.

The crucial implication of the two propositions is that, under incomplete information, the "weak" government can now try to take advantage of region's uncertainty by mimicking the "tough" type, since - if it can convince the region that it is "tough" - it might reach the first best equilibrium. Of course, the region anticipates this move, but at the equilibrium, it still expects with some positive probability the government to be "tough", and in some cases the region then responds optimally to a low level of financing with a low level of expenditure. Hence, the "weak" government can now achieve the first best equilibrium, while this was impossible under perfect information.

In terms of testable empirical predictions, the incomplete information version of the model offers a number of interesting suggestions. In particular, if we could convincingly argue that p – i.e. the ex ante credibility of the Central government's threat not to bail out in the future current regional deficits - changed along our sample period, the model would then offer the following testable implications. *First, coeteris paribus, it should be more likely to observe a low level of ex ante health financing when p is high than when p is low*. For instance, in case 2, under perfect information, the Central government immediately gives in and sets a high level of financing. On the contrary, in

the same case under incomplete information, the Central government sets a low level of ex ante financing with at least some positive probability, and this probability is increasing in p.[20] *Second, having observed a low level of ex ante financing*, *the region is more likely to react with a low level of expenditure, when p is high than when p is low.* In other words, when p is high, a low level of financing is a more reliable signal that the government is indeed "tough"; therefore, the region reacts by choosing a low level of financing. For example, in case 3 with perfect information, the government sets f at the beginning of the game, but the region does not believe the implied threat, and reacts by choosing a high level of expenditure. On the contrary, in the same case under incomplete information, upon observing f the region reacts by choosing a low level of expenditure, if p is sufficiently high[21].

4. The Empirical Analysis

4.1 Modelling bailing out expectations

A crucial problem for our analysis is to link the theoretical model with observable variables. In this respect, key to our argument is the role of p, the regional assessment of

[20] Recall from Proposition 2 that q^* is an increasing function of p, and $q^* = 1$ in the limiting case $p=p'$.

[21] In a repeated version of the game, one could also easily derive a further prediction. *If the region has observed a large amount of bailing out in the past by the Central government, it should rationally predict that the same government is weak with larger probability.* That is, after a massive bail out of past deficits by the *current* government who was in charge of the ordinary financing at the time the deficit was created, the ex ante reputation of this government (p in the model above) should be, *coeteris paribus*, lower. A problem with testing this implication in the Italian case is that it was never the case that the same

the "toughness" of central government. To explain why we believe regional expectations varied during the '90s, let us briefly recall some features of the Italian economic history. First, in 1992, the country faced a very severe financial crisis. The Italian currency went under attack by speculators, and - in spite of the effort of the Central bank - it was devaluated against the ECU and had to abandon the European system of fixed exchange rates. To avoid the risk of defaulting on public debt, the government introduced in 1992 the most severe fiscal crunch of the Italian history (5% of GDP). At the end of 1993, the Maastricht Treaty was finally approved, and all the main Italian political parties committed to join the EMU. Since 1994, Italy then began the long, painful, and eventually successful, fiscal adjustment process to meet the Maastricht requirements in 1997, the year which was set for the decision about the countries to be allowed in the EMU. In those years, many structural reforms were introduced to reach these aims. As the public health care sector is concerned, two basic reforms were implemented. Vertical imbalance at the regional level was reduced by providing regions with larger own resources, and this reduction was accompanied with the legal assignment of larger expenditure responsibility to regions, including an explicit legal obligation for complete regional responsibility for the new deficits created in managing the RHS [22].

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government was in charge of both ex-ante and ex-post financing; see the working paper version of this work for further comments.

[22] For example, the 1992 reform of the Italian NHS explicitly stated that "regions were to bear the financial consequences of supplying health care above nationally guaranteed uniform level, of setting up health units and beds above the national standards, and for the deficit of the Local Health Units".

We argue that these changes affected regional expectations in two ways. First, the *external constraints* imposed by the financial crisis and the Maastricht Treaty made it clear to all regions that the Central government was now more determined than in the past to impose them a strict budget constraint. Second, the mid-Nineties reforms also offered regions *more tools* to fulfil their financial obligations, hence further strengthening the Central government's commitment technology. We use several different proxies for capturing these changes on regional expectations: (a) a dummy "Euro" (DEUR), equal to 1 in 1997 (when EU countries were examined to define the first group of EMU participants) and 0 for all the remaining years in the sample; (b) an index of public budget tightness (PBT), measured by the ratio between the Italian Central government deficit and the average deficit at the EU level; (c) a time dummy for the adjustment period to Maastricht and the European rules on debt and deficit (DMAAS), equal to 1 from 1994 onwards; (d) the tax base of regional taxes (TAXBA), equal to: 0 till 1992; per capita labour incomes from 1993 to 1997 (the tax base of health care contributions, attributed to regions in 1993 and abolished in 1997); per capita value added from 1998 onwards (a proxy for the tax base of Irap, the new regional tax introduced in 1998); (e) a dummy variable for measuring the "political alignment" effect (DGOV), equal to 1 when coalitions in power at the local level and at the central level are the same.

Proxies (a) to (c) only vary across time, so that they affect all regions in the same way. This allows us to take into account measures introduced by the Central

government to control health expenditure *common to all Regions*.[23] Proxies (d) and (e) show instead variability both across time and across regions, so capturing *specific* effects on the single region[24]. The first three capture the strength of the external constraints: proxies (a) and (c) are obvious; the proxy (b) captures the fact that there was considerable uncertainty at the time about the harshness with which the Maastricht rules would have been implemented by the EU Commission. If all the main European countries had shown public finance data out of the mark with respect to the Maastricht targets, Italy could have reasonably hoped in an easing of the constraint on the deficit parameter. This justifies the inclusion of (b). Proxy (d) captures the different ability of regions to cope with financial problems by using their own tax resources, on the premise that richer regions have larger means to cover their deficits, and this may make more credible the threat by the central government not to rescue them (e.g. Rodden, 2002 and Von Hagen and Eichengreen, 1996). It is the same proxy used by Rodden (2000) for the German case, and it is one which has received considerable backing in the available empirical literature (see also Rodden, 2002, 2006). Finally, the proxy (e) summarises the effect on regional expectations of having a "friendly" Central government. The idea is that a Region may expect a more "benevolent" treatment, either ex-ante or ex-post, by a friendly government than by an adversary one. This is also a

[23] For instance, the introduction of co-payments for pharmaceuticals and some specific health care outpatient services.

[24] In the working paper version of this work, we also tried with different proxies, such as for example the size of regions (to understand whether a "too-big-to-fail" effect was at work) and other political variables. However, since their theoretical underpinnings in the soft budget constraint literature is less clear than the ones we selected and most coefficients were insignificant, we decided to drop them here.

dummy which has received some support in previous empirical studies (e.g. Rodden and Wibbels, 2002).

Notice that our way to capture bailout expectations differs from the one attempted in other works. In particular, Pettersson-Lidbom and Dahlberg (2003) (but also Levaggi and Zanola, 2003, analysing the Italian case), with reference to the dynamic structure implicit in any soft budget constraint problems, argue that the history of *past* bailing out should be the best predictor for expectations of *future* bailing out. However, this modelling strategy is clearly inappropriate in our case, as we want to model exactly the *shift* in expectations which occurred in the mid of the '90s as a result of the imposition of external constraints and several internal reforms, and this has clearly nothing to do with the history of previous bailing out[25].

4.2 The empirical strategy

As our simple model makes clear, the soft budget constraint problem is the result of a strategic game being played by several agents. Observed bailing out is then the equilibrium result of the strategic interaction of (at least) two agents, a giving organization and a receiving one, whose behaviour should then be explicitly modelled (Kornai *et al.*, 2003). Previous attempts to test soft budget constraints have avoided these problems, by focusing on the behaviour of the receiving organization only (e.g., Rodden, 2000 and Pettersson-Lidbom and Dahlberg, 2003). The simple dynamic

[25] Indeed, in testing the role of past bailing out interventions, we found that they do not affect the expenditure behaviour of the regional governments. See again the working paper version.

structure of the Italian system allows us to make some progress in this direction. We first test *Proposition 1* of our model, by checking if our proxies for all the changes in the institutional framework that occurred during the '90s (both time- and regional-varying) affected the financing decision of the central government. According to our story, in fact, even a "weak" government - by knowing the shift in expectations by regions - should be tempted to reduce financing in the first place. We then test *Proposition 2*, by checking how our proxies for bailout expectations, *conditional on financing*, affects regional expenditure. Our model in fact implies that regional expenditure should be affected more *tightly* by financing when the probability of the Central government being tough is high than when it is low, as regions should expect less bailing out in the future. We adopt different ways to test this idea. Since the hypothesis to be tested is a conditional one, a first method - that is gaining popularity in the political science literature - is to use a *multiplicative interaction model* (e.g., Brambor *et al.*, 2006), by simply interacting our proxies for *p* with funding[26]. We expect these interactions term to be "positive", meaning that the effect of financing on observed expenditure should be larger when regions expect the budget to be harder. One problem with this methodology however, is that, according to our own theoretical model, funding is not exogenous but it is itself influenced by expectations. Hence, this methodology might produce biased estimates. To cope with this, we then revert to an alternative methodology, *substituting* our estimates for "expected financing" in the

[26] We thank a referee for suggesting this strategy.

expenditure regression and checking the sign, the magnitude and the statistical significance of the coefficient. The basic idea is that it is funding conditional on regional expectations on *p* that should affect regional expenditure, rather than observed funding as such. However, this "Substitution Method" has its own drawbacks too. In particular, if the behavioural equation of the central government is not correctly specified, we may not make a correct inference on the causal relationship between expected financing and expenditure. A final alternative to overcome this problem is then to use Instrumental Variables to estimate the expenditure equation, at the cost of not modelling Central government behaviour explicitly[27]. An additional difficulty with the IV approach is that it needs good instruments. We argue below that our proxies for *p* may play this role, and as a final check for our theory we use them as instruments for detecting the direct effect of expectations on expenditure. The picture we obtain is fairly consistent across these three different methodologies, so providing separate and robust support to our explanation.

4.3 Data

Our empirical analysis is based on Italian regional public health care expenditure and funding over the years 1990-1999[28]. Data sources are described in detail in the

[27] See Pettersson-Lidbom and Dahlberg (2003), and Bordignon (2006) for further discussion.

[28] Since we have only a short time series (t=10) and a small cross-section (n=15), we could not test in our empirical analysis for the presence of unit root and cointegration. Standard unit root tests are only asymptotically valid and results heavily subject to test specification (Maddala and Kim, 1999; Karlsson and Löthgren, 2000; Gerdtham and Löthgren, 2000). It should also be noted that cointegration implies the

Appendix (Table A.2). All financial data are expressed in per capita terms and real 2000 terms by using a CPI index[29]. 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. On the contrary, ordinary funding per capita raised by 31% in real terms along the period, from 1.505 million lire in 1990 to 1.974 million lire in 1999. Average data for the period of interest are shown in Figure 1. The Figure makes it clear that following a common trend to all regions, both per capita real expenditure and real financing showed a reduction during the adjustment process, paired with an increase in the second half of the sample period. More importantly, the gap between expenditure and funding was almost entirely wiped out in 1995 and it started again to widen only after Italy gained admittance to the monetary union. Quite interestingly, the (rough) unconditional correlation between expenditure and funding is 0.86 during the period 1992-1996, when the adjustment process was more severe, and only 0.72 in the remaining years. In what follows, we test econometrically whether this holds true by controlling for all the variables that are likely to affect expenditure.

< figure 1 here >

idea of a long-run relationship between the variables under scrutiny, which is clearly inappropriate in our case. Expectations are indeed influenced by *short-run* variations in the proxies for *p*.

5. Results

5.1. Testing Proposition 1

We begin our empirical analysis by defining a model for ordinary (ex-ante) funding, which does not consider the proxy variables for expectations listed above. In this first attempt, we consider as regressors only the proportion of the population over age 65 (POP65), regional fixed effects (aimed at capturing historical differences in the level of expenditure across Regions), and year fixed effects[30]. As the age composition of the population was considered in the appropriation formula for ordinary funding only during the sub-periods 1990-1991 and 1997-1999, we define a dummy variable DAGE equal to 1 for these years, and equal to 0 for the sub-period 1992-1996. This is only a rough representation of the original formula, but it allows us to capture its main features[31]. Our "deterministic" model is represented by the following equation (1):

$$F_{it} = \sum_i \alpha_i + \sum_t \delta_t + \beta POP65_{it} DAGE_{it} + \varepsilon_{1,it} \qquad (1)$$

where F is health care funding and ε_1 is a disturbance term. Table 1 col. I collects our estimates. As expected, the share of the population over age 65 is an important

[29] A sector specific retail price index is unavailable. However, the use of a general CPI index is more appropriate for several reasons: most of the health care services are provided free of charge to citizens, and the biggest expenditure share (personnel costs) varies according to the CPI index.

[30] In fact, almost identical results we obtained from a model without regional fixed effects, considering a common constant term across regions (namely, funding per capita), historical expenditure (as to 1985, supposedly exogenous), and the proportion of the population over age 65.

determinant of regional funding during the 1990-1991 and 1997-1999 sub-periods. It guaranteed higher transfers to Regions with a higher proportion of people over age 65. Regional fixed effects are jointly significant, suggesting that structural differences in the historical level of expenditure were reflected in regional differences in funding. Year fixed effects are also jointly significant, but – more importantly – they show a lower magnitude starting from 1993 onwards, which hints at the role of an external enforcer in reducing funding to regions. However, the RESET test is significant, suggesting that the model is misspecified and that there are some important missing variables in this model, not captured by regional and year fixed effects only[32].

Almost identical results we obtain when considering, as a variation, the dependent variable as the *sum* of ex-ante and ex-post financing (table 1 col. IV). Indeed, our theoretical model suggests that expenditure today by regions should depend by financing today and expected future financing for today expenditure (i.e., bail outs). To check this, suppose for a moment that regional governments could perfectly forecast all future bail out interventions by the Central government. Total financing *TF* in year *t* could then be written as $TF_t = F_t + \Sigma_{t+n} BO_{t+n}(1+r)^{-n}$, where *F* is ex-ante financing, *BO* stands for bailout in some future years *t+n* of regional deficits realised in year *t*, and *(1+r)* is a discount factor[33]. Notice that, also in this case, coefficient on POP65 is

[31] The original formula accounted for health care consumption by age groups between 1985 and 1991, and from 1997 onwards. From 1997, it also included some indicators of health needs. For a more detailed description, see Bordignon *et al.* (2002).

[32] Throughout the paper, RESET test is conducted introducing $\hat{F}^2$. Introducing also $\hat{F}^3$ produces virtually identical results.

[33] We experimented with different discount rates *r*, obtaining virtually identical results.

positive (as expected) and statistically significant, regional fixed effects are jointly significant, year fixed effects show a lower magnitude from 1993, but RESET test is still significant.

< table 1 here >

We now argue that the variables that could be missing from both regressions are the structural changes in the Italian economic policy and institutional framework during the '90s. To test this idea, we now augment eq. (1) by including our proxies for changes in expectations. We first consider only time-varying proxies, and then add also proxies varying across regions. Notice that, as some of our variables show variability only across time, we do not include year fixed effects in our regressions[34]. Eq. (2) and (3) can then be written as:

$$F_{it} = \sum_i \alpha_i + \beta_1 POP65_{it}\, DAGE_{it} + \beta_2 DEUR_t + \beta_3 PBT_t + \beta_4 PBT_{t-1} + \\ + \beta_5 PBT_{t-2} + \beta_6 DMAAS_t + \varepsilon_{2,it} \tag{2}$$

$$F_{it} = \sum_i \alpha_i + \beta_1 POP65_{it}\, DAGE_{it} + \beta_2 DEUR_t + \beta_3 PBT_t + \beta_4 PBT_{t-1} + \beta_5 PBT_{t-2} + \\ + \beta_6 DMAAS_t + \beta_7 TAXBA_{it} + \beta_8 TAXBA_{it-1} + \beta_9 TAXBA_{it-2} + \beta_{10} DGOV_{it} + \varepsilon_{3,it} \tag{3}$$

[34] Indeed, as it is apparent from the definitions of our proxies for *p*, DEUR is simply a dummy for the year 1997, while DMAAS is a linear combination of year dummies.

As shown in table 1 col. II and III (for ex-ante financing) and col. V and VI (for total financing, both ex-ante and ex-post), all the new variables turn out to be strongly statistically significant and with the expected sign in both equations[35]. Notice also that RESET test detects again some sort of misspecification when considering time varying variables only as additional regressors; but the model turns out to be correctly specified when we consider *all* our proxies for Region's beliefs. Moreover, both PBT and TAXBA show a dynamic relationship with Central government financing, with coefficients on variables lagged one and two years being statistically significant. Unsurprisingly, given the evolution characterising our dependent variable, we observe a change in the sign of the coefficients on lagged variables. Still, looking at coefficients on PBT, an increase of 1% in the Italian deficit relative to EU average in year *t* decreases funding by about 20% in the long run, with the effect being more pronounced in year *t* and *t+1*. A much less important effect stems from TAXBA: increasing the tax base given to regions by about 10% brings about less than 1% change in financing. Finally, an economically important impact originates also from both the introduction of the Maastricht rules (-16% on funding) and from the "Euro" year (-15%).

While perhaps not surprising, these results are clearly consistent with our first theoretical prediction. The Central government – by knowing that it is now considered tougher by regions - has an incentive to cut down *planned* expenditure, and regions update their beliefs about the type of Central government on the bases of observed

[35] The only relevant exception is represented by the coefficient on DGOV.

funding. Indeed, our *a priori* are for all the coefficients to be negative in both equations. As the Maastricht requirements become more binding, Central government should be perceived as tougher (hence $\beta_6<0$), and this effect should be the more important the higher the Italian deficit with respect to the EU average (hence $\beta_3<0$), and the closer the deadline for the admission to the first stage of EMU (hence $\beta_2<0$). We have clear *a priori* on the TAXBA and the DGOV coefficients as well. For the first variable, an increase in the tax base given to regions should increase their ability to cope autonomously with their deficits, and this should make more credible for them the threat by Central government not to come in their rescue (hence $\beta_7<0$). For the second one, Arulampalan et al. (2008) account for a substantial empirical literature that tests this *"alignment effect"* using U.S. data, and provide new evidence using data from India, their results generally confirming that politically aligned local governments receive more funds than non-aligned constituencies (hence $\beta_{10}>0$)[36].

5.2.Testing Proposition 2

Consider next health expenditure. We divide our analysis in two parts: we first consider structural variables that previous empirical studies deem to be important determinants of health expenditure; we then test our second theoretical prediction, by considering the role of funding and regional bailout expectations. Beginning with the structural variables, and taking into account the result of the previous literature, we consider four

[36] On the effects of "co-partisanship" in federations see also Rodden and Wibbels (2002).

possible effects on expenditure: (a) a "demand effect", proxied by the proportion of the population over age 65 (POP65); (b) a "demand induction effect", determined by the number of physicians per 1000 inhabitants (PHYS); (c) a "supply effect", measured by the average number of beds per hospital (AVBEDS), a proxy for the economies of scale in producing health care services (see, e.g., Cellini *et al.*, 2000, for the Italian case); (d) an "income effect", proxied by GDP per capita (GDP)[37]. Hence, the general equation to be estimated is:

$$E_{it} = \sum_i \alpha_i + \sum_k \beta_k X_{kit} + \varepsilon_{4,it} \tag{4}$$

where the vector **X** includes all the four structural variables and ε_4 is a disturbance term. We add to the model also regional fixed effects and year effects. Our results are collected in table 2 col. I. After controlling for time and regional fixed effects, only coefficient on AVBEDS results statistically significant and with the expected sign. On the contrary, estimated coefficient for POP65, PHYS and GDP are not statistically significant[38]. Indeed, the F-test for the joint significance of structural variables shows a marginal role of these regressors in explaining expenditure. RESET test is not significant; however, as the funding formula was changed several times during the sample period, we checked for parameter stability using the dummy variable DAGE. Results for this augmented model are collected in the same table 2 col. II. As before, only the coefficient on AVBEDS is statistically significant and with the expected sign.

[37] Also notice that the income effect proxies for an "education effect", since income and education are highly correlated.

But now the F-test for the joint significance of structural variables fails to reject the null hypothesis, whilst RESET test is significant. Overall, these results seem then to suggest that, once we control for regional and year fixed effects, the role of structural variables is only marginal. Once again, year fixed effects are probably a (loose) proxy for the shift in expectations. We investigate on this point in what follows.

< table 2 here >

5.2.1. The role of expectations

In this section we test if bailing out expectations are the missing determinants of the expenditure equation. Our theoretical claim is that – after having observed a low level of funding – regions should be more likely to react with a low level of expenditure the higher *p*. To investigate this hypothesis, we begin by augmenting eq. (4) and by first considering as an additional regressor the actual level of financing *F*.[39] We estimate the following eq. (5):

$$E_{it} = \sum_i \alpha_i + \sum_k \beta_k X_{kit} + \delta_1 F_{it} + \delta_2 F_{it} DUP_{it} + \varepsilon_{5,it} \qquad (5)$$

[38] An impact statistically not significant of population ageing is found also in previous studies. See Barros (1998, p. 539).

[39] Previous empirical literature has already considered the role of funding. For instance, Di Matteo and Di Matteo (1998) found a positive impact of federal transfers on health expenditure in Canada, while a negative effect stemming from budgetary pressures is recorded by Barros (1998). However, both papers considered the entire public funding and did not explain why this variable should be included as a determinant of expenditure.

where DUP is a dummy variable equal to 1 from 1993 to 1997, and equal to 0 for the remaining years of our sample. Dummy variable *DUP* is introduced just to check for parameter stability during the years when the adjustment process was presumably more effective, following the financial crisis in 1992 till the admittance of Italy to the final stage of EMU in 1997 with the first group of countries.

Estimates of eq. (5) are collected in table 2, col. III and IV. As expected, the *F* coefficient is positive and statistically significant; however, it is not stable during our sample period, and it slightly decreases (but still remain positive) in the inner part of the '90s *when financing was reduced even in nominal terms*. More importantly, its magnitude is quite different (and lower) with respect to previous estimates available in the literature (e.g., Levaggi and Zanola, 2003, using Italian data relative to 1990-1993)[40]. Structural variables continue to play only a marginal role. Before going further, also notice that year fixed effects are probably collinear with the shift of regime, i.e. with the shift in the *F* coefficient in the central part of the '90s; this might be due to the fact that what really count in determining expenditure are the bailing out expectations measured by our proxies. We then drop year dummies in the analysis to follow.

[40] This result in itself hints at the role of bailout expectations. If the relationship between funding and expenditure were only due to a flypaper effect, there should be no reason for the observed change in the link between the two variables across the period.

In order to test Proposition 2, we begin with a multiplicative interaction model, i.e. we augment eq. (5) with interaction terms of financing and our proxies **Z** for expectations[41]:

$$E_{it} = \sum_i \alpha_i + \sum_k \beta_k X_{kit} + \delta_1 F_{it} + \sum_k \delta_k F_{it} Z_{kit} + \varepsilon_{6,it} \tag{6}$$

Estimates of eq. (6) are reported in table 2, col. V-VII. Most of the structural variables are now statistically significant and with the expected sign: GDP and PHYS show a positive coefficient, while AVBEDS keeps its negative sign. The coefficient on F slightly decreases with respect to estimates in col. III and IV. More importantly, coefficients of interacted terms are almost all statistically significant and with the expected signs. Coefficient on the interaction with DEUR is positive: it shows that in the crucial year for assessing Maastricht criteria, the link between expenditure and funding was the strongest. The same holds true for PBT: the tighter the central government budget, the stronger the correlation of funding with expenditure. This impact is illustrated clearly in Figure 2, which shows the marginal effect of funding on expenditure over the range of variation of PBT. The marginal effect $\partial E/\partial F$ and the 95% confidence interval are computed by holding constant at sample means all variables but PBT (which varies over its range), and by defining appropriate standard errors (e.g., Brambor *et al.,* 2005). Looking at regional-varying variables such as TAXBA, the impact of funding on expenditure is stronger in constituencies with a higher fiscal

[41] Notice that we did not included in our regression model the constitutive terms **Z**. As it will become clear below, *F* is strongly influenced by **Z**, and including these terms render coefficient on *F* insignificant. Results are available upon request from the authors.

autonomy. This is shown in Figure 3, which illustrates the marginal effect $\partial E/\partial F$ and the 95% confidence interval computed as before at sample means for all variables except TAXBA, with appropriate SE. Also in this case, marginal impact is larger the higher TAXBA.

< figure 2 and 3 here >

Interestingly, the coefficient on the interaction with DMAAS is negative: combined with F × PBT, this suggests that the EU rules were not important *per se*, but insofar as there was a substantial enforcement stemming from the conditions of central government finances. Finally, the coefficient on DGOV suggests that the "alignment effect" can work in two ways: on the one hand, as suggested by the literature, Central government increases transfers to "friendly" Regions; on the other hand, according to our results, "friendly" Regions reduce their expenditure more to balance their budget.

5.2.2. Tackling endogeneity: the Substitution and the IV method as robustness checks

As explained above, a possible objection to the previous results is that estimates of eq. (5) and (6) are likely to be biased, since financing is not exogenously given, but as suggested by our own theoretical model, depends on expectations. To overcome this endogeneity problem, we now substitute in eq. (5) actual funding F with the funding estimates $\hat{F}$ from eq. (2) and (3). Notice that $\hat{F}$ can be thought of as representing the

"expected" financing by Regions *given* changes in *p*, and this provides us with a further test for our second theoretical prediction: when *p* is larger, conditional on expected funding, regions should be more likely to react with a low level of expenditure[42]. The equation to be estimated then becomes:

$$E_{it} = \sum_i \alpha_i + \sum_k \beta_k X_{kit} + \delta_1 \hat{F}_{it} + \delta_2 \hat{F}_{it} DUP_{it} + \varepsilon_{7,it} \qquad (7)$$

Estimates are collected in table 2, col. VIII and X ($\hat{F}$ from eq. 2), and col. IX and XI ($\hat{F}$ from eq. 3). $\hat{F}$ coefficient shows again the expected positive sign and is statistically significant using both set of estimates, and considering both specifications of the funding equation. As before, the coefficient is not stable during the sample period; in particular, it slightly decreases from 1993 to 1997, but it still remains largely positive: it suggests that a 10% increase (decrease) in funding brings about roughly a 3% increase (decrease) in expenditure[43]. Note also that the RESET tests signal misspecification when financing is estimated by using *only* time varying proxies for changes in *p*. This suggests that beliefs *differed* among regions, and these differences were driven by variables such as TAXBA. Indeed, given *F*, a higher TAXBA is informative of a higher *p,* as according to theory, richer regions should expect less bailing out in the future. We finally augment again eq. (7) with the variable DGOV, the only one that can play a *direct* role on expenditure. Estimates of these augmented

[42] Our approach is close to Rodden (2000) that examines the impact of "expected" and "unexpected" revenues from the federal government on the regional expenditure in Germany, using an autoregressive forecasting model to estimate yearly expected values for revenues.

regressions are in table 2, col. XI to XV. The coefficient on DGOV turns out to be negative, as in the previous estimates, suggesting that friendly regions helped central government by reducing more their expenditure and balancing their budget.

< table 2 continued here >

As argued by Pettersson-Lidbom and Dahlberg (2003), one problem with the previous method is that if the equation for financing is not correctly specified, we may not make a correct inference on the causal relationship between expenditure and financing. They suggest a more traditional IV methodology instead. As a final robustness check for our results, we then revert to this methodology. We define two sets of instruments, namely our proxies for regional beliefs described above. 2SLS estimates of eq. (6) are reported in table 3, col. I to IV. Estimates of the $\hat{F}$ coefficients are very close to those reported in table 2[44]; as before, coefficients remain positive even in the inner part of the '90s. Among structural variables, only coefficients on POP65 and AVBEDS appear statistically significant and close in magnitude to estimates in table 2.

Of course, when using the IV methodology, one needs to check for instrument exogeneity and for instrument relevance. Beginning with the latter, we follow Staiger

[43] The coefficient may appear low, but recall that we are controlling here for regional fixed effects. Besides, as we have already noted, during our sample period, financing increased by 31% and expenditure only by 7%.

[44] Notice that adjusted R^2 of the first stage regression of all predetermined variables on financing is close to 90% in the more complete version of our model. It is then not surprising that using IV Method, the Substitution Method or actual values for financing produce very similar results.

and Stock (1997), and check the joint significance of the set of instruments in the first stage regression. Table 3, col. V to VIII, collects regressions of the endogenous variables F on the set of all predetermined variables. The relevant F-statistics reported in the table are largely above the value of 10, allowing us to conclude that our instruments do play an important role in explaining financing. As for exogeneity, it should be clear from our discussion above that there is no causal relationship between regional expenditure and our proxies for regional beliefs. The external constraints imposed by the Maastricht Treaty and the Stability and Growth Pact directly affected the Central government *only*, and had no *direct* bearing on regional governments[45]. Indeed, it would be very hard to explain the observed relationship between regional expenditure and our proxies without an expectation story. External variables affected regional expenditure through their effects on regional beliefs about the likelihood of future bail-outs.

< table 3 here >

6. Concluding remarks

This paper offers two main contributions. The first is to the huge empirical literature on health care expenditure. Several papers (e.g., Gerdtham and Jönsson, 2000, and Gerdtham and Loethgren, 2000, for OECD countries; Giannoni and Hitiris, 2002, for the Italian case) emphasise the role of GDP and other structural variables as the main

[45] Interestingly, an Internal Stability and Growth Pact for Regions (introducing sanctions for local

determinants of health expenditure across countries (or across regions), but as Culyer (1988) puts it, all these models are probably misspecified, because they do not consider the public budget mechanism used to finance health care (for an early exception see Di Matteo and Di Matteo (1998) on Canadian Provinces, and Levaggi and Zanola (2003) on Italian Regions). We point out that health expenditure is generally the result of the behaviour of several layers of government, whose strategic interactions should therefore be considered in the analysis, and answer Culyer's critique by explicitly considering the role of Central government financing in our analysis of the evolution of the health care sector in Italy during the '90s.

The second contribution is to the growing literature on soft budget constraints. This is a field where we suspect a lot, but where convincing evidence is hard to come by, because one of its key elements - bailing out *expectations* - cannot be directly observed. We consider a specific case study, the Italian adjustment process in the health sector in the '90s induced by an external enforcer (the European Commission for the admission to the EMU), to highlight the role of bailing out expectations in determining regional expenditure. Improving on existing literature, we attempt to test explicitly the effect of expectations on both sides of the market, the giving institution (the Central government) and the receiving one (the Regions). Our results provide support to the bailing out story. First, financing is influenced by variables that may be interpreted as capturing changes in bailing out expectations, and all these variables turn out to have

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governments not fulfilling the given targets) was only introduced in 2000.

the expected sign. Second, by using different econometric techniques (a multiplicative interaction model, the Substitution Method and the IV Method), we show that the link between ex ante funding and expenditure is stronger when regional expectations of future bailing out are lower. Finally, we also confirmed some previous theoretical and empirical studies, by showing that more autonomous regions had lower expectations for future bailing out and that a political "alignment effect" was at work in determining local behaviour.

Our results are of course specific to the peculiar institutional framework of Italy in the '90s. Institutional variation across countries is so large to warn one from easy generalizations. But our results at least suggest that there may be a lot to learn by explicitly considering intergovernmental relationships in explaining the evolution of key items of public expenditure, when these are the result of the interaction of different levels of government. On these grounds, it should also be noted that the current decentralisation process in Europe (in countries such as France, Spain, Belgium) is taking place in highly sensitive political fields (education, health, social welfare) and with very little backing of autonomous tax resources at the local level (Bordignon, 2006). To the extent that our results for the Italian case can be extended to these different countries, one should then worry about the possibility of a spreading out of the soft budget constraint disease.

Appendix: The Bailing Out Game with Incomplete Information

The game is solved by backward induction. Recall that if the central government sets *F* in the first period, then region can only set *E* by assumption and the game ends. If the central government sets *f* in the first period, and the region reacts by setting *e*, the game is also finished. Thus we have to consider only the case where the central government sets *f* in the first period, and the region reacts by setting *E*. In this case, in the final period, given our assumptions on both types of governments' payoffs, the tough government's best strategy is to play "not bailing out", while the weak government's best strategy is to play "bailing out". The final outcome will then be *(f,E)* in the first case and *(F, E)* in the second case, with the associated payoffs of agents.

Having solved the last stage, let us then move back to the first period and study the optimal strategies of the two types of central government. Consider first the tough type. For this type, setting *F* in period 1 is a dominated strategy; whatever the beliefs of the region, if the central government sets *F,* the region can only respond with *E* and for the tough type this outcome is worse with respect to any other alternatives: $U^{CT}(f,e) > U^{CT}(f,E) > U^{CT}(F,E) > U^{CbT}(F,E)$. Hence, the tough type certainly plays *f* in the first period.

Consider now the weak type. We take into account both the case (i) $U^{CbW}(F,E) > U^{CW}(F,E)$ and the case (ii) $U^{CbW}(F,E) < U^{CW}(F,E)$. Look first at (i). In this case, it is easy to see that setting *F* in period 1 is a dominated strategy for the weak type too; for if the central government sets *F,* region can only respond with *E* by assumption, and

whatever the beliefs of the region upon observing *f*, even in the worst possible case where region reacts by setting up *E*, the weak government is better off than giving in immediately: $U^{CbW}(F,E) > U^{CW}(F,E)$. We can then state the following:

PROPOSITION 1 Suppose it is commonly known that $U^{CbW}(F,E) > U^{CW}(F,E)$. Than both types of government sets *f* in the first period, and the region chooses *E* if $p<p'$, chooses *e* if $p>p'$ and is indifferent between *E* and *e* if $p=p'$, where $p' = [(U^{Rb}(F, E) - U^{R}(f,e)) / (U^{Rb}(F, E) - U^{R}(f,E))]<1$.

Proof 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*. Thus, it will choose *E* if $pU^{R}(f,E) + (1-p)\, U^{Rb}(F, E) > U^{R}(f, e)$ and *e* if the inequality is reversed. Solving the above equation for the value of *p* at which the region is indifferent, *p'*, we prove the proposition.

Consider next the case (ii) $U^{CbW}(F,E) < U^{CW}(F,E)$. In this situation, under complete information, the central government would simply give in immediately, setting up a high level of financing. Under incomplete information, however, the weak government can now try to take advantage of region's uncertainty and mimic the "tough" type, as if he can convince the region that is "tough", it might then get to the first best equilibrium.

Formally, let us then define a *separating equilibrium* (in pure strategies) as an equilibrium where each type plays in the first period a different optimal strategy, and a *pooling equilibrium*, as an equilibrium where both types play the same strategy in the first period. We begin by establishing the following:

LEMMA 1 Suppose it is commonly known that $U^{CbW}(F,E) < U^{CW}(F,E)$. Then, there is no separating equilibrium in pure strategies in our game.

Proof At the separating equilibrium, the weak type of government plays *F* and the tough type plays *f* in the first period. Given these equilibrium strategies, the region then rationally concludes that if the government plays *F* is of the weak type and reacts by setting *E*, while if the government plays *f* is of the tough type, and reacts by setting *e*. However, this cannot be an equilibrium. Given these posterior beliefs of the region at the proposed optimal strategies for the two types, the weak government would always be better off by playing *f* in the first period and having the region to answer surely with *e*: $U^{CW}(F,E) < U^{CW}(f,e)$. This is an optimal deviation for the weak type which breaks the separating equilibrium.

Thus, in our game, the weak government always finds it convenient to try to mimic the tough government. To see when this pooling behaviour can be supported in equilibrium, note that in our model it seems reasonable to assume the following. Since the tough type

will never play *F* in the first period out of dominance, while the weak type could play *F* under some solutions of the game, we assume that if the region observes in the first period that *F* is played, it rationally concludes that this move can only come from a weak government. Under this restriction on the region's out-of-equilibrium beliefs (with respect to the pooling equilibrium strategies), it is immediate to prove:

LEMMA 2 Suppose it is commonly known that $U^{CbW}(F,E) < U^{CW}(F,E)$. Then, under our above assumption on out-of-equilibrium beliefs, for $p \geq p'$ there exists a unique pooling equilibrium in pure strategies. At this equilibrium, both types of government choose *f* in the first period, and the region optimally selects *e* in the second period.

Proof At the pooling equilibrium strategies for the two types, both types of government plays *f* in the first period. Hence, the posterior of the region equals the *a priori* and for $p \geq p'$ the optimal reaction of the region is to set *e*. Note that this is an equilibrium; the tough government always plays *f* by dominance, and under our assumption on out-of-equilibrium beliefs, if the weak government deviates and sets *F* in the first period, region selects *E* and this outcome is worse for the weak government than the equilibrium outcome.

Hence, if *p* is sufficiently high, the weak government can successfully imitate the tough government. Although the region expects this, the probability that the government is

tough is too large for the region to be willing to run the risk of deviating and selecting a high level of expenditure. On the other hand, if p is lower than the threshold level p', the pooling equilibrium in pure strategies cannot be sustained. The region would expect the choice of f to come from a weak government with higher probability and would then rationally react by choosing E; expecting this, the weak government would then be better off by choosing F immediately. On the other hand, the resulting separating equilibrium in pure strategies could also not be sustainable, as we proved above, as at the separating posterior equilibrium beliefs, the weak government would always be better off by mimicking the tough type. The solution is then to look for mixed strategies equilibria, that is to equilibria where the weak government plays f with some equilibrium probability and region reacts by selecting e with some other equilibrium probability. The next proposition describes this equilibrium.

LEMMA 3 Suppose it is commonly known that $U^{CbW}(F,E) < U^{CW}(F,E)$. Then, under our assumption above on out-of-equilibrium beliefs, for $p<p'$ there exists a unique pooling equilibrium in mixed strategies. At this equilibrium, in the first period, the tough government always chooses f, and the weak government chooses f with probability q^* and F with probability $1- q^*$. The region, upon observing F chooses E, and upon observing f selects e in the second period with probability s^* and E with probability $1-$ s*. Equilibrium beliefs of the region are such that upon observing F it assigns zero probability to the government being of the tough type, and upon observing f it assigns

probability $p°(q^*) \equiv (p/(p+(1-p)q^*))$ to the government being of the tough type. Finally, $q^* = \{p[U^R(f, e)-U^R(f, E)]/(1-p)[U^{Rb}(F, E)-U^R(f, e)]\}$ and $s^* = \{[U^{CW}(F,E) - U^{CbW}(F,E)] /[U^{CW}(f ,e)- U^{CbW}(F,E)]\}$.

Proof Suppose the region expects the weak government to play f in the first period with probability q. The tough government always plays f by dominance. Then, by Bayes rule, upon observing f in the first period, the region concludes that with probability $p°(q) \equiv [p/(p+(1-p)q)]$ the government is tough. The region will then be indifferent between playing e or E upon observing f if $p°(q^*)\ U^R(f, E) + (1-p°(q^*))\ U^{Rb}(F, E) = U^R(f, e)$. Substituting for $p°(q)$ and solving for q, this gives q^*. 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: $U^{CW}(F,E) = (1\text{-}s^*)\ U^{CbW}(F,E) + s^*\ U^{CW}(f ,e)$. Note that the proposed strategies and beliefs indeed constitute a Perfect Bayesian equilibrium; by construction, there is no other strategies that would make any agent better off, given the strategies played by the other agents, and the beliefs of region are derived by using Bayes rule given the equilibrium strategies of the two types of government. Finally, note that this equilibrium is also unique, as we have shown that for $p<p'$ there is neither a separating nor a pooling equilibrium in pure strategies.

Finally, combining lemmas 1 to 3, we get Proposition 3 in the main text.

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Figure 1. Health care expenditure and funding (per capita, mln ITL, real 2000 terms)

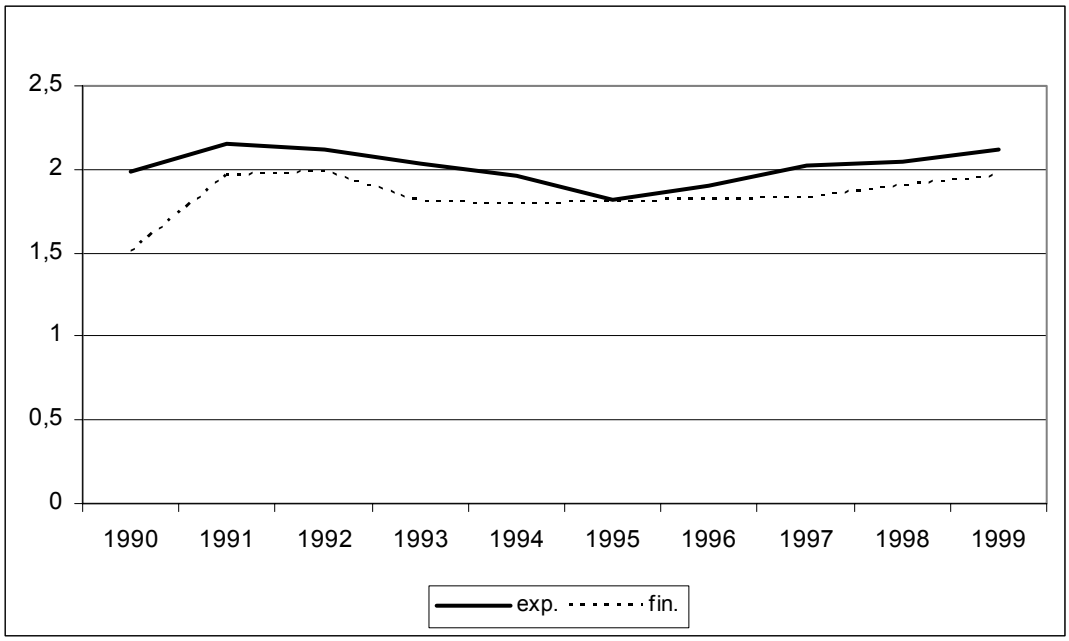
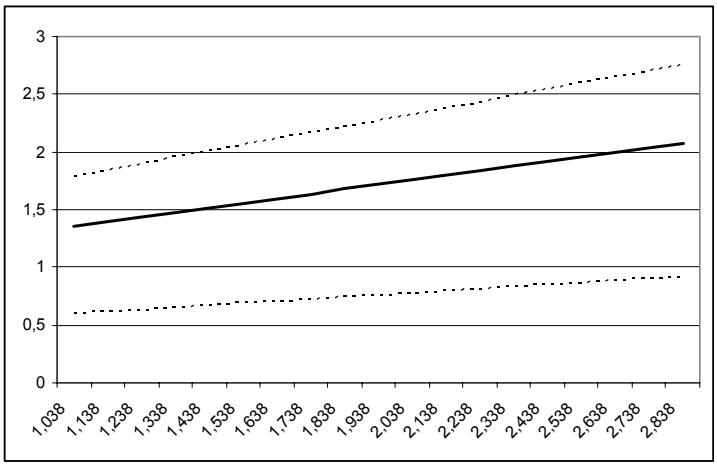


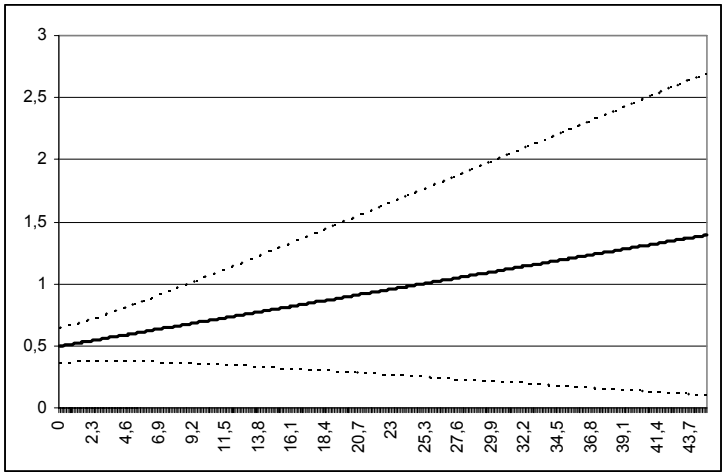
Figure 2. Marginal effect of funding on expenditure over the observed range of variation of PBT



Note: computed at sample means for all variables except PBT;

95% confidence interval defined by using appropriate SE

Figure 3. Marginal effect of funding on expenditure over the observed range of variation of TAXBA



Note: computed at sample means for all variables except TAXBA;

95% confidence interval defined by using appropriate SE

Table 1. Funding

	only ex-ante			*both ex-ante and ex-post (§)*		
	I	***II***	***III***	***IV***	***V***	***VI***
POP65 x DAGE	0.008***	0.005***	0.006***	0.008***	0.005***	0.006***
	(0.002)	(0.001)	(0.001)	(0.002)	(0.001)	(0.001)
D91	0.458***	-	-	0.458***	-	-
	(0.015)	-	-	(0.015)	-	-
D92	0.589***	-	-	0.590***	-	-
	(0.029)	-	-	(0.029)	-	-
D93	0.399***	-	-	0.400***	-	-
	(0.032)	-	-	(0.032)	-	-
D94	0.396***	-	-	0.398***	-	-
	(0.032)	-	-	(0.033)	-	-
D95	0.426***	-	-	0.441***	-	-
	(0.032)	-	-	(0.032)	-	-
D96	0.416***	-	-	0.431***	-	-
	(0.033)	-	-	(0.033)	-	-
D97	0.281***	-	-	0.296***	-	-
	(0.016)	-	-	(0.015)	-	-
D98	0.367***	-	-	0.383***	-	-
	(0.016)	-	-	(0.016)	-	-
D99	0.448***	-	-	0.466***	-	-
	(0.017)	-	-	(0.016)	-	-
DEUR	-	-0.163***	-0.247***	-	-0.172***	-0.237***
	-	(0.022)	(0.038)	-	(0.023)	(0.039)
PBT t	-	-0.199***	-0.300***	-	-0.211***	-0.295***
	-	(0.027)	(0.025)	-	(0.027)	(0.026)
PBT t-1	-	-0.187***	-0.322***	-	-0.182***	-0.321***
	-	(0.016)	(0.021)	-	(0.016)	(0.021)
PBT t-2	-	0.139***	0.273***	-	0.134***	0.277***
	-	(0.010)	(0.029)	-	(0.010)	(0.029)
DMAAS	-	-0.109***	-0.257***	-	-0.103***	-0.258***
	-	(0.020)	(0.014)	-	(0.020)	(0.015)
TAXBA t	-	-	-0.013***	-	-	-0.013***
	-	-	(0.002)	-	-	(0.002)
TAXBA t-1	-	-	0.019***	-	-	0.019***
	-	-	(0.001)	-	-	(0.001)
TAXBA t-2	-	-	0.005***	-	-	0.007***
	-	-	(0.001)	-	-	(0.001)
DGOV	-	-	-0.007	-	-	-0.014
	-	-	(0.016)	-	-	(0.016)
Regional fixed effects	yes	yes	yes	yes	yes	yes
Nr. Obs.	150	150	150	150	150	150
R-sq.	0.96	0.72	0.91	0.97	0.74	0.92
Adj. R-sq.	0.96	0.67	0.90	0.96	0.70	0.91
Model F-test	138.07 [0.00]	16.23 [0.00]	55.31 [0.00]	151.78 [0.00]	18.45 [0.00]	62.52 [0.00]
F-test regional effects	294.03 [0.00]	53.35 [0.00]	60.66 [0.00]	316.06 [0.00]	57.48 [0.00]	65.86 [0.00]
F-test year effects	203.93 [0.00]	-	-	207.45 [0.00]	-	-
RESET test	9.25 [0.00]	15.08 [0.00]	2.01 [0.16]	8.28 [0.00]	14.25 [0.00]	1.33 [0.25]

OLS; Beck and Katz (1995) panel corrected SE in parentheses; p-values in square brackets

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

(§) Discount rate for bailouts 5%; alternative rates produced virtually identical results

Table 2. Expenditure

	only structural		*actual funding*				
	I	***II***	***III***	***IV***	***V***	***VI***	***VII***
POP65	-0.001	-0.001	-0.002	-0.011**	-0.003	-0.001	-0.006
	(0.005)	(0.004)	(0.004)	(0.005)	(0.004)	(0.004)	(0.004)
GDP	0.011	0.011	0.010	0.005	0.029***	0.030***	0.028***
	(0.011)	(0.011)	(0.010)	(0.005)	(0.008)	(0.011)	(0.009)
PHYS	0.032	0.046	0.038	0.016	0.097***	0.112***	0.091***
	(0.033)	(0.033)	(0.030)	(0.030)	(0.030)	(0.032)	(0.030)
AVBEDS	-0.0005**	-0.0006**	-0.0006**	-0.0006**	-0.0006***	-0.0004**	-0.0004**
	(0.0002)	(0.0003)	(0.0002)	(0.0003)	(0.0002)	(0.0002)	(0.0002)
POP65 x DAGE	-	-0.0005	-	-	-	-	-
	-	(0.002)	-	-	-	-	-
GDP x DAGE	-	-0.0003	-	-	-	-	-
	-	(0.002)	-	-	-	-	-
PHYS x DAGE	-	-0.035	-	-	-	-	-
	-	(0.042)	-	-	-	-	-
AVBEDS x DAGE	-	0.0002	-	-	-	-	-
	-	(0.0003)	-	-	-	-	-
F	-	-	0.372***	0.317***	0.288***	0.342***	0.289***
	-	-	(0.128)	(0.035)	(0.059)	(0.083)	(0.077)
F x DUP	-	-	-0.023	-0.075***	-	-	-
	-	-	(0.072)	(0.005)	-	-	-
F x DEUR	-	-	-	-	0.166***	0.158***	0.156***
	-	-	-	-	(0.024)	(0.026)	(0.022)
F x PBT t	-	-	-	-	0.223***	0.189***	0.178***
	-	-	-	-	(0.033)	(0.038)	(0.034)
F x PBT t-1	-	-	-	-	-0.110***	-0.034	-0.046*
	-	-	-	-	(0.013)	(0.026)	(0.025)
F x PBT t-2	-	-	-	-	-0.022	-0.040*	-0.022
	-	-	-	-	(0.015)	(0.024)	(0.022)
Fx DMAAS	-	-	-	-	-0.132***	-0.078***	-0.085***
	-	-	-	-	(0.009)	(0.017)	(0.017)
F x TAXBA t	-	-	-	-	-	0.002**	0.002***
	-	-	-	-	-	(0.001)	(0.0009)
F x TAXBA t-1	-	-	-	-	-	-0.002	-0.001
	-	-	-	-	-	(0.001)	(0.001)
F x TAXBA t-2	-	-	-	-	-	-0.006***	-0.004***
	-	-	-	-	-	(0.002)	(0.002)
DGOV	-	-	-	-	-	-	-0.056***
	-	-	-	-	-	-	(0.016)
Regional fixed effects	yes	yes	yes	yes	yes	yes	yes
Year fixed effects	yes	yes	yes	no	no	no	no
Nr. Obs.	150	150	150	150	150	150	150
Adj. R-sq.	0.91	0.91	0.92	0.83	0.90	0.91	0.92
Model F-test	57.97 [0.00]	49.66 [0.00]	56.67 [0.00]	38.12 [0.00]	55.88 [0.00]	57.07 [0.00]	61.56 [0.00]
F-test reg. dummies	69.96 [0.00]	43.99 [0.00]	6.87 [0.00]	15.94 [0.00]	9.96 [0.00]	6.24 [0.00]	7.87 [0.00]
F-test year dummies	41.81 [0.00]	29.30 [0.00]	15.02 [0.00]	-	-	-	-
F-test structural vbs.	2.13 [0.08]	1.28 [0.26]	2.69 [0.03]	2.93 [0.02]	9.45 [0.00]	8.26 [0.00]	7.47 [0.00]
RESET test	0.91 [0.34]	3.25 [0.07]	0.12 [0.73]	1.09 [0.30]	1.17 [0.28]	1.63 [0.20]	6.01 [0.02]

OLS; Beck and Katz (1995) panel corrected SE in parentheses; p-values in square brackets

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

Table 2. Expenditure (contd.)

	expected funding only ex-ante		*expected funding both ex-ante and ex-post (§)*		*expected funding only ex-ante*		*expected funding both ex-ante and ex-post (§)*	
	VIII	***IX***	***X***	***XI***	***XII***	***XIII***	***XIV***	***XV***
POP65	-0.010*	-0.011**	-0.010*	-0.011**	-0.015***	-0.016***	-0.015***	-0.016***
	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
GDP	0.006	0.005	0.006	0.004	0.010*	0.008	0.009	0.007
	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.005)	(0.006)	(0.005)
PHYS	0.002	-0.004	-0.0001	-0.007	-0.006	-0.011	-0.008	-0.014
	(0.035)	(0.033)	(0.035)	(0.033)	(0.034)	(0.031)	(0.034)	(0.031)
AVBEDS	-0.0006**	-0.0006**	-0.0006**	-0.0006**	-0.0004	-0.0004	-0.0004	-0.0004
	(0.0003)	(0.0003)	(0.0003)	(0.0003)	(0.0003)	(0.0003)	(0.0003)	(0.0003)
F^	0.337***	0.360***	0.326***	0.356***	0.342***	0.365***	0.331***	0.357***
	(0.083)	(0.048)	(0.085)	(0.049)	(0.071)	(0.046)	(0.073)	(0.047)
F^ x DUP	-0.080***	-0.076***	-0.079***	-0.074***	-0.077***	-0.073***	-0.076***	-0.072***
	(0.006)	(0.005)	(0.006)	(0.005)	(0.006)	(0.004)	(0.005)	(0.004)
DGOV	-	-	-	-	-0.068***	-0.069***	-0.068***	-0.067***
	-	-	-	-	(0.022)	(0.022)	(0.023)	(0.022)
Regional fixed effects	yes	yes	yes	yes	yes	yes	yes	yes
Year fixed effects	no	no	no	no	no	no	no	no
Nr. Obs.	150	150	150	150	150	150	150	150
Adj. R-sq.	0.81	0.83	0.81	0.83	0.83	0.85	0.82	0.85
Model F-test	33.23 [0.00]	38.52 [0.00]	32.92 [0.00]	38.13 [0.00]	34.54 [0.00]	40.56 [0.00]	34.17 [0.00]	39.92 [0.00]
F-test reg. dummies	9.58 [0.00]	14.67 [0.00]	9.05 [0.00]	14.18 [0.00]	11.00 [0.00]	16.70 [0.00]	10.42 [0.00]	16.07 [0.00]
F-test structural vbs.	2.24 [0.07]	2.93 [0.02]	2.33 [0.06]	3.18 [0.02]	3.37 [0.01]	4.37 [0.00]	3.45 [0.01]	4.57 [0.00]
RESET test	16.18 [0.00]	1.83 [0.18]	18.38 [0.00]	2.24 [0.14]	16.05 [0.00]	1.90 [0.17]	16.78 [0.00]	2.01 [0.16]

OLS; Beck and Katz (1995) panel corrected SE in parentheses; p-values in square brackets

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

Col. VIII, X, XII and XIV: estimated funding obtained using only time varying vbs.; col. IX, XI, XIII and XV: using vbs. varying both across time and regions

(§) Discount rate for bailouts 5%; alternative rates produced virtually identical results

Table 3. Reduced form estimates

	Dep. Vb.: expenditure				*Dep. Vb.: funding*			
	actual funding only ex-ante		*actual funding both ex-ante and ex-post (§)*		*actual funding only ex-ante*		*actual funding both ex-ante and ex-post (§)*	
	I	***II***	***III***	***IV***	***V***	***VI***	***VII***	***VIII***
POP65	-0.008**	-0.009**	-0.008**	-0.009**	0.002	-0.002	0.003	-0.002
	(0.004)	(0.004)	(0.004)	(0.004)	(0.005)	(0.003)	(0.005)	(0.003)
GDP	0.003	0.003	0.001	0.002	0.037***	0.009	0.040***	0.009
	(0.006)	(0.005)	(0.006)	(0.005)	(0.008)	(0.008)	(0.008)	(0.008)
PHYS	0.014	0.015	0.010	0.011	0.023	-0.043	0.033	-0.041
	(0.034)	(0.033)	(0.034)	(0.033)	(0.042)	(0.031)	(0.042)	(0.030)
AVBEDS	-0.0007***	-0.0007**	-0.0007**	-0.0007**	0.0002	-0.00003	0.0002	-0.00009
	(0.0003)	(0.0003)	(0.0003)	(0.0003)	(0.0003)	(0.0002)	(0.0003)	(0.0002)
F	0.348***	0.349***	0.348***	0.344***	-	-	-	-
	(0.081)	(0.061)	(0.083)	(0.061)	-	-	-	-
F x DUP	-0.092***	-0.084***	-0.090***	-0.082***	-	-	-	-
	(0.009)	(0.009)	(0.009)	(0.009)	-	-	-	-
PBT t	-	-	-	-	-0.172**	-0.224***	-0.181**	-0.223***
	-	-	-	-	(0.082)	(0.059)	(0.082)	(0.058)
PBT t-1	-	-	-	-	-0.135**	-0.274***	-0.125**	-0.274***
	-	-	-	-	(0.060)	(0.045)	(0.060)	(0.045)
PBT t-2	-	-	-	-	0.177***	0.341***	0.174***	0.343***
	-	-	-	-	(0.032)	(0.028)	(0.032)	(0.028)
DEUR	-	-	-	-	-0.132**	-0.093**	-0.139**	-0.090**
	-	-	-	-	(0.063)	(0.044)	(0.063)	(0.043)
DMAAS	-	-	-	-	-0.113***	-0.238***	-0.108***	-0.238***
	-	-	-	-	(0.038)	(0.030)	(0.038)	(0.030)
TAXBA t	-	-	-	-	-	-0.007***	-	-0.007***
	-	-	-	-	-	(0.001)	-	(0.001)
TAXBA t-1	-	-	-	-	-	0.019***	-	0.019***
	-	-	-	-	-	(0.001)	-	(0.001)
TAXBA t-2	-	-	-	-	-	0.008**	-	0.009***
	-	-	-	-	-	(0.003)	-	(0.003)
DGOV	-	-	-	-	-	-0.027*	-	-0.032**
	-	-	-	-	-	(0.015)	-	(0.015)
Regional fixed effects	yes	yes	yes	yes	yes	yes	yes	yes
Year fixed effects	no	no	no	no	no	no	no	no
Nr. Obs.	150	150	150	150	150	150	150	150
Adj. R-sq.	0.83	0.83	0.83	0.83	0.69	0.88	0.73	0.89
Model F-test	-	-	-	-	15.64 [0.00]	40.81 [0.00]	18.08 [0.00]	46.97 [0.00]
F-test instruments relev.	-	-	-	-	20.83 [0.00]	50.88 [0.00]	20.32 [0.00]	51.32 [0.00]

Col. I-IV: 2SLS estimates. Instruments col. I and III: DEUR, DMAAS, PBT t, PBT t-1, PBT t-2. Instruments col. II and IV: all previous, TAXBA t, TAXBA t-1, TAXBA t-2, DGOV

Col. V-VIII: OLS estimates. Robust SE in parentheses; p-values in square brackets.

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

(§) Discount rate for bailouts 5%; alternative rates produced virtually identical results

Appendix

Table A.1. Bailing out of regional past deficits (current mln lire, per capita)

Regions	Additional deficits till 1994			Deficits from 1995 till 1999			Deficit 2000/01	
	L. 21/97	*Further deficits Dec. 1998*	*Deficit not bailed out (%)*	*95/97*	*98/99*	*Deficit not bailed out (%)*		*Deficit not bailed out (%)*
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Piemonte	0,00	0,00	0,00	95,46	141,84	55,45	155,72	84,11
Lombardia	40,86	1,02	-4,95	135,72	109,39	50,94	62,88	61,47
Veneto	76,59	5,39	11,19	98,75	112,74	44,60	126,52	81,11
Liguria	186,55	18,03	23,02	214,11	38,23	34,57	44,83	45,29
Emilia Romagna	188,79	14,04	20,31	253,83	106,36	47,19	41,79	42,82
Toscana	122,13	10,01	19,62	119,25	112,94	40,77	23,37	-8,62
Umbria	103,04	-14,63	-7,73	18,41	65,28	8,41	18,41	-33,33
Marche	138,02	-4,53	5,67	194,75	230,82	56,08	196,75	87,10
Lazio	245,67	24,44	22,69	297,38	282,06	53,31	273,25	91,49
Abruzzo	20,74	-4,75	-89,96	57,66	162,67	56,41	70,26	63,59
Molise	38,09	3,31	2,70	-12,10	9,08	-2049,00	149,78	82,83
Campania	193,27	4,94	16,71	62,42	161,56	36,82	226,39	89,04
Puglia	59,64	54,92	40,75	31,47	136,45	33,36	138,47	82,09
Basilicata	0,00	0,00	0,00	-37,10	44,17	-577,49	64,49	56,16
Calabria	116,30	25,00	29,40	53,59	127,37	26,81	181,73	85,47
TOTALE	113,14	11,27	17,77	134,18	140,62	52,56	149,55	82,26

Source: our calculations based on data provided by Ministero della Salute and Conferenza Stato-Regioni

(3) (6) (8) Percentage of past deficits not bailed out by central government; when negative the region received more funds than the original deficit

(3) Bailing out partly occurred in 1997, 1998, 1999, 2001 and 2002

(6) Bailing out partly occurred in 1999, 2001, 2002

(8) Bailing out occurred in 2000

Table A.2. Variables sources and definitions

Expenditure	Regional health care expenditure per capita, mln lire, real 2000 terms *Source: SANITEIA - Min. Bilancio e Tesoro*
Funding	Regional health care financing per capita, mln lire, real 2000 terms *Source: SANITEIA - Min. Bilancio e Tesoro*
GDP	Regional GDP per capita, mln lire, real 2000 terms *Source: ISTAT - Annuario Statistico*
POP65	Share of persons older than 65 out of the total regional population *Source: ISTAT - Annuario Statistico*
PHYS	Nr. of physicians per 1000 inhab. within each region *Source: ISTAT - Annuario Statistico*
AVBEDS	Average nr. beds per hospital within each region *Source: ISTAT - Annuario Statistico*
DGOV	Dummy = 1 if parties in power at the regional level and at the central level are the same
DEUR	Dummy = 1 for 1997
PBT	Index of public budget tightness calculated as "Italian deficit / Av. Deficit EU (incl. Italy)" *Source: Banca d'Italia - Supplemento al Bollettino Statistico*
DMAAS	Dummy = 1 from 1994 to 1999
DAGE	Dummy = 1 when allocation formula corrects for the age compostion of the population
TAXBA	Proxy of the tax base of regional taxes