BAILING OUT EXPECTATIONS AND HEALTH EXPENDITURE IN ITALY

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Abstract

In this paper we propose a simple model of bailing out that closely describes the intergovernmental relationships between the Central government and the regional governments in the Italian public health care sector. The theoretical model suggests that bail out expectations by regions can be thought as the missing variable emphasised by Culyer (1988) in empirical models explaining health expenditure. We test this prediction by using data on regional health expenditure during the years 1990-1999. We show that financing by regions is influenced by political variables that capture changes in bail out expectations. This "expected" funding has a positive relationship with expenditure, even when Central government decreased financing to regions. Moreover, the "alignment effect" shows that "friendly" regional governments receive more money and support Central government by reducing expenditure.

JEL Code: H51, H77.

Keywords: health care expenditure, intergovernmental relationships.

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1. Introduction

What determines health expenditure? This is an important policy question which has been addressed by a very large literature. On empirical grounds, the answer is often investigated by applying some modern version of the Wagner's law to data; e.g. by running regressions considering different countries, or different regions inside a country, and using as explanatory variables of health expenditure mainly GDP, and controlling for various indicators of cost and demand factors (see e.g. the survey in Gerdtham and Jönsson, 2000). However, the results of this literature are often disappointing, and it is argued that there is a need to enlarge the theoretical framework to be used as a guide for the empirical research.[1] Following this suggestion, it is somewhat surprisingly to note that most of the above literature tends to ignore the fact that health services, although financed (partly or totally) at the center, 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 the 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, health services are a *joint* responsibility of the central and the local level, and they are jointly financed by the two levels of government. The same is true in many unitary countries (e.g. the Nordic European ones) although in this case, administrative bodies, rather than political ones, are often in charge of the organisation of health services at the local level.

In all these cases, public health policy is then the result of the interaction of several layers of government, and one of the key insights of modern fiscal federalism theory is that the way in which this interaction takes place (e.g. how the tasks are defined at both levels, how they are financed, Constitutional and legal rules, etc.) may matter in determining the result. In particular, an increasing literature suggests that if

[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".

central government cannot commit not to bail out additional expenditure at local level, then local governments' budget constraint may become "soft", as local governments have an incentive to inflate local expenditure if they expect others to foot the bill (see e.g. Rodden et al., 2003 and Maskin, 1999 for a survey on the soft budget constraint literature as applied to the intergovernmental relationships). In turn, commitment problems are likely to be important in sensitive fields such as health care, as central government can hardly allow local governments to "fail" in providing essential health care services, especially if the same central government may be blamed for this failure, as it might happen in those countries where political and financial responsibilities across different levels of government are not well 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 expenditure. Regions claim that the central government deliberately under-finances them for the provision of health services which are mandated by constitutional law. 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.

However, the fact that ex-post financing of health service is largely used it is not in itself a proof of the existence of soft-budget constraint problems. Indeed, as we are going to stress further in this paper, 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 without bailing out interventions. Crucial to the notion of soft budget constraints is in fact the role of bailing out *expectations*; that is, the fact that local governments misbehave today because they *expect* central government help tomorrow. Thus, to prove the existence of soft budget constraints problems one needs

prove that those expectations actually played a role in local governments' behaviour. But, as expectations cannot be observed, this makes very difficult to assess empirically the existence of soft budget constraint problems.

Fortunately, in the case of Italy we have a "natural experiment" which allows us to attempt to overcome this difficulty. At the beginning of the '90s, public health expenditure was clearly out of control. Public health expenditure on GDP run at 6% 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, and the level of health expenditure indeed dropped in real terms in 1994; in 1995 regional health deficits were entirely wiped out, *although central government financing in real terms actually dropped in those same years*. However, in 1997, the situation began to deteriorate again, and in 2001 public health expenditure on GDP climbed at 6,2%, with regions accumulating again large health deficits. All this happened without any remarkable change in the quality of services offered (the Italian NHS is still considered one of the best of the world) 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 outs, regions believed it because a number of political facts which occurred at the beginning of the '90s (a financial crisis, external constraints imposed at the European level, some changes in the electoral rules) made this announcement credible. Hence, regions introduced severe and successful measures to control health expenditure. However, with the relaxation of the external constraint in 1997, after Italy obtained access to the final stage of EMU, central government reneged its threat not to bailing out regions again, thus proving to be

"weak". Hence, regions loosened the reins on health expenditure and this started to climb again. Furthermore, we also show that the effect of the central government restraints on regional behaviour also depended on regional political variables; regions which were ruled by "friendly" governments (i.e. by governments which had the same political majority of the Central government in charge) received more ex ante financing and reduced health expenditure more than those run by "unfriendly" governments[2].

Our results are of course specific to the Italian peculiar institutional framework and we make no claim that they can or should be automatically extended to other countries. But they at least suggest that the consideration of the specific institutions which rule the relationship between different levels of government may help in explaining the evolution of health expenditure (see in particular the case of Spain; e.g. Lopez-Casasnovas, 1998) and of other sensitive fields where soft budget constraint problems in intergovernmental relationships may be relevant (e.g. education).

Empirical analysis of soft budget constraint problems in intergovernmental relationships is scarce. There is a lot of casual empiricism limited to specific cases, but very few detailed analyses (see e.g. Inman, 2003). In this respect, our work is close in spirit to Rodden (2000) and to Dahlberg and Pettersson-Lidbom (2002). Both papers try to model how expectations of a bailing out intervention affect expenditure at a lower level of government. In a similar vein, we use proxy measures for bailing out expectations to estimate "expected" financing for Italian regions, and test whether this affected health care expenditure *even when* actual funding was reduced, as happened in Italy during the '90s.

By analysing its determinants, this work is also obviously related to the huge empirical literature on health care expenditure. For instance, Gerdtham and Jönsson (2000), Gerdtham and Loethgren (2000) for OECD countries, and Giannoni and Hitiris (2002) for the Italian case, all emphasise the role of GDP and other structural variables as main determinants of health expenditure across countries (or across regions). In a

[2] In the theoretical literature, this is known as the "alignment effect". See e.g. Dasgupta et al. (2001).

work related to the present paper, Di Matteo and Di Matteo (1998) show that, beside GDP and the proportion of the population over age 65, federal transfers are important in explaining the level of public expenditure in the Canadian Provinces. However, 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. We answer this critique by explicitly considering the role of central financing in our theoretical framework.

The remainder of the paper is structured as follows. Section 2 provides some stylised facts on the working of intergovernmental relationships in the funding of public health care sector in Italy. Section 3 develops a simple model of bailing out and derives some testable propositions. Section 4 briefly presents our data set, discusses our empirical strategy, and presents our basic results. Section 5 concludes the paper.

2. Intergovernmental Relationships in the Public Health Care Sector in Italy

Health care policy in Italy is the result of a complex net of institutional and political rules[3]. The 1948 Italian Constitution[4] gave Regions the organisation and management of the health services in their territory[5], while maintaining to the Central government the responsibility to ensure all Italian citizens the access to a comparable set of services. Hence, when the Italian NHS was first introduced in 1978[6], it became natural to structure it so as to recognise a specific role to each level of government in health care policy[7]. According to this institutional compromise, the Central Government was in charge of determining the set of mandatory health services which should be provided to

[3] In this section, we only offer a brief institutional introduction to the Italian NHS. For a more complete description of the Italian NHS and of its reforms in the '90s, see Bordignon et al. (2002).
[4] Reformed in 2001, by enlarging the role of local governments; see e.g. Bordignon et al. (2002) and Giarda (2001).
[5] Indeed, managing health services is the main competence of Italian Regions, covering about 80% of their total expenditure.
[6] The NHS substituted the former system based on publicly mediated private insurance.
[7] 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).

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 to the regional Health Units (regional Health Firms, since 1994) and to the regional hospitals; appointing the managers of the Health Units and Hospitals; determining the tariffs to be paid to private producers of health services and so on. Wages and salaries for physicians and nurses working in public hospitals were (and still are) determined at the central level through collective bargaining, but regions define integrative contracts and are 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 in the mid 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[8].

The funding of this peculiar system (in the '90s, but nothing substantial has changed since) needs some more detailed explanations, as it is at the hearth of the analysis of the sections to follow. Funding of the Italian NHS is guaranteed according to a sort of three stage process. First, with the December approval of the budgetary law for the following year, the central government sets the overall size of the National Health Fund, so effectively pre-determining or programming total public health expenditure for

[8] 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.

the next year. As the NHS is also financed by earmarked regional taxes (and tariffs)[9], what the central government basically does in December is to predetermine the amount of "topping up"[10] to be given through conditional grants to regions for financing health expenditure in the following year. This determines what is called the *ordinary 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 appropriation 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 theory, 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, this is not the case as some latitude in "interpreting" the formula is allowed and the formula itself (and parameters in the formula) have often been changed during the period (three times in 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. There are several rationales for this. First, for reasons of budget dressing, central government may have a short term incentive to under-estimate next year total health expenditure (or overestimate regional tax revenues) as this reduces its current outlays. As we explain below, this incentive was particularly strong at the beginning of our sample period, before the electoral reform of 1994, as the time span of Italian governments was

[9] 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; see Bordignon et al. (1999) for a description of this tax. Notice that the earmarking to health expenditure of this tax was abolished in 2001.

[10] 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.

remarkably short (on average around 10 months in the post war period up to 1992), and this implied that some other future governments would have to face the consequences of this under-funding. Second, given the difficulty in computing from the centre, lacking reliable data, a precise estimate of "standardised" or "efficient" health expenditure, it was always thought that under-funding may be helpful in controlling the expenditure behaviour of regions.

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 current resources, by raising short term debts, or simply by postponing payments to suppliers of the Regional Health Service (RHS, from now on)[11]. All these strategies were costly, as debt implied interest payments and suppliers, expecting delays, typically overpriced the RHS. In the medium run, they could also attempt to cut expenditure by reducing waste in the provision of health services (e.g. by rationalising the hospital network, hence reducing employment) or by reducing the non mandatory health services, or they could try to increase health resources by increasing their own (earmarked) taxes and tariffs[12]. These policies were on political grounds even more costly for regional governments. Hence, the convenience to use any of these 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.

Table A.1 in the Appendix summarises these bailing out interventions for the '90s[13]. The Table emphasises two points. First, bailing out of regional health deficits is

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

[12] Up to year 2000, however, regions never used their own tax resources to finance past health deficits, partly because in the transitory period following the Irap reform (1998-2001) tax autonomy on the main regional tax, Irap, was suspended. In 2001, following a bailing out agreement with the Central government, several regions increased the marginal tax on Irap and their surcharge rate on Irpef (personal income tax) to finance past health deficits. Tariff autonomy was instead more extensively used, but tariff revenues were always negligible with respect to total health expenditure.

[13] This table is the result of a careful collection and analysis of available data made by one of the author (Turati, 2003). Still, the information collected in the table must be taken with care, as it is often difficult to assess the precise moment when extra-ordinary central funds for health were effectively given to

not an exceptional occurrence in Italy. Basically, every two or three years, the central government "finds out" that it has made a "mistake" in computing the needs of regions to finance mandatory health services in the past and covers (part of) the past health deficits of regions by issuing government bonds and by taking care of regional Health Units debts. Hence, ex post bailing out can be rightly thought of as a normal *third stage of financing*, although legally *extra-ordinary*, of the Italian NHS. Second, both the time and the extent of the 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 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. Bailing out of past regional health deficits is endemic to the Italian NHS funding system, which implies that at the time the ordinary funding for each RHS is determined, each region knows for sure that there will be some extra funding from the central government in the future. However, the extent and the timing of the bailing out are not known a priori, and they are very hard to assess at the time regions take 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, is determined by current regional expectations of the future bailing out behaviour by central government*. The crucial point is then to determine how these expectations are shaped.

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regions (see below). In this table and in the analysis to follow we always refer to the 15 ordinary regions, leaving aside the 5 special regions (three small regions in the North of Italy plus the two big Islands). This is so because special regions have different functions (even as health care responsibilities are concerned) and different resources of the ordinary regions (Bordignon et al., 2002).

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. 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, we 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 select 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 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 answer 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 to select *E* and run a deficit. 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 increasing transfers, 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 later (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 constraints 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 the region so as to end up with a bailing out; in other words, bailing out may simply be a more convenient way of funding local expenditure than setting up a high level of financing in the first place. This last case also may have had some bearing in Italy before the 1992 financial crisis.

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 address this problem, 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 two "types" of central government, one which bails out regions and the other which does not. Also suppose that, while the payoffs of the region in the different outcomes of the game is common knowledge, the information about the type of central government is private information to the central government, with the region having only some a priori on the "type" of central government. 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). 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 these 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, 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 an 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.[14]

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 under 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 regions reacts by choosing a low level of expenditure, if p is sufficiently high (see Propositions 1 and 2).

Another implication can be found by further modifying the structure of the game. In the above model, if the region choose the high level of expenditure E, the

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

weak government would always reveal himself by bailing out regional deficits. But this feature is simply the result of having analysed a single shot of the financing–expenditure game. If we repeated the game several times, we would find equilibria where at least in the early stages, even the weak government would find it convenient not to bail out the region in the event of a deficit, in order to build a reputation of being "tough" for future periods (as in Kreps and Wilson, 1982). We do not work out this extension analytically here. There is, however, an obvious prediction of the repeated version of the model which seems worth exploring empirically: *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. In turn this would then imply, going back to our model, that we should observe higher level of ex ante financing and current expenditure.

4. The Empirical Analysis

Our empirical analysis is based on Italian regional public health care expenditure and funding over the years 1990-1999; data sources are described in details in the Appendix. All financial data are expressed in per capita and real 2000 terms by using a CPI index. 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. However, both expenditure and financing showed a reduction in the first half of the sample period, paired with an increase in the second half.

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*, that is the

regional assessment of the "toughness" of central government. To explain why we believe this expectation varied during the '90s, we need to briefly recall some features of Italian economic history. In 1992, the country faced a very severe financial and political 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. In turn, the devaluation of the national currency brought about a financial crisis, induced by the poor conditions of public finances. 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). Hence, in the country's economic history, the "1992" is surely a turning point: since then, Italy began the long and painful adjustment process to meet the Maastricht requirements in 1997. In the following years many other structural and fiscal reforms were indeed introduced. As the public health care sector is concerned, to give more fiscal autonomy to regions and increase their accountability in the management of the RHS, several reforms were implemented. In a few years, vertical imbalance at regional level was clearly reduced and this reduction was accompanied with the legal assignment of larger expenditure responsibility to regions, including complete regional responsibility for the new deficits created in managing the RHS.[15] Moreover, to further increase regional governments' accountability, electoral rules were also changed, introducing a majority rule voting mechanism at the regional level. A similar new majority voting system was set up also at the central level.

All these changes made it clear to regions that the Central government was now more determined than in the past to impose them a strict budget constraint; and all the reforms passed aimed to give regions the tools to fulfil these obligations, so further strengthening the commitment technology of the Central government. Accordingly, in terms of our model, we use several different proxies for capturing these changes in p:

[15] 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".

(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 dummy for the majority rule voting system (DMN), equal to 1 after the substitution of the old proportional voting system in 1994; (d) the expected length of Central government (LEN), measured by the ratio of the actual length of government in power at a given year with the average length of governments along the sample period; (e) 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); (f) a dummy variable for the size of a region (SCA) equal to 1 when regional population falls into the fourth quartile of the population distribution, and equal to 0 in the remaining cases; (g) a dummy variable for "friendly" governments (DGOV), equal to 1 when coalitions in power at the local level and at the central level are the same.

Proxies (a) to (d) only vary across time. Proxies (a) and (b) capture budgetary pressures coming from the constraints imposed by the Maastricht Treaty, while proxies (c) and (d) catch the strength of Central government to credibly enforce reforms. Proxies (e) to (g) show instead variability both across time and across regions. Proxy (e) measures the reduction of vertical imbalance across regions, 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. Proxy (f) captures the potential effect of scale on regions' expectations of bailing out (see below), whereas proxy (g) summarise the effect on regional expectations of having a "friendly" Central government.

4.1. Modelling Funding

We begin our empirical analysis by defining a simple model for ordinary funding, which do 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), and regional fixed effects aimed at capturing historical differences in the level of expenditure across Regions[16]. 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. Our deterministic model is represented by the following equation (1):

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

where F is health care funding and ε_1 is a disturbance term. Table 1 collects our estimates. As expected, the share of the population over age 65 is an important 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 in both sub-periods, suggesting that structural differences in the historical level of expenditure were reflected in regional differences in funding. Notice, however, that in this regression R^2 turns out to be very low. Clearly, there is some important variables that are missing in this model.

What could be missing are the structural changes in Italian economic policy during the 90s that also influenced Regions' beliefs. To test this idea, we now augment eq. (1) by including our proxies for changes in *p*. Notice that, as some of our variables show variability only across time, we do not include time dummies in our regressions.

[16] 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.

Moreover, since the introduction of a voting mechanism based on the majority rule also increased the length of governments, we consider DMN and LEN in turn. Eq. (2) and (3) can then be written as:

$$F_{it} = \sum_i \alpha_i + \sum_i \alpha_i DAGE_{it} + \beta_1 POP65_{it} DAGE_{it} + \beta_2 DEUR_t + \beta_3 PBT_t + \\ + \beta_4 DMN_t + \beta_5 TAXBA_{it} + \beta_6 SCA_{it} + \beta_7 DGOV_{it} + \varepsilon_{2,it} \tag{2}$$

$$F_{it} = \sum_i \alpha_i + \sum_i \alpha_i DAGE_{it} + \beta_1 POP65_{it} DAGE_{it} + \beta_2 DEUR_t + \beta_3 PBT_t + \\ + \beta_4 LEN_t + \beta_5 TAXBA_{it} + \beta_6 SCA_{it} + \beta_7 DGOV_{it} + \varepsilon_{3,it} \tag{3}$$

As shown in table 1, almost all estimated coefficients of the new variables turn out to be strongly statistically significant and with the expected sign in both equations. R^2 increases by about 20 points with respect to model (1), suggesting that institutional and structural changes were indeed important determinants of centrally defined health funding. Of course, it is not surprising that external constraints such as the Maastricht Treaty may have affected centrally determined funding and hence health expenditure in the period. But notice that this result is also consistent with our first theoretical prediction, that Central government, knowing that it is now considered tougher by regions, has an incentive to cut down planned expenditure (see section 3). Indeed, our *a priori* concerning the sign of β_2, β_3 and β_4 are for all the three coefficients to be negative in both equations. As the Maastricht requirements become binding, Central government should be perceived as tougher (hence $\beta_2<0$), and this effect should be more important the higher the Italian deficit with respect to the EU average (hence $\beta_3<0$). Moreover, the introduction of a majority rule voting system should increase the ability of the Central government to implement a given policy [hence $\beta_4<0$ in eq. (2)], because this type of voting mechanism increases its length [hence $\beta_4<0$ in eq. (3)]. As

the other variables are concerned, we have clear *a priori* on the TAXBA and DGOV coefficients as well. For the first variable, an increase in the tax base given to regions should increase their financial responsibility, and this should help the Central government to be perceived as tougher for them (hence $\beta_5<0$). For the second one, Dasgupta et al. (2001) account for a substantial empirical literature that tests this *"alignment effect"* using U.S. data, and provide new evidence using data from India; the results generally confirm that politically aligned local governments receive more funds than non-aligned constituencies (hence $\beta_7>0$).

On the contrary, we do not have a clear *a priori* on the SCA coefficient. One argument often used, the "common pool" argument (see e.g. Persson and Tabellini, 2000), suggests that bailing out is advantageous for residents in a given region, because the benefits of higher expenditure are concentrated in their area, while the costs are spread across the whole country. The smaller is the region, the lower is the perceived costs for its residents in terms of an increase in the national taxes needed to finance the bail out, and the more willing should the regional government be to increase expenditure and run a deficit. On the contrary, Wildasin (1997), referring to the usual "too big to fail" argument, suggests that larger regions should be more likely to increase expenditure than smaller ones as Central government cannot afford to let a large region "fail", because of the large negative externality that this would create on the whole country. Hence, larger regions should expect more funds. These two contrasting arguments could reasonably interplay in shaping the expectations of different regions, and their interaction could explain why the SCA coefficient is marginally significant in only one regression and not significant in the other one.

4.2. Modelling Health Expenditure

To test the other predictions of the model, we now move to health expenditure. We divide our analysis in two parts: we first consider structural variables that previous empirical studies deem to be important determinants of expenditure; we then consider

the role of funding and regional expectations, using as a proxy estimates from the funding equations.

Beginning with the structural variables, we consider: (a) the proportion of the population over age 65 (POP65); (b) the number of physicians per 1000 inhabitants (PHYS); (c) 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) GDP per capita (GDP). 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 to control for unobserved heterogeneity. Our results are collected in table 2. As expected, the relation between expenditure and GDP per capita is positive and statistically significant. On the contrary, estimated coefficient for POP65 is negative and statistically significant, whilst the number of physicians and the average number of beds per hospital are not significant. A possible explanation for the result on POP65 is that the effect of the age structure of the population is incorporated in the regional fixed effects.[17] RESET test is significant, suggesting some form of misspecification. As the funding formula was changed several times during the sample period, we checked for parameter stability as a potential source of misspecification in the expenditure equation (using the dummy variable DAGE). Results are collected in the same table 2. The introduction of these additional regressors partly changed our previous results, and the RESET test now confirms that the model seems to be correctly specified. The proportion of the population over age 65 shows again a negative and statistically significant relation with regional expenditure. On the contrary, GDP per capita is no longer significant, while a negative and statistically significant coefficient emerges for AVBEDS. We test for the joint significance of structural variables and of these last variables interacted with the dummy DAGE; both

tests overwhelmingly reject the null hypothesis. We also estimate two reduced models (column III and IV), by dropping the variables PHYS and AVBEDS that could reasonably be thought of as endogenous in the sample period; results are virtually unchanged, but now RESET test is significant, suggesting that the two models are misspecified. Overall, these results seem to suggest that, once we control for regional fixed effects, the role of structural variables is only marginal, whereas something more important could be missing. This last observation mirrors Culyer (1988), that reports that the missing variable lies in the public budget mechanism used to fund health care.

4.2.1. The role of expectations

In this section we test if bailing out expectations are the missing determinants of the expenditure equation. To investigate this hypothesis, we augment eq. (4) by first considering as an additional regressor the observed level of financing F, and then the funding estimates $\hat{F}$ from eq. (2) and (3). Note that $\hat{F}$ represents the "expected" financing by Regions *given* changes in p, and this provides us with a test for our second theoretical prediction. When p is larger, having observed a low level of funding, regions should be more likely to react with a low level of expenditure. In other words, after controlling for changes in p, there should be a *positive* correlation between funding and expenditure, *even if* Central government reduced funding to regions.[18] 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.

We first estimate the following eq. (5):

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

[18] 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.

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

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 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. V. As expected, *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*. Structural variables continue to play only a marginal role. Before going further, we explore the interaction between financing and our proxies for expectations. Estimates of the augmented regressions are collected in table 2, col. VI and VII. Results in col. VI show that most of the coefficients on the proxy variables for expectations turn out to be significant, but with the wrong sign; moreover, *F* coefficient seems now stable. On the contrary, results in col. VII show that the *F* coefficient is not stable, but most of the coefficients on the proxy variables are not statistically significant. Thus, these results seem to indicate that our proxies for Regions' beliefs are 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 "expected" funding and not observed financing is what really count in determining expenditure.

To explore this issue and provide a test for our second theoretical prediction, we now study how these results change by substituting observed financing with "expected" financing, i.e. the fitted values from eq. (2) and (3). Thence, the equation to be estimated becomes the following eq. (6):

$$E_{it} = \sum_i \alpha_i + \sum_k \beta_k X_{kit} + \delta_1 \hat{F}_{it} + \delta_2 \hat{F}_{it} DUP_{it} + \varepsilon_{6,it} \quad (6)$$

Estimates are collected in table 2, col. VIII e IX. $\hat{F}$ coefficient shows the expected positive sign and is statistically significant using both set of estimates. However, as

before, the coefficient is not stable during the sample period; in particular, its magnitude slightly decreases from 1993 to 1997, but it still remains positive. Notice also that the estimated coefficients are quite close to those in col. V, really suggesting that the role played by financing in influencing expenditure is due only to the "expected" part of funding. To check the robustness of this result, we again augment eq. (6) with our proxies for Regions' expectations. Estimates of these augmented regressions are in table 2, col. X and XI. $\hat{F}$ coefficient almost doubles and still remain statistically significant; it is also not stable during the sample period, but it still remains positive. Note that most of our proxy variables for expectations are now not significant; this suggests that they can be excluded from the expenditure equation and that their role is limited only in shaping regional beliefs. Among these variables, only DEUR and DGOV seem to play a role directly on expenditure. The first one pick up an increase in expenditure in 1997 (common for all the Regions). The second one shows that the "alignment effect" works in two ways: on the one hand, Central government increases transfers to "friendly" Regions; on the other hand, "friendly" Regions reduce expenditure to balance their budget. Overall, the results indicate that, even if Central government reduced funding to Regions, there is a positive relation between funding and expenditure after controlling for variations in *p* as predicted by our theoretical model.

4.2.2. Bailing out

To check the third prediction of our model, the variations in the regional expenditure after an episode of bailing out, we should ideally find an episode of bailing out implemented by the *same* Central government that was in power when the current funding to which the bailing out is referred was decided. However, this is impossible, as during the '90s, no Italian Central government in charge of the current funding for the year *t* was still in power when the bailing out of the year *t* deficit was determined.

Still, one could argue that after an episode of bailing out, regional expectations of the *current* Central government's "toughness" do change. For instance, Dahlberg and

Pettersson-Lidbom (2002) analyse how the probability of a bail out intervention by the Swedish central government influences the level of debt of local government. In a similar vein, to test empirically whether episodes of bailing out affected regional expectations, we define three different variables: (a) a dummy variable (DBO) equal to 1 for the years after a bailing out law was passed, and equal to 0 for the remaining years; (b) a measure for the cumulated health deficit (CUM), defined as the sum of all past deficits (D) net of bailing out interventions (BO); more formally, $CUM_t = \sum_{n=1990}^{t}(D_n - BO_n)$; (c) a measure of the expected burden of past deficits (EXB), defined as the percentage of the last deficit on which the Central government intervened that was not bailed out; hence, $EXB_t = (D_{t-k} - BO_t / D_{t-k})*100$.[19] Differently from the simple dummy variable DBO, variables (b) and (c) are hard to measure. Indeed, even after having collected the relevant data from bailing out laws (see table A.1 in the Appendix), we are not sure *when* this extra money was *actually* given to regions. Estimates of eq. (6) augmented with these variables in turn are reported in table 3. DBO, CUM and EXB coefficients turn out to be either not statistically significant or with the wrong expected sign. One explanation is that all the three variables are affected by measurement errors. However, in all these attempts, previous results are substantially unaffected. In particular, "expected" financing still shows a positive relationship with expenditure, even in the central part of the '90s.

5. Concluding remarks

In this paper, we offer a potential explanation for the evolution of public health expenditure in Italy during the '90s, based on the idea that in the central period, under the external constraints imposed by Maastricht rules and following a severe financial crisis and a number of institutional reforms, central government managed to curb regional expectations of further bailing out interventions, which then led to a reduction

[19] Notice that EXB may identify a sort of "adaptive" expectations: Regions expect Central government to bail out past deficits in the same proportion as it did the last time it intervened.

in health care expenditure dynamics. To this aim, in the previous sections we explained the main features of the Italian NHS, proposed a simple model of bailing out that closely describes the intergovernmental relationships in the Italian public health care sector, collected a data set on Italian regional health expenditure and politics during the years 1990-1999, and then tested the main predictions of the theoretical model.

Our results are roughly consistent with the theoretical predictions of the model. We show that financing by regions is influenced by political variables that may be interpreted as capturing changes in bailing out expectations. "Expected" funding has the expected positive relationship with expenditure, even when Central government decreased financing to regions. We do not get instead the expected result that regional expenditure increases following a massive bailing-out, but this may be the result of the difficulty of measuring the variables we were supposed to test. Moreover, we show that the "alignment effect" works in two directions: on the one hand, the Central government increases financing to "friendly" Regions; on the other hand, "friendly" regional governments support Central government by reducing health expenditure.

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 region answers 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 set *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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Table 1. Funding

	I	*II*	*III*
POP65 x DAGE	0.003***	0.027***	0.021**
	(0.009)	(0.009)	(0.009)
DEUR	-	-0.505***	-0.506***
	-	(0.055)	(0.055)
PBT	-	-0.484***	-0.509***
	-	(0.043)	(0.041)
DMN	-	-0.112***	-
	-	(0.016)	-
LEN	-	-	-0.129***
	-	-	(0.009)
TAXBA	-	-0.008***	-0.011***
	-	(0.002)	(0.002)
SCA	-	-0.008	-0.081*
	-	(0.026)	(0.042)
DGOV	-	0.026*	0.036*
	-	(0.015)	(0.021)
Regional fixed effects	yes	yes	yes
Reg. fixed eff. x DAGE	yes	yes	yes
Nr. Obs.	150	150	150
Adj. R-sq.	0.42	0.60	0.68
Model F-test	4.61***	7.20***	9.82***

OLS; Beck and Katz (1995) panel corrected SE in parentheses

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

Table 2. Expenditure

	I	*II*	*III*	*IV*	*V*	*VI*
POP65	-0.021***	-0.015**	-0.020**	-0.015**	-0.01**	-0.01***
	(0.008)	(0.006)	(0.008)	(0.007)	(0.005)	(0.004)
GDP	0.022***	0.009	0.021***	0.002	-0.004	0.016**
	(0.007)	(0.007)	(0.006)	(0.006)	(0.006)	(0.008)
PHYS	0.025	-0.048	-	-	-0.017	0.022
	(0.041)	(0.049)	-	-	(0.032)	(0.028)
AVBEDS	-0.0004	-0.0009**	-	-	-0.001***	-0.001***
	(0.0004)	(0.0005)	-	-	(0.0004)	(0.0003)
POP65 x DAGE	-	0.003	-	0.006	0.001	0.00006
	-	(0.005)	-	(0.005)	(0.003)	(0.002)
GDP x DAGE	-	-0.002	-	0.0001	-0.001	-0.003*
	-	(0.003)	-	(0.002)	(0.002)	(0.002)
PHYS x DAGE	-	0.054	-	-	0.004	0.017
	-	(0.054)	-	-	(0.035)	(0.034)
AVBEDS x DAGE	-	0.0003	-	-	0.0005	0.0004**
	-	(0.0004)	-	-	(0.0003)	(0.0002)
F	-	-	-	-	0.425***	0.470***
	-	-	-	-	(0.047)	(0.059)
F x DUP	-	-	-	-	-0.043***	-0.012
	-	-	-	-	(0.008)	(0.013)
DEUR	-	-	-	-	-	0.17***
	-	-	-	-	-	(0.057)
PBT	-	-	-	-	-	0.13**
	-	-	-	-	-	(0.066)
DMN	-	-	-	-	-	-0.140***
	-	-	-	-	-	(0.018)
TAXBA	-	-	-	-	-	0.004**
	-	-	-	-	-	(0.002)
SCA	-	-	-	-	-	-0.018
	-	-	-	-	-	(0.028)
DGOV	-	-	-	-	-	-0.068***
	-	-	-	-	-	(0.017)
Regional fixed effects	yes	yes	yes	yes	yes	yes
Nr. Obs.	150	150	150	150	150	150
Adj. R-sq.	0.66	0.73	0.67	0.73	0.85	0.91
Model F-test	17.36***	19.30***	19.61***	23.03***	36.81***	50.33***
F-test Reg. Dummies	28.24***	36.09***	-	-	-	-
F-test Structural Vbs.	3.42**	3.66***	-	-	-	-
F-test Structural Vbs. x DAGE	-	8.97***	-	-	-	-
RESET test	12.49***	1.32	13.99***	4.19**	1.60	0.43

OLS; Beck and Katz (1995) panel corrected SE in parentheses

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

Table 2. Expenditure (continued)

	VII	*VIII*	*IX*	*X*	*XI*
POP65	-0.01***	-0.012**	-0.012**	-0.01***	-0.02***
	(0.004)	(0.005)	(0.005)	(0.004)	(0.005)
GDP	0.003	0.006	0.005	0.026***	0.013
	(0.009)	(0.007)	(0.006)	(0.008)	(0.008)
PHYS	0.007	-0.024	-0.016	0.003	0.031
	(0.037)	(0.041)	(0.037)	(0.038)	(0.036)
AVBEDS	-0.0009***	-0.001**	-0.0009**	-0.0008***	-0.0006*
	(0.0003)	(0.0004)	(0.0004)	(0.0003)	(0.0003)
POP65 x DAGE	0.001	-0.0009	0.0003	-0.006	-0.005
	(0.003)	(0.005)	(0.004)	(0.005)	(0.004)
GDP x DAGE	-0.002	-0.002	-0.002	-0.004	-0.002
	(0.002)	(0.002)	(0.002)	(0.003)	(0.002)
PHYS x DAGE	-0.013	0.02	0.004	0.031	-0.012
	(0.035)	(0.047)	(0.042)	(0.053)	(0.036)
AVBEDS x DAGE	0.0004*	0.0005	0.0004	0.0004	0.0003
	(0.0002)	(0.0004)	(0.0003)	(0.0003)	(0.0002)
F	0.465***	-	-	-	-
	(0.093)	-	-	-	-
F x DUP	-0.046***	-	-	-	-
	(0.014)	-	-	-	-
DEUR	0.19***	-	-	0.318**	0.377**
	(0.07)	-	-	(0.142)	(0.160)
PBT	0.13*	-	-	0.192	0.227
	(0.08)	-	-	(0.150)	(0.165)
DMN	-	-	-	-0.091**	-
	-	-	-	(0.036)	-
LEN	-0.024	-	-	-	0.009
	(0.018)	-	-	-	(0.041)
TAXBA	0.003	-	-	0.004	0.004
	(0.002)	-	-	(0.002)	(0.003)
SCA	-0.045	-	-	0.001	-0.002
	(0.031)	-	-	(0.031)	(0.041)
DGOV	-0.063***	-	-	-0.076***	-0.077***
	(0.022)	-	-	(0.020)	(0.028)
F(II)	-	0.384***	-	0.655**	-
	-	(0.088)	-	(0.276)	-
F(II) x DUP	-	-0.067***	-	-0.071***	-
	-	(0.007)	-	(0.010)	-
F(III)	-	-	0.346***	-	0.714***
	-	-	(0.066)	-	(0.289)
F(III) x DUP	-	-	-0.071***	-	-0.102***
	-	-	(0.007)	-	(0.010)
Regional fixed effects	yes	yes	yes	yes	yes
Nr. Obs.	150	150	150	150	150
Adj. R-sq.	0.88	0.82	0.82	0.88	0.86
Model F-test	36.79***	28.43***	29.29***	36.79***	32.69***
F-test Reg. Dummies	-	-	-	5.62***	5.83***
F-test Structural Vbs.	-	-	-	-	-
F-test Structural Vbs. x DAGE	-	-	-	-	-
RESET test	0.17	0.42	0.09	1.47	0.49

OLS; Beck and Katz (1995) panel corrected SE in parentheses

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

Table 3. Bailing out

	I	*II*	*III*	*IV*	*V*	*VI*
POP65	-0,012**	-0,012**	-0,011***	-0,010**	-0,012**	-0,012**
	(0,005)	(0,005)	(0,005)	(0,005)	(0,005)	(0,005)
GDP	0,006	0,005	0,001	-0,0003	0,006	0,006
	(0,007)	(0,006)	(0,007)	(0,007)	(0,007)	(0,006)
PHYS	-0,026	-0,02	-0,037	-0,033	-0,025	-0,018
	(0,042)	(0,037)	(0,043)	(0,039)	(0,042)	(0,038)
AVBEDS	-0,001**	-0,0009**	-0,0009**	-0,0008**	-0,001**	-0,0009**
	(0,0004)	(0,0004)	(0,0004)	(0,0004)	(0,0004)	(0,0004)
POP65 x DAGE	-0,001	-0,0004	0,0001	0,001	-0,0007	0,0005
	(0,005)	(0,004)	(0,005)	(0,004)	(0,005)	(0,004)
GDP x DAGE	-0,002	-0,002	-0,001	-0,0007	-0,002	-0,002
	(0,002)	(0,002)	(0,002)	(0,002)	(0,003)	(0,002)
PHYS x DAGE	0,024	0,011	0,007	-0,006	0,019	0,004
	(0,049)	(0,042)	(0,048)	(0,044)	(0,049)	(0,044)
AVBEDS x DAGE	0,0005	0,0005	0,0004	0,0003	0,0005	0,0004
	(0,0004)	(0,0003)	(0,0004)	(0,0003)	(0,0004)	(0,0003)
F(II)	0,407***	-	0,338***	-	0,378***	-
	(0,079)	-	(0,096)	-	(0,087)	-
F(II) x DUP	-0,068***	-	-0,068***	-	-0,068***	-
	(0,007)	-	(0,007)	-	(0,007)	-
F(III)	-	0,397***	-	0,323***	-	0,348***
	-	(0,059)	-	(0,075)	-	(0,066)
F(III) x DUP	-	-0,072***	-	-0,072***	-	-0,072***
	-	(0,007)	-	(0,006)	-	(0,007)
DBO	-0,015	-0,026*	-	-	-	-
	(0,014)	(0,014)	-	-	-	-
CUM	-	-	0,100*	0,114**	-	-
	-	-	(0,053)	(0,053)	-	-
EXB	-	-	-	-	0,00009	0,0001
	-	-	-	-	(0,00008)	(0,00008)
Regional fixed effects	yes	yes	yes	yes	yes	yes
Nr. Obs.	150	150	150	150	150	150
Adj. R-sq.	0,81	0,82	0,82	0,83	0,82	0,82
Model F-test	27,25***	28,41***	28,20***	29,52***	27,35***	28,39***
RESET test	0,20	0,02	-	-	-	-

OLS; Beck and Katz (1995) panel corrected SE in parentheses

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

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*
LEN	Length of govt. "i" / Av. length of govt. in period 1990-1999 *Source: www.governo.it*
DMN	Dummy = 1 when national elections based on majority rule voting system
DAGE	Dummy = 1 when allocation formula corrects for the age compostion of the population
TAXBA	Proxy of the tax base of regional taxes
SCA	Dummy =1 when regional population falls into the 4th quartile of the population distribution

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