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Abstract

The vulnerability of health sector to corruption lies in the complex interaction between the social environment and the institutional setting of health systems. We investigate this interaction in the case of Italy, specifically looking at the impact of corruption on health expenditure. In Italy corruption is a social phenomenon. Health sector has been often involved in corruption offences and decentralized health expenditure is considerably out of control. We show that the impact of corruption on health expenditure is positive, along with ageing population, technological change and supply factors inducing demand in pharmaceuticals and hospitalization. Moreover, the empirical analysis demonstrates that corruption affects pharmaceutical expenditure and accredited private hospital expenditure, suggesting implications for health governance and policy.

Keywords: health expenditures, corruption, panel data, sur model.

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1 Introduction

In recent years a growing literature [surveyed in 1, 2] has investigated the effects of corruption on the health sector. In developing and transitional economies corruption lowers the quality of health care, limits the access to health services and increases health expenditure. The general framework of the determinants of corruption in public administration [3] is consolidated by specific features of health sector: inelastic demand for health services, high degree of asymmetric information, large variety of interacting actors (regulators, payers, public and private providers, consumers) with opposite interests. Several papers have showed how these features enhance corrupted practices in the different sectors of the health care; and it has been argued that the occurrence of corruption finds a favorable environment where social norms are weaker and corrupt practices are tolerated or even justified [2-6]. Corruption in health sector is a phenomenon in which social environment, health governance and financing are intertwined. Centralized or decentralized health financing may enhance different levels of corruption, since different are the levels of financial accountability. Public participation and local accountability of public resources are in theory higher in decentralized than in centralized fiscal systems [7]. In corrupted social environments the decentralization may improve health outcomes [8, 9]; but it may also foster corruption [10], due to the lacking of adequate institutional checks and balances at local level.

The evidence of the negative effects of corruption on health outcomes [11, 12], implies that corruption directly affects the amount of health expenditure. Nevertheless, the role of corruption as a determinant of health expenditure has not been specifically investigated. This paper concentrates on this issue, investigating the case of Italy. Italian health expenditure is decentralized and largely out of control; high levels of corruption place Italy 69 out of the 183 countries ranked in the Transparency International Corruption Perceptions Index 2011 (bottom list, with Greece and Portugal of European countries),

and health sector is involved in corruption offences. In Italy, corruption is rooted in political and economic history and its evolution has paralleled the growth of public expenditure, culminated in the 1980's. The impressive emergence of corruption scandals in politics and public administration during the 1990's, overwhelmed the political system and favored the demand for an institutional change in the direction of the decentralization and fiscal federalism [13-17]. A relevant step toward decentralization was taken in the health sector, that had not been immune from corruption scandals [18], following a process aimed at improving the performance and constraining the costs of health care. But decentralization has not controlled health expenditure and has not prevented health sector from corruption. Health expenditure amounts to 9.1% of GDP in 2008 and counts on average for 75 % of regional public expenditures. The large amount of public resources and the inadequacy of regional health governance have made the health sector particularly exposed to corruption, whose impact on health expenditure has been often stressed by the national audit office [19, 20].

The purpose of this paper is to empirically investigate this impact in the decade from 1998 to 2008. The investigation has been conducted on total health expenditure and on its four main categories (pharmaceutical, primary care, inpatient and accredited private hospital), focusing on the influence of corruption along with demographic factors, per capita GDP and health care inputs. Our results highlight the role of corruption as a determinant of accredited private hospital expenditure and pharmaceutical expenditure, suggesting implications for health governance and policy.

The paper is organized as follows. In the next section we present the main features of Italian health system and expenditure; in section 3 and 4 we illustrate the data and the empirical model; the results are presented and discussed in section 5; conclusions are drawn in section 6.

2 Health system and expenditure in Italy

The Italian National Health Service (NHS), founded in 1978, is a universal health care system providing comprehensive health insurance coverage and uniform health benefits to the whole population. In the last 15 years the Italian NHS has undergone, like other European countries, important reforms [21], in the direction of decentralization of health management and policy responsibilities to the sub-layers of government —21 administrative jurisdictions, specifically 19 regions and two autonomous provinces. In 1999, the reform of NHS introduced the essential levels of health services (ELS), defined and financed by central government and provided by regional authorities. Since then regions have developed relatively different health systems, characterized by different mix of public and accredited private hospitals. The accreditation of private hospitals aims at reducing the monopoly power of public providers and improving efficiency of health services, with a reimbursement scheme based on Diagnostic Related Groups (DRG) applied to both public and accredited private hospitals. The 2001 Constitutional reform has assigned the health sector to regional competency, but with relevant regulating and financing functions maintained by the central government [22,23]. As result of this contradictory reform, Italian regions are required to spend enough to provide ELS, while central government is required to finance regions enough to provide ELS. Bailing out expectations from central government and the separation of financing responsibilities from expenditure responsibilities have been considered a relevant stimulus for the uncontrolled growth of Italian health expenditure [24-28] in a context of often inadequate regional health governance and accountability [29-31].

Health expenditure has always been higher than the available funding, with deficits mainly concentrated in poorer regions [23, 26]. From 1998 to 2008 (Fig. 1) the trend of Italian health expenditure reflects the timing of interventions by central government to finance regional health deficits:

in 2001 additional central government funds were allocated to cover NHS deficits accumulated since 1994; and in 2005, further central government funds were allocated to cover NHS deficit and regions, unable to contain deficits, underwent (centrally monitored) budgetary balance plans, whose effectiveness has been questioned [32,33].

(*FIGURE* 1)

3 The data

The empirical investigation of the determinants of Italian health expenditure is based on a yearly panel data set for the 21 administrative jurisdictions for the period 1998-2008. We collected data on public health system from "*Health for All*" dataset [34] of Italian National Account. The public administration corruption rate has been gathered from Information system on justice [35]. In the first part of our analysis we consider as dependent variable the total per capita public health expenditure (TOT_HE). We first control for the basic determinants of public health expenditure: health care activity inputs, such as doctors rate (TOT_DOC) and beds rate (TOT_BEDS); time, as a partial proxy for technological change (TIME);and socio-economic variables, such as regional per capita GDP (GDP), population density (DENS) and population over 65 (POP_65). Finally, we specifically control for corruption rate (COR). By following Del Monte and Papagni [17], corruption is defined as the rate of crimes against public administration at regional level. The number of crimes against public administration are based on statutes of the ISTAT-*Annals of Judicial Statistics*[1]. In the second part of the analysis we divide the total health expenditure into four main components: pharmaceutical (PHARM), primary care (PRIM), inpatient (INP), accredited

[1]The crimes against the public administration included in the Papagni and Monte index are bribery,extortion,misappropriation,embezzlement and abuse of office.

private hospital (PRIV). As shown in table 1, per capita pharmaceutical is the largest expenditure category (183 euros); followed by accredited private hospital (93.4 euros), primary care (87.3 euros) and inpatient (43.6 euros) expenditures.

In addition to the above listed determinants, we control each component of the spending for specific health care inputs: medical prescriptions (PRES), general practitioners (GP_DOC), physicians (PHYS_DOC), private specialists (PRIV_DOC) and private beds (PRIV_BEDS).

Variable definitions and summary statistics are given in table 1.

(*TABLE* 1)

4 Empirical model

The empirical analysis has been conducted in two steps. Initially, we have used a single-equation approach with fixed and random effects to examine whether the variable of interest (i.e corruption) is significantly correlated with public health expenditure, after controlling for basic determinants of health spending (such as regional Income, ageing, population density, doctors and beds). In the second step, we have adopted a Seemingly Unrelated Regression (SUR) to estimate the impact of corruption on the four main components of public health expenditure in Italy: pharmaceutical, primary care, inpatient and accredited private hospitals.

Tthe basic econometric specification [36] is the following:

$$\ln TOT\_HE_{it} = \alpha_i + \beta_1 \ln GDP_{it} + \beta_2 \ln POP\_65_{it} + \beta_3 \ln TOT\_BED_{it} + \quad (1)$$
$$+ \beta_4 \ln TOT\_DOT_{it} + \beta_5 \ln DENS_{it} + \beta_6 \ln COR_{it} + \beta_7 TIME_{it} + \varepsilon_{it}$$

Where the subscripts i stands for region and t for time.

The dependent variable, total per capita public health expenditure, is regressed on the standard socio-economic variables (such as income, population ageing and density), corruption and the time trend. All variables are taken in natural logarithms, allowing us to consider the estimated coefficients as elasticities.

In order to consider the impact of corruption on each component of health expenditure, we employed a Seemingly Unrelated Regressor model (SUR), originally introduced by Zellner [37]. Specifically we estimate four equations as stochastically independent, of the following form:

$$\ln PHARM_{it} = \alpha_i + \beta_1 \ln GDP_{it} + \beta_2 \ln POP\_65_{it} + \beta_3 \ln TOT\_BED_{it} + \quad (2)$$
$$+ \beta_4 \ln TOT\_DOT_{it} + \beta_5 \ln PRES_{it} + \beta_6 \ln DENS_{it} + \ln COR_{it} + \beta_7 TIME_{it} + \varepsilon_{it}$$

$$\ln\ PRIM_{it} = \alpha_i + \beta_1 \ln GDP_{it} + \beta_2 \ln POP\_65_{it} + \beta_3 \ln TOT\_BEDS_{it} + \quad (3)$$
$$+ \beta_4 \ln GP\_DOC_{it} + \beta_5 \ln DENS_{it} + \beta_6 \ln COR_{it} + \beta_7 TIME_{it} + \varepsilon_{it}$$

$$\ln INP_{it} = \alpha_i + \beta_1 \ln GDP_{it} + \beta_2 \ln POP\_65_{it} + \beta_3 \ln TOT\_BEDS_{it} + \quad (4)$$
$$+ \beta_4 \ln PHYS\_DOC_{it} + \beta_5 \ln DENS_{it} + \beta_6 \ln COR_{it} + \beta_7 TIME_{it} + \varepsilon_{it}$$

$$\ln INP_{it} = \alpha_i + \beta_1 \ln GDP_{it} + \beta_2 \ln POP\_65_{it} + \beta_3 \ln PRIV\_DOC_{it} + \quad (5)$$
$$+ \beta_4 \ln PRIV\_BEDS_{it} + \beta_5 \ln DENS_{it} + \beta_6 \ln COR_{it} + \beta_7 TIME_{it} + \varepsilon_{it}$$

Note that to obtain more robust estimates, we have investigated the impact of corruption after controlling in each component of the spending for specific covariants: medical prescriptions (PRES), general practitioners (GP_DOC), physicians (PHYS_DOC), private specialists (PRIV_DOC) and private beds (PRIV_BEDS).

5 Results and discussion

Table 2 presents the estimation of the fixed and random effect of the basic model. The result of the Hausman test shows that the differences in

coefficients between the two models are not systematic, thus implying that the random-effects (GLS) model is to be preferred. Therefore, the following comments are based on the results obtained with the GLS.

Our findings confirms that in Italy [38] ageing population is a relevant determinant of health expenditure. In line with previous studies [36, 38-41], the doctor rate and beds rate impact positively on health expenditure, suggesting a supply induced demand for health services. Our estimates support the observation that health expenditure is not a luxury good [42]; however, income is positive and statistically significant. This result implies an income effect, suggesting that, despite the universality of Italian health care system, the (formally equal) access to health care services is not independent from income and possibly related to the different regional models of health decentralization. Time trend, interpreted as a partial proxy for technological change, is positive and statistically significant. This result confirms the observed evidence of the impact of technology on health expenditure [43,44]. Finally, the impact of corruption on health expenditure is positive and statistically significant. This is a relevant result, which requires further specifications: since the impact of corruption is expected to be different among the components of health expenditure.

(*TABLE* 2)

Table 3 shows the results of the SUR model with an R^2=0.78 for the pharmaceutical expenditure, 0.64 for primary care expenditure, 0.68 for inpatient expenditure and 0.72 for accredited private hospitals expenditure, all indicating a good fit.

SUR estimates confirm random effects results for GDP only for the two largest components of total health expenditure: pharmaceutical expenditure [45] and accredited private hospital expenditure. The over 65 population significantly impacts on all the components of health expenditure; while popu-

lation density only impacts on inpatient and accredited private hospital expenditures. The number of beds exerts a negative impact on pharmaceutical expenditure. A similar result has been found also in the case of Spain [46]. The coefficients of physicians, general practitioners and private specialists are positive and statistically significant respectively on impatient, primary and accredited private hospital expenditure, thus implying a supply induced demand of hospitalization. As expected the prescriptions rate is positively related to pharmaceutical expenditure. Technological change confirms its impact: time trend is positive and statistically significant.

Our findings implies that corruption in health system is sectorial. The estimated impact of corruption is positive for all the components of health expenditure, but statistically significant (99% confidence level) only for pharmaceutical expenditure and accredited private hospital expenditure. These results appear to reflect the link between corruption and the institutional setting of Italian health system. Regional health systems are characterized by different mix of public and private accredited hospitals. Nevertheless, this form of competition has not prevented corruption and has showed an elusive impact on efficiency [47], suggesting that performances are dependent from the institutional setting in which hospitals operate. That is, more in general, from the governance and regulation of regional health systems, often lacking adequate monitoring and accountability procedures of health services provision. In this respect, our estimation result on the impact of corruption on accredited private hospitals expenditure supports the observation that privatization of health services does not reduce corruption in the health sector when public systems of regulation and control of private care and treatments are inadequate or lacking [11].

Also the largely documented impact of corruption on the pharmaceutical sector may be traced to the setting of public governance and regulation. The pharmaceutical policies on procurement, quality control, pricing and prescribing may elude accountability and transparency, fostering collu-

sion between the involved actors [48-52]. In Italy, after the involvement in corruption offences, the pharmaceutical sector was reformed in 1993. Co-payments schemes were introduced and from 2001 a new pricing scheme has split the pharmaceutical market into two groups, according to the patent situation and recognizing "premium prices" for innovative drugs. Recent studies [53,54] show that this scheme incentives the promotion of products more expensive and still under patent protection, whose consumption is a relevant driver of Italian pharmaceutical expenditure, in a context of weak regional policies of control on prescribing behaviors [20-55].

(*TABLE* 3)

6 Conclusions

The vulnerability of health sector to corruption lies in the complex interaction between the social environment and the institutional setting of health systems. In our study the role of this interaction emerges in the impact of corruption on health expenditure in Italy. We have shown that this impact is positive but also sectorial; and it is parallel to the impact of ageing population, technological change and supply factors inducing demand in pharmaceuticals and hospitalization. Specifically, the empirical analysis demonstrates that corruption in Italy affects pharmaceutical expenditure and accredited private hospital expenditure, suggesting a relation between corruption and the institutional setting of Italian health system. In this respect, decentralization has not prevented the Italian health sector from corruption. The split between the central government responsibility for health financing and the regional responsibility for health expenditure, has amplified the problems of accountability in regional health care systems [24-25]. This situation has made the Italian health sector more vulnerable to corruption. Thus confirming that where corruption is systemic, the resistance to corruption in health

sector is in appropriate systems of governance, monitoring and transparency of the health care delivery process.

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Table 1. Descriptive statistics

Variables	**Descriptions**	**Obs.**	**Mean**	**Std. Dev.**	**Min**	**Max**
TOT_HE	Per capita Total public health expenditure (euro)	231	1457.4	282.63	883	2063
PHARM	Per capita Public pharmaceutical expenditure (euro)	231	180.9	40.24	83	278
PRIM	Per capita Public primary care expenditure (euro)	231	87.3	20.50	6	147
INP	Per capita Public Inpatient and specialization expenditure (euro)	231	43.6	20.60	12	110
PRIV	Per capita Public Private-clinics expenditure (euro)	231	93.4	63.80	0	307
TOT_DOC	Total Doctors per 10.000 pop.	231	18.7	2.40	12.82	23.88
PHYS_DOC	Physician Doctors per 10.000 pop.	231	17.7	2.12	11.18	23.24
GP_DOC	GP and paeditrians per 10.000 pop.	231	8.2	0.64	6.17	10.14
PRIV_DOC	Private Doctor per 10.000 pop.	231	2.1	1.34	0	5.12
TOT_BEDS	Total Beds per 10.000 pop.	231	42.2	7.12	29.55	66.68
PRIV_BEDS	Private beds per 10.000 pop.	231	6.7	4.66	0	24.54
PRES	Medical prescriprions per 10.000 pop.	231	7.5	1.66	3.84	12.03
GDP	Per capita GDP	231	22256.4	5873.98	11449	33469
POP_65	Population (%) over 75	231	9.1	1.74	5.04	13.6
DENS	Population density	231	176.7	105.60	105.6	426
COR	Regional corruption rate, per 10.000 pop.	231	8.1	4.08	2.35	18.6
TIME	Trend	231	-	-	1998	2008

Table 2. Econometric results: Fixed and Random effects

Dependent Variable: *Regional Public health expenditure*	Fixed Effects		Random effects	
	Coefficient	Std.err.	Coefficient	Std.err.
GDP	0.501***	0.149	0.289***	0.053
TOT_DOC	0.266***	0.072	0.338***	0.062
TOT_ BEDS	-0.057	0.045	-0.046	0.041
POP_65	0.408***	0.148	0.045	0.071
DENS	0.071	0.295	0.025	0.019
COR	0.037*	0.021	0.055***	0.018
TIME	0.028***	0.005	0.042***	0.002
CONS	0.476	2.308	2.62	0.54
R^2 *within*	0.955		0.951	
R^2 *between*	0.377		0.562	
R^2 *overall*	0.532		0.898	
Hausman	23.82			
p-value-Hausman Test	0.0089			

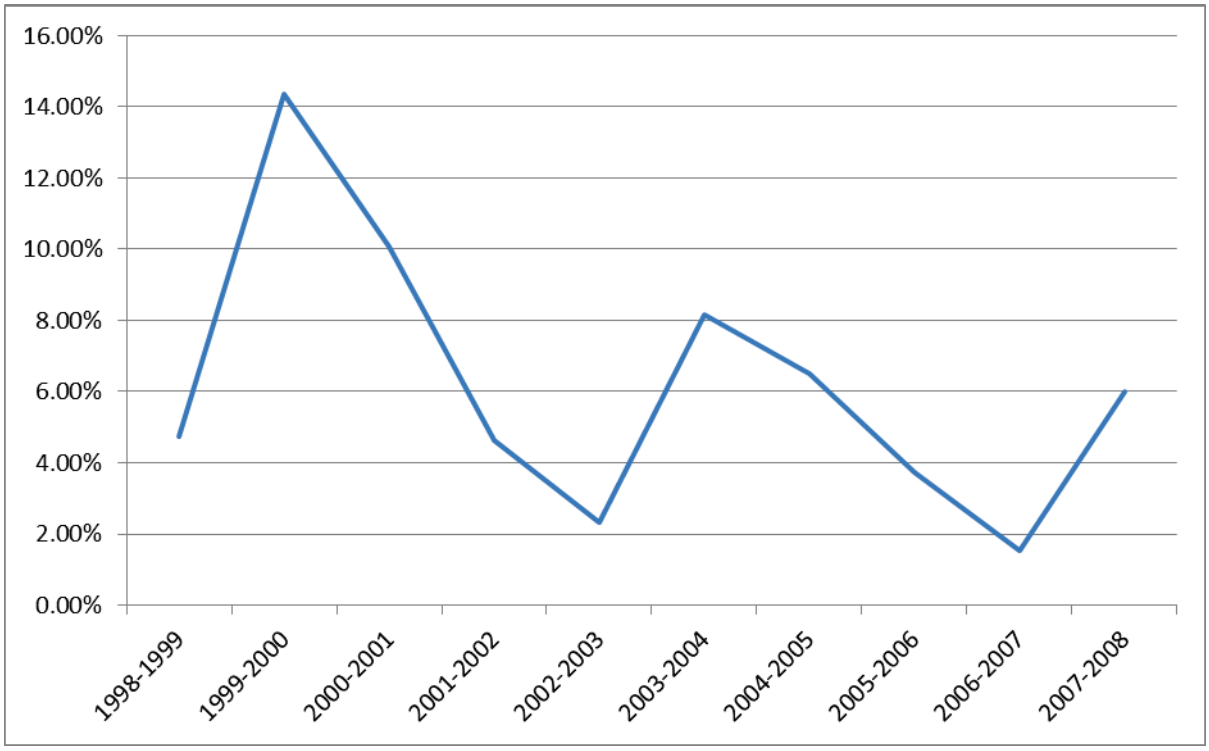
Note that ***;**, * statistically significant at 1%,5% and 10% respectively.

Table 3.SUR results

	PHARM	PRIM	INP	PRIV
GDP	0.362*** (0.059)	0.096 (0.106)	0.138 (0.179)	1.098*** (0.243)
POP_65	0.121** (0.063)	0.105*** (0.019)	1.372*** (0.198)	1.137*** (0.263)
TOT_BEDS	-0.235*** (0.066)	-0.123 (0.132)	-0.570 (0.203)	-
TOT_DOC	0.008 (0.096)	-	-	-
GP_DOC	-	0.067** (0.254)	-	-
PHYS_DOC	-	-	1.075*** (0.261)	-
PRIV_DOC	-	-	-	0.614*** (0.115)
PRIV_BEDS	-	-	-	-0.165 (0.111)
PRES	0.718*** (0.072)	-	-	-
DENS	0.021 (0.018)	0.012 (0.031)	0.367*** (0.042)	0.440** (0.064)
COR	0.229*** (0.027)	0.048 (0.054)	0.084 (0.074)	0.272*** (0.103)
TIME	0.016*** (0.005)	0.058*** (0.009)	0.058*** (0.014)	0.025** (0.016)
COST	0.789 (0.545)	4.845 (1.101)	3.064 (1.790)	5.051 (2.276)
R^2	0.78	0.64	0.68	0.72
Breush-Pagan-Test	42.56	p-value=0.0000		

The table reports coefficients and standard errors (in brackets)
***;**, * statistically significant at 1%,5% and 10% respectively.

Figure 1. Trend of health expenditure in Italy (Var. %)



Source*: Health For All* (ISTAT 1998-2008)