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Corruption and health expenditure in Italian Regions

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Abstract

In Italy, the corruption is a social phenomenon affecting the health sector. In this paper we show that the impact of corruption on Italian health expenditure is positive, along with ageing population, technological change and supply factors inducing demand in pharmaceuticals and hospitalization. Moreover, the empirical analysis shows that corruption affects pharmaceutical expenditure and conventionated private hospital expenditure, suggesting a relation between corruption and the governance of Italian health system.

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1 Introduction

In recent years a growing literature (surveyed in Lewis, 2006; Vian, 2008) has investigated the negative effects of corruption on health care access, quality and outcomes. It has been argued that the vulnerability of health sector to corruption is the result of the interaction between the social environment and the institutional setting of health systems. In this literature, the influence of corruption on health expenditure is often stressed, but specific estimates are generally lacking. Our purpose is to explore this issue in a preliminary investigation of the case of Italy.

Italian health expenditure is decentralized and amounts to 9.1% of GDP in 2008; 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 largely involved in corruption offences. The impressive emergence of corruption scandals in politics and public administration during the 1990's, overwhelmed the political system and favored the demand for government decentralization and fiscal federalism, aimed at improving local accountability of public resources. A relevant step toward decentralization was taken in the health sector. In the last 15 years the Italian National Health Service (NHS) has undergone a process of decentralization of health management and policy responsibilities to the sub-layers of government – 21 administrative jurisdictions, specifically 19 regions and two autonomous provinces. The NHS is a universal system, providing health insurance coverage and essential levels of health services (ELS) to the whole population. The ELS are defined and financed by central government (France *et al.,* 2005), but provided by regional authorities. In this institutional context, bailing out expectations from central government and the lacking of regional financial responsibility have been considered a stimulus for the uncontrolled growth of Italian health expenditure (Liberati, 2003; Mosca, 2006; Tediosi *et al.,* 2009; Bordignon and Turati, 2009). The large amount of financial resources devoted to health sector, the inadequacy of regional health governance and a social environment strongly affected by

corruption have exposed, as reported by the national audit office (Corte dei Conti, 2012), the health expenditure to recurrent corrupt practices.

In this paper we investigate corruption as a determinant of Italian health expenditure 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 conventionated private hospital), focusing on the influence of corruption along with demographic factors, per capita GDP and health care inputs. Our results highlight the impact of corruption on accredited private hospital expenditure and on pharmaceutical expenditure.

The paper is organized as follows. In sections 2 and 3 we illustrate the data and the empirical model; the results are presented and discussed in section 4; conclusions are drawn in section 5.

2. 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 (Istat, 2012a) of Italian National Account. The public administration corruption rate has been gathered from Information system on justice (Istat, 2012b). 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 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 control for corruption rate (COR). By following Del Monte and Papagni (2007), corruption is defined as the rate of crimes (bribery, extortion, misappropriation, embezzlement and abuse of office) against public administration at regional level. We also control for possible endogeneity measure and serial correlation between health expenditure and

corruption rate: the results of Durbin-Wu-Husman test show that all regressors are strictly exogenous (Appendix A, Tables 1-2).

In the second part of the analysis we divide the total health expenditure into four main components: pharmaceutical (PHARM), primary care (PRIM), inpatient (INP), conventionated private hospital (PRIV)[1]. 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 insert here)

3. 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 conventioated private hospitals.

The basic econometric specification (Gerdtham and Jonsson, 2000) is the following:

$$ln\text{TOT\_HE}_{it} = \alpha_i + \beta_1 ln\text{GDP}_{it} + \beta_2 ln\text{POP\_65}_{it} + \beta_3 ln\text{TOT\_BED}_{it} + \\ + \beta_4 ln\text{TOT\_DOT}_{it} + \beta_5 ln\text{DENS}_{it} + \beta_6 ln\text{COR}it + \beta_7 \text{TIME}_{it} + \varepsilon_{it} \quad (1)$$

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

[1] This hospitals are handled at the private level but financed by the public system.

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 (1962). Specifically we estimate four equations as stochastically independent, of the following form:

$$lnPHARM_{it} = \alpha_i + \beta_1 lnGDP_{it} + \beta_2 lnPOP\_65_{it} + \beta_3 lnTOT\_BED_{it} + \\ + \beta_4 lnTOT\_DOT_{it} + \beta_5 lnPRES_{it} + \beta_6 lnDENS_{it} + lnCOR_{it} + \beta_7 TIME_{it} + \varepsilon_{it} \quad (2)$$

$$lnPRIM_{it} = \alpha_i + \beta_1 lnGDP_{it} + \beta_2 lnPOP\_65_{it} + \beta_3 lnTOT\_BEDS_{it} + \\ + \beta_4 lnGP\_DOC_{it} + \beta_5 lnDENS_{it} + \beta_6 lnCOR_{it} + \beta_7 TIME_{it} + \varepsilon_{it} \quad (3)$$

$$lnINP_{it} = \alpha_i + \beta_1 lnGDP_{it} + \beta_2 lnPOP\_65_{it} + \beta_3 lnTOT\_BEDS_{it} + \\ + \beta_4 lnPHYS\_DOC_{it} + \beta_5 lnDENSit + \beta_6 lnCOR_{it} + \beta_7 TIME_{it} + \varepsilon_{it} \quad (4)$$

$$lnPRIVit = \alpha_i + \beta_1 lnGDP_{it} + \beta_2 lnPOP\_65_{it} + \beta_3 lnPRIV\_DOC_{it} + \\ + \beta_4 lnPRIV\_BEDS_{it} + \beta_5 lnDENS_{it} + \beta_6 lnCORit + \beta_7 TIME_{it} + \varepsilon_{it} \quad (5)$$

In order 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).

4. Results and discussion

Table 2 presents the estimation of the fixed and random effects 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 fixed-effects model is to be preferred. Therefore, the following comments are based on fixed effect estimates.

Our estimates support the observation that health expenditure is not a luxury good (Baltagi and Moscone, 2010); however, income is positive and statistically significant. This result implies an income effect, suggesting that, despite the universality of Italian NHS, the (formally equal) access to health care services is not independent from income and possibly related to the different models of health decentralization adopted by the Italian regions.

Our findings confirm that in Italy (Gianonni and Hitiris, 2002) ageing population is a relevant determinant of health expenditure. In line with previous studies (Di Matteo and Di Matteo, 1998; Crivelli *et al.,* 2006; Costa-Font, 2007), the doctor rate and beds rate impact positively on health expenditure, suggesting a supply induced demand for health services. Time trend, is positive and statistically significant. This result confirms the observed evidence of the impact of technology on health expenditure (Martin Martin *et al.,* 2011). Finally, the impact of corruption on health expenditure is positive and statistically significant. This is a relevant result, which requires further specifications: in particular, 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 fixed effects results for GDP only for the two largest components of total health expenditure: pharmaceutical expenditure (Clemente *et al.,* 2008) and accredited private hospital expenditure. The over 65 population significantly impacts on all the components of health expenditure; while population 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 (Lauridsen *et al.,* 2008). 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 show 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 conventionated private hospital expenditure. 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, suggesting a relation between performances and the quality of governance and regulation of regional health systems (Barbetta *et al.*, 2007). The estimated impact of corruption on accredited private hospital expenditure may be interpreted in this context, also supporting 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 weak or lacking (Gupta *et al.*, 2000).

Also the estimated impact of corruption on the pharmaceutical expenditure may be interpreted as a result of the inadequacy of public governance and regulation. It has been documented that pharmaceutical policies on procurement, quality control, pricing and prescribing elude accountability and transparency, fostering collusion between the involved actors (Cohen *et al*., 2002; WHO, 2009). In Italy, after the involvement in corruption offences, the pharmaceutical sector was reformed in 1993. Copayments 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 (Ghislandi *et al.*, 2005; Gallizzi *et al.*, 2011) 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 (Corte dei Conti, 2012).

(TABLE 3)

5. Conclusions

In this paper we have shown that in Italy the impact of corruption on health expenditure is positive but also sectorial; and it is parallel to the impact of ageing population, of technological change and of supply factors inducing demand in pharmaceuticals and hospitalization. Specifically, the empirical analysis demonstrates that corruption in Italy affects pharmaceutical expenditure and conventionated private hospital expenditure, suggesting a relation between corruption and the regional governance of Italian health system. This may support the observation (Lewis, 2006; Vian, 2008) that where corruption is a social phenomenon, the most effective policies against corruption in health sector require strengthening the accountability and transparency of health governance.

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Tables

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 Conventionated Private hospital 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 Paeditricians per 10.000 pop.	231	8.2	0.64	6.17	ott-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 prescriptions 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 65	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	Time trend	231	2003	3.16	1998	2008

Table 2. Econometric results: Fixed and Random effects

Dependent Variables: Regional Public Health expenditure	**Fixed effects**		**Random Effects**	
	Coefficients	Std.err.	Coefficients	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	0.028***	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	INPATIENT	PRIVATE
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_DOC	0.008** (0.096)	-	-	-
TOT_BED	-0.235*** (0.066)	-0.123 (0.132)	0.570 (0.203)	-
GP_DOCT	-	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
Breusch-Pagan-Test	42.56	*p*_value=0.00		

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

APPENDIX A

Table A.2 Table A.2 Endogeneity test

	OLS	IV
	Public Health_expenditure	Public Health_expenditure
GDP	0.289***	0.438***
TOT_DOC	0.338***	0.113*
TOT_BED	-0. 046	-0. 048
POP_65	0.045	0.034
DEN	0.025	0.010
COR	0.055***	0.065***
TIME	0.042***	0.035***
CONS	2.620	2.412
DWH	**45.76***	

Variable Instrumented: corruption rate (COR). Instruments: Regional Income per capita (GDP), Total Doctor rate (TOT_DOC), Total beds rate, % of Population over 65 (POP_65), Density(DENS) and Time.
Note that OLS estimates do not differ substantially from IV estimates. Furthermore Durbin-Wu-Hausman test (DWH) suggest that Corruption is exogenous.