

Financial crisis, fiscal austerity, and health in Italy

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Abstract

The European economic crisis (2007-2008) and the Italian sovereign debt crisis (2010-2011) forced the Italian Government to adopt some fiscal austerity measures. The aim of this paper is to analyse the effects of such austerity measures on the health of the Italian population. Our preliminary results show that both a decrease in public healthcare expenditure and in utilization of secondary services reflects a deterioration in health of the population, in quality of healthcare and in some mortality rates.

Keywords: Austerity measures, Recession, Bail-out plans, Mortality rate, Hospitalization rate

JEL classification: I11, I18, G01

1. Introduction

The 2007-08 financial crisis in Europe affected many countries simultaneously and led to a global economic crisis placing threats and difficulties to health. Governments across Europe undertook a path of austerity, adopting several measures to deal with it, such as fiscal adjustments and budgeting cuts.

Moreover, austerity policies have included cuts to health spending as well as social security spending related to unemployment. The interaction of fiscal austerity with economic shocks and weak social

protection is what ultimately seems to escalate health crises in Europe (Karanikolos et al.,2013). In this context, the growth of public health expenditure become one of the most relevant elements of the health policy debates in most European economies.

One of consequences of cuts health spending has been access restrictions to healthcare services.

Recent studies show that exists a positive statistical relationship between those countries with high level of cuts health spending and those experiencing the highest level of unmet need due to health care costs.

During austerity years, cuts on health spending have reduced access to health care but also have risen individual diseases. An increase of suicides and outbreaks of infectious diseases are becoming more common in countries involved economic downturn. Also, several social diseases, such as alcohol, drugs and psychological disorders, appears in most of countries.

The aim of this paper is to assess whether the economic crisis that has engulfed Europe since 2007-2008 and the Italian sovereign debt crisis in 2010-2011 have both had any impact on the health of Italian population.

In order to do that, we analyse the impact of the decision to adopt a bail-out plan, interpreted as a fiscal austerity measure, on:

1. Public health expenditure
2. Hospitalisation rates and mortality rates relative to a selection of diseases

2. Bail-out plans

Healthcare expenditure in Italy represents a significant and growing proportion of the budget of the Italian Public Administration over time. Similar consideration can be done for current public health care expenditure. Its amount is around 7% of GDP in 2014 and has significantly grown more than GDP in recent decades. Considering the current public health expenditure on GDP, it was up 5.9% in the 2002 to 6.9% in 2014 (MEF-RGS, 2015) 2014. So, since 2007 some Regions have adopted restrictive policies (bail-out plans, BOPs) "in order to face with their serious structural and economic-financial unbalances in the regional health system" (MEF-RGS). The BOP is an industrial program aimed to achieve a profound and structural reorganization of the Regional Health Service

(SSR). It concerns through the identification of inefficiency areas leading to economic unbalances and the planning and implementation of appropriate measures to correct these problems. The BOP duration is at least three years and each region can decide to extend it in the subsequent 3-years (or more 3-years periods), until economic-financial unbalances in the regional health system will be removed.

All BOPs and strategies adopted by Italian regions since 2007 are summarized in the Table 1.

[Table 1 about here]

3. Data

We have collected longitudinal data, available annually, for a period of 16 years (from 1999 to 2014) for 19 Regions and 2 Autonomous Provinces (Trento and Bolzen) for a total of 336 observations. All data was downloaded from the Health for All database (HFA) and from the I.Stat data warehouse. Our data contains information on per capita healthcare expenditure (at constant prices), a set of mortality indexes and hospitalization rates, inputs variables and socio-economic characteristics.

We figure out analysis on mortality rate and suicides rate and also mortality rate for drugs addicted, mental disorder, respiratory diseases, TBC and alcohol disease. Moreover, we collect information about acute hospitalization rate and for several diseases, such as HIV, both psychological and psychological for drugs addiction, respiratory diseases and alcohol diseases. We include relevant inputs such as numbers of acute ordinary beds and the proportion of medical and non-medical staff. Educational level is grouped in four classes: primary/no education, middle, secondary and tertiary. Then, we consider some SES determinants such as the proportion of young people (aged 0-14), of people aged over 65 years old and the proportion of female population, the unemployment rate for population aged over 15 years old. In order to use a proxy of income, we include the percentage of per capita GDP at constant prices and the value of GDP at constant prices (in € mln).

We analyse effect of austerity strategies on per capita health care expenditure (at constant prices) and on mortality and hospitalization rates by using several measures of policy.

Dummy variables *bop_1*, *bop_2* and *bop_3* are equal to 1 if the Region adopts a BOP in the period 2007-2009, 2010-2012 and 2013-2014, respectively; dummy variables *bop_12* and *bop_23* are equal to 1 if the Region adopts a BOP in the period 2007-2009 and reconfirms it in the subsequent 3-years period 2010-2012 and if the Region adopts a BOP in the period 2010-2012 and extends policy in the subsequent period 2013-2014, respectively. In order to measure the effect of BOP in the exact year of its adoption, we also build the variable *bop*; the dummy variable *bop_forward* (or *bop_123*) is equal to 1 in the exact year when the Region adopts the BOP and onwards, while the variable *bop_duration* shows the duration of a BOP (in number of years) for each region. Moreover, we include *pharma_ticket*, a dummy variable that is equal 1 if region adopts a fixed copayment on pharmaceutical expenditure.

Table 2 shows descriptive statistics for our sample overall. Among 336 observations in our sample about 3% of Regions adopt a BOP in a given year. Table 3 and 4 compare the summary statistics between Regions with a BOP in the exact year of its adoption with those that do not have (i.e for them $bop=0$ for all years) and Regions with a BOP by the end of our sample with those that do not have (i.e. for them $bop_forward=0$ in all years), respectively.

Table 5, 6 and 7 compare summary statistics between Regions that adopt a BOP in the 3- years period 2007-2009 with those that do not have (i.e for them $bop_1=0$ for all years), Regions that adopt a BOP in the 3- years period 2010-2012 with those that do not have (i.e for them $bop_2=0$ for all years) and Regions that adopt a BOP in the period 2013-2014 with those that do not have (i.e for them $bop_3=0$ for all years), respectively.

[Tables 2-7 about here]

4. Methodology

We use a difference in difference methodology to test whether there are any differences in the level of per capita public healthcare expenditure, in the level and type of hospitalizations and in the quality of healthcare between Regions under a BOP and the others, whether the adoption of BOP has made any difference at all or whether indeed there are long-standing differences in the level of per capita

public healthcare expenditure, in the level and type of hospitalizations and in the quality of healthcare between Regions, which have made some of them more likely to adopt BOP than others.

First at all, we test the effect of BOPs on the per capita PHEC over time for regions with BOPs and regions without BOPs. Then we analyse the effect of each 3-years period of BOPs (or combination of them) on hospitalizations and mortality. We explore the robustness of our results using different combinations of controls.

One of the main challenges in evaluating whether BOPs have any effect on the level of per capita PHEC and level and quality of health is the ability to draw firm conclusions based on comparison between Regions with BOPs and without BOPs, when the decision to adopt BOP is voluntary (due to high health budgeting). Allowing for this potential selection bias is therefore a key component of our research and we describe below our approach to this. We use the DID methodology for dealing with selection bias (or self-selection) in treatment effect models. This methodology considers regions with BOPs as an experiment and it looks for a naturally occurring comparison group that can mimic the properties of the treatment group in the properly designed experimental context.

This method is termed DID since it is usually implemented by comparing the difference in the average level of activity before and after the adoption of BOP for the eligible group (treatment group) with the before and after contrast for the control group (Blundell and Costa Dias, 2002). This approach can be used to isolate the average effect of the regions with BOPs (treatment) on those regions without BOPs ('treated'). This approach measures the average effect of the treatment on the treated (ATT) by removing unobservable regional effects and common macro effects.

5. Empirical results

5.1 Per Capita Public Health Expenditure analysis

Figure 1 shows per capita PHEC trend when region adopts BOP considering the exact year of BOP's adoption, in the year of BOP's adoption and onwards and considering the duration of BOP for all regions. Dashed lines in the 2007/2008 and 2010/2011 represent the European economic crisis period and Italian sovereign debt crisis, respectively. All frames show that the introduction of austerity measure (BOPs) decreases the level of per capita PHEC in regions that adopt BOPs.

Moreover, the Figure 2 the level of per capita PHEC for regions that adopt BOPs in the year 2007, 2010 and 2011, respectively. It confirms a decreasing level of per capita PHEC over time for regions that adopt BOPs.

[Figure 1-2 about here]

Table 8 shows the regression results for the DID models in which we test the effect of austerity policy on per capita PHEC. In the column 1 we have a positive and significant effect of BOPs on per capita PHEC. It confirms that the effect of policy is not so relevant if we consider only the exact year of BOPs introduction. A decreasing effect on per capita PHEC there is if we consider the subsequent years of BOPs introduction (column 2). Considering the duration of BOPs, in other words the severity of austerity measure, we have a positive and significant effect on per capita PHEC.

[Table 8 about here]

5.2 Mortality and hospitalization rates

Since the BOPs' introduction decreases the level of per capita PHEC we analyse how the effect of austerity measures influence health. To test it, we use several mortality and hospitalization rates.

Table 9, 10 and 11 show the regression results for the DID models in which we test the effect of BOPs introduction affect the mortality rate, suicides rate and mortality rate by several diseases. In the Table 9, we consider the effect of each 3-years period on dependent variables and we notice that an introduction of BOPs increases mortality rate, but it is not confirmed if we analyse by each disease. It can suggest that austerity measures are not so drastic for some type of diseases (for example for respiratory diseases).

Table 10 highlights results on mortality rates if we consider the effect of BOPs during the years 2007-2012, 2010-2014 and 2007-2014, respectively. In general, signs of each mortality rates is positive and it confirms that the introduction of BOPs has a negative effect on health quality over time.

In line with literature, the effect of severity of BOPs decreases the mortality rates (Table 11). Our results confirm that during the austerity years, there was a pronounced slowdown in the rate of improvement in mortality in Italy as well as in all European countries (Ruhm, 2015).

[Table 9-11 about here]

Table 12, 13 and 14 show the regression results for the DID models in which we test the effect of introduction of BOPs can affect the hospitalization rates. Table 12 highlights that the introduction of austerity measures decreases hospitalization rates. These results are confirmed in the Table 13 and 14. It suggests that BOPs reduce the utilization of hospitalization increasing unmet need of health care in the region with BOPs.

[Table 12-14 about here]

6. Conclusion

Our results show different effects of austerity measures on per capita PHEC, mortality and hospitalization rates. In terms of policy implications, these results suggest that there is a negative trade-off between economic targets and people wellbeing. Though the introduction of BOPs reduces the level of per capita PHEC in regions with high level of public health expenditure, it will be a disadvantage for the health of people living in these regions in terms of services offered to the public and quality of life.

From a methodological perspective, there are at least two issues we still need to address:

1. DID methodology. It relies on two critically important assumptions of (i) common time effects across groups and (ii) no systematic composition changes within each group (Blundell and Costa Dias, 2002). The drawback of the DID approach is that it assumes random assignment to the treatment group, whereas in the context of introduction of BOPs, assignment of regions to the treatment and control groups is not random. As a consequence,

the estimation of the effect of BOPs may be biased by the existence of confounding factors (Becker and Ichino, 2002). A possible solution is to adopt a matching method as a way to correct the estimation of treatment effects controlling for the existence of confounding factors based on the idea that the bias is reduced when the comparison of outcomes is performed using treated and control regions that are as similar as possible (Becker and Ichino, 2002). Under the matching assumption, the only remaining difference between treated and non-treated groups is the treatment. Consequently, if each region with BOPs can be matched with a region with the same matching variables, but that has not adopted BOPs, then the impact of the BOPs can be isolated (Blundell and Costa Dias, 2002).

2. All regions without BOPs control group. The disadvantage of this control group is that it may be very heterogeneous, including also regions that may have unobserved differences in social-economics determinants time trends, thereby violating the identifying assumption of the DID method (Dawson et al., 2007). A possible solution would be to use the propensity score matching method to match regions with BOPs with regions without BOPs on the basis of observable characteristics, other than their level of per capita PHEC. The advantage of this method is that statistically there is a strong match between regions with BOPs and without BOPs on their observable pre-treatment characteristics, although the control group is still smaller.

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Figure 2. Per capita Public Health Expenditure trend by the year of BOPs adoption

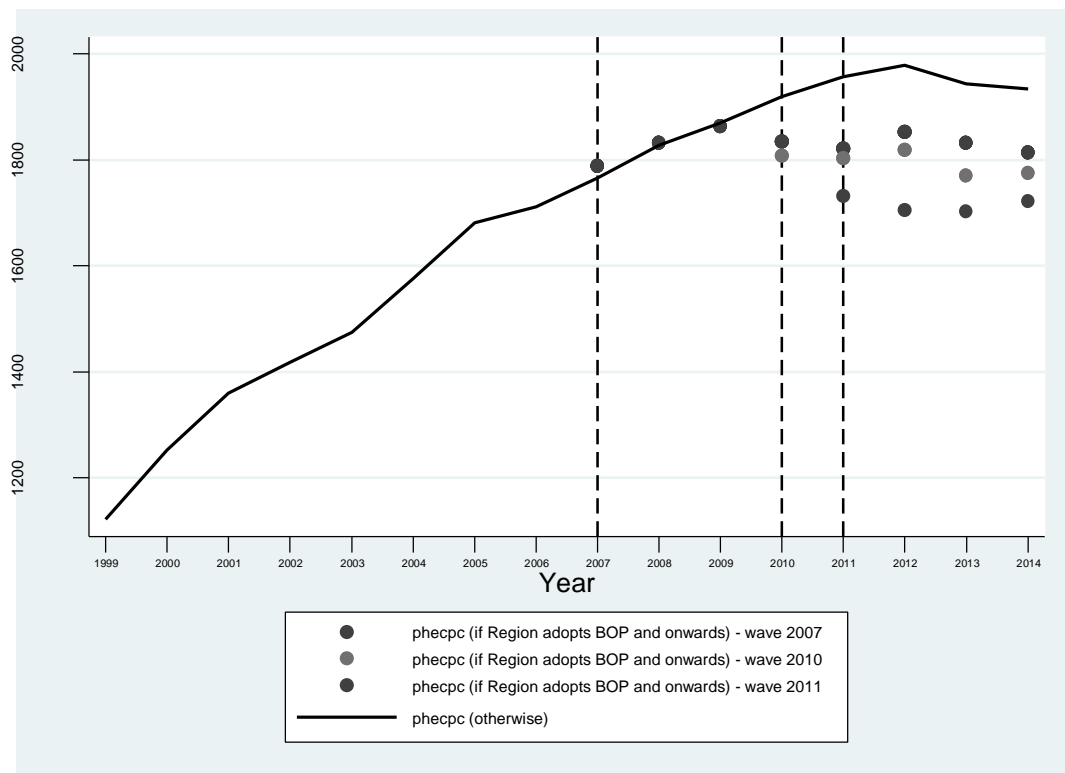


Table 1. Regional BOPs strategies and co-payment policies

Region	Bail-out Plan			Health care co-payment			
	Hospitalization rate reduction	Number of beds changes	Staff costs constrain	Outpatient services (since 1993)	Top-up co-payment	Pharma expenditure in convention	A&E attendences without ticket payment (since 2007)
Abruzzo	X	X	X	X	since 2011	2002 and since 2007	X
Basilicata				X	Not applicable	dal 2007	Not applicable
Calabria	X	X	X	X	Since 2011	2002-2005 and since 2007	X
Campania	X	X	X	X	Since 2011	Since 2007	X
Emilia Romagna				X	Since 2011	Since 2007	X
Friuli Venezia Giulia				X	Since 2011	2007-2014	X
Lazio	X	X	X	X	Since 2011	2002-2005 and since 2007	X
Liguria	X	X	X	X	Since 2011	Since 2002	X
Lombardy				X	Since 2011	Since 2002	X
Marche				X	Since 2011	2007-2013	X
Molise	X	X	X	X	Since 2011	Since 2002	X
Bolzen				X	Not applicable	Since 2002	X
Trento				X	Since 2015	2002 and since 2007	X
Piedmont	X	X	X	X	Since 2011	Since 2002	X
Apulia	X	X	X	X	Since 2011	Since 2002	X
Sardinia	X	X	X	X	Not applicable	2002-2004 and 2007-2014	X
Sicily	X	X		X	Since 2011	Since 2002	X
Tuscany				X	Since 2011	Since 2007	X
Umbria				X	Since 2011	Since 2007	X
Aosta Valley				X	Not applicable	2007-2014	X
Veneto				X	Since 2011	Since 2002	X

Note: Abruzzo, Campania, Lazio, Molise e Sicilia adopted BOP in the 2007, Calabria e Apulia in the 2010, Liguria and Sardinia adopted BOP from the 2007 to 2009 and Piedmont from 2010 to 2017.

Sources: Data elaboration from Jommi et al. (2003), Otto et al. (2004), Cavalli e Otto (2007), Federfarma.it, Piani di Rientro Regionali, AGENAS (2015) and Italian Health Ministry.

Table 2. Summary statistics - Full dataset

Variable	Obs	Mean	Std. Dev.	Min	Max
<i>Dependent variables</i>					
Per capita Public Health Expenditure (at current prices)	336	1658.77	291.04	915	2271
Mortality rate	328	100.25	13.61	74.51	144.73
Suicides rate	328	0.74	0.25	0.31	1.93
<i>Mortality rate for:</i>					
Drugs addicted	336	0.18	0.24	0.01	1
Mental disorders	328	2.19	0.99	0.50	5.77
Respiratory diseases	328	6.87	1.19	4.69	10.78
TBC	328	0.09	0.14	0.02	1
Alcohol	328	0.09	0.19	0.01	1
Acute hospitalizations rate	336	132.69	24.77	79.91	200.48
<i>Hospitalization for:</i>					
HIV	336	4.12	4.76	0.16	39.45
Psychological diseases for drugs addiction	336	1.23	0.60	0.32	4.09
Psychological diseases	336	52.91	16.34	23.87	99.21
Respiratory diseases	336	125.00	18.50	83.22	180.03
Alcohol diseases	336	16.83	9.15	4.02	44.88
<i>Policy variables</i>					
bop_1	336	0.06	0.24	0	1
bop_2	336	0.07	0.26	0	1
bop_3	336	0.05	0.21	0	1
bop_12	336	0.13	0.34	0	1
bop_23	336	0.12	0.32	0	1
bop	336	0.03	0.17	0	1
bop_forward	336	0.18	0.39	0	1
bop_duration	336	3.33	3.71	0	8
Pharma ticket	336	0.65	0.48	0	1
<i>Inputs</i>					
Acute ordinary beds (numbers)	336	9184.97	7877.67	373	40487
Share of non-medical staff (%)	315	43.89	4.09	35.63	54.33
Share of medical staff (%)	315	56.11	4.09	45.67	64.37
<i>Education</i>					
Primary	336	29.29	8.23	14.57	46.93
Middle	336	30.58	3.21	23.19	39.90
Secondary	336	31.06	5.04	19.76	42.28
Tertiary	336	9.07	2.76	3.65	18.17
<i>Controls</i>					
Share of Population aged 0-14 (%)	336	13.87	1.72	10.37	19.09
Share of Population aged 65+ (%)	336	20.28	2.92	7.93	27.86
Share of Population aged 75+ (%)	336	9.81	1.82	5.27	14.92
Share of female population (%)	336	51.44	0.44	50.55	52.85
Unemployed rate aged 15+	336	9.06	5.68	1.85	28.01
% GDP per capita at constant prices	336	0.03	0.01	0.02	0.04
GDP at constant prices (in € mln)	336	75917.16	77051.56	4147.90	352926.40

Table 3. Mean Comparison: Regions with BOP vs. Regions without BOP (by the end of our sample period; 1999-2014)

Variable	<u>BOP (=1 by the year of Regions adopted BOP)</u>		<u>BOP (=0 in all years)</u>		<u>Difference</u> BOP=1 - BOP=0
	Obs	Mean	Obs	Mean	
<u>Dependent variable</u>					
Per capita Public Health Expenditure (at current prices)	10	1787.20	326	1654.83	132.369
<u>Controls</u>					
Share of Population aged 0-14 (%)	10	4.46	326	4.53	-0.068
Share of Population aged 75+ (%)	10	9.89	326	9.81	0.081
Share of female population (%)	10	51.55	326	51.44	0.116
% GDP per capita at constant prices	10	0.02	326	0.03	-0.003

Note: Significance levels: * < 10% ** < 5% *** < 1%

Table 4. Mean Comparison: Regions with BOP_forward vs. Regions without BOP_forward (by the end of our sample period; 1999-2014)

Variable	<u>BOP forward (=1 by the year of Regions adopted BOP and subsequent years)</u>		<u>BOP forward (=0 in all years)</u>		<u>Difference</u> BOP_forward=1 - BOP_forward=0
	Obs	Mean	Obs	Mean	
<u>Dependent variable</u>					
Per capita Public Health Expenditure (at current prices)	61	1816.97	275	1623.68	193.287***
<u>Controls</u>					
Share of Population aged 0-14 (%)	61	4.44	275	4.55	-0.106
Share of Population aged 75+ (%)	61	10.22	275	9.72	0.505*
Share of female population (%)	61	51.54	275	51.42	0.119*
% GDP per capita at constant prices	61	0.02	275	0.03	-0.006***

Note: Significance levels: * < 10% ** < 5% *** < 1%

Table 5. Mean Comparison: Regions adopting BOPs during the years 2007-2009 vs. Regions without BOP (by the end of our sample period; 1999-2014)

Variable	<u>BOP 1 (=1 if Regions adopted BOPs during years 2007-2009)</u>		<u>BOP 1 (=0 if Regions did not adopt BOPs during years 2007-2009)</u>		<u>Difference</u>
	Obs	Mean	Obs	Mean	$BOP_{I=1} - BOP_{I=0}$
<i>Dependent variables</i>					
Mortality rate	21	99.88	307	100.28	-2.531
Suicides rate	21	0.60	307	0.75	-0.163**
<i>Mortality rate for:</i>					
Drugs addicted	21	0.21	315	0.18	0.022
Mental disorders	21	1.99	307	2.20	-0.552*
Respiratory diseases	21	6.41	307	6.90	-0.376
TBC	21	0.07	307	0.09	-0.03
Alcohol	21	0.05	307	0.09	-0.055
Acute hospitalizations rate	21	134.28	315	132.59	0.811
<i>Hospitalization rate for:</i>					
HIV	21	6.77	315	3.94	1.787
Psychological diseases for drugs addiction	21	1.13	315	1.24	-0.132
Psychological diseases	21	54.85	315	52.78	1.086
Respiratory diseases	21	130.09	315	124.66	5.187
Alcohol diseases	21	18.20	315	16.74	2.457
<i>Policy variables</i>					
Pharma ticket	21	1	315	0.63	0.356**
<i>Inputs</i>					
Acute ordinary beds (numbers)	21	9309.05	315	9176.70	514.65
Share of non-medical staff (%)	21	39.98	294	44.17	-2.849**
Share of medical staff (%)	21	60.02	294	55.83	2.849**
<i>Education</i>					
Primary	21	25.32	315	29.56	-3.339
Middle	21	31.90	315	30.49	1.504
Secondary	21	32.02	315	30.99	0.723
Tertiary	21	10.76	315	8.96	1.106
<i>Controls</i>					
Share of Population aged 0-14 (%)	21	13.72	315	13.88	-0.012
Share of Population aged 65+ (%)	21	51.61	315	51.43	-0.098
Share of female population (%)	21	20.31	315	20.28	0.116
Unemployed rate aged 15+	21	9.39	315	9.04	0.126
% GDP per capita at constant prices	21	0.02	315	0.03	-0.003
GDP at constant prices (in € mln)	21	72979.01	315	76113.04	-794.352

Note: Significance levels: * < 10% ** < 5% *** < 1%

Table 6. Mean Comparison: Regions adopting BOPs during years 2010-2012 vs. Regions without BOP during years 2010-2012 (by the end of our sample period; 1999-2014)

Variable	<u>BOP 2 (=1 if Regions adopted BOPs during years 2010-2012)</u>		<u>BOP 2 (=0 if Regions did not adopt BOPs during years 2010-2012)</u>		<u>Difference</u>
	Obs	Mean	Obs	Mean	$BOP_2 = 1 - BOP_2 = 0$
<i>Dependent variables</i>					
Mortality rate	24	99.30	304	100.33	-2.531
Suicides rate	24	0.63	304	0.75	-0.163**
<i>Mortality rate for:</i>					
Drugs addicted	24	0.12	312	0.19	0.022
Mental disorders	24	2.30	304	2.18	-0.552*
Respiratory diseases	24	6.55	304	6.89	-0.376
TBC	24	0.05	304	0.09	-0.03
Alcohol	24	0.04	304	0.09	-0.055
Acute hospitalizations rate	24	114.69	312	134.08	0.811
<i>Hospitalization rate for:</i>					
HIV	24	4.19	312	4.11	1.787
Psychological diseases for drugs addiction	24	0.85	312	1.26	-0.132
Psychological diseases	24	44.90	312	53.52	1.086
Respiratory diseases	24	111.87	312	126.01	5.187
Alcohol diseases	24	14.15	312	17.04	2.457
<i>Policy variables</i>					
Pharma ticket	24	1	312	0.63	0.356**
<i>Inputs</i>					
Acute ordinary beds (numbers)	24	9247.92	312	9180.13	514.65
Share of non-medical staff (%)	24	39.89	291	44.22	-2.849**
Share of medical staff (%)	24	60.11	291	55.78	2.849**
<i>Education</i>					
Primary	24	23.78	312	29.72	-3.339
Middle	24	31.90	312	30.48	1.504
Secondary	24	33.42	312	30.87	0.723
Tertiary	24	10.90	312	8.93	1.106
<i>Controls</i>					
Share of Population aged 0-14 (%)	24	13.95	312	13.86	-0.012
Share of Population aged 65+ (%)	24	51.52	312	51.43	-0.098
Share of female population (%)	24	20.03	312	20.30	0.116
Unemployed rate aged 15+	24	12.24	312	8.82	0.126
% GDP per capita at constant prices	24	0.02	312	0.03	-0.003
GDP at constant prices (in € mln)	24	77593.33	312	75788.22	-794.352

Note: Significance levels: * < 10% ** < 5% *** < 1%

Table 7. Mean Comparison: Regions adopting BOPs during years 2013-2014 vs. Regions without BOP during years 2013-2012 (by the end of our sample period; 1999-2014)

Variable	<u>BOP 3 (=1 if Regions adopted BOPs during years 2013-2014)</u>		<u>BOP 3 (=0 if Regions did not adopt BOPs during years 2013- 2014)</u>		<u>Difference</u>
	Obs	Mean	Obs	Mean	$BOP_3 = 1 - BOP_3 = 0$
<i>Dependent variables</i>					
Mortality rate	16	99.26	312	100.30	-2.531
Suicides rate	16	0.56	312	0.75	-0.163**
<i>Mortality rate for:</i>					
Drugs addicted	16	0.10	320	0.19	0.022
Mental disorders	16	2.46	312	2.18	-0.552*
Respiratory diseases	16	6.52	312	6.89	-0.376
TBC	16	0.10	312	0.09	-0.03
Alcohol	16	0.09	312	0.09	-0.055
Acute hospitalizations rate	16	102.46	320	134.21	0.811
<i>Hospitalization rate for:</i>					
HIV	16	3.54	320	4.15	1.787
Psychological diseases for drugs addiction	16	0.73	320	1.26	-0.132
Psychological diseases	16	41.06	320	53.50	1.086
Respiratory diseases	16	101.16	320	126.19	5.187
Alcohol diseases	16	11.25	320	17.11	2.457
<i>Policy variables</i>					
Pharma ticket	16	1	320	0.64	0.356**
<i>Inputs</i>					
Acute ordinary beds (numbers)	16	8764.19	320	9206.01	514.65
Share of non-medical staff (%)	8	39.04	307	44.02	-2.849**
Share of medical staff (%)	8	60.96	307	55.98	2.849**
<i>Education</i>					
Primary	16	21.93	320	29.66	-3.339
Middle	16	31.68	320	30.52	1.504
Secondary	16	34.48	320	30.88	0.723
Tertiary	16	11.91	320	8.93	1.106
<i>Controls</i>					
Share of Population aged 0-14 (%)	16	13.78	320	13.87	-0.012
Share of Population aged 65+ (%)	16	51.47	320	51.44	-0.098
Share of female population (%)	16	20.82	320	20.26	0.116
Unemployed rate aged 15+	16	17.13	320	8.66	0.126
% GDP per capita at constant prices	16	0.02	320	0.03	-0.003
GDP at constant prices (in € mln)	16	75657.06	320	75930.17	-794.352

Note: Significance levels: * < 10% ** < 5% *** < 1%

Table 8. Per capita Public Health Expenditure (at current prices) estimation of by BOPs

VARIABLES	Per capita Public Health Expenditure (at current prices)		
	(1) FE Coeff.\Std. Err.	(2) FE Coeff.\Std. Err.	(3) OLS Coeff.\Std. Err.
<i>Policy variables</i>			
bop	0.019** (0.009)		
bop_forward		-0.030** (0.012)	
bop_duration			0.151*** (0.017)
<i>Controls</i>			
Share of Population aged 0-14 (%)	0.087*** (0.020)	0.080*** (0.021)	0.088*** (0.020)
Share of Population aged 75+ (%)	0.096*** (0.020)	0.105*** (0.020)	0.097*** (0.020)
Share of female population (%)	-0.056* (0.033)	-0.062* (0.033)	-0.055* (0.033)
% GDP per capita at constant prices	35.143*** (4.875)	35.024*** (4.831)	35.744*** (4.808)
period	0.019*** (0.004)	0.018*** (0.004)	0.019*** (0.004)
<i>Time fixed effect</i>			
Constant	7.237*** (1.790)	7.517*** (1.790)	7.160*** (1.782)
Observations	336	336	336
R-squared	0.913	0.914	0.912

Note: Robust standard errors in parentheses *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Table 9. Mortality rates' estimation. Regions adopting BOPs during years 2007-2009, 2010-2012, 2013-2014

	(1)	(3)	(4)	(5)	(6)	(7)	(8)
	Types of mortality rate						
	Mortality rate	Drugs addicted	Mental disorders	Respiratory diseases	TBC	Alcohol	Suicides rate
	FE Coeff.\Std. Err.	FE Coeff.\Std. Err.	FE Coeff.\Std. Err.	FE Coeff.\Std. Err.	FE Coeff.\Std. Err.	FE Coeff.\Std. Err.	FE Coeff.\Std. Err.
VARIABLES							
<i>Policy variables</i>							
bop_1	0.006 (0.008)	0.122 (0.288)	0.007 (0.024)	-0.026* (0.014)	0.034 (0.058)	0.095 (0.163)	0.060 (0.043)
bop_2	0.021* (0.011)	-0.097 (0.211)	0.015 (0.035)	-0.023 (0.025)	-0.033 (0.189)	-0.010 (0.227)	0.044 (0.043)
bop_3	0.025** (0.012)	-0.334 (0.270)	0.008 (0.064)	-0.060** (0.025)	0.391 (0.292)	-0.120 (0.148)	-0.130* (0.075)
<i>Education</i>							
Primary	0.197** (0.076)	1.966 (1.145)	0.082 (0.254)	-0.048 (0.141)	-0.938 (1.007)	-0.319 (1.165)	0.418** (0.167)
Middle	0.196* (0.104)	2.518** (1.140)	0.718 (0.479)	-0.163 (0.244)	1.726 (1.099)	1.891 (1.467)	-0.311 (0.259)
Secondary	0.306*** (0.106)	-1.459 (1.477)	-0.072 (0.485)	-0.017 (0.232)	-0.937 (1.275)	1.972 (1.582)	0.326 (0.260)
Tertiary	0.118** (0.046)	2.581*** (0.723)	0.181 (0.195)	0.051 (0.106)	0.483 (0.608)	1.199 (0.734)	-0.098 (0.129)
Unemployed rate aged 15+	-0.068*** (0.019)	-0.081 (0.267)	-0.084 (0.065)	-0.050 (0.039)	-0.157 (0.209)	0.639** (0.254)	-0.090 (0.054)
<i>Year fixed effect</i>							
Constant	YES 2.192** (0.854)	YES -16.790 (11.019)	YES -2.147 (3.405)	YES 2.747 (1.948)	YES -2.101 (7.242)	YES -18.350* (10.073)	YES -1.468 (1.586)
Observations	328	336	328	328	328	328	328
R-squared	0.688	0.325	0.863	0.560	0.165	0.146	0.253
Number of id	21	21	21	21	21	21	21

Note: Robust standard errors in parentheses *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Table 10. Mortality rates' estimation. Regions adopting BOPs during years 2007-2012, 2010-2014, 2007-2014

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Types of mortality rate						
	Mortality rate	Drugs addicted	Mental disorders	Respiratory diseases	TBC	Alcohol	Suicides rate
	FE	FE	FE	FE	FE	FE	FE
VARIABLES	Coeff.\Std. Err.	Coeff.\Std. Err.	Coeff.\Std. Err.	Coeff.\Std. Err.	Coeff.\Std. Err.	Coeff.\Std. Err.	Coeff.\Std. Err.
<i>Policy variables</i>							
bop_12	-0.004 (0.006)	0.237 (0.210)	0.007 (0.036)	0.037* (0.021)	-0.423 (0.353)	0.110 (0.287)	0.174* (0.085)
bop_23	0.015* (0.007)	-0.219 (0.253)	0.008 (0.039)	0.002 (0.025)	-0.067 (0.212)	-0.105 (0.224)	-0.015 (0.052)
bop_123	0.010 (0.008)	-0.115 (0.400)	-0.000 (0.041)	-0.062** (0.026)	0.457 (0.360)	-0.015 (0.277)	-0.115 (0.098)
<i>Education</i>							
Primary	0.197** (0.076)	1.966 (1.145)	0.082 (0.254)	-0.048 (0.141)	-0.938 (1.007)	-0.319 (1.165)	0.418** (0.167)
Middle	0.196* (0.104)	2.518** (1.140)	0.718 (0.479)	-0.163 (0.244)	1.726 (1.099)	1.891 (1.467)	-0.311 (0.259)
Secondary	0.306*** (0.106)	-1.459 (1.477)	-0.072 (0.485)	-0.017 (0.232)	-0.937 (1.275)	1.972 (1.582)	0.326 (0.260)
Tertiary	0.118** (0.046)	2.581*** (0.723)	0.181 (0.195)	0.051 (0.106)	0.483 (0.608)	1.199 (0.734)	-0.098 (0.129)
Unemployed rate aged 15+	-0.068*** (0.019)	-0.081 (0.267)	-0.084 (0.065)	-0.050 (0.039)	-0.157 (0.209)	0.639** (0.254)	-0.090 (0.054)
<i>Year fixed effect</i>							
Constant	YES 2.192** (0.854)	YES -16.790 (11.019)	YES -2.147 (3.405)	YES 2.747 (1.948)	YES -2.101 (7.242)	YES -18.350* (10.073)	YES -1.468 (1.586)
Observations	328	336	328	328	328	328	328
R-squared	0.688	0.325	0.863	0.560	0.165	0.146	0.253
Number of id	21	21	21	21	21	21	21

Note: Robust standard errors in parentheses *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Table 11. Mortality rates' estimation by BOPs duration

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Types of mortality rate						
	Mortality rate	Drugs addicted	Mental disorders	Respiratory diseases	TBC	Alcohol	Suicides rate
	FE	FE	FE	FE	FE	FE	FE
VARIABLES	Coeff.\Std. Err.	Coeff.\Std. Err.	Coeff.\Std. Err.	Coeff.\Std. Err.	Coeff.\Std. Err.	Coeff.\Std. Err.	Coeff.\Std. Err.
<i>Policy variables</i>							
bop_duration	-0.038*** (0.005)	-0.214** (0.094)	-0.189*** (0.024)	-0.100*** (0.012)	-0.319*** (0.085)	-0.420*** (0.100)	-0.072*** (0.019)
<i>Education</i>							
Primary	0.376*** (0.049)	1.693 (1.138)	0.294 (0.340)	0.160 (0.127)	-0.709 (0.519)	1.239 (1.057)	0.385** (0.167)
Middle	-0.051 (0.056)	1.257 (1.234)	-0.531 (0.399)	-0.314** (0.125)	0.947 (0.819)	0.229 (1.044)	-0.353* (0.205)
Secondary	0.201*** (0.049)	-3.912*** (1.286)	-1.718*** (0.325)	0.085 (0.148)	-1.580* (0.869)	1.740 (1.366)	0.223 (0.241)
Tertiary	0.015 (0.030)	2.749*** (0.770)	-0.022 (0.164)	-0.000 (0.084)	0.149 (0.533)	0.637 (0.738)	-0.111 (0.141)
Unemployed rate aged 15+	-0.012 (0.009)	-0.220 (0.203)	0.034 (0.051)	0.044* (0.023)	-0.174 (0.134)	0.419** (0.195)	0.043 (0.033)
period	0.015*** (0.001)	-0.047 (0.037)	0.121*** (0.011)	0.012*** (0.004)	-0.038* (0.022)	-0.014 (0.035)	0.018*** (0.006)
<i>Year fixed effect</i>							
Constant	YES 2.764*** (0.434)	YES -2.727 (9.725)	YES 6.820** (2.962)	YES 2.280** (1.130)	YES 3.236 (4.463)	YES -14.133 (9.220)	YES -0.499 (1.485)
Observations	328	336	328	328	328	328	328
R-squared	0.958	0.479	0.886	0.814	0.471	0.459	0.863

Note: Robust standard errors in parentheses *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Table 12. Hospitalization rates' estimation. Regions adopting BOPs during years 2007-2009, 2010-2012, 2013-2014

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)
	Acute hospitalizations rate	Reason of hospitalization				
		HIV	Psychological diseases for drugs addiction	Psychological diseases	Respiratory diseases	Alcohol diseases
	FE Coeff.\Std. Err.	FE Coeff.\Std. Err.	FE Coeff.\Std. Err.	FE Coeff.\Std. Err.	FE Coeff.\Std. Err.	FE Coeff.\Std. Err.
<i>Policy variables</i>						
bop_1	-0.002 (0.015)	-0.011 (0.109)	0.005 (0.080)	-0.051 (0.058)	-0.050 (0.030)	0.000 (0.069)
bop_2	-0.043 (0.029)	-0.330 (0.252)	-0.136 (0.114)	-0.077 (0.083)	-0.078** (0.031)	0.018 (0.068)
bop_3	-0.055* (0.030)	-0.093 (0.265)	-0.150 (0.151)	-0.085 (0.098)	-0.120** (0.042)	0.051 (0.099)
Pharma ticket	0.046** (0.017)	0.194** (0.078)	-0.109* (0.057)	0.027 (0.034)	0.065*** (0.023)	0.088* (0.050)
<i>Inputs</i>						
Acute ordinary beds (numbers)	0.561*** (0.100)	-0.297 (0.602)	0.549** (0.254)	0.166 (0.139)	0.375*** (0.077)	0.536** (0.240)
Share of non-medical staff (%)	1.562** (0.738)	-2.178 (8.508)	2.554 (5.045)	-1.508 (2.153)	1.593 (0.946)	3.237 (3.886)
Share of medical staff (%)	2.297** (0.866)	1.726 (11.096)	5.650 (5.868)	-0.723 (2.653)	2.539** (1.162)	4.847 (4.472)
<i>Controls</i>						
Share of Population aged 0-14 (%)	0.150 (0.137)	-2.504 (1.459)	0.234 (0.738)	0.037 (0.325)	0.284* (0.160)	-0.133 (0.609)
Share of Population aged 65+ (%)	0.005 (0.085)	-0.268 (0.515)	-0.491*** (0.158)	0.034 (0.113)	0.035 (0.069)	0.018 (0.212)
<i>Year fixed effect</i>						
Constant	YES -15.420** (6.792)	YES 12.378 (78.507)	YES -35.878 (42.826)	YES 11.105 (19.601)	YES -15.456* (8.507)	YES -32.891 (32.547)
Observations	315	315	315	315	315	315
R-squared	0.900	0.406	0.428	0.764	0.776	0.864
Number of id	21	21	21	21	21	21

Note: Robust standard errors in parentheses *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Table 13. Hospitalization rates' estimation. Regions adopting BOPs during years 2007-2012, 2010-2014, 2007-2014

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)
	Acute hospitalizations rate	Reasons of hospitalization				
		HIV	Psychological diseases for drugs addiction	Psychological diseases	Respiratory diseases	Alcohol diseases
	FE Coeff.\Std. Err.	FE Coeff.\Std. Err.	FE Coeff.\Std. Err.	FE Coeff.\Std. Err.	FE Coeff.\Std. Err.	FE Coeff.\Std. Err.
<i>Policy variables</i>						
bop_12	0.012 (0.007)	0.014 (0.064)	0.008 (0.033)	0.042 (0.025)	0.110 (0.073)	-0.033 (0.060)
bop_23	-0.041 (0.027)	-0.141 (0.112)	-0.026 (0.059)	-0.027 (0.022)	0.127 (0.133)	0.018 (0.071)
bop_123	-0.014 (0.016)	-0.008 (0.102)	-0.059 (0.066)	-0.093** (0.040)	-0.279 (0.178)	0.034 (0.069)
Pharma ticket	0.046** (0.017)	-0.109* (0.057)	0.027 (0.034)	0.065*** (0.023)	0.058 (0.063)	0.088* (0.050)
<i>Inputs</i>						
Acute ordinary beds (numbers)	0.561*** (0.100)	0.549** (0.254)	0.166 (0.139)	0.375*** (0.077)	0.450 (0.344)	0.536** (0.240)
Share of non-medical staff (%)	1.562** (0.738)	2.554 (5.045)	-1.508 (2.153)	1.593 (0.946)	-11.034** (3.911)	3.237 (3.886)
Share of medical staff (%)	2.297** (0.866)	5.650 (5.868)	-0.723 (2.653)	2.539** (1.162)	-12.495** (4.815)	4.847 (4.472)
<i>Controls</i>						
Share of Population aged 0-14 (%)	0.150 (0.137)	0.234 (0.738)	0.037 (0.325)	0.284* (0.160)	1.237** (0.575)	-0.133 (0.609)
Share of Population aged 65+ (%)	0.005 (0.085)	-0.491*** (0.158)	0.034 (0.113)	0.035 (0.069)	0.523** (0.247)	0.018 (0.212)
<i>Year Fixed effect</i>						
Constant	YES -15.420** (6.792)	YES -35.878 (42.826)	YES 11.105 (19.601)	YES -15.456* (8.507)	YES 83.972** (32.312)	YES -32.891 (32.547)
Observations	315	315	315	315	315	315
R-squared	0.900	0.428	0.764	0.776	0.618	0.864
Number of id	21	21	21	21	21	21

Note: Robust standard errors in parentheses *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Table 14. Hospitalization rates' estimation by BOPs duration

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)
	Acute hospitalizations rate	Reasons of hospitalization				
		HIV	Psychological diseases for drugs addiction	Psychological diseases	Respiratory diseases	Alcohol diseases
	FE Coeff.\Std. Err.	FE Coeff.\Std. Err.	FE Coeff.\Std. Err.	FE Coeff.\Std. Err.	FE Coeff.\Std. Err.	FE Coeff.\Std. Err.
<i>Policy variables</i>						
bop_duration	-0.453*** (0.046)	-0.548*** (0.139)	-0.245*** (0.054)	-0.264*** (0.048)	-0.221 (0.159)	-0.488*** (0.096)
Pharma ticket	0.021** (0.009)	-0.121*** (0.035)	0.021 (0.018)	0.064*** (0.012)	0.042 (0.042)	0.050* (0.026)
<i>Inputs</i>						
Acute ordinary beds (numbers)	0.693*** (0.066)	0.808*** (0.191)	0.150* (0.078)	0.386*** (0.067)	0.596*** (0.219)	0.530*** (0.133)
Share of non-medical staff (%)	1.531*** (0.556)	2.431 (2.701)	-0.317 (1.002)	2.632*** (0.655)	-10.860*** (2.201)	2.480 (1.659)
Share of medical staff (%)	2.109*** (0.706)	4.530 (3.337)	0.524 (1.260)	3.450*** (0.841)	-12.826*** (2.914)	3.696* (1.989)
<i>Controls</i>						
Share of Population aged 0-14 (%)	0.151* (0.090)	0.096 (0.427)	0.101 (0.168)	0.300*** (0.106)	1.205*** (0.346)	-0.231 (0.294)
Share of Population aged 65+ (%)	0.008 (0.077)	-0.380** (0.149)	0.071 (0.121)	0.059 (0.072)	0.426*** (0.135)	0.002 (0.170)
<i>Year Fixed effect</i>	YES	YES	YES	YES	YES	YES
Constant	-13.977*** (4.913)	-30.987 (23.410)	2.332 (8.799)	-22.241*** (5.851)	84.929*** (19.696)	-22.941 (14.099)
Observations	315	315	315	315	315	315
R-squared	0.924	0.831	0.912	0.826	0.716	0.938

Note: Robust standard errors in parentheses *** $p < 0.01$, ** $p < 0.05$, * $p < 0$

