The demand for pharmaceuticals: evidence from Italy

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Abstract

This study exploits a natural experiment in Italy to estimate how the demand for pharmaceuticals responds to variations in co-payment levels. After a period where co-payments were zero by a national law, the decision over co-payments was devolved to the twenty Italian regions. While some regions re-introduced the co-payment, others did not. Using a difference-in-difference approach on regional monthly data over the period 2001-2003, we find that the introduction of the co-payment led to a reduction in the number of prescriptions by 7%. Moreover, we find that the elasticity of the number of prescriptions per capita with respect to an increase in the co-payment, conditional on having one, is around 0.1. We also find that such effect is not symmetric. When some regions reduced (but not removed) the co-payment, the elasticity of the number of prescriptions per capita with respect to a reduction in the co-payment was around 0.01.

Keywords: Prescriptions; co-payments; moral hazard.
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1. Introduction

Pharmaceutical expenditure is growing in many OECD countries (Maynard and Bloor, 2003). The average pharmaceutical expenditure in the OECD has increased from 1% of GDP in 1990 to 1.45% in 2007 (OECD Health Database 2007). It accounts for a substantial part of total health expenditure, about 17% in 2007.

Policymakers often argue that the introduction of an increase in co-payments is a possible solution to the rise of pharmaceutical expenditure. This policy has two main advantages: i) it reduces moral hazard, by discouraging patients with low expected benefit to purchase the medicine, and, ii) it raises revenues for the government. However, if the co-payment is not means-tested, increasing co-payments might have some equity implications. Poor patients may be put off by the co-payment and may give up treatment even when needed.

Health insurance theory suggests that the optimal co-payment is such that it trades off insurance (equalisation of marginal utilities across health states) with moral hazard (allocative efficiency requires equalisation of marginal benefit with marginal cost). Setting a co-payment at zero is sub-optimal because patients demand excessive care. Setting a co-payment equal to the cost of health care is also sub-optimal because it eliminates insurance. Therefore, the optimal co-payment lies between zero and the full cost of health care.

Moreover, the optimal co-payment is inversely related to the elasticity of demand (see for example Zweifel and Breyer, 1997; Gravelle and Siciliani, 2008). This result is intuitive. The higher is the elasticity of demand, the higher is the scope for containing moral hazard. Indeed we observe in many OECD countries that the optimal co-payment is negligible for certain types of health care, like surgery, as the demand is likely to be unresponsive to price, while it is positive for others, like dental care, or pharmaceuticals.

In a recent study, Goldman and Philipson (2007) argue that the optimal co-payment for pharmaceuticals set in many countries is below the level predicted by the standard insurance theory. They suggest that this is because pharmaceutical and curative care are substitutes. Higher co-payments for pharmaceuticals would lead to a reduction in the demand for pharmaceuticals and, simultaneously, to an increase in the demand for acute care.

The main implication from the theoretical literature for the pursuit of empirical work is that an accurate estimation of the elasticity of demand is critical for policy makers to set optimal co-payments. We estimate the responsiveness of demand with respect to co-payment levels using Italian data.

Policy makers are interested not only on the effect of co-payments on demand, but ultimately on the effect of the co-payment on public and total pharmaceutical expenditure. Suppose that the demand is totally unresponsive to co-payments and no one in the population is exempt from the co-payment. Then an increase in co-payment expenditure by 1 million Euro, should translate in a reduction in NHS pharmaceutical expenditure by the same amount. If the demand is responsive to co-payments, then NHS pharmaceutical expenditure should reduce by *more* than 1 million Euro. However, if a significant proportion of patients is exempt, then NHS pharmaceutical expenditure may be *a priori* undetermined.

Similarly, if demand is inelastic to co-payments, then higher co-payment expenditure should have no effect on total (public and private) pharmaceutical expenditure. If demand is elastic, it should reduce total pharmaceutical expenditure. We test whether these predictions are correct using data on Italian pharmaceutical expenditure.

The empirical literature estimating the responsiveness of demand for pharmaceuticals is limited. Evidence from the Rand Health Insurance Experiment carried out in the US in the eighties suggests that the demand for pharmaceuticals responds to co-payments. Leibowitz, Manning, Newhouse (1985) suggest that when patients paid 95% of the costs, drug expenditure was 57% higher than for patients with a zero co-payment.

O’Brien (1989) uses time-series data from the English NHS during the period 1969-1986. He finds that the elasticity of the number of prescriptions with respect to the co-payment is between -0.33 and -0.64. Ryan and Birch (1991) use a similar database for the period 1979-1989. They find that the elasticity is significantly lower and equal -0.11. Using data until 1992 and testing for co-integration, Hughes and McGuire (1995) find an elasticity of -0.32.

Exploiting a natural experiment in Canada, Contoyannis, et al. (2005) employ an instrumental-variable approach and find that the elasticity of drug expenditure with respect to price is between -0.12 and -0.16. Street, Jones and Furuta (1999) use data from Russia and show that patients who are fully exempted from prescription charges have a higher utilisation of prescription items.

In this study we take advantage of a natural experiment in Italy to estimate the effect of variations in the level of the co-payments on the demand for pharmaceutical prescriptions. We make use of intra-regional variations and two exogenous shocks. Figure 1 depicts the average co-payment per prescription for a selection of Italian regions for each month between 2000 and 2007. After a period where co-payments ranged between 2 and 3 Euro, the co-payment was abolished in January 2001 due to a law of the national government (first shock). However, after few months they were reintroduced (second shock) but the decision on the co-payment level was devolved to the twenty Italian regions.

Figure 1 shows that regions differed in the amount of co-payment reintroduced. During year 2001 the co-payment was about zero in all regions. In year 2003, Piemonte, Lombardia and Ligura introduced a co-payment over 2 Euro; Veneto, Puglia, Calabria, Sicilia chose a co-payment of about 2 Euro; Trentino Alto Adige, Lazio and Molise chose a co-payment close to 1 Euro per average prescription. The remaining regions left it at about zero.

This represents an ideal setting for a natural experiment of the effect of a co-payment on the demand for pharmaceutical prescriptions. After a situation where the co-payment was zero across all Italian regions, some regions (those reported in Figure 1) decided to introduce the co-payment (treatment group) by varying amounts, while others did not. The latter can therefore act as the control group. Moreover, since 2004, some regions (namely Calabria, Sicilia, and later Piemonte, Lombardia, Liguria, Lazio and Puglia) who had re-introduced the co-payment, reduced its average amount, while the others left it at 2002 levels. Again, the latter group can be used as control for a decreasing co-payment policy for assessing whether the effects of co-payments on average number of prescriptions is symmetric.

We find that the introduction of a co-payment in 2003 compared to 2001, reduced the demand for prescriptions by 7%. Moreover, we find that the elasticity of the number of prescriptions is around 0.1. A 10% increase in the co-payment reduces the number of prescriptions by 1%. We also find evidence that the effect is not symmetric. When some regions reduced (but not removed) the co-payment, a reduction in the co-payment by 10% increased the number of prescriptions by only 0.1%.

The study is organised as follows. Section 2 presents the empirical model. Section 3 describes the data. Section 4 discusses our main results. Section 5 concludes.

3. The econometric model

Consider a panel data where y_{itm} measures the per capita number of prescription for region *i* in year *t*, and month *m*, where *t=1,2; m=1,2,…,12.* y_{itm} is the dependent variable of the following model:

$$y_{itm} = \alpha + \beta_{tm} T \cdot M + \gamma I_{itm} + \delta X_{itm} + c_i + u_{itm}, \quad t = 1,2; m = 1,2,...,12. \qquad (1)$$

where *T* is the year dummy variable, and is equal to one if $t = 2$ and zero otherwise, *M* is the month dummy variable, and is equal to 1 if month is January, 2 if month is February, … 12 if month is December, X_{itm} is a set of characteristics of region *i* at time *t* and month *m*, c_i is a time-invariant observed effect of region *i*, and u_{itm} is an idiosyncratic error. I_{itm} is a binary variable which takes a value equal to 1 if region *i* belongs to the "treatment group" in year *t* (e.g. a co-payment is introduced, a reimbursement policy is changed, etc.) and zero otherwise, regardless of the month. While in year 1 no region is in the "treatment group", in year 2 some regions are in the "treatment group" while the others are not. The specification of model (1) also assumes that treatment period starts in January and ends in December, i.e. treatment takes place for a full year period. Hence, the coefficient γ is the monthly average "treatment effect", i.e. the effect of the policy on the number of prescriptions in the treatment group on an average month. For instance, if $I_{itm} = 1$ when a positive co-payment per prescription is introduced, then we expect the coefficient γ in eq.(1) to be negative (the introduction of a co-payment reduces the number of per capita prescriptions by γ).

A straightforward way to estimate the treatment effect is to take the year-first difference (FD) of eq.(1) to remove the individual fixed effects, c_i. We obtain:

$$(y_{i2m} - y_{i1m}) = \phi_m M + \gamma(I_{i2m} - I_{i1m}) + \delta(X_{i2m} - X_{i1m}) + (u_{i2m} - u_{i1m}) \, ,$$

or, more compactly, using $\Delta \equiv \Delta_t$ to denote year-differences,

$$\Delta y_{im} = \phi_m M + \gamma \Delta I_{im} + \delta \Delta X_{im} + \Delta u_{im} \, . \qquad (1b)$$

Where ΔI_{im}=1 for the treatment group and ΔI_{im}=0 for the control group, in month *m*. If $E(\Delta I_{im} \Delta u_{im}) = 0$ in model (1b), that is, the change in treatment status is uncorrelated with changes in the idiosyncratic errors, then a consistent estimate of the treatment effect can be obtained by using fixed effect or pooled OLS estimation of Δy_{im} on $\Delta I_{im}, \Delta X_{im}$ and a full set of month dummies (Blundell and MaCurdy, 1999). The OLS estimate of the treatment effect for model (1) is:

$$\hat{\gamma} = \Delta \overline{y}_{treated} - \Delta \overline{y}_{control} \, , \qquad (1c)$$

which is a difference in difference (DD) estimate except that we differentiate the means of the same regions over year and month.

Model (1) allows one to estimate the average effect on the “treatment group” when a policy is expressed as a dichotomous event, i.e. co-payment versus no co-payment (or a “participate” versus “not participate” event). Define P_{itm} as the intensity of the policy (for example the amount of Euros patients need to pay as a co-payment). Then, in the case of a policy (or treatment) whose intensity can vary upon the decision of participation, model (1) becomes:

$$y_{itm} = \eta + \xi_{tm} T \cdot M + \lambda (I_{itm} P_{itm}) + \zeta X_{itm} + c_i + u_{itm}, \quad t = 1,2; m = 1,\ldots,12. \qquad (2)$$

where $(I_{itm} P_{itm})$ is equal to the intensity of the “treatment” in region *i* at time *t*, month *m*, if region *i* has been treated and is equal zero otherwise. The yearly-differenced model can then be estimated provided that $E(\Delta P_{im} \Delta u_{im} \mid I_{im} = 1) = 0$ and

$$\hat{\lambda} = \frac{\Delta \overline{y}_{treated} - \Delta \overline{y}_{control}}{\Delta P_{treated}} \qquad (2c).$$

For example, if the intensity of the treatment P_{itm} is the co-payment on average prescription, a negative $\hat{\gamma}$ in model (1) would estimate the average reduction of prescriptions under the assumption of zero elasticity of the co-payment conditional on having a co-payment in region *i* at year t, month m. Instead, using model (2), $\hat{\lambda}$ can be used to estimate the elasticity of the per capita number of prescriptions to the average co-payment per prescription. A simple transformation of per capita number of prescriptions, y_{itm}, and co-payment per average prescription, P_{itm}, in logs would suffice to interpret the coefficient $\hat{\lambda}$ as elasticity.

3. Data and sample selection

The data used in this study are provided by *Federfarma*, the Italian federation of 15,500 pharmacies. They are freely available upon registration from Federfarma's website. The data include information about all pharmaceuticals that patients do not pay at the counter (except for some possible co-payment), which are reimbursed to pharmacies by the National Health Service (*Class A* pharmaceuticals). There is no information about pharmaceuticals completely paid by customers (*Class C* pharmaceuticals).[3]

Federfarma data on class A pharmaceuticals are used by the Ministry of Health for monitoring the pharmaceutical expenditure of the Italian NHS. About 86-89% of NHS pharmaceutical expenditure is reimbursed directly to the pharmacies (the Federfarma associates). The remaining part of the NHS pharmaceutical expenditure (also known as "direct distribution"), is bought directly by the Local Health Authorities (known as "ASL") and hospitals, and is directly distributed to patients. In 2005, total pharmaceutical net expenditure accounted for nearly 12 thousands billion Euro, which was about 12.6% of total NHS expenditure.

Federfarma data are aggregated by Regions and have monthly frequency. We built a balanced panel where the cross-section dimension is $N = 20$ (the number of Italian regions), and the time-series dimension is $T = 134$ (starting in January 1996 and ending in March 2007).

The main variables included in this study are: i) the per capita number of NHS prescriptions; ii) out-of-pocket co-payment expenditure per average prescription. Both variables are measured by region. The number of NHS prescriptions is the total number of prescriptions that have been collected by all pharmacies in each region and month. NHS pharmaceutical expenditure is the expenditure that the NHS reimburses to pharmacies according to the agreements between the

[3] Class B pharmaceuticals, only partially reimbursable, were briefly introduced in mid-1990 but soon removed and all pharmaceuticals of that category placed either in Class A or in Class C.

NHS and representatives of the pharmaceutical industry, which cover "class A" pharmaceuticals.[4] Table 1 provides the descriptive statistics.

Co-payments in Federfarma data include both a cost-sharing scheme and a reference pricing scheme. According to the former, patients are required to contribute to the cost of pharmaceuticals bought either by a fixed amount per prescription or item, or by a proportional-to-final-price amount, or by paying the difference between the final price and a deductible. Reference pricing schemes are regulation mechanisms defined at the national level and designed to define a maximum reimbursement price ("reference price") for the NHS for all products belonging to the same reference group or cluster: in case the price is larger than the reference price, the difference is paid by patients. Unfortunately, Federfarma does not allow disentangling between reference pricing and cost-sharing schemes of co-payments. However, as cost-sharing schemes after January 2001 have been introduced only in ten regions out of twenty[5], the average (per prescription) co-payment net of the reference price component is computed deducting the monthly (per prescription) average of co-payments in regions without cost-sharing schemes, i.e. where only reference price was in place.[6] The average reference price per prescription after January 2001 is computed to be equal to 0.31 Euro (standard error 0.02), while the average per prescription cost-sharing component is equal to 0.76 Euro (standard error 0.94) in regions where it was introduced and zero otherwise. Hereafter, we name co-payment the amount net of reference pricing.

The number of prescriptions has been standardised by the size of the population in each region. These variables present some variability across regions. The per capita number of prescription in northern regions tends to be lower than that of southern regions. These variables are also characterised by strong seasonality. Per capita prescription consumption is much smaller during the summer: a simple OLS regression of the number of per capita prescriptions over months and a constant, shows that 1,000 people asked on average 669 prescriptions but the number asked in August was 122 smaller than what asked in January. Although the trend is similar, there is some variability across regions. Moreover, a Dickey-Fuller test for the time-series of regional total number of prescriptions would not reject the null hypothesis of unit root against the alternative

[4] Although pharmaceutical prescriptions abide to slightly different rules as for the maximum numbers of items to be included in one single prescription or the cost of the co-payment depending on the region considered and the type of pharmaceuticals included, data do not allow a more detailed analysis of single prescriptions [revise; not clear].

[5] Namely, Piedmont, Liguria, Lombardy, Veneto, Abruzzi, Molise, Puglia, Campania and Sicily and the Autonomous Province of Bozen (https://www.federfarma.it/FarmaciFarmacie/TicketRegionali.aspx).

[6] A similar approach was also used by Pamolli et al. (2007).

of stationary process for fourteen out of twenty regions at 5% significance value, while none of the variables are integrated of order two. This calls for the need of first differentiating the variables under study before any empirical analysis is carried out to avoid the problem of spurious regression due to common trends.

Regions also differ by economic development and demographics. Table 1 shows the yearly mean for some demographic variables and a selection of years: richer regions of the North have a per capita GDP that is twice that of poorest regions of the South; some regions (e.g. Liguria) are much older than others (e.g. Campania).

We exploit the peculiar discontinuity in the co-payment time-series. From 1996 to 2000, the average per-prescription co-payment was between 2 and 3 Euro in all regions. Since January 2001 a national law eliminated the co-payment and imposed it to be zero for all regions. This law did not last long. By the beginning of 2002 regions were free to reintroduce the co-payment and had discretion over its amount. Some regions decided to reintroduce the co-payment, while others did not, causing an increased variability of the average co-payment across regions (recall Figure 1). The data provide an ideal natural experiment for analysing the effects of variations in co-payment levels on the number of prescriptions and the amount of pharmaceutical expenditure: some regional pharmaceutical expenditures were "treated" by introducing co-payment, while others were not and can act as controls.

We use difference-in-difference models with two periods as outlined in Section 2 looking at the effect on co-payment on yearly per capita prescriptions. Due to the strong seasonality in the data and the different timings at which different regions have been treated, we compare a whole year with another whole year. Looking at Figure 1, one might notice that while during 2001 average co-payment was equal zero in all regions, 2002 was a year of transition while in year 2003 the regions with a positive level of co-payment in January had approximately the same level in December. In the first sample, we select all regions in all months for year 2001 and 2003 only. As a robustness check, we modified the selection removing year 2003 and replacing it with year 2004, which was still characterised by positive level of co-payments by regions who reintroduced it in 2002, although some of them started a decreasing trend.

Finally, as the trend started decreasing in some regions after 2004, we also test whether a reduction of co-payment has the same magnitude (of course with opposite sign), than its increase. Referring to Figure 1, one can notice that during 2006, the level of average co-payment in January was approximately as that December across all regions. However, it was sizably smaller that in previous years for some regions (namely, Piemonte, Lombardia, Liguria, Lazio, Calabria and Sicilia). Hence, we select the whole year 2003 as a period of relatively high and constant co-payments in some regions and the whole year 2006 as a period where some regions had been treated by a reduction of the co-payment. As controls, in addition to regions not presented in Figure 1, which kept co-payment at zero level, also regions where no change happened between the two periods were included.

As control variables we also use: i) the proportion of individuals who are older than 65 years old; ii) GDP; iii) a dummy variable equal to if the government is from the centre-left party and equal to zero if it is from a centre-right party. All these variables are measures at regional level but annually. Variables i) and ii) are available from ISTAT (the National Office of Statistics). Variable iii) has been built using information from the Ministry of the Interior.

4. Results

Table 2 provides the results. Our dependent variable is the per capita number of prescriptions in year 2001 (t=1) and year 2003 (t=2). For each year t and each region i, the data are measured monthly (m=1,…,12). In year 2001 (t=1) a national law imposed all regions to have a co-payment equal to zero. At the beginning of 2002 the decision over the possibility of introducing a co-payment was devolved to the regions. Some regions introduced a positive co-payment, while others did not. In 2003 (t=2) the regions who had introduced the co-payment left it roughly unchanged throughout the whole year.

The first part of Table 2 provides the average effect of introducing a co-payment (model 2). The “treatment group” includes all the regions who introduced a co-payment, while the “control group” includes those regions where the co-payment was zero throughout 2001-2003. The coefficient associated with the control group is equal to -0.069 and is statistically significant at 1% level. It suggests that those regions who introduced the co-payment experienced a reduction in the number of prescription by 7%, which corresponds to about 40 prescriptions every 1000 residents.

The second part of Table 2 presents the estimation of model (3). It provides the elasticity of the number of prescriptions to the average co-payment, conditionally on the co-payment being positive. The elasticity is equal to 0.1 and is statistically significant at 1% level. Conditionally on the co-payment being introduced, a 10% increase of the copayment reduces the average number of prescriptions by about 1%. The coefficients of the other control variables show that where centre-left government were in power, both at the regional and national level, the per capita number of prescriptions was smaller. This result arises for two possible reasons: first, centre-left government have been stricter in controlling the expansion of health expenditures during the period considered, and secondly some regions governed by centre-left coalitions (e.g. Toscana, Emilia Romagna) are more involved in direct pharmaceutical distribution through their health institutions. The proportion of elderly or young population, instead have no statistically significant effect. The relationship between log-GDP and log-co-payment is found to be concave, i.e. increasing at low levels of GDP and decreasing afterwards.

Table 2 above suggests that increasing the co-payment by 10% reduces the number of prescriptions by 1%. What is the effect of a reduction in the co-payment? Is the effect symmetric? Could we argue from these results that if the co-payment was reduced by 10% then it would lead to an increase in average prescriptions by roughly 1%? The peculiar profile of co-payment across Italian regions allows the estimation of the effect of a reduction in the average co-payment. For this aim we use monthly observations in year 2003 (t=1) and year 2006 (t=2). Between 2003-2006 very small changes of co-payments occurred. However, some regions (namely, Piemonte, Lombardia, Liguria, Lazio, Calabria and Sicilia) had a lower average co-payment level than in 2003. Table 3 presents the results. In the first part, it shows that the average effect of reducing the co-payment induced an increase in the average number of prescriptions by 2%. Such effect is smaller compared to Table 2 and is probably due to the fact that although reduced, the treated regions have not completely removed co-payments. The second part of Table 2 suggests that the elasticity of the number of prescriptions with respect to the co-payment, conditionally on the co-payment being positive, is equal to 0.01 and it is statistically significant at 1% level. A reduction in the co-payment by 10% reduces the number of prescriptions by 0.1%. The effect is therefore much smaller compared to the one identified in Table 2, indeed it is ten times smaller).

Sensitivity analysis

As a robustness check, we also estimate the effect of an increased co-payment using as the treatment group year 2004 rather than year 2003. The results are presented in Table 4 and are analogous to Table 3. Introducing a co-payment reduces the number of prescriptions by 6%. An increase in the copayment by 10% reduces the number of prescriptions by 0.9%.

Table 5 uses year 2004 as the control group, rather then year 2003. The results are in line with Table 3. A reduction in the co-payment reduces the number of prescriptions by 2%. A reduction in the co-payment by 10% increases the number of prescriptions by less than 0.1%.

5. Conclusions

We have investigated the effect of co-payments on the demand for prescriptions by exploiting a natural experiment across Italian Regions. Using a difference-in-difference approach, we have found that the elasticity of the number of prescriptions is around 0.1. A 10% increase in the copayment reduced demand by 1%. We also find that the effect is not symmetric. When some regions reduced (but not removed) the level of co-payment, the elasticity of prescriptions with respect to a reduction in the co-payment was much smaller elasticity, around 0.01.

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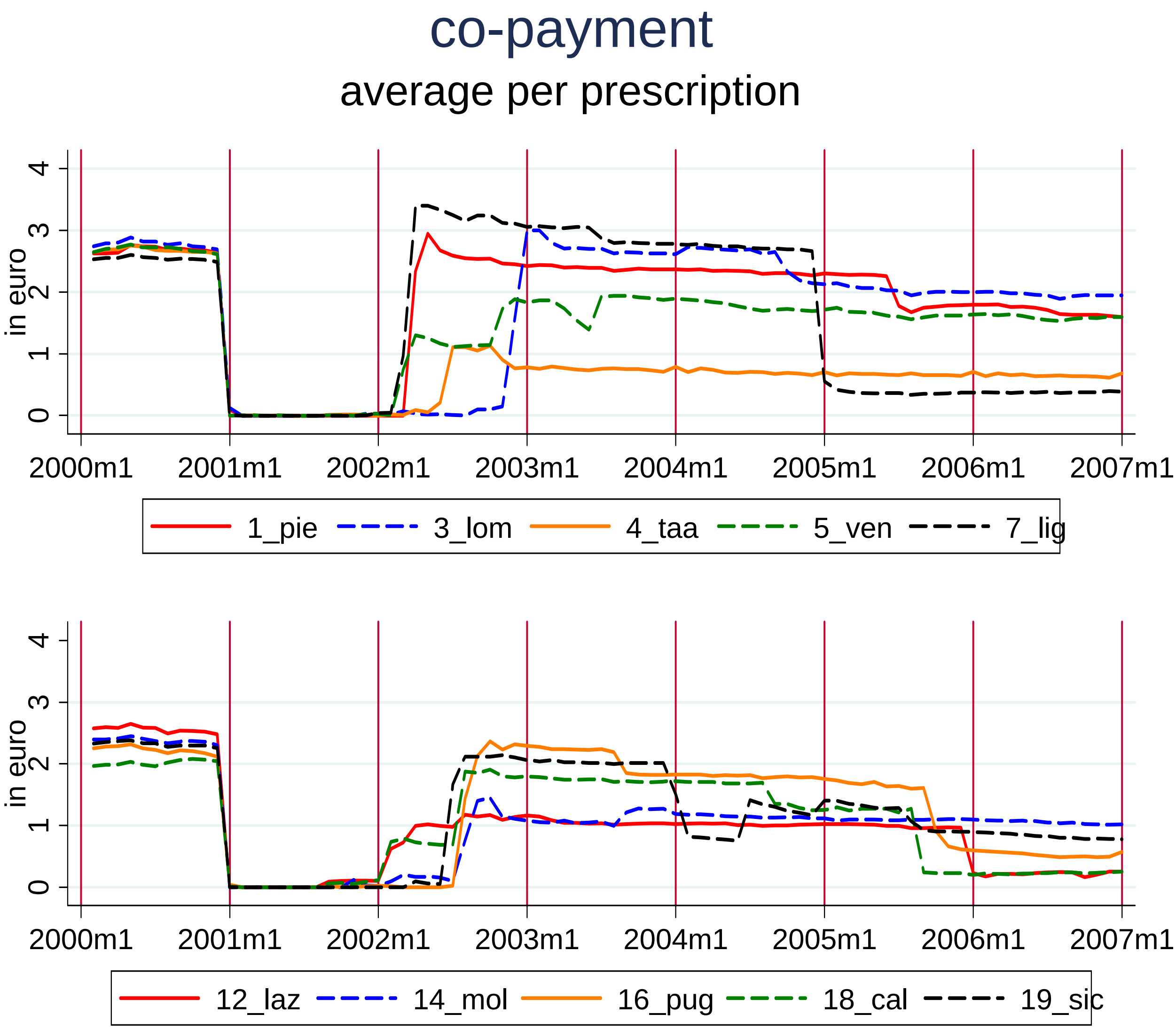
Figure 1: Co-payment per average prescription by a selection of Italian regions.



Source: authors' calculation using Federfarma data (www.federfarma.it).
Note: The twenty Italian regions are: Piemonte (1_pie means), Valle d'Aosta (2_aos), Lombardia (3_lom), Trentino Alto Adige (4_taa), Veneto (5_ven), Friuli Venezia Giulia (6_fri), Liguria (7_lig), Emilia Romagna (8_emi), Toscana (9_tos), Umbria (10_umb), Marche (11_mar), Lazio (12_laz), Abruzzo (13_abr), Molise (14_mol), Campania (15_cam), Puglia (16_pug), Basilicata (17_bas), Calabria (18_cal), Sicilia (19_sic), Sardegna (20_sar).

Table 1: Yearly means for main economic and demographic variables used in the analysis, for a selection of years.

Region	**year**	**per capita prescriptions (a)**	**average co-payment (a)**	**share of population aged 15 or less (b)**	**share of population aged 65 or more (b)**	**per capita GDP (in thousand Euro) (b)**
1.Piemonte	2001	0.56	0.01	12.1%	21.3%	20.891
1.Piemonte	2003	0.58	2.39	12.3%	21.9%	20.528
1.Piemonte	2005	0.60	2.02	12.4%	22.4%	
2. Valle d'Aosta	2001	0.51	0.00	12.9%	19.2%	24.121
2. Valle d'Aosta	2003	0.55	0.00	13.1%	19.6%	23.907
2. Valle d'Aosta	2005	0.58	0.00	13.3%	20.2%	
3.Lombardia	2001	0.51	0.01	13.2%	18.2%	23.291
3.Lombardia	2003	0.52	2.73	13.4%	18.8%	22.820
3.Lombardia	2005	0.54	2.04	13.6%	19.4%	
4.Trentino Alto Adige	2001	0.42	0.00	16.1%	17.0%	23.514
4.Trentino Alto Adige	2003	0.47	0.75	16.1%	17.2%	23.350
4.Trentino Alto Adige	2005	0.47	0.67	16.2%	17.6%	
5.Veneto	2001	0.53	0.00	13.5%	18.3%	20.969
5.Veneto	2003	0.53	1.81	13.7%	18.7%	20.495
5.Veneto	2005	0.55	1.64	13.9%	19.2%	
6.Friuli Venezia Giulia	2001	0.53	0.00	11.5%	21.5%	20.456
6.Friuli Venezia Giulia	2003	0.58	0.00	11.8%	21.9%	20.747
6.Friuli Venezia Giulia	2005	0.61	0.00	12.0%	22.5%	
7.Liguria	2001	0.70	0.00	10.6%	25.6%	20.057
7.Liguria	2003	0.69	2.93	10.9%	26.3%	20.104
7.Liguria	2005	0.74	0.38	11.0%	26.6%	
8.Emilia Romagna	2001	0.61	0.00	11.7%	22.4%	22.827
8.Emilia Romagna	2003	0.66	0.00	12.1%	22.6%	22.535
8.Emilia Romagna	2005	0.68	0.00	12.5%	22.7%	
9.Toscana	2001	0.65	0.00	11.7%	22.5%	20.053
9.Toscana	2003	0.68	0.00	11.9%	22.9%	19.779
9.Toscana	2005	0.71	0.00	12.1%	23.2%	
10.Umbria	2001	0.68	0.00	12.3%	22.8%	17.703
10.Umbria	2003	0.78	0.00	12.3%	23.1%	17.333
10.Umbria	2005	0.81	0.00	12.5%	23.3%	
11.Marche	2001	0.63	0.00	12.9%	21.8%	18.259
11.Marche	2003	0.68	0.00	13.0%	22.2%	18.026
11.Marche	2005	0.74	0.00	13.1%	22.6%	
12.Lazio	2001	0.69	0.01	13.9%	18.0%	20.027
12.Lazio	2003	0.72	0.85	13.9%	18.6%	20.292
12.Lazio	2005	0.77	0.78	13.9%	19.1%	
13.Abruzzo	2001	0.66	0.00	13.9%	20.5%	15.778
13.Abruzzo	2003	0.71	0.00	13.7%	20.9%	15.569
13.Abruzzo	2005	0.77	0.00	13.4%	21.3%	
14.Molise	2001	0.59	0.01	14.3%	21.1%	14.279
14.Molise	2003	0.67	1.12	13.8%	21.5%	14.500
14.Molise	2005	0.68	1.10	13.4%	22.0%	
15.Campania	2001	0.67	0.02	18.5%	14.3%	11.718
15.Campania	2003	0.70	0.11	18.0%	14.8%	11.935
15.Campania	2005	0.75	0.07	17.5%	15.3%	
16.Puglia	2001	0.64	0.01	16.7%	15.9%	12.115
16.Puglia	2003	0.63	2.10	16.2%	16.6%	12.062
16.Puglia	2005	0.72	1.44	15.8%	17.2%	
17.Basilicata	2001	0.66	0.00	15.6%	18.6%	12.822
17.Basilicata	2003	0.72	0.00	15.1%	19.3%	12.872
17.Basilicata	2005	0.76	0.00	14.5%	19.9%	
18.Calabria	2001	0.70	0.00	16.6%	17.1%	11.363
18.Calabria	2003	0.70	1.54	15.9%	17.6%	11.686
18.Calabria	2005	0.86	0.70	15.3%	18.3%	
19.Sicilia	2001	0.74	0.00	17.1%	16.9%	12.259
19.Sicilia	2003	0.71	2.02	16.7%	17.4%	12.589
19.Sicilia	2005	0.78	1.17	16.2%	18.0%	

20.Sardegna	2001	0.58	0.00	13.8%	16.1%	13.687
20.Sardegna	2003	0.69	0.55	13.3%	16.7%	13.889
20.Sardegna	2005	0.72	0.00	12.9%	17.6%	

Source: our calculations using Federfarma and Istat data.

Note: (a) Federfarma and Istat data source (b) Istat data source

Table 2: Difference-in-Difference estimation of log average per capita prescription, where in second period some regions increased the co-payment.

		Before treatment year:2001. After treatement year:2003			
Treated	-0.060***	-0.069***	log(av. co-payment)|Treated	-0.093***	-0.102***
	(0.000)	(0.000)		(0.000)	(0.000)
log(GDP)		22.846***	log(GDP)		20.734***
		(0.000)			(0.000)
log(GDP) squared		-1.037***	log(GDP) squared		-1.011***
		(0.000)			(0.000)
log(pop. 65+)		1.227*	log(pop. 65+)		0.907
		(0.053)			(0.120)
log(pop. 15-)		0.234*	log(pop. 15-)		0.006
		(0.073)			(0.962)
center-left national gov't		-0.098***	center-left national gov't		-0.058***
		(0.000)			(0.002)
center-left regional gov't		-0.050***	center-left regional gov't		-0.002
		(0.002)			(0.857)
const.	0.098***	-0.060**	const.	0.155***	0.065**
	(0.000)	(0.024)		(0.000)	(0.011)
Obs.	240	240	Obs.	240	240
F	0.000	0.000	F	0.000	0.000
R-squared	0.512	0.597	R-squared	0.576	0.649
Adj. R-Squared	0.486	0.566	Adj. R-Squared	0.554	0.622

Notes: p-values in parenthesis. Time dummies are omitted. Robust standard errors computed. Treated regions are: Piemonte, Lombardia, Trentino Alto Adige, Veneto, Liguria, Lazio, Molise, Puglia, Calabria and Sicilia; all others act as control.

* p<.10, ** p<.05, *** p<.01

Table 3: Difference-in-Difference estimation of log average per capita prescription, where in second period some regions decreased the co-payment.

		Before treatment year:2003. After treatement year:2006			
Treated	0.049***	0.021**	log(av. co-payment) | Treated	-0.025***	-0.010***
	(0.000)	(0.010)		(0.000)	(0.001)
log(pop. 65+)		0.089***	log(pop. 65+)		0.079***
		(0.000)			(0.000)
log(pop. 15-)		-0.080***	log(pop. 15-)		-0.076***
		(0.000)			(0.000)
centre-left national gov't		0.104***	centre-left national gov't		0.101***
		(0.000)			(0.000)
centre-left regional gov't		0.053***	centre-left regional gov't		0.052***
		(0.000)			(0.000)
const.	0.115***	0.161***	const.	0.073***	0.115***
	(0.000)	(0.000)		(0.000)	(0.001)
Obs.	240	240	Obs.	240	240
F	0.000	0.000	F	0.000	0.000
R-squared	0.530	0.658	R-squared	0.560	0.663
Adj. R-Squared	0.505	0.635	Adj. R-Squared	0.536	0.641

Notes: p-values in parenthesis. Time dummies are omitted. Robust standard errors computed. Treated regions are: Piemonte, Lombardia, Liguria, Lazio, Calabria and Sicilia; all others act as control.

* p<.10, ** p<.05, *** p<.01

Table 4: Robustness check: Difference-in-Difference estimation of log average per capita prescription, where in second period some regions increased the co-payment.

Before treatment year:2001. After treatement year:2004

Treated	-0.062***	-0.064***	log(av. co-payment)|Treated	-0.083***	-0.088***
	(0.000)	(0.000)		(0.000)	(0.000)
log(GDP)		9.095***	log(GDP)		10.583***
		(0.000)			(0.000)
log(GDP) squared		-0.381***	log(GDP) squared		-0.508***
		(0.000)			(0.000)
log(pop. 65+)		0.843***	log(pop. 65+)		1.317***
		(0.002)			(0.000)
log(pop. 15-)		0.036	log(pop. 15-)		0.034
		(0.685)			(0.703)
center-left national gov't		-0.186***	center-left national gov't		0.095***
		(0.000)			(0.000)
center-left regional gov't		-0.005	center-left regional gov't		0.021***
		(0.633)			(0.001)
const.	0.191***	-0.067***	const.	0.134***	0.152***
	(0.000)	(0.000)		(0.000)	(0.000)
Obs.	240	240	Obs.	240	240
F	0.000	0.000	F	0.000	0.000
R-squared	0.624	0.689	R-squared	0.628	0.686
Adj. R-Squared	0.604	0.665	Adj. R-Squared	0.609	0.662

Notes: p-values in parenthesis. Time dummies are omitted. Robust standard errors computed. Treated regions are: Piemonte, Lombardia, Trentino Alto Adige, Veneto, Liguria, Lazio, Molise, Puglia, Calabria and Sicilia; all others act as control.

* p<.10, ** p<.05, *** p<.01

Table 5: Robustness check: Difference-in-Difference estimation of log average per capita prescription, where in second period some regions decreased the co-payment.

			Before treatment year:2004. After treatement year:2006		
Treated	0.035***	0.012	log(av. co-payment) | Treated	-0.019***	-0.006**
	(0.000)	(0.104)		(0.000)	(0.029)
log(pop. 65+)		0.064***	log(pop. 65+)		0.058***
		(0.000)			(0.000)
log(pop. 15-)		-0.054***	log(pop. 15-)		-0.051***
		(0.000)			(0.000)
Centre-left national gov't		0.052***	centre-left national gov't		0.185***
		(0.000)			(0.000)
Centre-left regional gov't		0.047***	centre-left regional gov't		0.046***
		(0.000)			(0.000)
const.	0.027***	0.195***	const.	0.042***	0.063*
	(0.000)	(0.000)		(0.000)	(0.052)
Obs.	240	240	Obs.	240	240
F	0.000	0.000	F	0.000	0.000
R-squared	0.700	0.786	R-squared	0.723	0.789
Adj. R-Squared	0.685	0.771	Adj. R-Squared	0.709	0.774

Notes: p-values in parenthesis. Time dummies are omitted. Robust standard errors computed. Treated regions are: Piemonte, Lombardia, Liguria, Lazio, Calabria and Sicilia; all others act as control.

* p<.10, ** p<.05, *** p<.01