

# Does purchase centralization reduce public expenditure? Evidence from the Italian health-care system

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## Abstract

The introduction of Central Purchasing Bodies within the regional health care systems in Italy during the first decade of 2000s constituted a call for cost reduction and public expenditure restraint in the public health sector. Indeed, regional CPBs operating for local hospitals were introduced to centralize purchases of goods and services, with the aim of reducing prices and facilitate cost reductions, mainly leveraging on economies of scale and larger bargaining power. In this work, we examine this hypothesis adopting a difference-in-difference model to test the causal relationship of the introduction of regional CPBs operating in the health-care systems. Our findings show that per capita total expenditure is reduced to a range of 3-4%, according to the specification of the model, where local hospitals are supplied through a regional CPB. Specifically, this reduction is mainly driven by a subset of supplies, that is health services (e.g., medical and other health-related professional consultancies), while the impact on goods and other non-health services expenditure is not significant. Moreover, the obtained expenditure reduction is achieved without a significant downsizing of local services to citizens.

**Keywords:** Purchase centralization Difference-In-Difference Health-care Public expenditure Expenditure reduction

**JEL classification:** H69 L88

## 1. Introduction

The recent public debate developed within the European Union about fiscal discipline on public finance requirements puts a constraint on public expenditure and deficit that EU member states should respect (Bel and Warner, 2015). In order to curb public expenditure while ensuring a satisfactory level of service to the population, national governments have

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adopted different strategies that can be traced back to two main strands. On the one hand, the aggregation of local entities (for instance, municipalities) with the aim of reducing the number of sub-national government units (Ferraresi et al., 2017) and, consequently, pursuing efficiency gains (Oates, 1972; Case et al., 1993), also through the formal adoption of forms of cooperation among local authorities. On the other hand, a more direct form of intervention affecting public expenditure, that is the centralization of the purchase of goods and services through the introduction of dedicated national or sub-national agencies. Indeed, purchase centralization would ensure a reduction of purchasing costs, together with the possibility of targeting purchases of more innovative or more responsive to new higher standards products (Albano and Sparro, 2010). As a consequence, in recent years the degree of central public procurement has been favored by the introduction of Central Purchasing Bodies (CPBs) across several European countries, including UK, France, Sweden, Denmark, Austria and Italy (Dimitri et al., 2006).

The recent economic literature has mainly focused on the study of the effects of the first form of centralization, obtaining mixed results on the effective impact of local entities aggregation on public expenditure restraint. For instance, while Reingewertz (2002), Blesse and Baskaran (2016), and Ferraresi et al. (2017) find that the effect of amalgamation led to a reduction in per capita expenditure on aggregated municipalities in comparison with the pre-amalgamation phase (respectively for Israel, Germany and Italy), Moisio and Uusitalo (2013) obtain the opposite result for Finland. At the same time, some works have analyzed the effects of purchase centralization mainly on prices restraint. For instance, analyzing the Italian national procurement system, Bandiera et al. (2009) found that a national centralized authority can produce a reduction of costs on a sample of public bodies. Analogously, Baldi and Vannoni (2017) showed that centralization of purchases is correlated to a reduction of prices of selected drugs within a sample of Italian hospitals.

Nevertheless, with respect to the purchase centralization, the most relevant contributions mainly refer to the procurement management literature, and theorize and test the effects of centralization on expenditure by focusing the analysis on private firms and their production system. Specifically, purchase centralization is usually indicated as a lever that can favor the containment of firm's expenditure, both externally within its own reference market, or internally by modifying the purchasing decision-making processes. As for the external level, purchase centralization favors the development of economies of scale and larger bargaining

power resulting from the aggregation of volumes of purchases and by standardization of the required categories of goods and services (Tella and Virolainen, 2005; Joyce, 2006; Trautmann et al., 2009). As for the internal level, the centralization of purchases can effectively streamline the procurement processes (Karjalainen, 2011), allowing the reduction of single transaction costs by decreasing the number of contracts to be negotiated, implemented and managed.<sup>4</sup> Moreover, the organization which is empowered of the centralization of purchases allows the sharing of best practices among the centralized entities (Faes et al., 2000), favouring a reduction of administrative workload (Arnold, 1999). On the other hand, also the critical issues related to the centralization of purchases may be external and internal. As for the external, possible imperfections of market competition may arise with the centralization of purchases, due to the introduction of stringent requirements on the supplier who may participate in tenders. This could prevent the achievement of acquisition targets required, and the smaller supplier will clash against a barrier to entry for participation in tenders for the most significant amounts of purchases (Caldwell et al., 2005). As for internal issues, a possible increase in costs may arise from the need to set up a new administrative unit dedicated to the relationship with the central purchasing authority (Cousins et al., 2008), with consequent arising costs in terms of specific staff training, the development of dedicated IT tools and other possible operational risks.

The aim of this work is to fill the gap in the literature by studying the causal impact of purchase centralization of local authorities on their costs and expenditure, by exploiting the methodological framework and the counterfactual empirical approach so far adopted to study the impacts of aggregation and amalgamation. We will also provide a measure of this impact on the single local authority's cost structure. We focus our work on health-care public expenditure, since it is one of the most relevant public expenditure items within the European Union countries. Moreover, we take Italy as case study, since it recently introduced regional Central Purchasing Bodies (called "Centrali di Committenza Regionali") in 2006 in accordance with a 2004 EU Directive (Di Cascio, 2014), within a health-care system which is widely considered as highly-decentralized. Indeed, in Italy public expenditure on health is mostly allocated to local entities (i.e., regions) according to a quasi-federal institutional

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<sup>4</sup> Several works quantified a general reduction in costs typically around 10-15% (Nollet and Beaulieu, 2005), although differentiated by economic sector. Specifically, for healthcare sector, Muse & Associates (2000) estimated the savings resulting from the centralization of purchases between 10 and 15% within the American healthcare industry, while Cleverly and Nutt (1984) found a saving due to joint purchases by hospitals between 12 and 25%. As for the other sectors, Pedersen (1996) estimated even greater savings (20-35%) in different industrial sectors (including electronics and automotive). Similarly, in a seminal study Corey (1978) estimated a saving of about 12% due to the centralization of purchases in General Motors.

structure introduced in 2001 within the Constitutional Law reform (Ferrè et al., 2014), and most of local hospitals (“Aziende Sanitarie Locali”, or “ASLs”) are small and fragmented.

Differently from Baldi and Vannoni (2017) who base their analysis on a sample of 52 ASLs focusing on the prices of pharmaceutical products from 2009 to 2012, in this work we investigate the effects of the introduction of Central Purchasing Bodies on all categories of expenditure, leveraging on the adoption of official administrative data which allows to observe all the Italian ASLs’ balance sheets over the period 2001-2012. Taking advantage of the fact that, although mandatory, the introduction of the CPB did not occur simultaneously in all the regional health-care systems in Italy - which could adopt it with different timing and with significant organizational differences (Brusoni and Marsilio, 2007) - we use a difference-in-difference model to identify the causal relationship of the introduction of regional CPBs operating in the health-care systems. The main result is that where the ASL is supplied through a regional CPB, its per capita total expenditure is reduced to a range of 3-4%, according to the specification of the model. In addition, the reduction is mainly driven by a subset of supplies, that is health services (for instance, medical and other health-professional consultancies), while the impact on goods and other non-health services expenditure is not significant. Moreover, the reduction in expenditure is achieved without a significant downsizing of local services to citizens. Also surviving a robustness test on confounding factors, we are confident that the identified relationship should be considered as casual.

We have structured this work as follows. First, we describe the institutional setting of the Italian system of regional Central Purchasing Bodies (section 2). Second, we present our dataset and the empirical strategy for ascertaining the impact of the introduction of CPBs on ASLs’ expenditure (section 3). Third, we perform the econometric analysis, also providing a focus on different expenditure categories and checking for the quality of other health outcomes (section 4). Fourth, we conduct robustness tests to confirm our previous results (section 5). In the last section, we draw some conclusive remarks emerging from our research.

## **2. The institutional setting of the Italian system of Central Purchasing Bodies**

Expenditure on health-care is one of the most significant items of public expenditure across the European Union Countries. Indeed, Tab. 1 shows that from 2002 it represented the second

most relevant cost category (equal to 7.2% of GDP) for the 28 EU countries, right after “Social Protection”.

**Table 1** – EU 28 total Government Expenditure by category as a % of GDP and EU 28 local Government Expenditure (in parenthesis) by category as a % of GDP.

<b>EU 28 Government (and Local) Expenditure</b>	<b>2002</b>	<b>2003</b>	<b>2004</b>	<b>2005</b>	<b>2006</b>	<b>2007</b>	<b>2008</b>	<b>2009</b>	<b>2010</b>	<b>2011</b>	<b>2012</b>	<b>2013</b>	<b>2014</b>	<b>2015</b>
<b>Health</b>	<b>6.2</b>	<b>6.4</b>	<b>6.4</b>	<b>6.5</b>	<b>6.6</b>	<b>6.5</b>	<b>6.7</b>	<b>7.4</b>	<b>7.3</b>	<b>7.1</b>	<b>7.2</b>	<b>7.2</b>	<b>7.2</b>	<b>7.2</b>
	<b>(1.4)</b>	<b>(1.5)</b>	<b>(1.5)</b>	<b>(1.4)</b>	<b>(1.4)</b>	<b>(1.4)</b>	<b>(1.5)</b>	<b>(1.6)</b>	<b>(1.6)</b>	<b>(1.6)</b>	<b>(1.5)</b>	<b>(1.6)</b>	<b>(1.5)</b>	<b>(1.5)</b>
Social protection	17.5	17.9	17.7	17.6	17.3	17	17.5	19.4	19.3	19	19.4	19.5	19.4	19.2
	(2.2)	(2.2)	(2.3)	(2.3)	(2.3)	(2.3)	(2.3)	(2.5)	(2.6)	(2.6)	(2.6)	(2.7)	(2.7)	(2.7)
General Public Services	6.8	6.6	6.5	6.5	6.3	6.3	6.5	6.7	6.7	6.8	6.9	6.9	6.7	6.2
	(1.6)	(1.6)	(1.6)	(1.6)	(1.6)	(1.6)	(1.6)	(1.8)	(1.7)	(1.6)	(1.6)	(1.6)	(1.6)	(1.5)
Economic Affairs	4.1	4.2	4.2	4.2	4.2	4.0	4.6	4.9	5.1	4.5	4.6	4.3	4.3	4.3
	(1.4)	(1.5)	(1.5)	(1.4)	(1.4)	(1.4)	(1.5)	(1.6)	(1.6)	(1.5)	(1.5)	(1.5)	(1.4)	(1.4)
Education	5.1	5.1	5.0	5.0	5.0	4.9	5.0	5.3	5.3	5.1	5.0	5.0	5.0	4.9
	(2.0)	(2.0)	(2.0)	(2.0)	(2.1)	(2.0)	(2.0)	(2.1)	(2.1)	(2.1)	(2.0)	(2.0)	(1.9)	(1.9)
Others *	5.8	6.0	5.9	6.0	6.1	6.0	6.1	6.5	6.2	5.9	5.8	5.7	5.6	5.6
	(2.2)	(2.2)	(2.2)	(2.3)	(2.3)	(2.3)	(2.3)	(2.5)	(2.4)	(2.3)	(2.3)	(2.1)	(2.1)	(2.0)

\* Including Defence, Public order and safety, Environment protection, Housing and community amenities, Recreation, culture and religion

The same phenomenon also occurs for Italy (see Tab. 2), where expenditure on health is the third largest category of expenditure (7.1% of GDP).

**Table 2** – Italy total Government Expenditure by category as % of GDP and Italy total Local Expenditure (in parenthesis) by category as % of GDP.

<b>Italy Government (and Local) Expenditure</b>	<b>2002</b>	<b>2003</b>	<b>2004</b>	<b>2005</b>	<b>2006</b>	<b>2007</b>	<b>2008</b>	<b>2009</b>	<b>2010</b>	<b>2011</b>	<b>2012</b>	<b>2013</b>	<b>2014</b>	<b>2015</b>
<b>Health</b>	<b>6.3</b>	<b>6.3</b>	<b>6.6</b>	<b>6.8</b>	<b>6.9</b>	<b>6.7</b>	<b>7</b>	<b>7.5</b>	<b>7.4</b>	<b>7.1</b>	<b>7.2</b>	<b>7.2</b>	<b>7.2</b>	<b>7.1</b>
	<b>(6.1)</b>	<b>(6.1)</b>	<b>(6.5)</b>	<b>(6.7)</b>	<b>(6.8)</b>	<b>(6.6)</b>	<b>(6.9)</b>	<b>(7.3)</b>	<b>(7.3)</b>	<b>(7.0)</b>	<b>(7.0)</b>	<b>(7.0)</b>	<b>(7.0)</b>	<b>(7.0)</b>
Social protection	17.1	17.3	17.3	17.4	17.4	17.5	18.1	19.8	19.9	19.8	20.5	21	21.3	21.5
	(0.6)	(0.7)	(0.7)	(0.6)	(0.7)	(0.7)	(0.7)	(0.8)	(0.8)	(0.8)	(0.8)	(0.8)	(0.7)	(0.7)
General Public Services	9.5	9.2	8.8	8.7	8.4	8.6	8.9	8.6	8.3	8.6	9.4	9.1	8.9	8.4
	(2.2)	(2.3)	(2.2)	(2.2)	(2.3)	(2.1)	(2.1)	(2.6)	(2.2)	(2.0)	(2.0)	(2.0)	(2.1)	(2.1)
Economic Affairs	4.5	4.4	4.2	4.2	5.1	4.2	4.0	4.7	4.2	4.2	4.1	3.9	4.1	4.1
	(2.3)	(2.3)	(2.4)	(2.3)	(2.3)	(2.2)	(2.2)	(2.4)	(2.3)	(2.2)	(2.1)	(2.1)	(2.0)	(1.9)
Education	4.5	4.6	4.4	4.5	4.5	4.5	4.4	4.6	4.4	4.1	4.1	4.1	4.0	4.0
	(1.2)	(1.2)	(1.2)	(1.2)	(1.2)	(1.2)	(1.2)	(1.2)	(1.1)	(1.1)	(1.0)	(1.0)	(1.0)	(0.9)
Others *	4.8	5.5	5.6	5.6	5.3	5.4	5.4	6.0	5.8	5.6	5.7	5.6	5.3	5.4
	(2.2)	(2.1)	(2.2)	(2.2)	(2.1)	(2.1)	(2.0)	(2.2)	(2.0)	(2.1)	(2.1)	(2.2)	(1.9)	(1.9)

\* Including Defence, Public order and safety, Environment protection, Housing and community amenities, Recreation, culture and religion

However, differently from EU-28 where the expenditure is mainly concentrated at the Central Level Authority, Tab. 2 shows that the Italian local authorities are almost the unique owners of expenditure on the health-care sector (7.0% of GDP), since it is defined at the regional (NUTS 2) level.

Given the relevance of the European debate on public expenditure (particularly for the health-care sector) and deficit restraint, both from a social and an economic perspective, the EU member states have jointly decided to formally adopt Purchasing Authorities with the task of centralizing public procurement, introducing the legal concept of “Central Purchasing Body”. The definition of CPBs first emerges from the EU Directive 18/2004. In particular, according to article 1 paragraph 10 of the Directive “a ‘central purchasing body’ is a contracting authority which:

- acquires supplies and/or services intended for contracting authorities, or
- awards public contracts or the conclusion of framework agreements for works, supplies or services intended for contracting authorities.”

In compliance with the EU directive, the notion of CPB was introduced within the Italian legal system with the "Code of Contracts" (i.e., “*Codice dei Contratti*”): in particular article 3, paragraph 34 of Legislative Decree no. 163/2006 states that a CPB is defined as a contracting authority which acquires products or services’ supplies intended for contracting administrations or entities, or awards public contracts, or concludes framework agreements for works, products or services’ supplies intended for contracting authorities or other entities. The Code regulates the procurement of CPBs also in article 33. In particular, it states that contracting entities (i.e., “*enti aggiudicatori*”) and stations (i.e., “*stazioni uniche appaltanti*” or “*SUA*”) can acquire works, supplies and services through the use of CPBs, even aggregating or forming a consortium (paragraph 1) and that CPBs are obliged to observe this code (paragraph 2). Considering that within the Italian system Regions are in charge of defining purchases in the health-care sector, this national law should have been formally adopted by Regions, introducing CPBs within their systems by specific regional laws.

However, the history of the institution of regional subjects responsible for the aggregation of the demand did not have an immediate legal and operational reflection in all the Italian Regions, despite having started in 2006. Indeed, at first the application of the rule should have been referred to competitions called from April 2012<sup>5</sup>, and consequently Regions would have had structured their CPB within this deadline. Then, the application of the law was furtherly postponed for three times: first, in December 2011 to the end of 2012<sup>6</sup>, second, in June 2013<sup>7</sup>

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<sup>5</sup> As for Art. 23, paragraph 5 of Decree Law 201/2011.

<sup>6</sup> As for Art. 29m paragraph 11-ter of Decree Law 216/2011.

to January 2014 (with reference to the purchase through the CPBs for municipalities up to 5,000 inhabitants) and, more recently, in January 2014 to January<sup>8</sup> 2015.

Therefore, in some cases a unique CPB was introduced within the Region (e.g. So.Re.Sa. S.p.A. in Campania), in others, smaller and more disseminated CPBs were not immediately aggregated (e.g. Umbria and Veneto, respectively until 2014 and 2011). Moreover, by analyzing the phenomenon from the category of expenditure's perspective, among the first group of Regions, some have established Central Purchasing Bodies both for the "common" basic expenditure and for other types of expenditure (e.g., in Puglia with EmPulia from 2007 and later, from 2014, with InnovaPuglia). In other cases, it was instead ordered the creation of several CPBs typically specialized in the field of Information Technology or of health-care services (for instance, Umbria Salute – C.R.A.S., which performs the functions of regional CPB only for the health-care sector)<sup>9</sup>.

We provide here a first graphic synthetic representation (Fig. 1), where we highlight in grey those Regions/Autonomous Provinces where a regional CPB working for the health sector was introduced during the period 2001-2012.



<sup>7</sup> As for Law n.71 ("Emergency provisions relating to Expo 2015, waste and seismic events")

<sup>8</sup> As for January 15<sup>th</sup> 2014 regional law ("Provisions for formation of the annual and multiannual budget of the Region" - Financial Law 2014)

<sup>9</sup> See Appendix 1 for a comprehensive view of the evolution of the legal framework behind the introduction of CPBs among the Italian Regions.

**Figure 1.** Year of implementation of the first “CPB” operating for the health-care sector (period: 2001-2012)

Three regions (Campania, Emilia-Romagna and Tuscany) were early adopters, having introduced a CPB before their presence was made compulsory in 2006. Six regions decided to adopt a CPB immediately after the 2006 law (Calabria, Liguria, Lombardia, Piemonte, Puglia and Sardinia), while other five regions adopted their CPB between 2010 and 2012 (Basilicata, Marche, Sicily and Veneto). The other four regions and two Autonomous Provinces were late adopters, having introduced a regional CPB only after 2012. The 2014 Financial Law brought an end to this phase of differentiated implementation among Regions, with the introduction of a new institution named “Aggregator” (i.e. Italian “Soggetto Aggregatore”). These local entities were identified in a rather limited number (i.e., maximum 2 per region and typically coincident one with the region itself and one with the most important city) and were forced to 35 in the whole country. To safeguard the organizational models which were already working in some areas, the regions have interpreted the reform providing the Aggregator identified by each Region<sup>10</sup> with the freedom to operate through a furtherly functionally divided organization.

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<sup>10</sup> As for Article 9, paragraph 1 of Decree Law 66/2014



### **3. Empirical Analysis**

#### **3.1 The dataset**

In order to correctly understand and represent which were the effects of the introduction of CPBs on ASLs' public expenditure, we built a homogenous dataset by ASLs at national level, focusing both on financial and demographic variables for the period 2001-2012. For the construction of a homogeneous and complete dataset we had to deal with two main issues. The first concerns the ASLs' structure of costs as is represented within their balance sheets whose structure has changed twice in the period 2001-2012. The second is related to the identification of ASLs themselves as units of analysis, since during the analyzed period several regional organizational changes led to ASLs' closure and aggregation. With regard to the first issue, we collected financial data of the ASLs for the 19 Italian Regions and 2 Autonomous Provinces, using the official databank of the balance sheets, produced by the Ministry of Health. In particular, we used the balance sheets of the ASLs only (excluding from our analysis the other different types of hospitals) for the available period (from 2001 to 2012). From the analysis of the balance sheets, three different structure schemes emerge: one for the period 2001-2007, one for the period 2008-2011 and one for 2012. The differences are mainly due to the level of granularity of the available data. In order to ensure best comparability within the historical series, we have recoded the lines as expressed within the first two schemes to those of the last scheme (i.e., 2012). Concerning the second issue, we managed to represent all the regional organizational changes which led to aggregation of local ALSs<sup>11</sup>. In this scheme, the ASLs are univocally identified by ID codes present within the financial statements. In order to identify a unique ID for all the ASLs and the whole period, we aggregated data associated to formerly independent ASLs to the ASL aggregating them for our final year of analysis (i.e., 2012). Hence, we obtained a total of 144 unique IDs for all the ASLs, from 2001 to 2012.

#### **3.2 The treatment variable**

The dataset includes a treatment variable which summarizes the institutional structure in terms of public procurement within which the individual ASL operates. This variable should describe whether the single ASL works within a Region which concentrated the public procurement to a CPB operating in the health sector over the period 2001-2012. Moreover, it

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<sup>11</sup> Abruzzo went from 6 to 4 ASLs from 2010, Basilicata from 5 to 2 from 2008, Bolzano from 4 to 1 from 2007, Calabria went from 11 to 6 from 2008 and to 5 since 2011, Campania from 13 to 7 from 2009, Emilia-Romagna from 13 to 11 from 2004, Marche from 13 to 1 from 2006, Molise from 4 to 1 from 2006, Piemonte from 22 to 13 from 2008, Puglia from 12 to 6 from 2007.

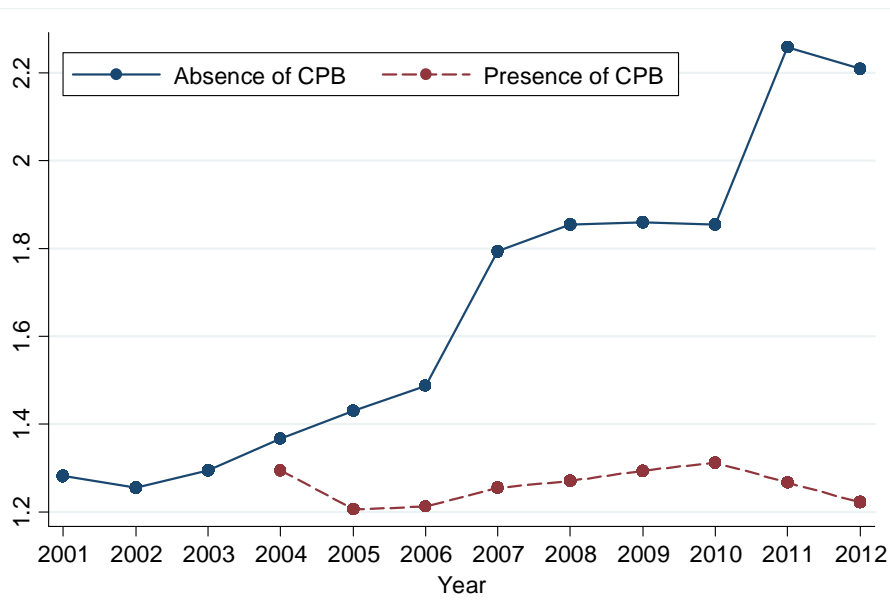
should take into account that eight among Regions and Autonomous Provinces did not adopt the CPB in the period of analysis (as illustrated in Fig. 1), and that ASLs belonging to the same Region cannot operate in a different procurement scheme. Consequently, we constructed the treatment variable attributing for each year value 1 to ASLs operating in Regions/Autonomous Provinces which were purchasing through their regional health CPB, and 0 otherwise.

### **3.3 The dependent variables**

We adopt a set of dependent variables describing the expenditure of ASLs, extrapolated from their balance-sheets. Since three ASLs' balance-sheet schemes were progressively adopted from 2001 to 2012 and due to the fact that they are not perfectly consistent through time, in order to obtain a sufficiently long-time series for our empirical analysis we reconciled the lines to the highest comparable level of granularity. For instance, while for the 2008-2011 and 2001-2007 schemes you find two different lines named "Diagnostic chemicals materials" and "Diagnostic materials, RX plates, contrast agents for RX, etc.", for 2012 scheme one can find a single line named "Chemical products" to which are attributable the costs of the first two items. Hence, the reconciliation to a common framework led to the construction of four macro-categories: expenditure on health goods, health services, non-health goods and non-health services.<sup>12</sup> The health goods category includes the expenditure for supplies directly used for the patient's specialist care, among which, for instance, pharmaceutical and chemical products, vaccines and surgical devices. On the other hand, non-health goods are those products used for the ASL maintenance and for generic patient support, including, for instance, alimentary products, wardrobe and cleaning materials and stationery. Instead, health services include, for instance, medical advisory provided by medical specialists for primary health care and by other pharmaceutical and rehabilitation specialists who are not directly hired by the ASL and do not receive a fixed wage. Finally, non-health services include the costs for services supporting the ASL activities, for instance including the staff working within the laundry and the canteen, and the external training services. We also consider a "total expenditure" variable obtained as their sum by ASL and year. Figure 2 shows a preliminary description of the differences in terms of total expenditure by ASL operating in the presence or absence of a regional CPB.

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<sup>12</sup> See Appendix 3 for further details on the aggregation of single balance sheet lines into the 4 macro-categories.



**Figure 2.** Per capita expenditure on health and non-health goods and services (total expenditure) by Italian ASLs in the presence or absence of regional CPBs. The figure presents the level of expenditure per capita for ASLs in areas with a CPB (dashed line) and without a CPB (solid line) for the period 2001-2012. See Appendix 2 for a more detailed discussion based on categories of expenditure.

The per capita expenditure of ASLs operating within regions where a CPB is not introduced is always higher than that of ASLs operating in regions where a CPB is working. Moreover, this difference increases over time, as the regions keep adopting CPBs over the following years.<sup>13</sup>

Tab. 3 shows a first descriptive view of the difference between per capita expenditure of ASL purchasing or not their goods and services through a CPB.

**Table 3 – ASL’s expenditure by typology, purchasing or not through a CPB.**

Main variables	All	Absence of CPB	Presence of CPB	Difference
Obs.	1717	1097	620	
<b>Total expenditure per capita</b>	1420.26 (45.22)	1509.95 (70.17)	1261.55 (14.58)	-0.248 ***
<b>Expenditure on health goods pc</b>	146.17 (2.21)	138.60 (2.87)	159.57 (3.34)	0.021 ***
<b>Expenditure on health services pc</b>	1177.88 (41.95)	1270.38 (64.97)	1014.22 (15.79)	-0.256 ***
<b>Expenditure on non-health goods pc</b>	10.54 (0.21)	11.70 (0.29)	8.50 (0.25)	-0.003 ***
<b>Expenditure on non-health services pc</b>	85.66 (2.45)	89.28 (3.70)	79.25 (1.78)	-0.010 **

Note: standard errors are in parenthesis.

\* Significant at the 10% \*\* Significant at the 5% \*\*\* Significant at the 1%

<sup>13</sup> Appendix 4 is dedicated to a more detailed focus on the historical pattern of health-care systems’ structure and expenditure behaviors by region/autonomous province.

From this representation two main aspects emerge. First, per capita ASL's total expenditure is equal to ~1,420€, of which the most relevant part derives from expenditure on health services (~1,178€, i.e. approximately 83% of the total). Second, for all the categories of expenditure, apart from "health goods" and including the "total expenditure", ASL's per capita expenditure is lower when a CPB is present within the Region where the ASL is located.

To complete our set of dependent variables, we included further five variables describing the level of health outcome supplied to the population (i.e., number of First Aid Centers, number of physicians and of nurses, number of ordinary and "day-hospital" beds), since these variables can be interpreted as a proxy of the service-level by ASL. Data for this set of variables are available at the ASL level only for 139 ASLs and for a total of five years from 2006 to 2010. Tab. 4 shows the difference between the health outcome variables by ASLs in presence or not of a regional CPB.

**Table 4** – Health outcome variables (per 100 inhabitants) by ASL, purchasing or not through a CPB.

<b>Main variables</b>	<b>All</b>	<b>Absence of CPB</b>	<b>Presence of CPB</b>	<b>Difference</b>
<b>Obs.</b>	695	345	350	
<b>First Aid centers</b>	0.04 (0.00)	0.04 (0.00)	0.04 (0.00)	0.00
<b>Physicians</b>	9.00 (0.48)	8.34 (0.81)	9.64 (0.52)	-1.30
<b>Nurses</b>	20.56 (0.93)	19.10 (1.51)	22.00 (1.09)	-2.90
<b>Ordinary beds</b>	15.66 (0.70)	14.66 (1.14)	16.66 (0.83)	-2.00
<b>"Day-hospital" beds</b>	1.90 (0.10)	1.95 (0.17)	1.85 (0.10)	0.09

*Note:* standard errors are in parenthesis.

\* Significant at the 10% \*\* Significant at the 5% \*\*\* Significant at the 1%

As preliminary descriptive result, we obtain that the mean difference of all these variables before and after the introduction of a CPB is not significant. In other terms, the health service level by ASL, measured by these health outcome variables, did not significantly differ depending on the presence of a CPB.

### 3.4 Control variables

Our dataset also includes a set of control variables. In particular, we collected demographic data from ISTAT to be used within the empirical analysis: the total resident population, also

divided by age groups (particularly, 0-5 years and >65 years) and the number of households. All the control variables are at the ASL level, consistent with the perimeter of the dependent variables and are available for the whole period apart from the variable “Households” which has missing entries for all the ASLs in 2001 and 2002.

### 3.5 Empirical framework

In this section, we provide the econometric analysis of the potential benefits of the introduction of a CPB within the health-care systems of the 19 Italian Regions and the 2 Autonomous Provinces. In particular, we adopt the Difference in Difference technique. In our case the treatment is the introduction of a CPB within the Regional health-care system, which was adopted in different years by 19 Regions and 2 Autonomous Provinces. The goal of the analysis is to compare the difference between the control group (the unaffected ASLs) and the treatment group (the affected ASLs) before and after the introduction of the treatment, in a sort of natural experiment. These models observe for each ASL of the panel the effect of the introduction of the CPB in the corresponding Region on their expenditure for health and non-health goods and services. We use annual ASL-level panel data for the period 2001-2012. The original pool is composed of 144 units, that is the total number of ASLs in Italy in 2012. Since during the first decade of the century in Italy several ASLs were merged together, to ensure full comparability of the units within the entire time series, we aggregated the variables related to ASLs that were merged in 2012, within the whole period.

We are interested in analyzing the expenditure of the ASLs, with particular reference to the expenditure on health goods (e.g., vaccines) and services (e.g., professional consultancies on health topics), and the expenditure on “non-health” goods (e.g., food for hospital patients) and services (e.g., cleaning of hospital goods). We first estimate our basic model, which considers the total amount of ASLs’ expenditure as dependent variable and is expressed as follows:

$$THE_{it} = \alpha + \beta dl_{it} + \gamma X_{it} + \phi_i + \phi_t + \epsilon_{it}, \quad (1)$$

where  $THE$  is the natural log of the per capita Total Health Expenditure generated by the ASLs. Moreover,  $dl_{it}$  is the treatment variable which takes value 1 if the ASL belongs to a  $i$  Region/Autonomous Province where there exists a CPB operating for the health sector (exclusively or not), for any  $t$  year. Moreover, we introduced a set of control variables  $X$ , which includes the total population, the total amount of the youngest cohort (<6 years) per

capita, the total amount of the oldest cohort (>64 years) per capita and the total amount of household per capita. The estimation includes ASL ( $\varphi_i$ ) and temporal ( $\varphi_t$ ) fixed effects. We then estimate again the model adopting as dependent variables the four components of the total amount of ASL's expenditure.

## **4. Empirical results**

### **4.1 Check on common trend assumption**

We first conduct a test to ascertain whether the common trend assumption holds, in order to check the validity of the adoption of the difference in difference method. In particular, we want to verify that the main dependent variables of the treated and untreated groups show a common trend in the pre-treatment period. Hence, we construct two new "placebo" treatment variables: the first is constructed so that the actual treatment is anticipated of one year, the second of two years. If the estimations obtained using these two "artificial variables" as main regressors would provide a result in line with those obtained with the real treatment variable, we could conclude that the effect of expenditure reduction due to the introduction of the CPB would be merely a statistical artefact.

More specifically, we conduct eight different regressions: indeed, as anticipated, we adopt two placebo treatments as two different main regressors, we use total ASLs' expenditure as dependent variable, both excluding and including demographic controls.

**Table 5** – Common trend assumption test on total ASLs’ expenditure

<b>Independent variables</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>
Treatment Effect	-0.02 (0.01)	-0.03 (0.02)	0.03 (0.02)	0.02 (0.02)
Total Population	-	0.00*** (0.00)	-	0.00*** (0.00)
Population 0-5 years	-	-9.77* (5.76)	-	-8.86 (5.67)
Population >64 years	-	0.44 (1.79)	-	-0.51 (1.69)
Households	-	-0.31 (1.04)	-	0.01 (1.02)
Year FE	+	+	+	+
ASL FE	+	+	+	+
N. ASL	144	144	144	144
N. Obs.	1,717	1,440	1,717	1,440
Prob > F	0.00	0.00	0.00	0.00

Note: Robust standard errors clustered at the ASL level are reported in parentheses.

\* Significant at the 10% level, \*\* Significant at the 5% level, \*\*\* Significant at the 1% level.

Tab. 5 shows the results of the conducted estimations on ASLs’ total expenditure. Column 1 and 2 show the results with regards to models with the placebo anticipated treatment of one year, respectively with or without controls, while Column 3 and 4 show the placebo treatment anticipated of two years, again respectively with or without controls. The main result that emerges is that in none of the regressions the treatment coefficient is statistically significant, both anticipating the treatment of one or two years (when we use the latter as the main regressor the sign becomes positive). Moreover, there are no significant differences in adopting the model with or without demographic controls.

**Table 6** – Common trend assumption test on ASLs’ expenditure by sub-categories

<b>Independent variables</b>	<b>5 - HG</b>	<b>6 - HS</b>	<b>7 - NHG</b>	<b>8 - NHS</b>	<b>9 - HG</b>	<b>10 - HS</b>	<b>11 - NHG</b>	<b>12 - NHS</b>
Treatment Effect	0.02 (0.03)	-0.05 (0.03)	0.02 (0.04)	0.02 (0.03)	0.05 (0.03)	0.03 (0.03)	0.08 (0.05)	0.05 (0.04)
Total Population	0.00* (0.00)	0.00*** (0.00)	0.00 (0.00)	0.00 *** (0.00)	0.00* (0.00)	0.00*** (0.00)	0.00 (0.00)	0.00 *** (0.00)
Population 0-5 years	-29.61 *** (8.63)	-5.51 (6.53)	-21.61 * (12.31)	-14.14 ** (6.79)	-28.93 *** (8.40)	-4.23 (6.51)	-20.53 * (12.07)	-13.45 ** (6.60)
Population >64 years	-4.17 (3.00)	2.42 (2.34)	-0.34 (4.92)	-1.48 (2.47)	-4.79 (3.01)	1.08 (2.02)	-1.34 (4.99)	-2.09 (2.45)
Households	0.79 (2.38)	-1.01 (1.15)	-4.72 * (2.41)	-1.49 (1.81)	0.99 (2.33)	0.56 (1.09)	-4.38 * (2.36)	-1.29 (1.79)
Year FE	+	+	+	+	+	+	+	+
ASL FE	+	+	+	+	+	+	+	+
N. ASL	144	144	144	144	144	144	144	144
N. Obs.	1,440	1,440	1,440	1,440	1,440	1,440	1,440	1,440
Prob > F	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Note: Robust standard errors clustered at the ASL level are reported in parentheses.

\* Significant at the 10% level, \*\* Significant at the 5% level, \*\*\* Significant at the 1% level.

Table 6 shows the same set of results including demographic controls, by sub-categories of expenditure: Health Goods (HG), Health Services (HS), Non-Health Goods (NHG) and Non-Health Services (NHS). Columns 5 to 8 show the results with regards to models with the placebo anticipated treatment of one year, while in Columns 9 to 12 the placebo treatment is anticipated of two years. Consistently with the general model with total expenditure, for none of the estimations the placebo treatment is significant. These results thus confirm the common trend assumption, providing full reliability to the difference in difference model.

## 4.2 General Analysis

We provide in Tab. 7 the results of the first set of two regressions estimated using as dependent variable the per capita total expenditure.



**Table 7** – Basic specification – OLS DiD and FE on the entire panel

<b>Independent variables</b>	<b>1</b>	<b>2</b>
Treatment Effect	-0.03 *** (0.01)	-0.04 *** (0.01)
Total Population	-	0.00 *** (0.00)
Population 0-5 years	-	-9.39 (5.70)
Population >64 years	-	0.53 (1.72)
Households	-	-0.41 (1.03)
Year FE	+	+
ASL FE	+	+
N. ASL	144	144
N. Obs.	1,717	1,440
Prob > F	0.00	0.00

Note: Robust standard errors clustered at the ASL level are reported in parentheses.

\* Significant at the 10% level, \*\* Significant at the 5% level, \*\*\* Significant at the 1% level. In the first estimation, from the total number of possible hypothetical observations (i.e., 1,728), the actual number of observations used in these estimations is equal to 1,717, because of missing data for eleven ASLs for 2001. In the second estimation, the inclusion of the demographic variables reduces the number of observation to 1440. Each of these specifications of the model is estimated including robust standard errors and year and ASL fixed-effects.

Column 1 is the basic version of model using the natural log of per capita total expenditure as regressor and not including any demographic control. As mentioned earlier, in the analyzed period some ASLs have never made purchases through a CPB, while other ASLs have made purchases autonomously for a first period and later the Region centralized their purchases introducing a CPB. The introduction of a CPB seems to cause a general reduction of ASLs' per capita total expenditure and the magnitude of this statistical significant relationship is equal to -3%. Column 2 is our favorite specification of the model which is estimated using the natural log of per capita total expenditure as regressor, and includes the demographic control variables. The results of this analysis substantially confirm the estimations obtained in the specification of the model without demographic controls. Indeed, we obtained a negative impact of the introduction of the CPB on ASLs' per capita total expenditure, whose magnitude increases in absolute terms to -4%.

### 4.3 Analysis by category of expenditure

Tab. 8 shows the results of the second set of regressions in which we use as dependent variables per capita expenditure by category (i.e., health goods, health services, non-health goods, non-health services).

**Table 8** –OLS DiD and FE on the entire panel by sub-category of expenditure

<b>Independent variables</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>
Treatment Effect	0.04 (0.03)	-0.04 *** (0.02)	0.03 (0.04)	0.02 (0.03)
Total Population	-	-	-	-
Population 0-5 years	-	-	-	-
Population >64 years	-	-	-	-
Households	-	-	-	-
Year FE	+	+	+	+
ASL FE	+	+	+	+
N. ASL	144	144	144	144
N. Obs.	1,717	1,717	1,717	1,717
Prob > F	0.00	0.00	0.00	0.00

Note: Robust standard errors clustered at the ASL level are reported in parentheses.

\* Significant at the 10% level, \*\* Significant at the 5% level, \*\*\* Significant at the 1% level.

Each of these specifications of the models is again estimated including robust standard errors and year and ASL fixed-effects. The results shown in column 3 to 6 are estimation of the same model, where the main regressor is respectively the natural log of per capita expenditure on health goods (col. 3), health services (col. 4), non-health goods (col. 5) and non-health services (col. 6). From this set of regressions, we obtain that only expenditure on health services seems to be significantly affected by the introduction of a CPB. Indeed, the coefficient is negative and equal to -0.04. This result, combined with the general one, suggests that the negative effect on expenditure of the ASLs associated to the introduction of the CPB is strongly guided by the effect obtained for expenditure on health services, due to

the fact that it averagely represents alone more than 80% of the total amount of allocated costs.

Tab. 9 shows the second set of estimations expressed from model (1), which includes the set of demographic control variables.

**Table 9** – Specification including demographic controls – OLS DiD and FE on the entire panel

<b>Independent variables</b>	<b>7</b>	<b>8</b>	<b>9</b>	<b>10</b>
Treatment Effect	0.02 (0.03)	-0.06 *** (0.02)	0.02 (0.04)	0.02 (0.02)
Total Population	0.00 * (0.00)	0.00 *** (0.00)	0.00 (0.00)	0.00 *** (0.00)
Population 0-5 years	-29.84*** (8.70)	-4.92 (6.54)	-21.87 * (12.33)	-14.39 ** (6.86)
Population >64 years	-4.13 (2.97)	2.51 (2.19)	-0.31 (4.85)	1.50 (2.43)
Households	0.80 (2.39)	-1.15 (1.12)	-4.69 * (2.43)	-1.44 (1.80)
Year FE	+	+	+	+
ASL FE	+	+	+	+
N. ASL	144	144	144	144
N. Obs.	1,440	1,440	1,440	1,440
Prob > F	0.00	0.00	0.00	0.00

Note: Robust standard errors clustered at the ASL level are reported in parentheses.

\* Significant at the 10% level, \*\* Significant at the 5% level, \*\*\* Significant at the 1% level.

As for the first set of estimations, each of these specifications is estimated including robust standard errors and year and ASL fixed-effects. Columns 7 to 10 are the results of the estimation of models 3 to 6 (now including demographic controls), where the regressors are respectively natural log of per capita expenditure on health goods (col. 7), health services (col. 8), non-health goods (col. 9) and non-health services (col. 10). These regressions essentially confirm the results of the first set: expenditure on health services seems to be significantly affected by the introduction of a CPB, even controlling for demographic variables. In particular, the coefficient is slightly larger and equal to -0.06. Again, for the other typologies

of expenditure it does not emerge any significant effect associated with the introduction of CPBs.

#### 4.4 Check on the supply of health services

One possible drawback of the analysis conducted so far concerns the level of health services locally provided by ASLs. Indeed, a reduction in costs allocated to health and non-health goods and services by these structures could materialize in a reduction of service received by the local population. This result would change the interpretation of our previous conclusions, as the cost reduction would not be the derived from an economy of scale or from other forms of efficiency, but would be due to a more general shrinking of the welfare level provided to citizens. To test this hypothesis, we estimated ten different models using instead of the variables related to health and non-health expenditure as dependent variable five possible proxies of the level of health output supplied to the population. Tab. 10 shows the results of this analysis,

**Table 10** - Check on the supply of health services

Independent variables	First Aid		Physicians		Nurses		Ordinary beds		Day-hospital beds	
	1	2	3	4	5	6	7	8	9	10
Treatment Effect	-0.00 (0.03)	-0.01 (0.03)	-0.04 (0.03)	-0.06 0.04	-0.07 0.04	-0.09** (0.04)	0.01 (0.02)	0.00 (0.02)	0.06 0.06	0.05 (0.06)
Total Population	-	0.00 (0.00)	-	0.00 (0.00)	-	0.00 (0.00)	-	0.00* (0.00)	-	0.00 (0.00)
Population 0-5 years	-	6.70 (7.97)	-	21.02*** (7.04)	-	7.27 (8.31)	-	6.87* (3.62)	-	-20.21 (17.17)
Population >64 years	-	4.40 (3.29)	-	8.81*** (3.06)	-	12.54*** (4.79)	-	1.86 (1.58)	-	3.43 (7.86)
Households	-	1.83 (2.02)	-	-1.47 (2.99)	-	-0.66 (3.54)	-	0.78 (0.86)	-	6.14 (4.00)
Year FE	+	+	+	+	+	+	+	+	+	+
ASL FE	+	+	+	+	+	+	+	+	+	+
N. ASL	139	139	139	139	139	139	139	139	139	139
N. Obs.	691	691	695	695	695	695	692	692	695	695
Prob > F	0.00	0.00	0.00	0.00	0.26	0.12	0.00	0.00	0.00	0.00

Note: Robust standard errors clustered at the ASL level are reported in parentheses.

\* Significant at the 10% level, \*\* Significant at the 5% level, \*\*\* Significant at the 1% level.

We adopted five different dependent variables and we estimated for each of them two models, one excluding and one including demographic control variables. In particular, we use the number of per capita First Aid Centers (Columns 1/2), as it represents a significant declination of the healthcare supply, with a particular focus on urgent and emergency

situations. We also included the per capita number of physicians (Columns 3/4) and of nurses (Column 5/6), since these variables can be interpreted as a proxy of the level of care provided by professionals within the Italian National Health System. Finally, we included the per capita number of ordinary and “day-hospital” beds (respectively, Columns 7/8 and 9/10), which are an indicator of the National Health System supply. The indicator counts the number of ordinary or day-hospital beds "used" on a monthly basis by ASLs. For all these variables, the denominator used to calculate the indicator is the average resident population. This data is available at the ASL level only for a shorter period than that of the original sample, for a total of five years (from 2006 to 2010). In addition, this data is not available for 5 ASLs<sup>14</sup>. However, overall the reference panel has a total between 691 and 695 observations, according to the dependent variable of the model. Concerning the models which do not include demographic controls, the first result is that none of the variables used as proxies of healthcare supply was significantly impacted by the introduction of CPBs, albeit a negative coefficient emerges for First Aid centers and for the number of physicians and nurses, while a positive coefficient emerges for the variables related to the number of available beds. These results are broadly confirmed also introducing the demographic control variables. Indeed, the coefficients have the same sign and are not significant, with the exception of the number of per capita nurses. With this regard, the reduction in the number of per capita nurses could be justified by the fact that during the analyzed period, Italy has lost competitiveness compared to European peers in terms of average salary and working conditions for nurses (Chaloff, 2008) and this caused a leak of professionals abroad. In addition, the healthcare sector experienced several cuts in terms of lifelong training of nurses and recruitment of new professionals, which were partially substituted for a subset of activities with new less skilled professionals called “OSS” (“Operatore Socio Sanitario”, i.e., Social Health Operator), who do not necessary hold a university degree and are less specialized, hence resulting as less expensive for the system. These elements, combined with the general aging and subsequent retirement of nurses, could be considered as the main reason behind this reduction.

## 5. Robustness check

According to our analysis, the introduction of CPBs causes a reduction of expenditure on total expenditure on health, with a particular focus on health services. This result suggests that centralizing purchases can be considered as a useful tool for larger efficiencies in the health care sector. However, the centralization of purchases is not necessarily the only way to

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<sup>14</sup> “Roma B”, “Roma C”, “Roma D”, “Roma E” and “Torino 2”.

achieve savings on public expenditure in health, nor the most efficient one. In this section, we test that the identified efficiency is also due to possible third factors. In particular, we refer to the merger of ASLs decided by the Regions during the analysed period, since the aggregation of two or more originally distinct cost centres should lead to a “natural” contraction of certain fixed unsinkable costs. To control for this effect, we construct a dummy variable which describes whether an ASL was the result of an aggregation process from a given year onward or not, and we included it in the estimation of our original model (1).

Therefore, we estimate the following equation:

$$THE_{it} = \alpha + \beta dI_{it} + \gamma A_{it} + \delta X_{it} + \phi_i + \phi_t + \epsilon_{it} \quad (2)$$

where the dependent variable  $THE_{it}$  is the natural logarithm of per capita total health expenditure,  $dI_{it}$  is the treatment variable that takes value 1 if the ASL belongs to a  $i$  Region/Autonomous Province where a CPB is operating for the health sector (exclusively or not), for any  $t$  year, and  $A_{it}$  is the dummy variable that takes value 1 when the  $i$  hospital at time  $t$  is the result of a merge of two or more hospitals and 0 elsewhere. We also introduce  $X$  as a set of control variables including the total population, the total amount of the youngest cohort (<6 years) per capita, the total amount of the oldest cohort (>64 years) per capita and the total amount of household per capita. The estimation also includes ASL ( $\phi_i$ ) and year ( $\phi_t$ ) fixed effects. In a second version of the model, we replicate the analysis using the natural logarithm of per capita expenditure in health services as dependent variable. Tab. 11 shows the results of these analysis.

**Table 11 – Robustness test**

Independent variables	1	2
Treatment effect	-0.04 *** (0.01)	-0.05 *** (0.02)
Aggregation	-0.09 *** (0.03)	-0.10 *** (0.04)
Total Population	0.00 *** (0.00)	0.00 *** (0.00)
Population 0-5 years	-13.19 ** (5.63)	-9.44 (6.49)
Population >64 years	1.19 (1.77)	1.64 (2.20)
Households	-0.34 (1.00)	-1.07 (1.09)
Year FE	+	+
ASL FE	+	+
N. ASL	144	144
N. Obs.	1,440	1,440
Prob > F	0.00	0.00

Note: Robust standard errors clustered at the ASL level are reported in parentheses.

\* Significant at the 10% level, \*\* Significant at the 5% level, \*\*\* Significant at the 1% level.

Column 1 describes the results for the model having total health expenditure as dependent variable. Two main findings can be deduced. First, consistently with empirical works examining the impact of amalgamation of sub-national entities on the cost structure<sup>15</sup>, we find that the aggregation of ASLs shows a negative and statistically significant impact on the reduction of total health expenditure (-9%). Second, even with this specification of the model controlling for ASLs aggregation, the effect of the introduction of the CPB still leads to a reduction of total health expenditure (-4%). This result is fully consistent with the one obtained with the estimation of the general model, even in terms of the coefficient magnitude.

Column 2 describes the results for the model including only expenditure on health services as dependent variable. Results are essentially in line with the first specification of the model. Indeed, also according to this estimation, we obtain that the coefficient for ASLs' aggregation is negative (-10%) and statistically significant. Moreover, controlling for ASLs' aggregation, the effect of the CPB policy on expenditure on health services is still negative (-5%) and significant, again in line with previous results.

<sup>15</sup> See, for instance, Reingewertz (2002), Blesse and Baskaran (2016), and Ferraresi et al. (2017)

Overall, this set of results provides us with further corroboration of the goodness and robustness of our empirical results, thus confirming the positive impact of the introduction of Central Purchasing Bodies on the reduction the ASLs' expenditure.

## **6. Conclusions**

According to OECD (2011) the elements that characterize the action of the central purchases are related to three main stylized facts: “large procurement volumes generate better prices”, “transaction costs are reduced” and “other benefits of a significant nature occur”, which cannot be directly expressed in economic terms, mainly including need of standardization and professionalization within Public Administration, and increase of simplicity in the acquisition of goods and services. These principles are also the basis of the outcome of European political debate that led to the introduction in 2004 of the concept of purchase centralization among all member States with the EU Directive n.18. As a member country, Italy adopted the Directive introducing its contents in 2006 within the Legislative Decree n.164, providing for the mandatory establishment of CPBs at a regional level. The Regions have welcomed the introduction of this policy instrument in different ways, coming to complete the dissemination of CPBs only between 2014 and 2015. The main goal of this work was to verify that the introduction of a CPB - a subject in charge of purchasing goods and services at the regional level - has created an advantage in terms of reduction of ASLs expenditure, at least with the same level of service provided to citizens. In other terms, we wanted to assess whether the purchase centralization of goods and services used by ASLs has made local health-care procurement more efficient.

The realization of this study was based on two preliminary analysis. First, referring to legislation from time to time introduced at the regional level, we promptly represented when single Regions/Autonomous Provinces have introduced a CPB within their system, in order to supply the ASLs of its territory. This legal analysis allowed us to produce a treatment variable to identify those regions - and consequently ASLs - which were affected by the introduction of a CPB operating in the health-care sector over the period 2001-2012. Second, we built the panel for the analysis in three steps: first, by collecting official financial data for the ASLs for the 19 Italian Regions and 2 Autonomous Provinces, then reconciling the single balance sheets lines to a common framework and aggregating them into four macro-categories (expenditure on health goods, health services, non-health goods and non-health services),



finally identifying a unique ID for the whole period (considering aggregation of ASLs during the period of analysis). Hence, we obtained a panel of 144 IDs for ASLS from 2001 to 2012.

We then set our empirical strategy adopting the difference in difference technique: we compared the difference between the control group (the unaffected ASLs) and the treatment group (the affected ASLs) before and after the introduction of the treatment. The analysis results show that costs related to the purchase of goods and services by ASLs were actually reduced by the introduction of CPBs, in a range that goes from -3% to -4% of total expenditure, depending on the introduction of demographic controls in the model.

However, if we divide total costs in the four main macro-categories (health and non-health goods and services), we find that the effect is significant only for expenditure on health services, with a range between -4% and -6% (depending on the introduction of demographic controls), while the other macro-categories are not affected in a statistically significant way by the introduction of regional CPBs. Moreover, we estimated ten versions of our basic model by introducing a set of five health outcome variables as dependent variables to ensure that the reduction of ASLs expenditure was not associated to a mere cut of health services and instead was the result of a real efficiency. These models have substantially confirmed that the introduction of regional CPBs is related to a reduction on health services expenditure, provided the same level of services to the population.

To conclude, the results obtained for total expenditure and for expenditure on health services are corroborated by robustness test. In particular, we have verified that our results are confirmed when we control for the aggregation of ASLs, a widespread phenomenon occurred during the analyzed period theoretically associated with a higher degree of efficiency. Indeed, even including in the model a dummy variable accounting for ASLs' aggregation, the estimated impact of the introduction of CPB is negative, significant and consistent with the one obtained in the general model.

**Appendix 1** - Evolution of the Italian national and regional legal framework for CPBs' adoption from later 90's to 2015

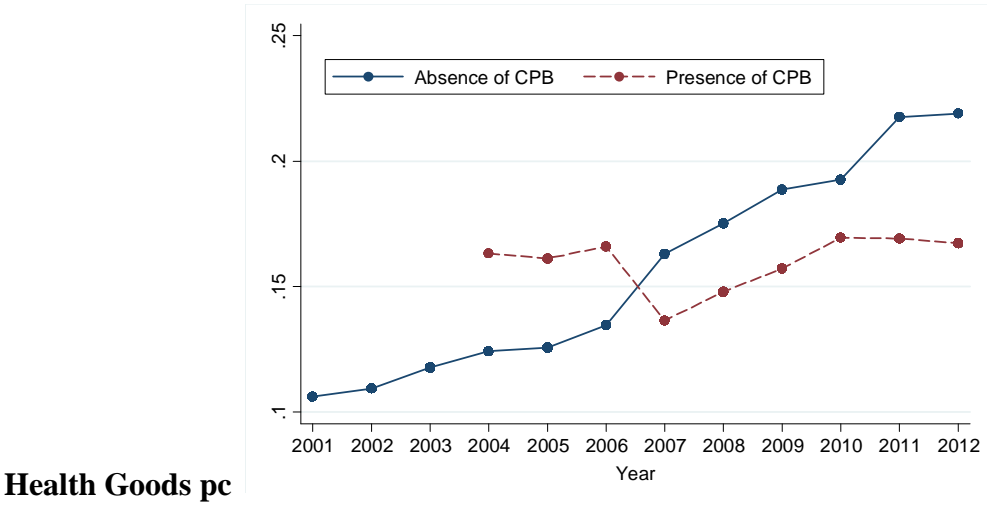
Region/Autonomous Province	#	Name of the CPB	Year of institution	Istitutive norms	Type of expenditure	Reference to national law
Abruzzo	1	Stazione Unica Appaltante del Servizio Genio Civile L'Aquila	2015	D.G.R. N.340 - 5/05/2015	Mixed (including health)	Art. 9 D.L n. 66 - 2014
Basilicata	1	SSR Centrale di Committenza	2012	Art. 21 L.R. n. 16 - 8/08/2012	Health	Art. 445 L. n.296 - 27/12/2006
	1 (substituting the previous institution)	Stazione Unica Appaltante della Regione Basilicata	2014	Art. 10 L.R. n.26 - 18/08/2014	Mixed (including health)	Art. 445 L. n.296 - 27/12/2006; Art. 9 D.L n. 66 - 2014
Calabria	1	Stazione Unica Appaltante Calabria	2007	Art. 1 L. n 26 - 7/12/2007; further integration D.G.R. n.340 - 5/05/2015	Mixed (including health)	Art. 445 L. n.296 - 27/12/2006; Art. 9 D.L n. 66 - 2014
Campania	1	So.Re.Sa. S.p.A.	2005	Art. 2 L.R. n.24 - 29/12/2005	Health	Art. 445 L. n.296 - 27/12/2006; Art. 9 D.L n. 66 - 2014
	1	So.Re.Sa. S.p.A.	2014	L.R. n. 16 - 7/08/2014	Mixed (including health)	Art. 445 L. n.296 - 27/12/2006; Art. 9 D.L n. 66 - 2014
	2	Città Metropolitana di Napoli	2015	Autorità Nazionale Anticorruzione (A.N.AC.) Act - 23/07/2015,	Non-health	Art. 9 D.L n. 66 - 2014
Emilia Romagna	1	Agenzia Regionale Intercent - ER	2004	L.R. n. 11 - 24/05/2004; further modifications L.R. n.17 - 24/10/2013	Mixed (including health)	L.R. n. 6 - 24/03/2004; Art. 445 L. n.296 - 27/12/2006
	2	Città Metropolitana di Bologna	2015	Autorità Nazionale Anticorruzione (A.N.AC.) Act - 23/07/2015,	Non-health	Art. 9 D.L n. 66 - 2014
Friuli Venezia Giulia	1	Ente per la gestione accentrata dei servizi condivisi	2014	Art. 7 L.R. n. 17 - 16/10/2014	Health	Art. 445 L. n.296 - 27/12/2006
	2	Servizio Centrale Unica di Committenza FVG	2014	L.R. n. 26 - 12/12/2014	Non-health	Art. 445 L. n.296 - 27/12/2006

Lazio	1	Direzione Centrale Acquisti della Regione Lazio	2014	Modifications to Art. 498-bis and 498-ter of the regional regulation n. 1/2002 and further modifications	Mixed (including health)	Art. 445 L. n.296 - 27/12/2006
	2	Città Metropolitana di Roma Capitale	2015	Autorità Nazionale Anticorruzione (A.N.AC.) Act - 23/07/2015,	Non-health	Art. 9 D.L n. 66 - 2014
Liguria	1	Centrale Regionale di Acquisto	2007	L.R. n.14 - 3/04/2007	Health	Art. 445 L. n.296 - 27/12/2006
	1 (substituting the previous institution)	Agenzia Regionale Sanitaria - Centrale Regionale di Acquisto per il Servizio Sanitario Regionale	2012	L.R. n. 34 - 6/11/2012	Health	Art. 445 L. n.296 - 27/12/2006
	2	Stazione Unica Appaltante Liguria	2014	L.R. n.41 - 29/12/2014	Non-health	Art. 9 D.L n. 66 - 2014
	3	Città Metropolitana di Genova	2015	Autorità Nazionale Anticorruzione (A.N.AC.) Act - 23/07/2015,	Non-health	Art. 9 D.L n. 66 - 2014
Lombardia	1	ARCA S.p.A.	2007	Art. 1 par. 1b and 3bis L.R. 33 - 28/12/2007	Mixed (including health)	Art. 445 L. n.296 - 27/12/2006
	2	Città Metropolitana di Milano	2015	Autorità Nazionale Anticorruzione (A.N.AC.) Act - 23/07/2015,	Non-health	Art. 9 D.L n. 66 - 2014
Marche	1	SUAM	2012	L.R. n. 12 - 14/05/2012	Mixed (including health)	Art. 445 L. n.296 - 27/12/2006
Molise	1	Servizio regionale Centrale Unica di Committenza del Molise	2015	L.R. n.8 - 04/05/2015	Mixed (including health)	Art. 445 L. n.296 - 27/12/2006; Art. 9 D.L n. 66 - 2014
Piemonte	1	Società di committenza regione Piemonte spa	2007	L.R. n. 19 - 6/08/2007	Mixed (including health)	Art. 445 L. n.296 - 27/12/2006
	2	Città Metropolitana di Torino	2015	Autorità Nazionale Anticorruzione (A.N.AC.) Act - 23/07/2015,	Non-health	Art. 9 D.L n. 66 - 2014

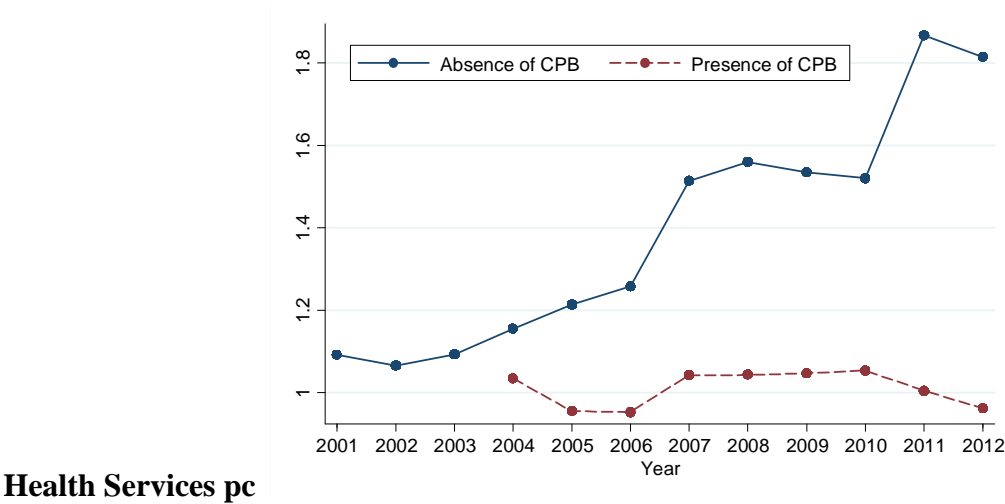
Puglia	1	Empulia	2007	Disciplina per l'utilizzo della piattaforma telematica EmPULIA	Mixed (including health)	Art. 445 L. n.296 - 27/12/2006
	1 (substituting the previous institution)	InnovaPuglia	2014	Art. 20 L. R. n. 37 - 1/08/2014	Mixed (including health)	Art. 9 D.L n. 66 - 2014
	2	Città Metropolitana di Bari	2015	Autorità Nazionale Anticorruzione (A.N.AC.) Act - 23/07/2015,	Non-health	Art. 9 D.L n. 66 - 2014
Sardegna	1	Sardegna CAT	2007	Art. 9 L.R. n.2 - 29/05/2007	Mixed (including health)	Art. 445 L. n.296 - 27/12/2006
Sicilia	1	UREGA	2011	L.R. n.12 - 12/07/2011	Mixed (including health)	Art. 445 L. n.296 - 27/12/2006
	2	Centrale Unica di committenza per l'acquisizione di beni e servizi	2015	Art. 55 L.R. n.5 - 7/05/2015	Mixed (including health)	Art. 9 D.L n. 66 - 2014
	3	Città Metropolitana di Catania	2015	Autorità Nazionale Anticorruzione (A.N.AC.) Act - 23/07/2015,	Non-health	Art. 9 D.L n. 66 - 2014
Toscana	1	ESTAV	2005	Art. 10 L.R. n.40 - 24/02/2005	Health	Art. 445 L. n.296 - 27/12/2006
	1 (substituting the previous institution)	ESTAR	2014	Art. 10 L.R. n.40 - 24/02/2005	Health	Art. 445 L. n.296 - 27/12/2006
	2	SUA Toscana	2014	DGR n.1232 - 22/12/2014	Non-health	Art. 9 D.L n. 66 - 2014
	3	Città Metropolitana di Firenze	2015	Autorità Nazionale Anticorruzione (A.N.AC.) Act - 23/07/2015,	Non-health	Art. 9 D.L n. 66 - 2014

Trento	1	AGENS	2009	Art. 39-bis L.P. n. 3 - 16/06/2006	Non-health	Art. 445 L. n.296 - 27/12/2006
	1 (substituting the previous institution)	APAC	2012	Art. 39-bis L.P. n. 3 - 16/06/2006	Non-health	Art. 445 L. n.296 - 27/12/2006
	1 (changing perimeter of expenditure)	APAC	2015	Art. 39-bis L.P. n. 3 - 16/06/2006	Mixed (including health)	Art. 445 L. n.296 - 27/12/2006; Art. 9 D.L n. 66 - 2014
Bolzano	1	ACP	2011	Art. 27 L.P. n.15 - 21/12/2011	Non-health	Art. 445 L. n.296 - 27/12/2006
	1 (changing perimeter of expenditure)	ACP	2015	Approvazione della strategia della Provincia autonoma di Bolzano nell'acquisto centralizzato - 22.12.2015	Mixed (including health)	Art. 445 L. n.296 - 27/12/2006
Umbria	1	CRAS	2014	Art.9 L.R. n.9 - 29/04/2014	Health	Art. 445 L. n.296 - 27/12/2006
	2	Città Metropolitana di Perugia	2015	Autorità Nazionale Anticorruzione (A.N.AC.) Act - 23/07/2015,	Non-health	Art. 9 D.L n. 66 - 2014
Valle d'Aosta	1	INVA	2013	Art. 21 comma 2 - L.R. 08/04/2013 n. 8	Mixed (including health)	Art. 445 L. n.296 - 27/12/2006
Veneto	1	CRAS	2011	DGRV n. 2370 - 29/12/2011	Health	Art. 445 L. n.296 - 27/12/2006
	1 (substituting the previous institution and changing perimeter of expenditure)	CRAV	2014	Deliberazione della Giunta Regionale n. 2626 - 29/12/2014	Mixed (including health)	Art. 445 L. n.296 - 27/12/2006; Art. 9 D.L n. 66 - 2014
	2	Città Metropolitana di Vicenza	2015	Autorità Nazionale Anticorruzione (A.N.AC.) Act - 23/07/2015,	Non-health	Art. 9 D.L n. 66 - 2014

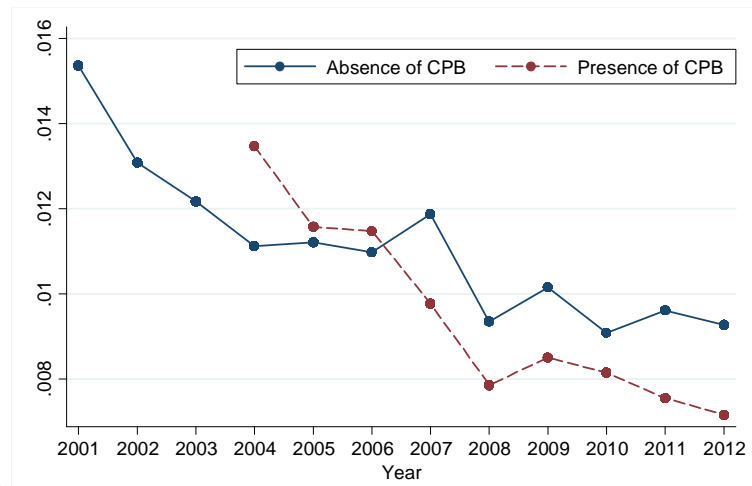
**Appendix 2 - Per capita expenditure on health and non-health goods and services by Italian ASLs in the presence or absence of regional CPBs**



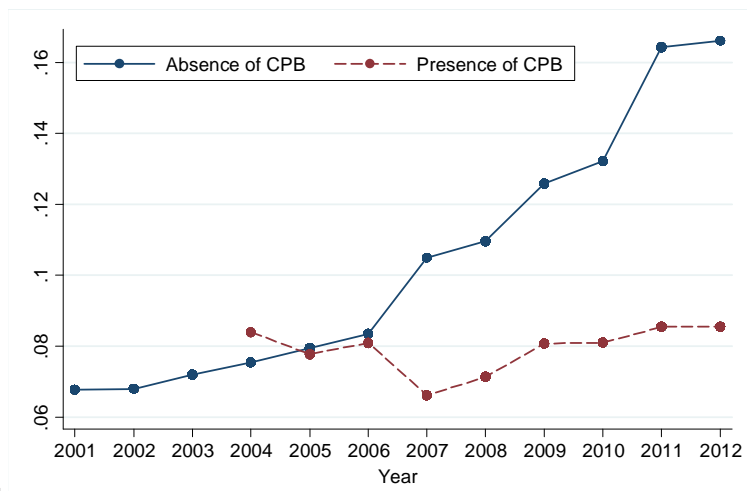
**Health Goods pc**



**Health Services pc**



**Non-Health Goods pc**



**Non-Health Services**

**Appendix 3 – Methodology of aggregation of ASL’s single balance sheet lines into 4 macro-categories (Health Goods, Non-Health Goods, Health Services, Non-Health Services)**

Health Goods	2012				2008-2011				2001-2007	
	line	code	sub-line	sub-code	line	code	sub-line	sub-code	line	code
Purchases of health goods	B.1.A)	ba0020	B.1.A.1)	ba0030	B.1.A)	b01005	B.1.A.1)	b01010	B.1.a)	b0020
			Pharmaceuticals and blood products				Pharmaceuticals and blood products		Pharmaceuticals and products	
			B.1.A.3) Dietary products	ba0250			B.1.A.3) Dietary products	b01020	B.1.b) Blood and dietary products	b0030
			B.1.A.5) Materials for the prophylaxis (vaccines)	ba0260			B.1.A.4) Materials for the prophylaxis (vaccines)	b01025	B.1.c) Materials for the prophylaxis (vaccines)	b0040
			B.1.A.6) Chemical products	ba0270			B.1.A.5) Diagnostic chemicals materials	b01030	B.1.d) Diagnostic chemicals materials	b0050
			B.1.A.3.1) Dispositivi medici	ba0220			B.1.A.6) Diagnostic materials, RX plates, contrast agents for RX, ECG paper, ECG, etc.	b01035	B.1.e) Diagnostic materials, RX plates, contrast agents for RX, ECG paper, ECG, etc.	b0060
			B.1.A.3.3) <i>In vitro</i> diagnostic medical devices	ba0240			B.1.A.7) Surgical and medical products	b01040	B.1.f) Surgical and medical products	b0070
			B.1.A.2) Blood and its components	ba0070			B.1.A.8) Prosthetic materials	b01045	B.1.g) Prosthetic and Hemodialysis materials	b0080
			B.1.A.3.2) Active implantable medical devices	ba0230			B.1.A.9) Hemodialysis Materials	b01050		
			B.1.A.7) Materials and products for veterinary use	ba0280			B.1.A.10) Materials and products for veterinary use	b01055	B.1.h) Products for veterinary use	b0090
								B.1.i) Surgical materials, medical and diagnostic products for veterinary use	b0100	

Non-Health Goods	2012				2008-2011				2001-2007	
	line	code	sub-line	sub-code	line	code	sub-line	sub-code	line	code
Purchase of non-health goods	B.1.B)	ba0310	B.1.B.1)	ba0320	B.1.B)	b01070	B.1.B.1) Alimentary products	b01075	B.1.j) Alimentary products	b0110
			Alimentary products				B.1.B.2) Wardrobe, cleaning and cohabitation materials	b01080	B.1.k) Wardrobe, cleaning and cohabitation materials	b0120
			B.1.B.2) Wardrobe, cleaning and cohabitation materials	ba0330			B.1.B.3) Fuels and lubricants	b01085	B.1.l) Fuels and lubricants	b0130
			B.1.B.3) Fuels and lubricants	ba0340			B.1.B.4) IT supports and stationery	b01090	B.1.m) IT supports and stationery	b0140
			B.1.B.4) IT supports and stationery	ba0350			B.1.B.5) Mantainance materials	b01095	B.1.n) Mantainance materials	b0150
			B.1.B.5) Mantainance materials	ba0360			B.1.B.6) Other non-health goods and products	b01100	B.1.o) Other	b0200
			B.1.B.6) Other non-health goods and products	ba0370			B.1.B.7) Non-health goods by public health authorities of the Region	b01105		
		B.1.B.7) Non-health goods by public health authorities of the Region	ba0380							

Non-Health Services	2012				2008-2011				2001-2007	
	line	code	sub-line	sub-code	line	code	sub-line	sub-code	line	code
Purchase of non-health services	B.2.B)	ba1560	B.2.B.1) Non-health services	ba1570	B.2.B)	b02500	B.2.B.1) Non-health services	b02505	B.2.13) Non-health services	b0590
			B.2.B.2) Consultancies, partnerships, temporary and other non-health services	ba1750			B.2.B.2) Consultancies, partnerships, temporary and other non-health services	b02595	B.2.10.2) Non-health consultancies	b0530
			B.2.B.3) Training (outsourced or not)	ba1880			B.2.B.3) Training (outsourced or not)	b02655	B.2.12) Training (outsourced or not)	b0580

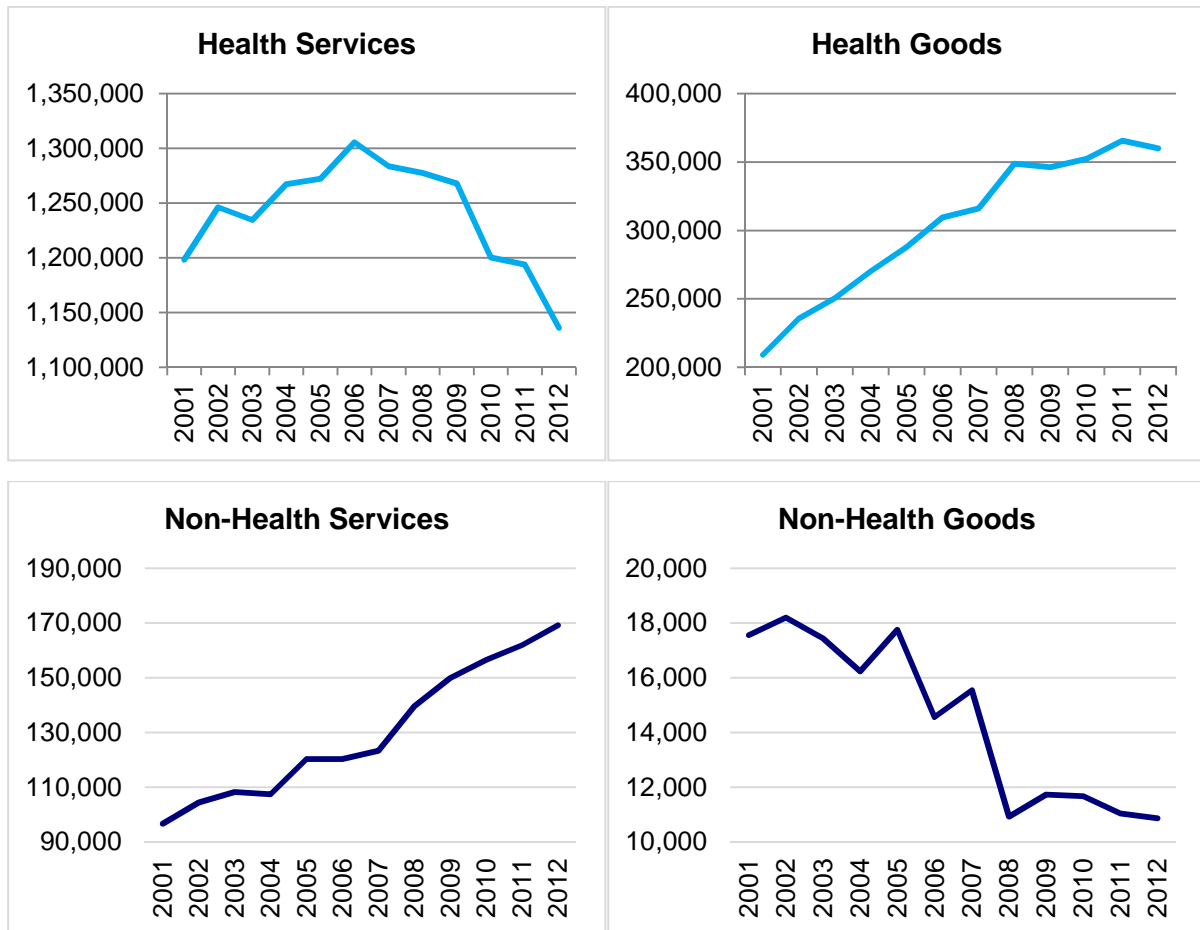


Health Services	2012				2008-2011				2001-2007		
	line	code	sub-line	sub-code	line	code	sub-line	sub-code	line	code	
Purchase of health services	B.2.A)	ba0400	Purchase of health services for primary care	ba0410	B.2.A)	b02005	Purchase of health services for primary care	b02010	B.2.1)	Purchase of health services for primary care	b0220
			B.2.A.2) Purchase of health services for pharmaceutical needs	ba0490			B.2.A.2) Purchase of health services for pharmaceutical needs	b02050	B.2.2)	Purchase of health services for pharmaceutical needs	b0230
			B.2.A.3) Purchase of health services for ambulatory specialist care	ba0530			B.2.A.3) Purchase of health services for ambulatory specialist care	b02070	B.2.3)	Purchase of health services for ambulatory specialist care	b0240
			B.2.A.4) Purchase of health services for rehabilitation assistance	ba0640			B.2.A.4) Purchase of health services for rehabilitation assistance	b02125	B.2.4)	Purchase of health services for rehabilitation assistance	b0290
			B.2.A.5) Purchase of health services for supplementary assistance	ba0700			B.2.A.5) Purchase of health services for supplementary and prosthetic assistance	b02150	B.2.5)	Purchase of health services for supplementary and prosthetic assistance	b0340
			B.2.A.6) Purchase of health services for prosthetic assistance	ba0750							
			B.2.A.7) Purchase of health services for hospital care	ba0800			B.2.A.6) Purchase of health services for hospital care	b02175	B.2.6)	Purchase of health services for hospital care	b0390
			B.2.A.8) Purchase of residential and semi-residential psychiatric services	ba0900			B.2.A.7) Purchase of residential and semi-residential psychiatric services	b02225	B.2.7)	Purchase of health services for other forms of assistance	b0440
			B.2.A.9) Purchase of distribution of File F drugs	ba0960			B.2.A.8) Purchase of distribution of File F drugs	b02250			
			B.2.A.10) Purchase of thermal performance	ba1030			B.2.A.9) Purchase of thermal performance	b02280			
			B.2.A.11) Purchase of medical transport services	ba1090			B.2.A.10) Purchase of medical transport services	b02310			
			B.2.A.12) Purchase of socio-sanitary health services	ba1140			B.2.A.11) Purchase of socio-sanitary health services	b02335			
			B.2.A.13) Partnership to the staff for freelance professionals activities (intramoenia)	ba1200			B.2.A.12) Partnership to the staff for freelance professionals activities (intramoenia)	b02360	B.2.8)	Partnership to the staff for freelance professionals activities (intramoenia)	b0470
			B.2.A.14) Health reimbursements, checks and contributions	ba1280			B.2.A.13) Health reimbursements, checks and contributions	b02365	B.2.9)	Health reimbursements, checks and contributions	b0480
			B.2.A.15) Consultancies, partnerships, temporary and other healthcare and social services	ba1350			B.2.A.14) Consultancies, partnerships, temporary and other healthcare and social services	b02405	B.2.10.1)	Health consultancies	b0520
			B.2.A.16) Other social and health services	ba1490			B.2.A.15) Other social and health services	b02470	B.2.11)	Other health services	b0540
			B.2.A.17) Costs for differential tariffs (TUC)	ba1550							

## Appendix 4 - The expenditure behavior by Region

### Abruzzo

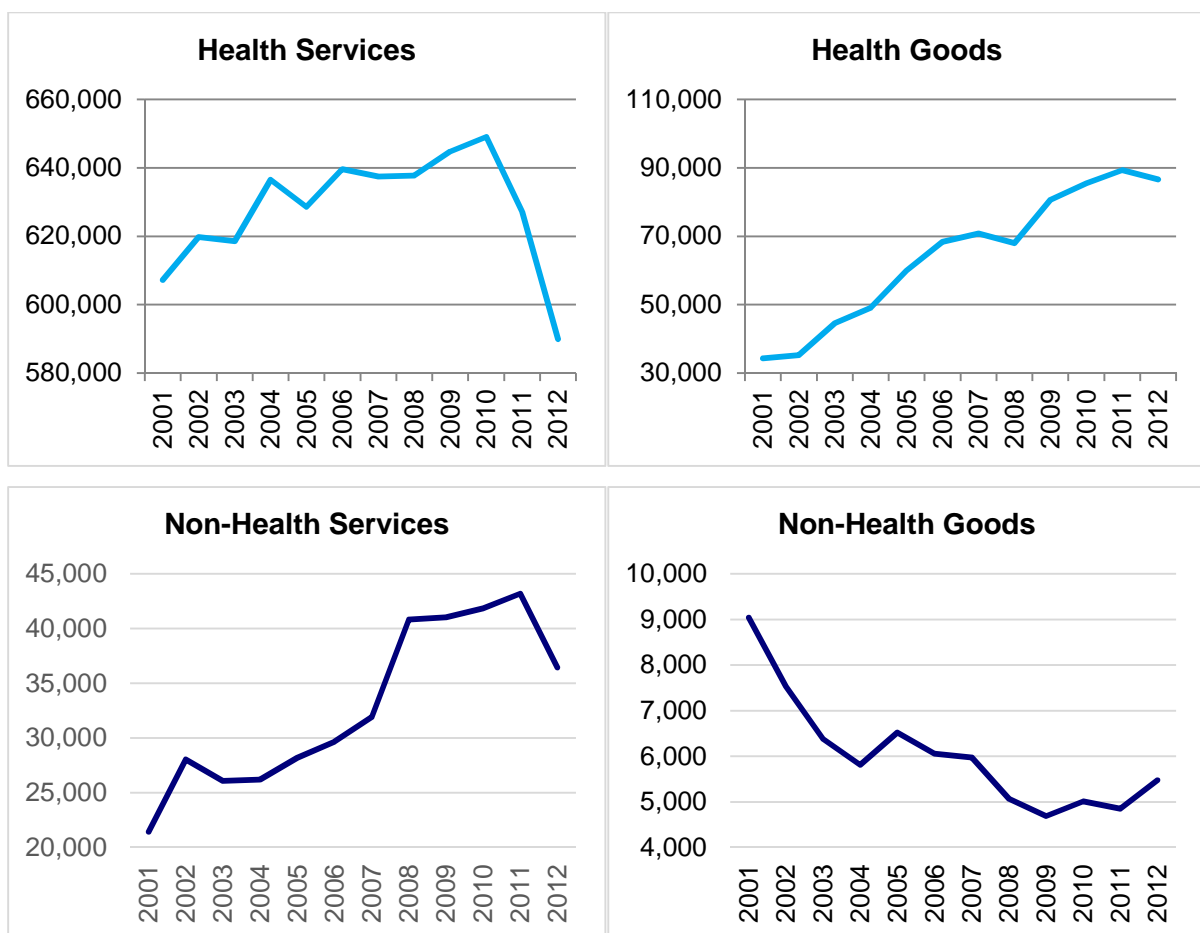
From 2001 to 2015, no Central Purchasing Bodies were implemented in Abruzzo. Only in May 2015, following the D.L 66 – 2014, it was established the "Stazione Unica Appaltante del Servizio Genio Civile de L'Aquila" with D.G.R. n. 34. To this station were attributed spending powers both in health and in the "non-health" matters.



## Basilicata

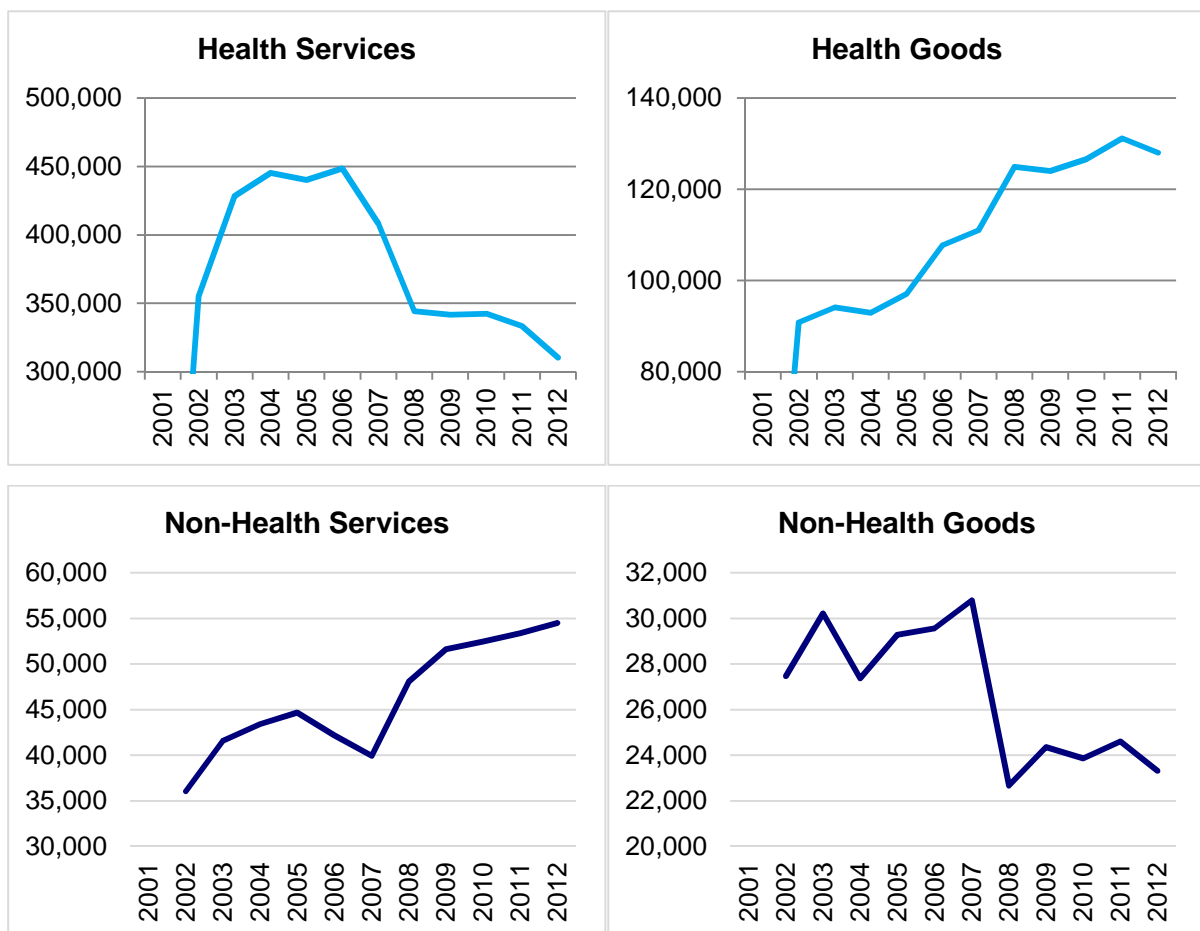
The Region Basilicata set up a first Central Purchasing Body in 2002, with L.R. n. 16/2002. This CPB had the function to centralize purchases of the health services and authorities for the whole Region, in accordance with Law No. 296//2006, for the purchase of goods and services.

In 2014 with LR n.26/2014 the CPB has been replaced by a Contracting Station, (i.e. “SUA – Regione Basilicata”). This new station keeps the CPB’s functions with reference to the healthcare sector and is also in charge of the procurement of other Regional "non-health" Local Authorities, in accordance with D.L n. 66/2014.



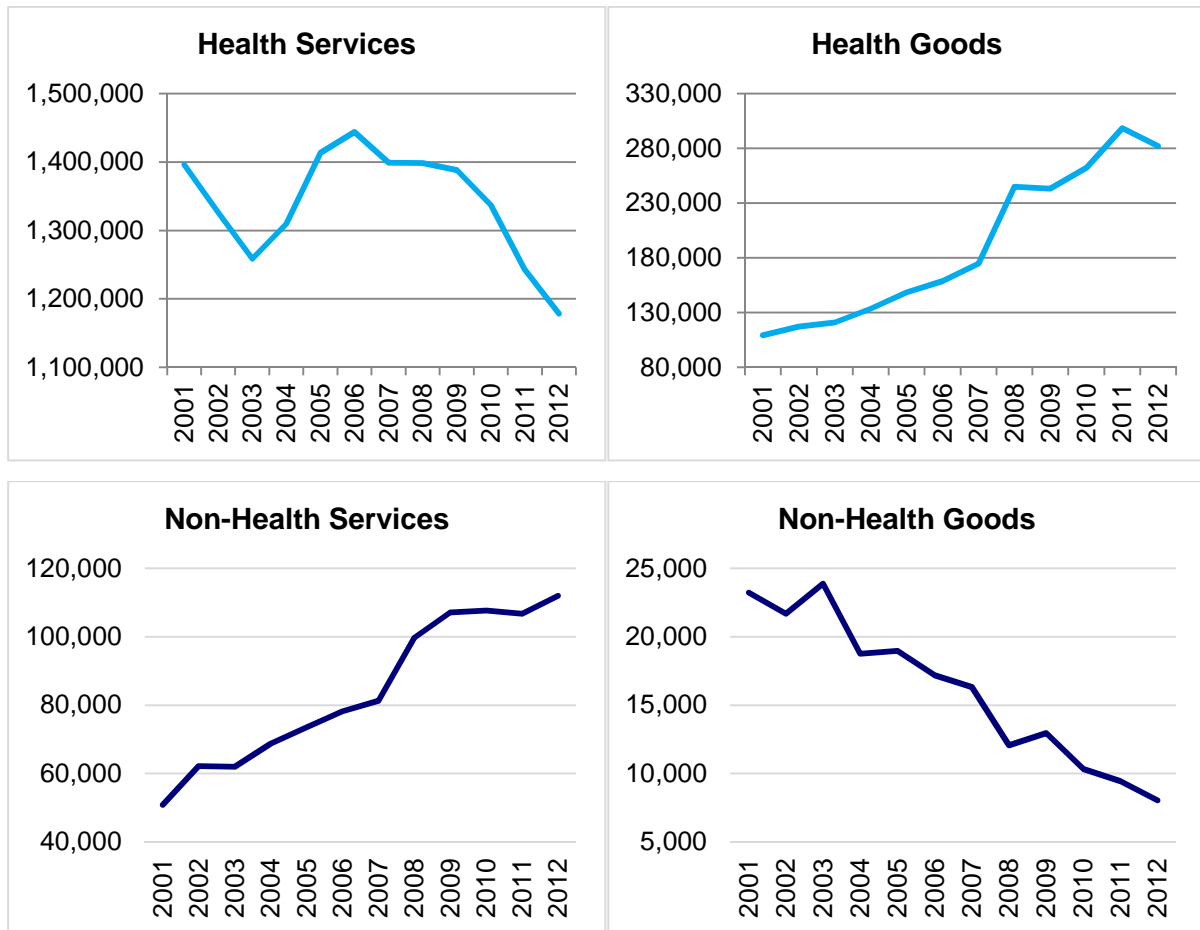
## Bolzano

The Autonomous Province of Bolzano has established a first Central Purchasing Body, with L.P. n.15/2011, which works in favor of local authorities, organizations and institutions in different public sectors. However, the health sector is not explicitly mentioned in the legislation, alluding to an exclusion of health matters from the perimeter of action of the CPB. With the "Approvazione della strategia della Provincia autonoma di Bolzano nell'acquisto centralizzato" of December 2015, the health sector is explicitly included among the tasks of the CPB, along with the other already mentioned sectors.



## Calabria

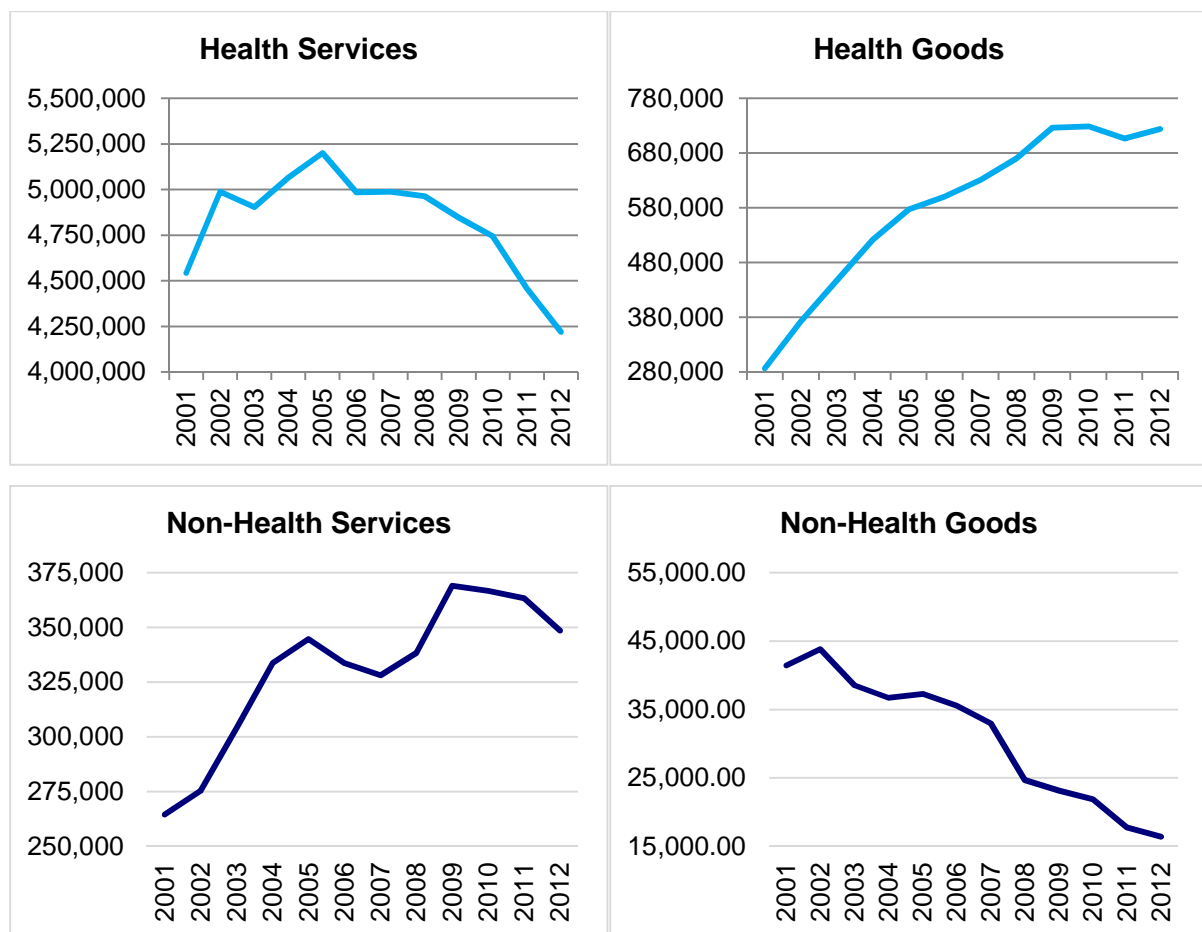
Region Calabria established its first CPB in 2007 with L. n 26/2007. The CPB, which is hinged in the Contracting Station (i.e. “SUA”), is responsible for the acquisition of goods and provision of services for the Region and for the organizations, companies and agencies which are supervised or controlled by the Region, and for the institutions of the regional health service.



## Campania

With L.R. n.24/2005, Region Campania has set up a Central Purchasing Body assigning the role of central purchases of products and services for the regional health system to So.Re.Sa. S.p.A., a company owned by the the Region itself, which had been already active since 2003. In addition to this role, So.Re.Sa., with L.R. n. 16/2014, was identified as the Contracting Station (i.e., “SUA”) under D.L. 66/2014, which concludes public contracts or framework agreements for supplies or services not only in favour of ASL or hospitals of the Campania Region, but also for several instrumental bodies of the Region and for other public local authorities in the region.

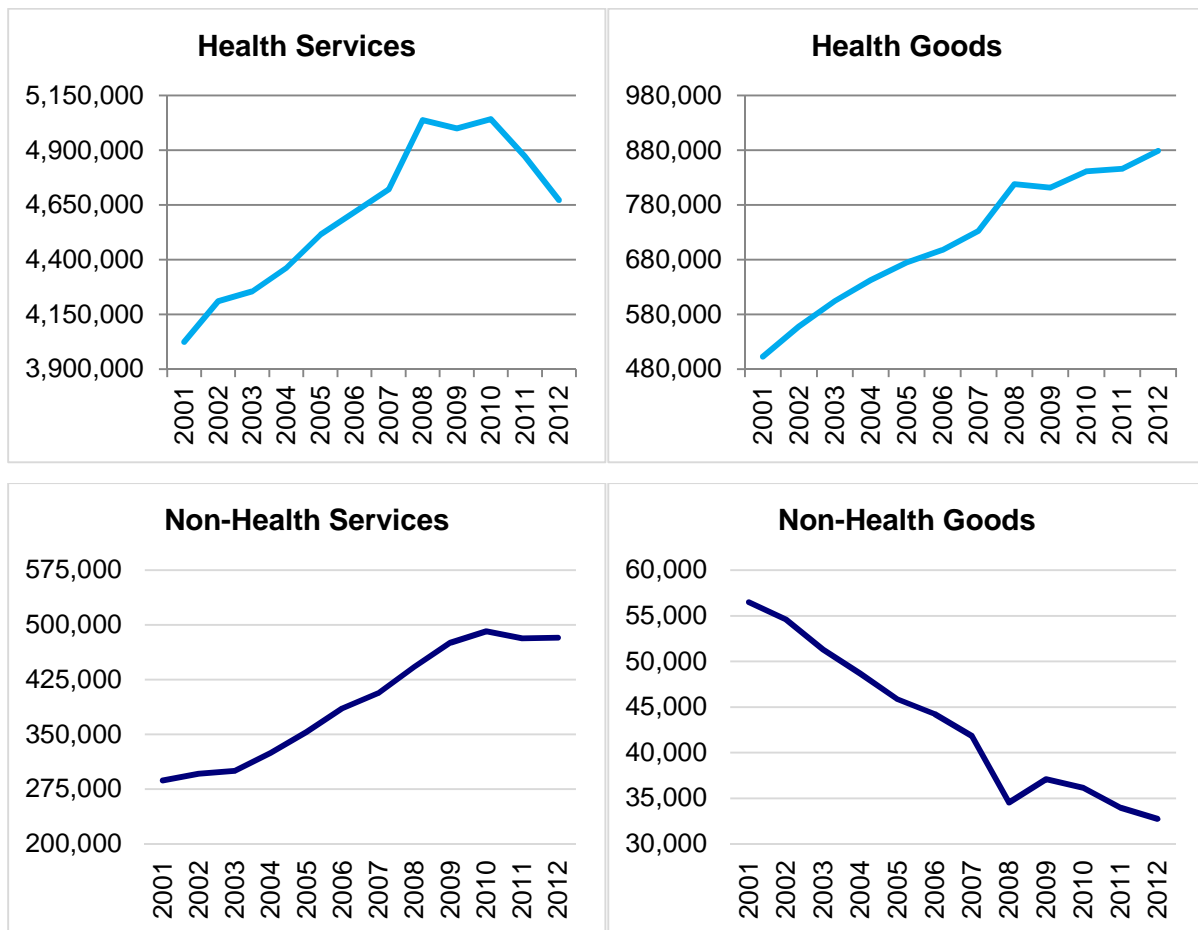
Moreover, with the National Anti-Corruption Authority’s act (i.e., “Autorità Nazionale Anticorruzione”) of 23.07.2015, it was established a Contracting Station (i.e., “SUA”) held by the Metropolitan City of Naples in favour of the regional "non-health" local entities.



## Emilia Romagna

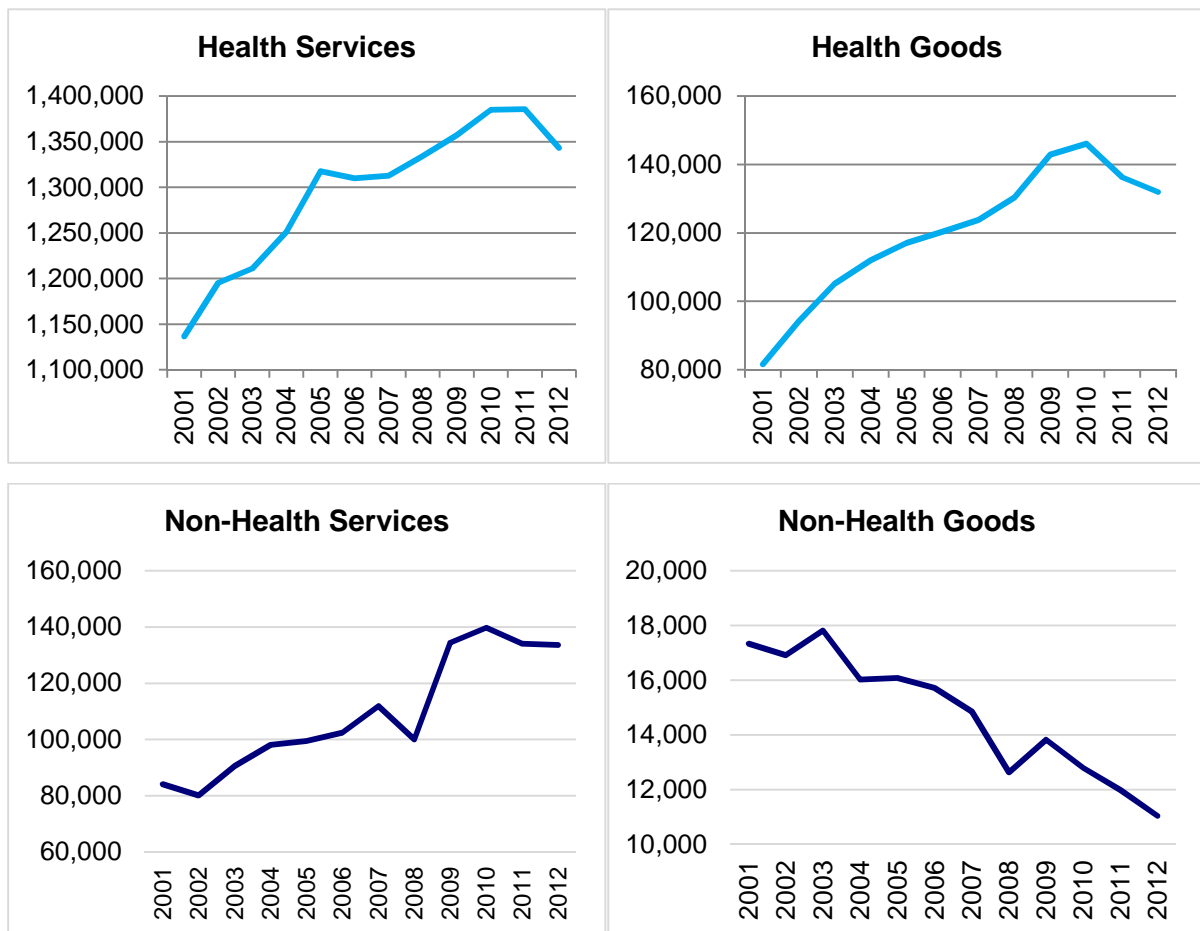
With L.R. 11/2004 Emilia Romagna attributed to the “Agenzia Regionale Intercent” the role of Central Purchasing Body for the goods and services in favour of the region itself (and its organizations, associations, companies and institutions) of the ASLs and the hospitals belonging to the Regional Health Service, as well as to other local public authorities (including schools).

Moreover, with the National Anti-Corruption Authority’s act (i.e., “Autorità Nazionale Anticorruzione”) of 23.07.2015, it was established a Contracting Station (i.e., “SUA”) held by the Metropolitan City of Bologna in favour of the regional "non-health" local entities.



## Friuli Venezia Giulia

In order to improve the efficiency and effectiveness of the Regional Health Service, with L.R. 17/2014 Friuli Venezia Giulia has set up its CPB, called “Ente per la gestione accentrata dei servizi condivisi”. The CPB on behalf of the Regional Health Service agencies acts demand aggregator and central purchaser for the acquisition of goods and services in the health sector. At the same time, Friuli Venezia Giulia with L.R. 26/2014 has instituted another CPB, competent in the other public sectors (excluding health), called “Servizio Centrale Unica di Committenza FVG”.



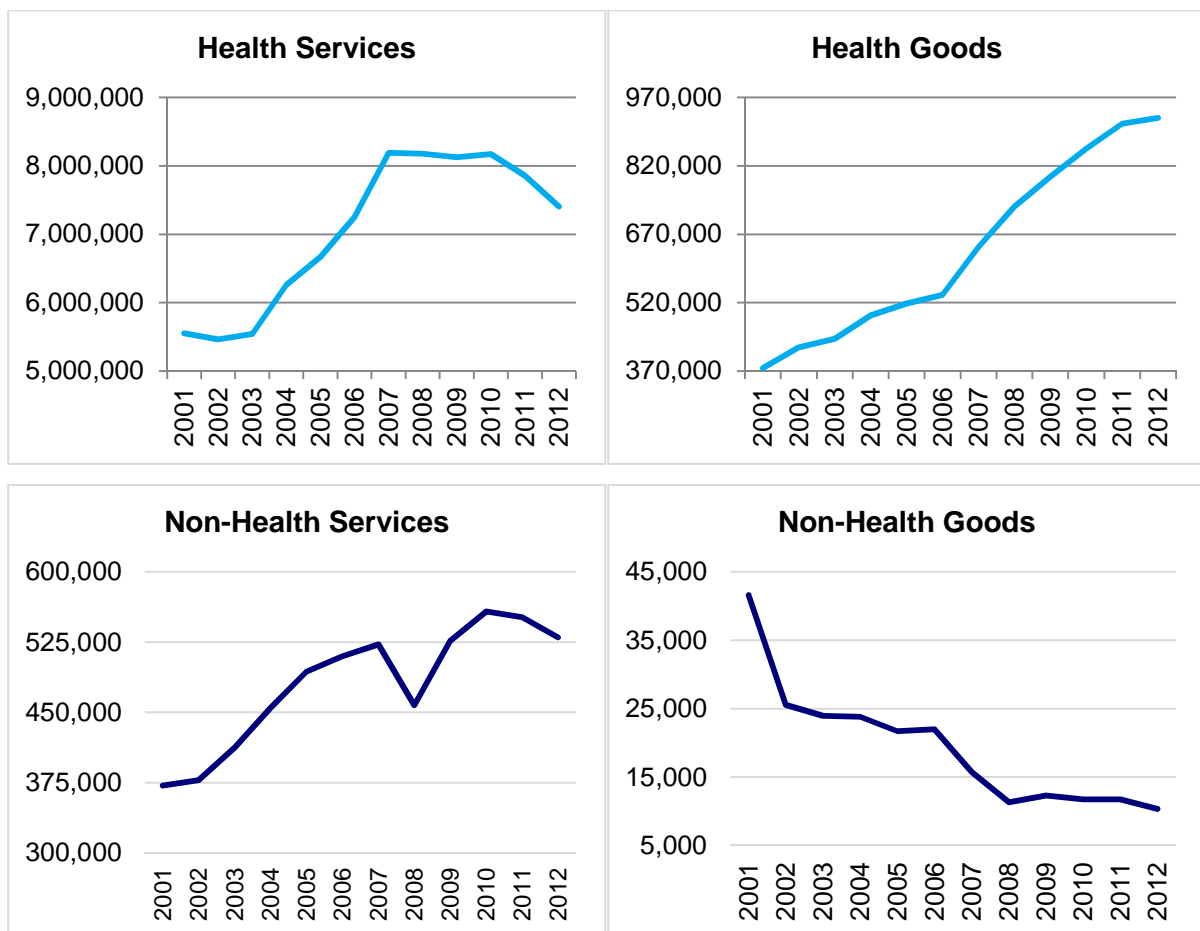


## Lazio

During the analysed period, the Region Lazio has adopted a CPB only in 2014.

In particular, the modifications to Art. 498-bis and 498-ter of the regional regulation n. 1/2002 Lazio entrusted the "Direzione Centrale Acquisti" (i.e., the Purchases DG) the CPB functions both in the health and "non-health" sectors.

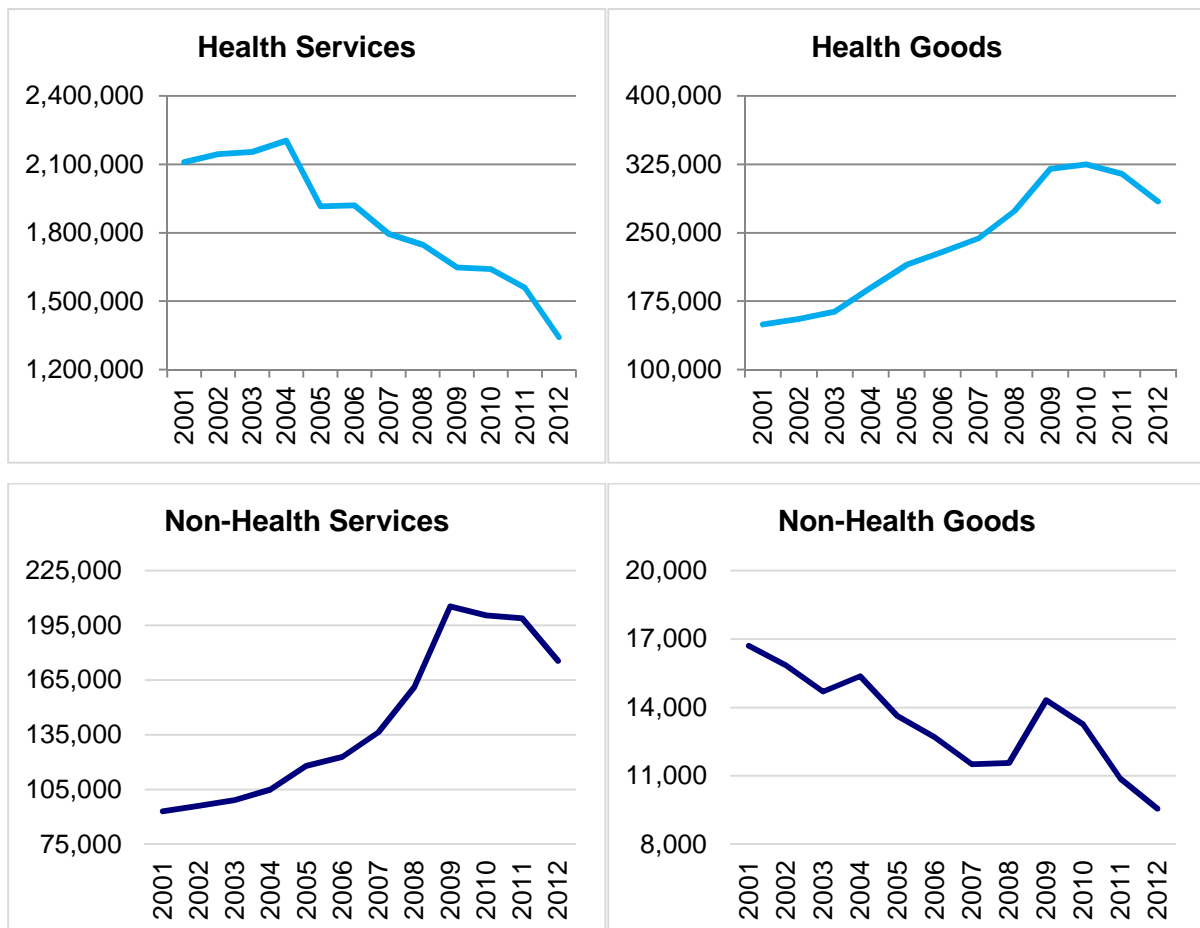
Moreover, with the National Anti-Corruption Authority's act (i.e., "Autorità Nazionale Anticorruzione") of 23.07.2015, it was established a Contracting Station (i.e., "SUA") held by the Metropolitan City of Rome in favour of the regional "non-health" local entities.



## Liguria

With L.R. 14/2007 the Liguria Region has set up the first regional CPB, which was legally instituted as a consortium. It had the task to act as an aggregator of demand and purchaser for all the hospitals of the region. In 2012 the L.R. 34 set up the “Agenzia Regionale Sanitaria - Centrale Regionale di Acquisto per il Servizio Sanitario Regionale” (i.e., the Regional Health Agency), a new CPB with the same functions of the simultaneously repealed Consortium, but structured within the organization of the region itself.

For what that concerns the other public "non-health" sectors, with L.R. 41/2014 Liguria instituted the regional Contracting Station (i.e., "SUA"), which carries out the functions of a CPB. Similarly, with the National Anti-Corruption Authority's act (i.e., “Autorità Nazionale Anticorruzione”) of 23.07.2015, it was established a Contracting Station held by the Metropolitan City of Genoa in favour of the regional "non-health" local entities.

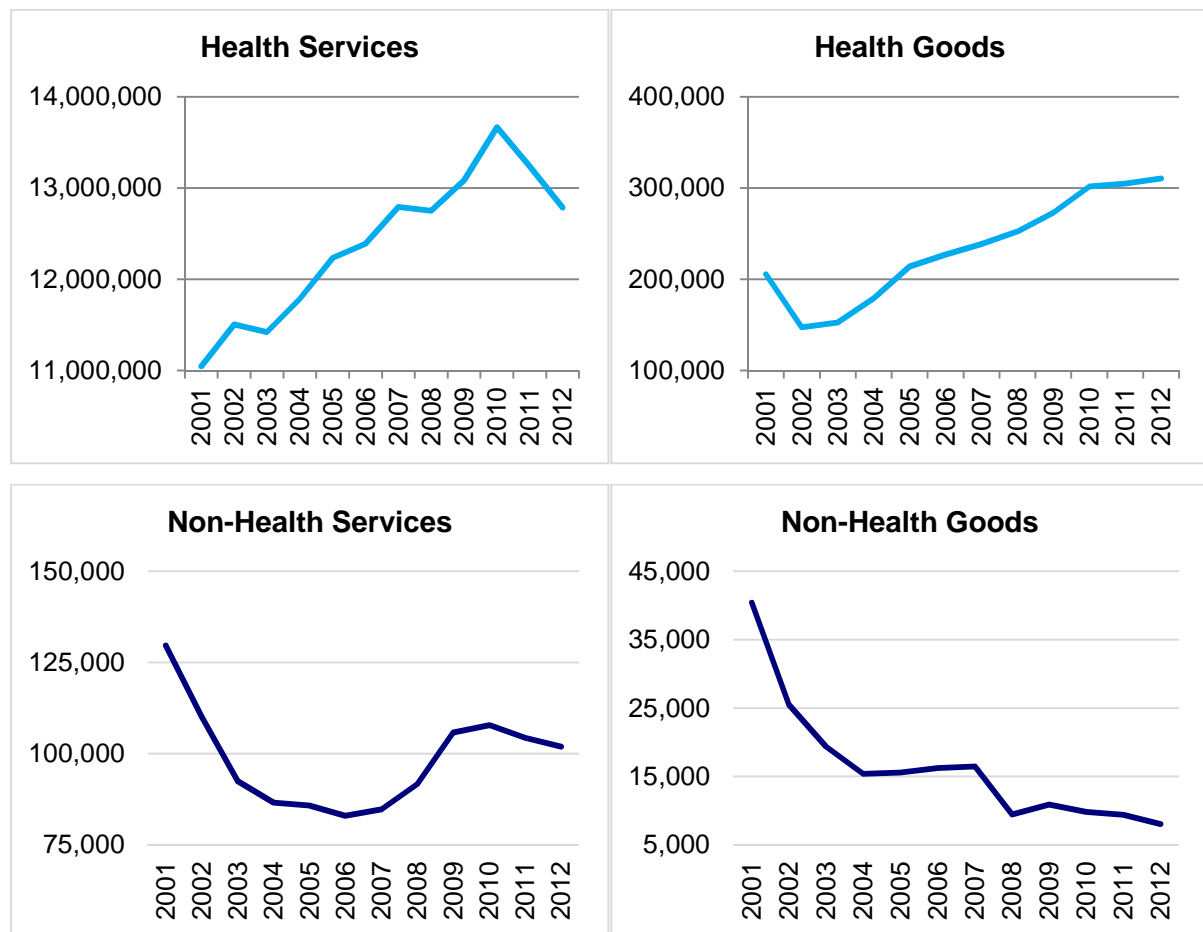


## Lombardia

With L.R. 33/2007, Region Lombardia has entrusted to the owned company ARCA S.p.A. (originally instituted in 1997) the CPB function, in accordance with L. 296/2006. A later change to the text dating back to 2014 also attributed to ARCA the role of Contracting Station (i.e., "SUA").

ARCA operates both on behalf of institutions and services within the healthcare sector, and for the Region itself and the other Local Entities.

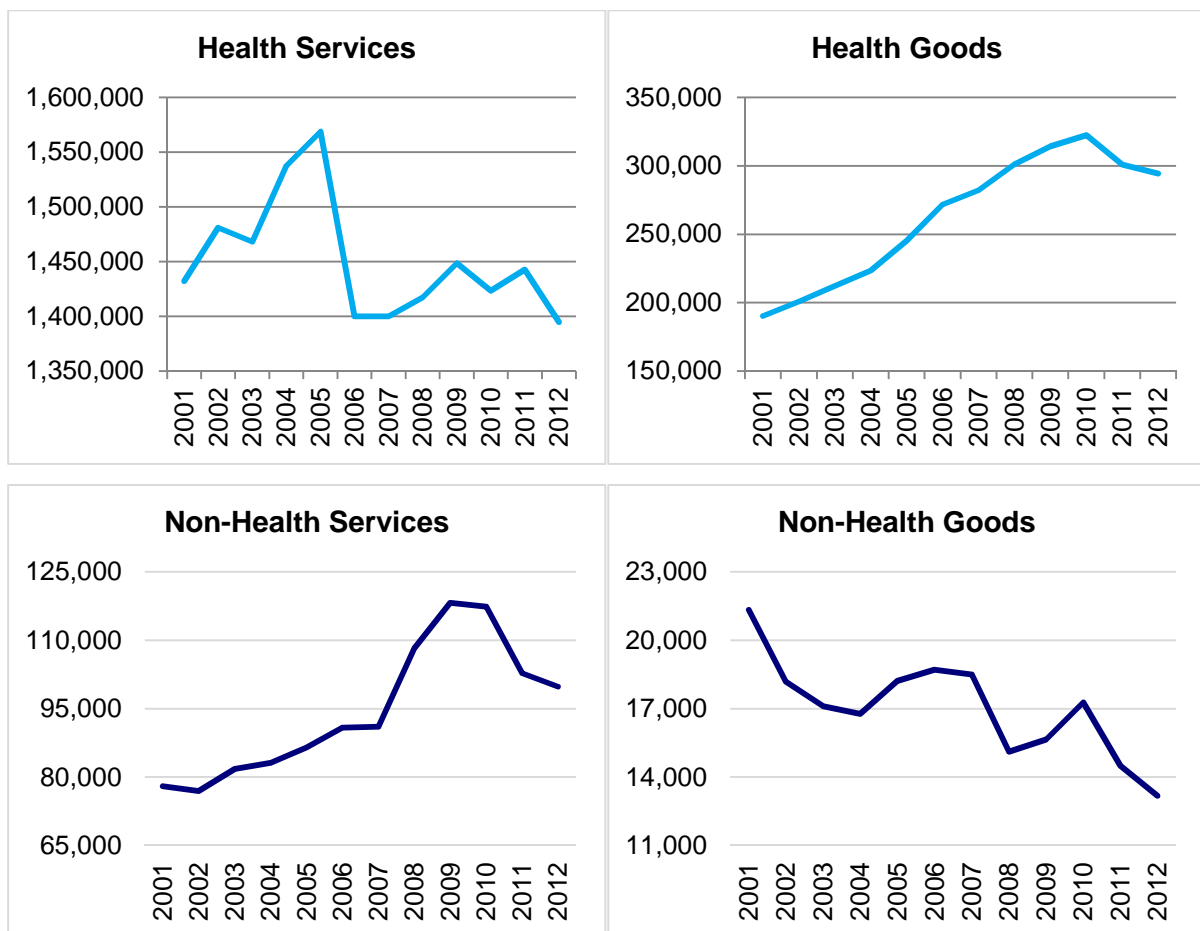
Moreover, with the National Anti-Corruption Authority's act (i.e., "Autorità Nazionale Anticorruzione") of 23.07.2015, it was established a Contracting Station (i.e., "SUA") held by the Metropolitan City of Milan in favour of the regional "non-health" Local Entities.



## Marche

Region Marche has instituted the first regional CPB in 2012 with L.R. n.12.

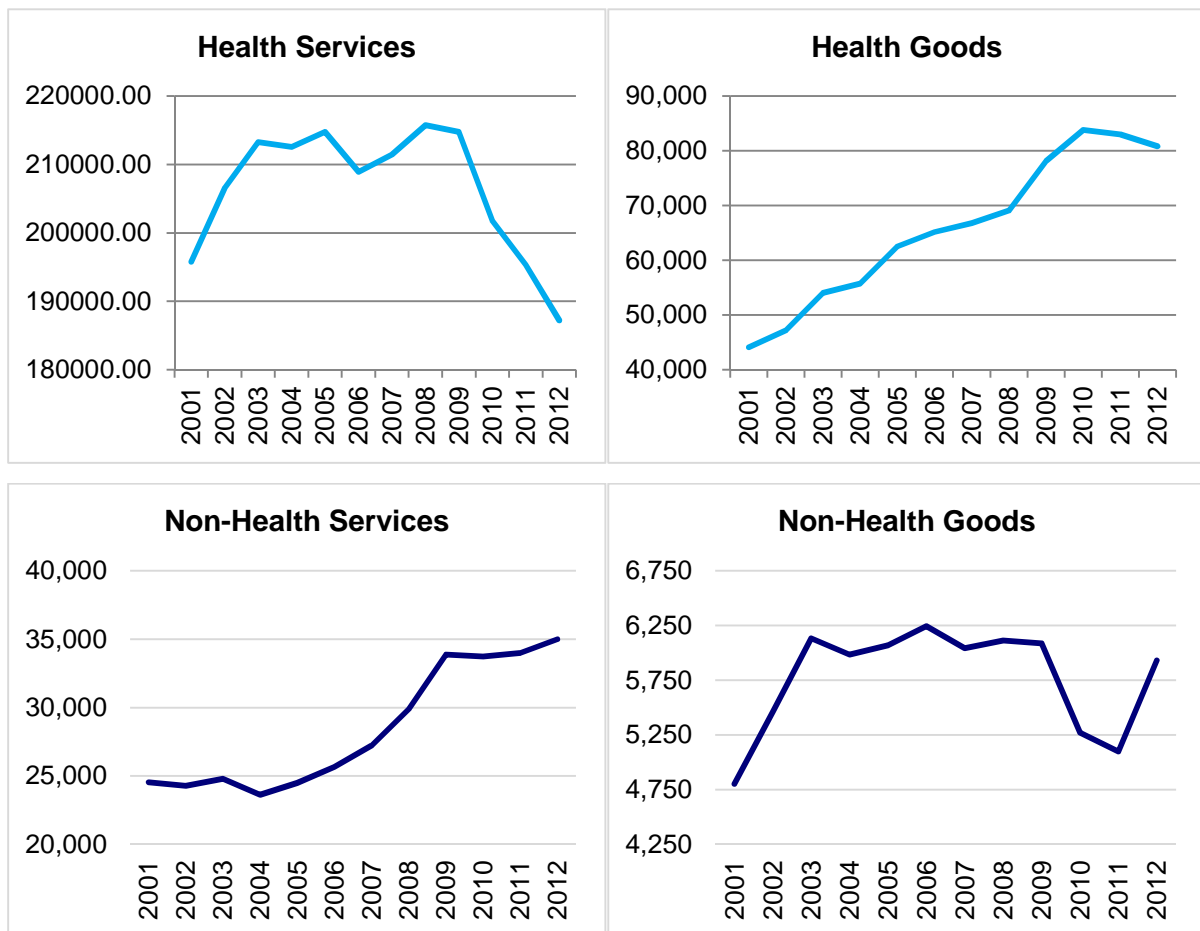
The CPB oversees the containment and rationalization of expenditure on the purchase of goods and services for both the National Health Service regional entities and for the other subsidiary bodies of the Region operating in the "non-health" sectors. Since 2014, the CPB is also performing as a Contracting Station (i.e., "SUA") on the same scope of activities, in order to ensure the effectiveness, efficiency and economy in the performance of contractual procedures; impartiality, transparency and regularity of public contract management; prevention of the risk of mafia infiltration and compliance with safety regulations at work.



## Molise

In the analysed period Region Molise has set up a CPB only in 2015, with L.R. n. 8 under Art. 445 L. n.296/2006. To the CPB is at the same time also attributed the Contracting Station function (i.e., "SUA") pursuant to Art. 9 D.L n. 66/2014.

The CPB operates on behalf of regional authorities and the bodies of the Molise Region System, local authorities within the Region, as well as of the Regional Health Service entities. The creation of the Regional CPB implements state regulations on rationalization of spending and obligations on aggregation of purchases.

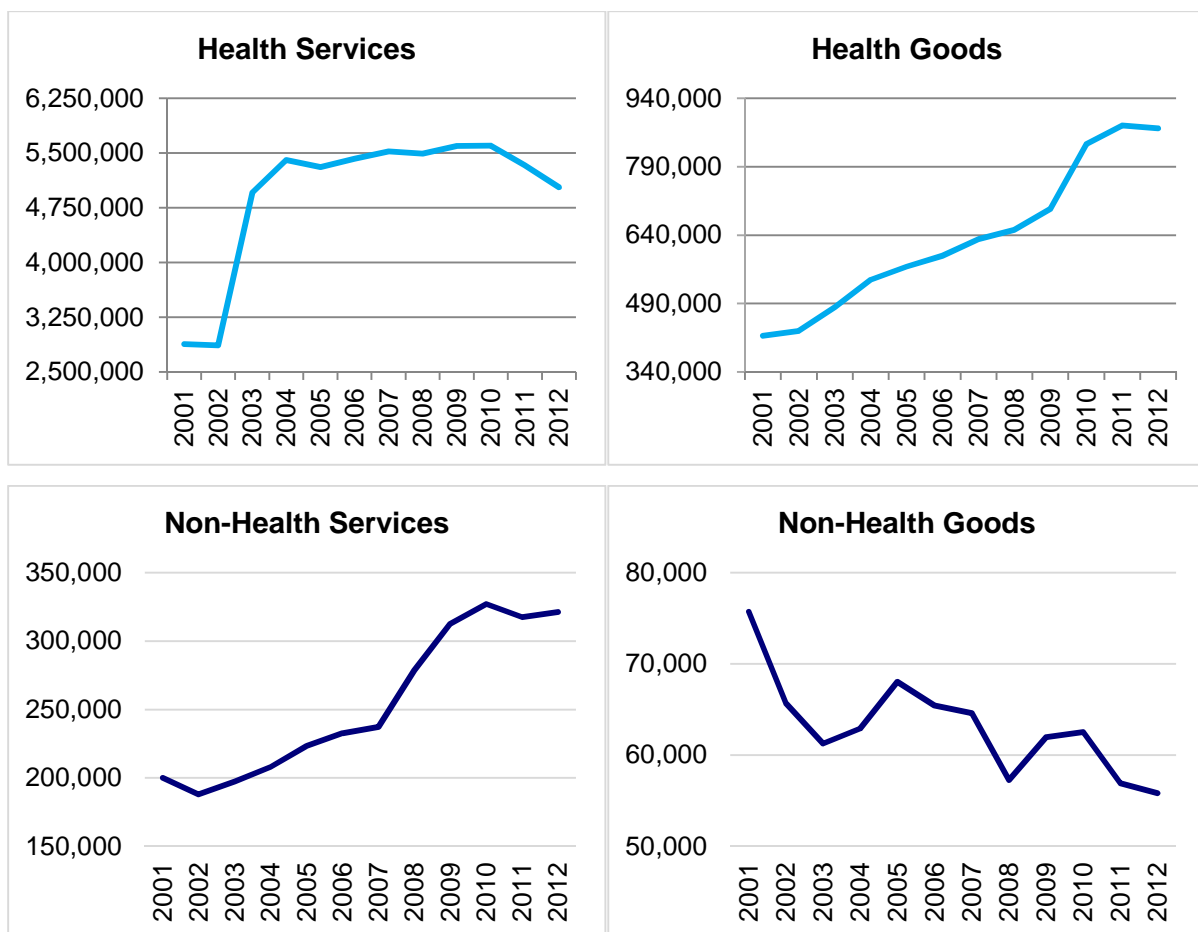


## Piemonte

Region Piemonte has established the Regional CPB, called "Società di Committenza Regione Piemonte S.p.A" with L.R. 19/2007, pursuant to Article 33 of Legislative Decree of 12 April 2006, n. 163. From 2014 it is also Contracting Station (i.e., "SUA") pursuant to Article 13 of Law 13 August 2010, n. 136.

The beneficiaries of the activities include regional and local authorities, organizations and entities of the regional health service and university school education institutions.

Moreover, with the National Anti-Corruption Authority's act (i.e., "Autorità Nazionale Anticorruzione") of 23.07.2015, it was established a Contracting Station (i.e., "SUA") held by the Metropolitan City of Turin in favour of the regional "non-health" local entities. Moreover, with the National Anti-Corruption Authority's act (i.e., "Autorità Nazionale Anticorruzione") of 23.07.2015, it was established a Contracting Station (i.e., "SUA") held by the Metropolitan City of Turin in favour of the regional "non-health" local entities.

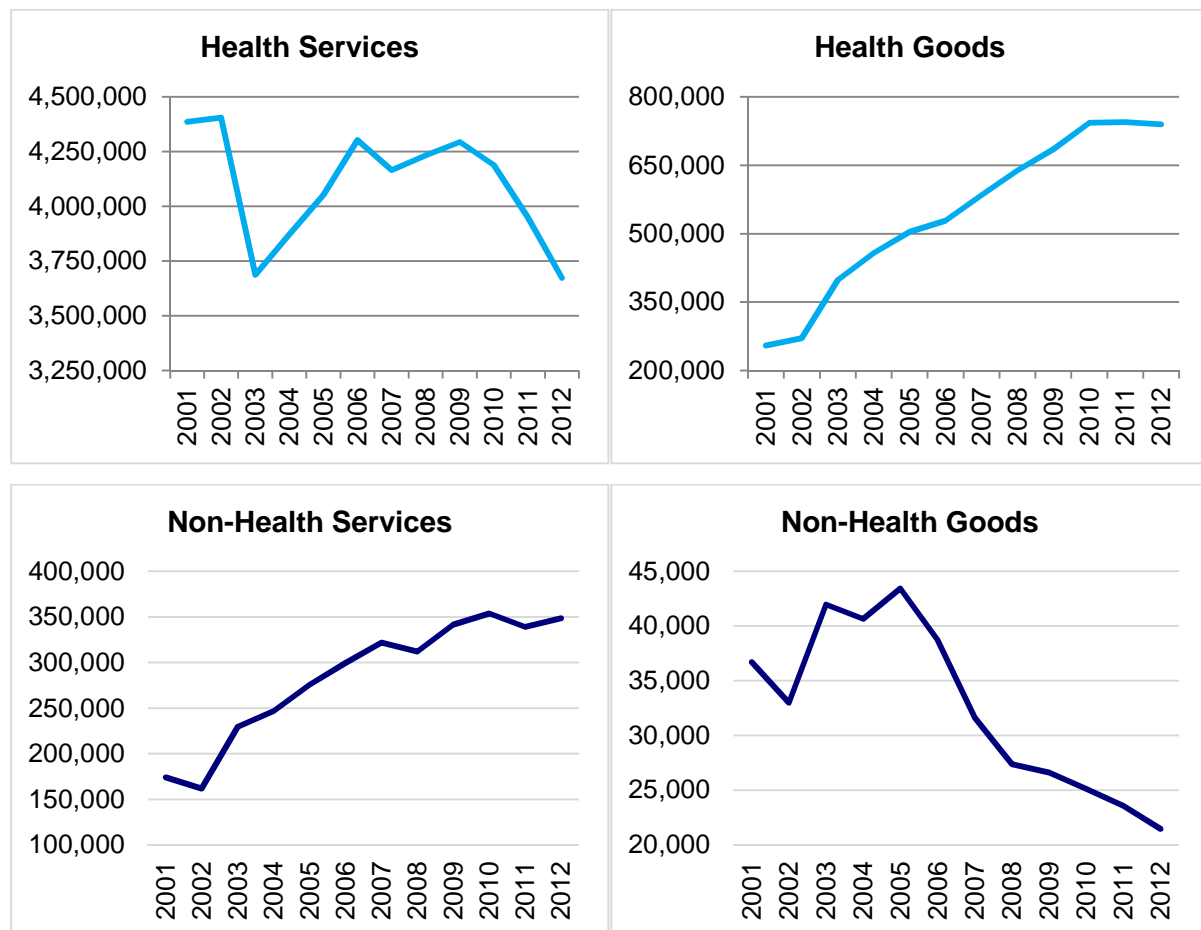


## Puglia

Region Puglia instituted the first CPB in 2007, attributing to the authority “EmPulia” the task of centralizing purchases for government agencies and services in the region, including health authorities, as required by Law No. 296/2006.

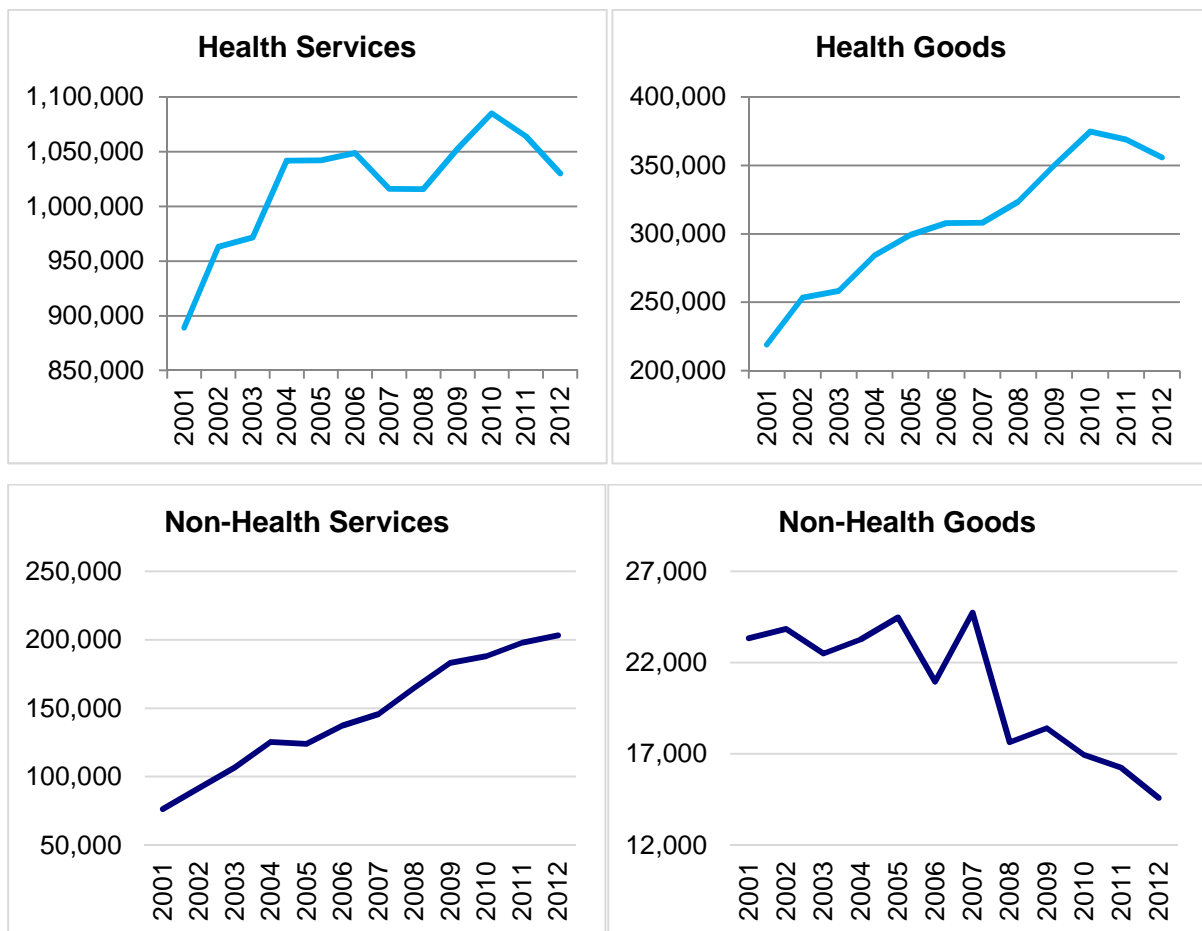
In order to pursue the public finance targets and transparency, regularity and cost effectiveness of public contract management, Region Puglia has furtherly designated the in-house company InnovaPuglia S.p.A. as the Contracting Station of the Region (L.R. 37/2014). InnovaPuglia also carries out the functions of CPB in favour of the same health and “non-health” institutions, replacing EmPulia.

Moreover, with the National Anti-Corruption Authority’s act (i.e., “Autorità Nazionale Anticorruzione”) of 23.07.2015, it was established a Contracting Station (i.e., “SUA”) held by the Metropolitan City of Bari in favour of the regional "non-health" local entities.



## Sardinia

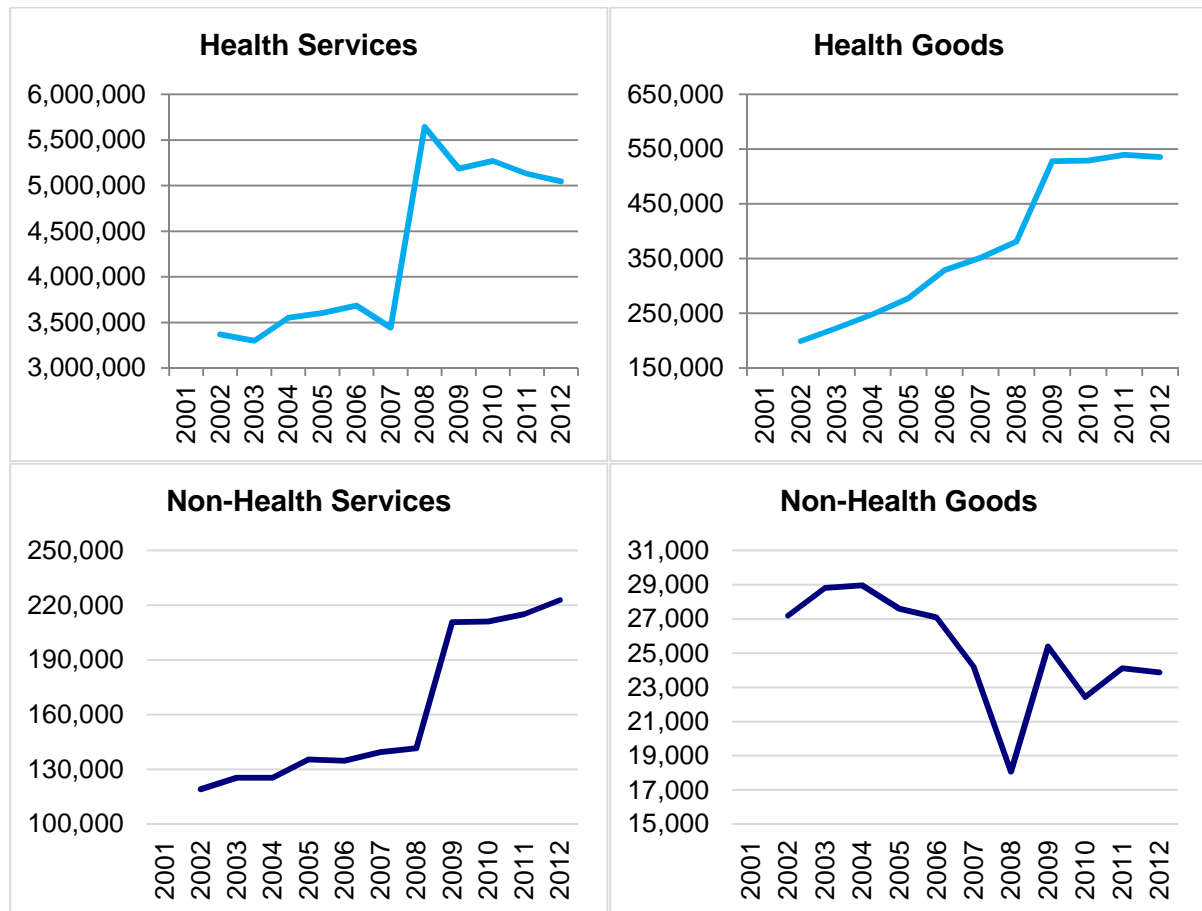
With L.R. 2/2007 Sardinia attributed to “Centro di Acquisto Territoriale” (CAT) the functions of a CPB, i.e. the coordination of activities of expenditure, the simplification and acceleration of the process of purchasing the regional administrations. In particular, the involved authorities are of health nature (hospital of the regional health service) and administrative nature (bodies of regional and local agencies as well as school and university education institutions present and operating in the Region).





## Sicilia

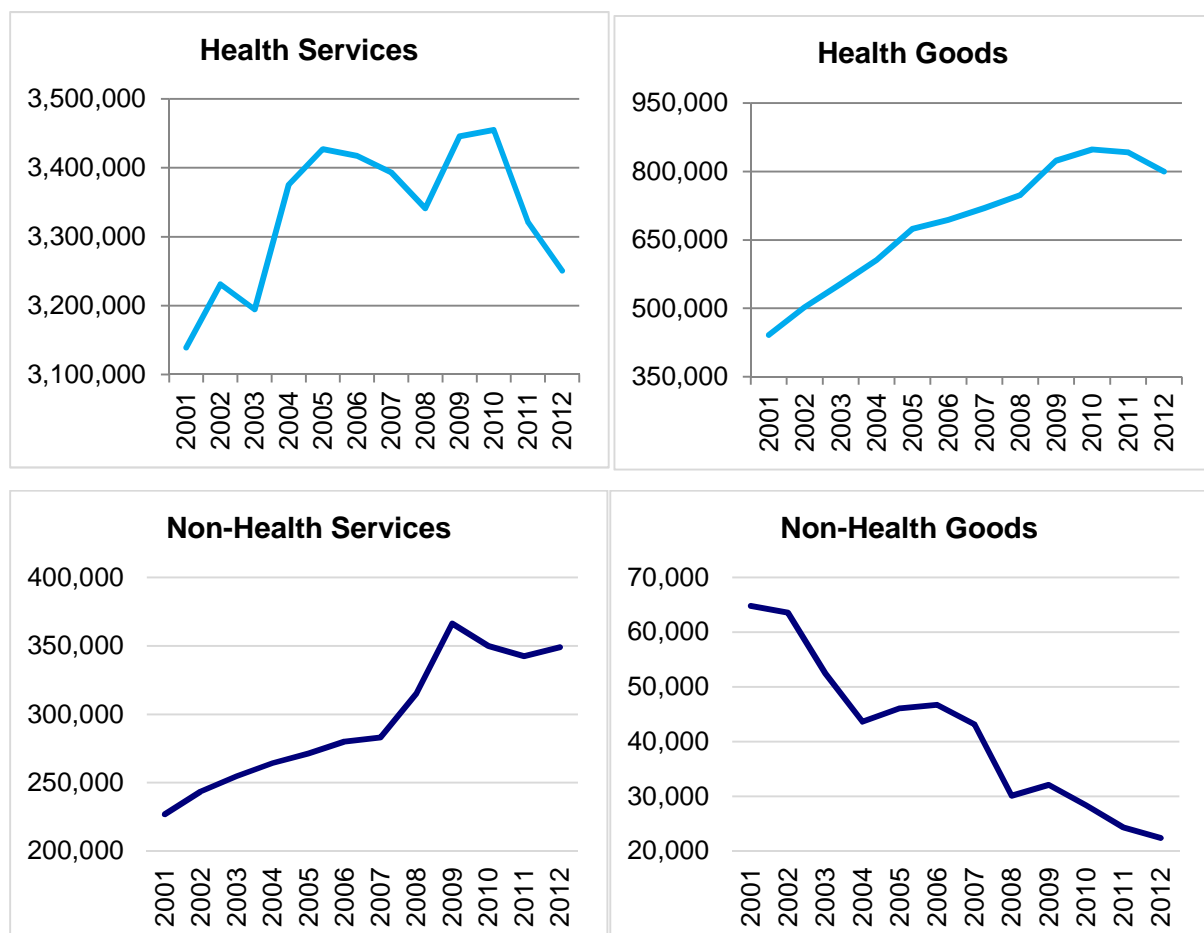
Region Sicily has officially established the first CPB in 2015, with Art. 55 of L.R. 5/2015, with the name of “Centrale unica di committenza per l’acquisizione di beni e servizi”. The CPB is in charge of purchasing goods and services for different bodies of the Regional Administration, for government agencies and companies of the regional health service. However, with L.R. n.12 / 2011 Sicily had already set up the “UREGA” (i.e., “Ufficio regionale per l’espletamento di gare per l’appalto di lavori pubblici”) which is the Regional Office for the completion of tenders for the procurement of public works, organized at the provincial level supervised by a central section, with the task of carrying out tenders for Regional entities, including those operating within the health sector. Hence, the CPB operates in collaboration with UREGA, without prejudice to the powers attributed to UREGA concerning public procurement. Moreover, with the National Anti-Corruption Authority’s act (i.e., “Autorità Nazionale Anticorruzione”) of 23.07.2015, it was established a Contracting Station (i.e., “SUA”) held by the Metropolitan City of Catania in favour of the regional "non-health" local entities.



## Toscana

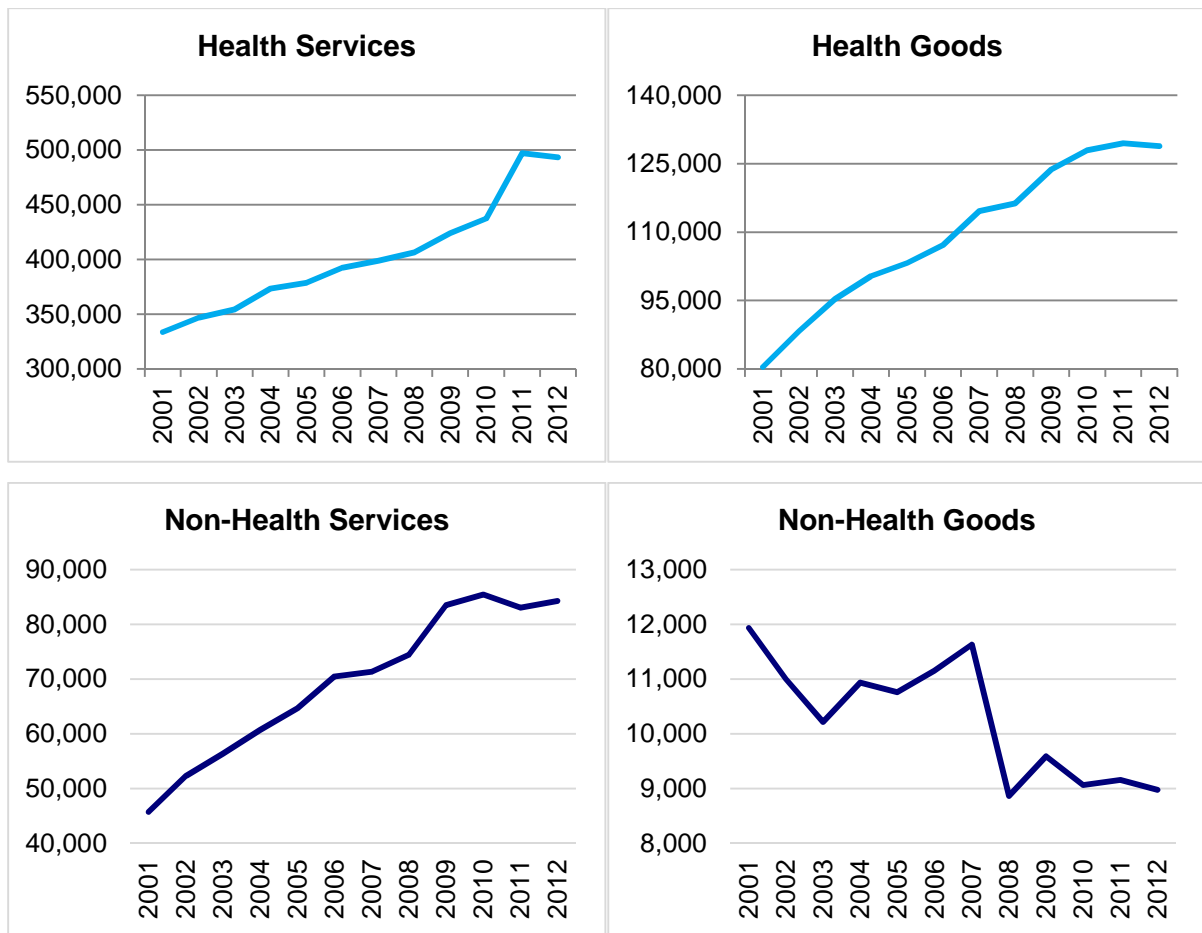
With Art. 10 L.R. 40/2005, Tuscany has established three CPBs (at the province level of aggregation): Central, North West and South East “ESTAV”. The three CPBs operate only in favour of health institutions working within the Region. In 2014 Tuscany established the ESTAR (the acronym of “Ente di Supporto Tecnico e Amministrativo Regionale”) with L.R. 26/2014: its aim is to optimize the regional expenditure on health goods and services while maintaining high quality standards in the provision of services. It replaced the three ESTAVs. Again in 2014, with DGR n.1232/2014 Tuscany instituted a new Contracting Station (i.e., “SUA”), which exclusively operates in the "non-health" sector.

Moreover, with the National Anti-Corruption Authority’s act (i.e., “Autorità Nazionale Anticorruzione”) of 23.07.2015, it was established a Contracting Station (i.e., “SUA”) held by the Metropolitan City of Florence in favour of the regional "non-health" local entities.



## Trento

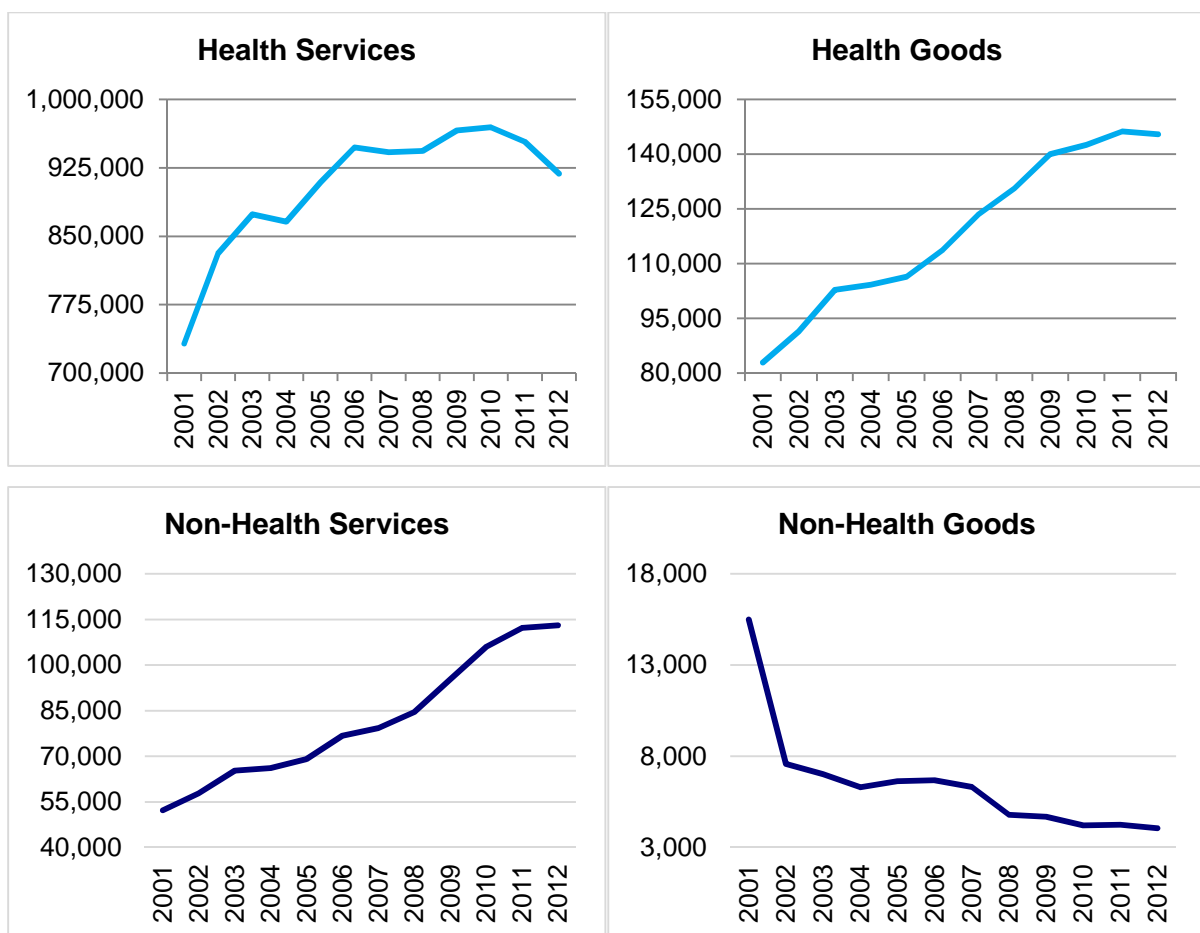
With L.P. 3/2006 the Trento Autonomous Province established the first CPB called AGENS (ie, "AGENZia per i Servizi"), then successively called APAC (ie, " Agenzia Provinciale per gli Appalti e Contratti ") in 2012, which operated as CPB for the acquisition of services and goods for local entities not operating within the health sector. In 2015 it has been attributed also to APAC the function of regional Contract Station (i.e., "SUA") and was also entrusted with the function of CPB for the "health" sector.



## Umbria

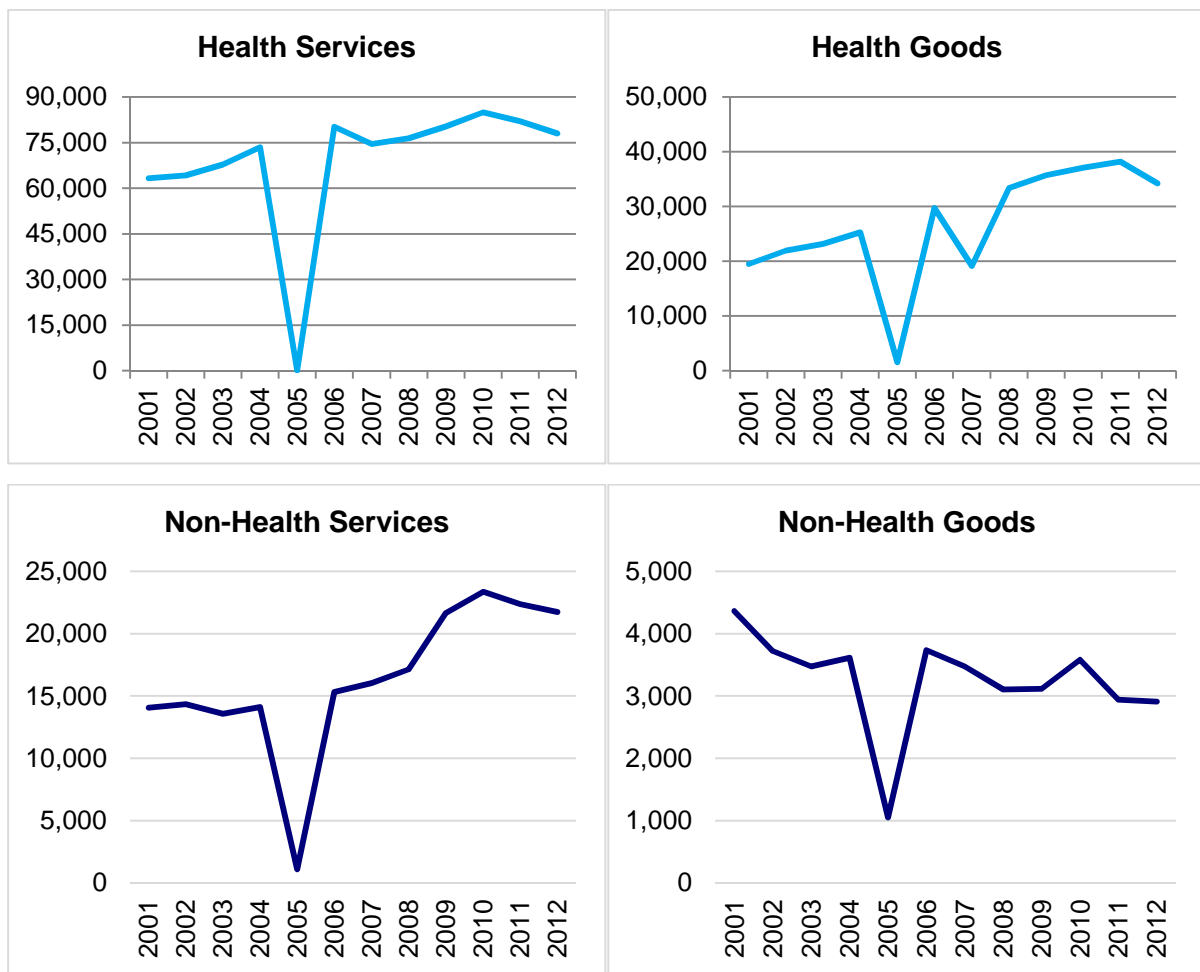
In the analysed period Region Umbria has instituted a CPB only in 2014, with L.R. 9/2014, under Art. 445 L. n.296/2006. The CPB is called “Centrale Regionale di Acquisto per la Sanità” and belongs to the regional consortium “Umbria Salute”, operating on behalf of the Region in order to ensure the optimization of the resources of the Regional Health Service through the rationalization of health expenditure for goods and services.

Moreover, with the National Anti-Corruption Authority’s act (i.e., “Autorità Nazionale Anticorruzione”) of 23.07.2015, it was established a Contracting Station (i.e., “SUA”) held by the Metropolitan City of Perugia in favour of the regional "non-health" local entities.



## Valle d'Aosta

In 1987 Region Valle d'Aosta founded the INVA S.p.A., a company owned by the Region and the other regional public bodies and ASLs: its main function was the development and management of the information and technology systems. With L.R. n. 8/2013, the INVA has also acquired the Central Purchasing Body function under L. n.296/2006. INVA S.p.A. provides goods and services for both ASL that for the other local authorities, both for health and “non-health” expenditure.

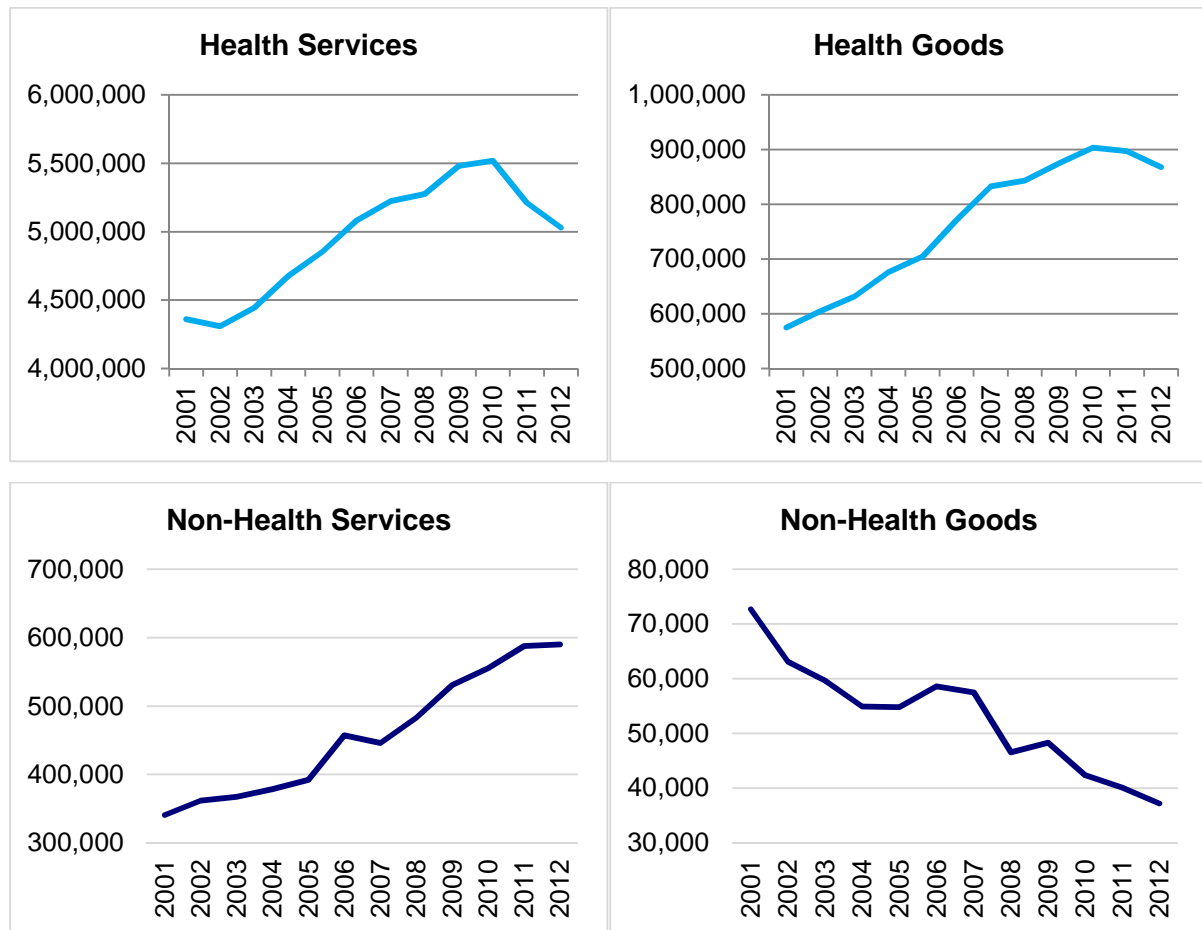


## Veneto

Region Veneto founded the first CPB, called CRAS in 2011. “Coordinamento Regionale Acquisti per la Sanità” was established with DGRV n. 2370 of 29/12/2011 and operates as a CPB exclusively for the healthcare regional entities.

By Decision of the Regional Council n. 2626 of 29/12/2014, CRAS has been substituted by CRAV (“Centrale Regionale Acquisti per la Regione del Veneto) and has been also appointed of the function of Contracting Station (i.e., "SUA"), still operating as CPB both for health entities and for the other local and regional authorities.

Moreover, with the National Anti-Corruption Authority’s act (i.e., “Autorità Nazionale Anticorruzione”) of 23.07.2015, it was established a Contracting Station (i.e., “SUA”) held by the Metropolitan City of Vicenza in favour of the regional "non-health" local entities.



## References

- Albano, G. L., & Sparro, M. (2010). Flexible Strategies for Centralized Public Procurement. *Review of Economics and Institutions*, 1(2).
- Angrist, J. D. and Pischke, J.S. (2009). *Mostly harmless econometrics: an empiricist's companion* (Vol. 1). Princeton: Princeton university press.
- Arnold, U. (1999). Organization of global sourcing: ways towards an optimal degree of centralization. *European Journal of Purchasing & Supply Management*, 5(3), 167-174.
- Baldi, S., & Vannoni, D. (2017). The impact of centralization on pharmaceutical procurement prices: the role of institutional quality and corruption. *Regional Studies*, 51(3), 426-438.
- Bandiera, O., Prat, A. & Valletti, T., 2009. Active and Passive Waste in Government Spending: Evidence from a Policy Experiment. *American Economic Review*, 99(4), pp.1278–1308.
- Bel, G., & Warner, M. E. (2016). *Factors explaining inter-municipal cooperation in service delivery: a meta-regression analysis*. *Journal of Economic Policy Reform*, 19(2), 91-115.
- Blesse, S., & Baskaran, T. (2016). Do municipal mergers reduce costs? Evidence from a German federal state. *Regional Science and Urban Economics*, 59, 54-74.
- Brusoni, M., & Marsilio, M. (2007). La gestione centralizzata degli approvvigionamenti nei sistemi sanitari regionali. *Annessi Pessina E., Cantù E., a cura di, Rapporto OASI*.
- Caldwell, N., Walker, H., Harland, C., Knight, L., Zheng, J., & Wakeley, T. (2005). Promoting competitive markets: The role of public procurement. *Journal of Purchasing and Supply Management*, 11(5), 242-251.
- Case, A.C., Rosen, H.S., & Hines, J.R. (1993). Budget spillovers and fiscal policy interdependence: Evidence from the states. *Journal of public economics*, 52(3): 285-307
- Chaloff, J. (2008). *Mismatches in the formal sector, expansion of the informal sector: Immigration of health professionals to Italy*. OECD.

Cleverley, W. O., & Nutt, P. C. (1984). The effectiveness of group-purchasing organizations. *Health Services Research, 19*(1), 65.

Corey, E. R. (1978). Should companies centralize procurement. *Harvard business review, 56*(6), 102-110.

Cousins, P., Lamming, R., Lawson, B., & Squire, B. (2008). *Strategic supply management: principles, theories and practice*. Pearson Education.

Di Cascio, F. (2014). La centralizzazione degli appalti, la spending review e l'autonomia organizzativa locale, in *Giornale di diritto amministrativo* n. 2.

Dimitri, N., Piga, G., & Spagnolo, G. (Eds.). (2006). *Handbook of procurement*. Cambridge University Press.

Faes, W., Matthyssens, P., & Vandembemt, K. (2000). The pursuit of global purchasing synergy. *Industrial Marketing Management, 29*(6), 539-553.

Ferraresi, M., Migali, G., & Rizzo, L. (2017). Does inter-municipal cooperation promote efficiency gains? Evidence from Italian municipal unions. Società Italiana di Economia Pubblica, WP n. 725

Ferré, F., de Belvis, A. G., Valerio, L., Longhi, S., Lazzari, A., Fattore, G., ... & Maresso, A. (2014). Health Systems in Transition. *Health, 16*(4).

Hendrick, T. E. (1996). *Purchasing consortiums: Horizontal alliances among firms buying common goods and services: What? who? why? how?.* Center for Advanced Purchasing Studies.

Imbens, G. (2007, October). Estimating average treatment effects in Stata. In *West Coast Stata Users' Group Meetings 2007 (No. 18)*. Stata Users Group.



Joyce, W. B. (2006). Accounting, purchasing and supply chain management. *Supply Chain Management: An International Journal*, 11(3), 202-207.

Karjalainen, K. (2011). Estimating the cost effects of purchasing centralization—Empirical evidence from framework agreements in the public sector. *Journal of Purchasing and Supply Management*, 17(2), 87-97.

Moisio, A., & Uusitalo, R. (2013). The impact of municipal mergers on local public expenditures in Finland. *Public Finance and Management*, 13(3), 148.

Muse & Associates, 2000. The Role of Group Purchasing Organizations in the US Health Care System. HIGPA, Washington.

Nollet, J., & Beaulieu, M. (2005). Should an organisation join a purchasing group?. *Supply Chain Management: An International Journal*, 10(1), 11-17.

Nollet, J., & Beaulieu, M. (2003). The development of group purchasing: an empirical study in the healthcare sector. *Journal of Purchasing and Supply Management*, 9(1), 3-10.

Oates, W. E. (1972). Fiscal federalism. *Books*.

OECD (2011). Centralised Purchasing Systems in the European Union, *SIGMA Papers*, No. 47, OECD Publishing, Paris.

Pedersen, J. (1996). Product standardization: playing to win. *Vivo*, 14(6), 15-20.

Reingewertz, Y. (2012). Do municipal amalgamations work? Evidence from municipalities in Israel. *Journal of Urban Economics*, 72(2), 240-251.

Tella, E., & Virolainen, V. M. (2005). Motives behind purchasing consortia. *International Journal of Production Economics*, 93, 161-168.

Trautmann, G., Bals, L., & Hartmann, E. (2009). Global sourcing in integrated network structures: The case of hybrid purchasing organizations. *Journal of International Management*, 15(2), 194-208.