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Contents

List of Tables

List of Figures

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Introduction

This thesis intends to provide a contribution to the Public Economics discipline, with emphasis on the empirical aspects of Public Policy Choice. It consists of three distinct studies, presented in the following chapters, which represent examples of analyses of national or local policy reforms. Therefore, each of the contributions aims at analyzing the impact of a quite specific reform - or a broader national policy - adopted by local or national governments with distinct goals from time to time, leveraging on different counterfactual methods for policy impact evaluation.

In the first chapter, we propose to test the effects of health-care sector decentralization on infant mortality, a proxy for the quality of citizens' health, adopting as unit of analysis 25 EU countries between 1995 and 2013.

The economic literature mainly identifies health decentralization with its fiscal definition, that is the share of local over the total public expenditure on health (see, for instance, Jiménez-Rubio (2011b; 2011a), Uchimura and Jutting (2009), Jiménez and Smith (2005) and Robalino et al. (2001)). Nevertheless, economic researchers are still discussing around the principle that fiscal decentralization might not be an accurate measure of the overall concept of decentralization (see, for instance, Martinez-Vazquez and McNab (2003) and Fisman and Gatti, 2002), therefore leading to mismeasurement biases in the estimation and interpretation of its impact on different economic and social outcomes.

Following this approach, in this chapter we first replicate an OLS model widely-adopted in literature to estimate the effect of the sole fiscal decentralization on infant mortality. Our results show a not significant impact.

In the second part of the chapter, in order to correct the endogeneity of the OLS basic model due to the mismeasurement of health care system decentralization when proxied by fiscal decentralization, we run a set of two-stage least square models. As instruments for fiscal decentralization, we construct and adopt a set of categorical variables, describing the level of accountability in the health sector attributed to local entities, both through constitutional reforms and the appointment of hospital managers at the local level. We then

check their goodness as instruments for fiscal decentralization, both from a theoretical and a statistical perspective.

Results from the two-stage least square models confirm that the positive effects of fiscal decentralization on the reduction of infant mortality are significant only if they occur in contexts in which local authorities have been made accountable by the national government from a political and managerial perspective, suggesting that the sole fiscal decentralization is not *per se* an assurance of real improvement of the quality of the citizens' health.

Chapter 2 explores the impact of local authorities' purchase centralization on their total expenditure. We base the analysis on the methodological framework and the counterfactual empirical approach so far adopted to study the impacts of aggregation and amalgamation, also providing a measure of this impact not yet estimated in literature. More specifically, we study the effect of the introduction of Central Purchasing Bodies ("Centrali Uniche di Acquisto") on all the Italian local hospitals' expenditure, over the period 2001-2012. We use a difference-in-difference model to identify the causal relationship between the introduction of regional CPBs operating in the health-care system and local hospitals' expenditure.

In the first part of the chapter, we identify and represent the year of the introduction of a CPB in each regional health care system, promptly referring to local legislation. Consequently, we produce a treatment variable which identifies those local hospitals affected by the introduction of a CPB operating in the health-care sector over the analyzed period. We then build the dependent variable accounting for health expenditure adopting official financial data from the local hospitals' balance sheets. We also consider its composition in four sub-categories (i.e., expenditure on health goods, health services, non-health goods and non-health services).

The second part of the chapter is dedicated to the empirical analysis. We first check the common trend assumption to verify whether a difference in difference model may be properly adopted. Then, we run a difference in difference model to study the impact of the introduction of regional CPBs by comparing the affected local hospitals' expenditure with a control group (the unaffected local hospitals), before and after the introduction of the

treatment. We then replicate the analysis, adopting as dependent variables the four sub-categories of expenditure. Results suggest that overall costs related to the purchase of goods and services by local hospitals were reduced by the introduction of CPBs. In particular, the decrease is driven by a reduction on health services expenditure. Moreover, we check that the quality of some health outcomes (e.g., the number of first aid centers) were not reduced due to the introduction of CPBs. Lastly, these results are confirmed by a robustness test, checking the resiliency of our results controlling for the aggregation of local hospitals.

In chapter 3 we discuss the effects of a relevant reform in budget definition and authorization within the U.S. system - the 1974 Congressional Budget and Impoundment Control Act (or, 1974 Budget Act) - on the restraint of public spending and debt. Also in this case, we adopt a counterfactual analysis tool called synthetic control (Abadie and Gardeazabal, 2003) which has significantly been spreading during the last decade.

The first part of the chapter is dedicated to the description of the Act and its contextualization in the historical and political framework of the period. The 1974 Budget Act marked a turning point in the U.S. fiscal history. With the Act, Congress decisively asserted its budgetary power, becoming more independent from the President in developing the budget and setting overall levels of federal expenditures. Hence, we intend to assess whether the introduction of the Act prevented still higher increases in public spending and debt.

In the second part of the chapter, in order to test its effects, we adopt a synthetic control model to understand what would have happened to public spending and debt without the 1974 Budget Act. Consequently, we first provide a description of the synthetic control tool as a useful counterfactual method to test the introduction of this policy. Since synthetic control analysis is based on the principle of building a reference comparison unit as an "artificial counterfactual" which is then used as a reference for comparison to the real treated unit, a discrepancy in the outcome variable (spending or debt) after the 1974 treatment is interpreted as the true effect of the intervention itself. As a matter of fact, our synthetic control analysis suggests that public debt-to-GDP and public expenditure-to-GDP

both increased in the eight years later its introduction, but less than what would have happened without the Act.

This result survives a set of typical robustness tests for synthetic control: the geographical and the chronological placebos. The geographical placebo tests whether our observed impact of the 1974 Budget Act in the U.S. could have also been obtained by applying the model to the other countries where the reform did not happen, thus including the U.S. in the donor pool. In the chronological placebo, we test whether the treatment in a different year would have generated an identical result to the U.S. outcomes. These analyses conducted both for public debt and spending do not show similar significant impacts when applied to different countries (geographical placebo) or years of treatment (chronological placebo), thus confirming our main results.

Chapter 1

Re-assessing health care decentralization and its impact on infant mortality: evidence from the EU countries

1.1 Introduction

In recent years several countries were interested by decentralization reforms (Oates, 1999). Clear examples of this trend can be found among the most developed countries (Martinez-Vazquez et al., 2016), where a long-run decentralization process has been operating since the 1950s (Hooghe et al., 2010). At the same time, this phenomenon is emerging among developing countries (Garman et al., 2001), even though often with different motivations, for instance using decentralization as a political alternative to central planning to obtain an appropriate and sustainable economic growth (Akin et al, 2001). Analogously, if we analyze in more detail the evolution of the delegation of powers specifically in health care systems, a strong tendency to decentralization has been emerging in several countries, especially the most developed ones. Among the others, Italy and Spain have been sharing their central fiscal, administrative and political authorities in the field of health with regions and municipalities at the local level (Saltman et al, 2006).

The key idea behind decentralization is inherently quite disruptive: a decentralized health care system could more luckily be better organized, more efficiently structured and more easily steered than a centralized health care system (Saltman et al., 2007). This conclusion may derive from two key perspectives. On the one hand, it is based on a "democratic approach" to decision-making: all the decisions should be taken by the entire population, through their elected representatives or by small groups in local communities, who are directly accountable for their strategies and actions (Jommi and Fattore, 2003). On the other hand, the provision of subsidies to local governments may encourage efficient levels of health services, through an enhanced "cost-conscious" approach (Bergman, 1998). Indeed, the main argument for decentralizing decision-making in the health care sector is that local decision makers would have better knowledge of their citizens' health needs and requests (Jervis and Plowden, 2003). This would make the provision of health care products more appropriate than the one directly providable by national policy makers (Jimenez and Smith, 2005).

A large part of the literature on health care decentralization describes the advantages of a decentralized provision of health service (e.g. Jiménez-Rubio, 2011b; Uchimura and Jutting, 2009; Jiménez and Smith, 2005; Robalino et al., 2001; Habibi et al., 2003; Yee, 2001; Mahal et al., 2000). However, the concept of health care decentralization is mainly defined uniquely in its "fiscal" or "finance" version (e.g., public expenditure decentralization), not fully taking into consideration some other subtler political, institutional and administrative features of the system that, while being not directly measurable, may play a role in the provision of services to citizens, indirectly influencing their health quality.

In this work we propose to test the effects of the decentralization of the healthcare system on infant mortality, a proxy for the quality of citizens' health[1], adopting as unit of analysis 25 EU countries for the period between 1995 and 2013, with a twofold goal. On the one hand, we want to contribute to the debate on the impact evaluation of decentralization policies on public health outcomes. In this respect, we replicate one of the most popular models in economic literature to analyze the relationship between fiscal decentralization and infant mortality rate. On the other hand, we intend to investigate in more details whether fiscal decentralization can be considered a comprehensive proxy for the broader concept of decentralization of the healthcare system when we look at its impact on health outcomes. With this in mind, we will evaluate the hypothesis that the original model may suffer from an endogeneity bias due to the mismeasurement of health-care decentralization when proxied by the sole fiscal decentralization (Fisman and Gatti, 2002). Therefore, after constructing a robust set of instrumental variables, we will estimate the model in two stages in order to correct endogeneity.

Our work is structured as follows: section 2 is a review of the literature concerning the effects of health care system's decentralization on the quality of health services provided to the population; in section 3 we replicate the standard OLS model adopted to test and measure the effects of the fiscal decentralization on infant mortality rate; section 4 is dedicated to the discussion of a set 2SLS models adopted to correct for endogeneity; lastly, we provide our conclusive remarks in section 5.

[1] This is a standard proxy adopted, for instance, by Jiménez-Rubio and García-Gómez (2017), Jiménez-Rubio (2011b), Uchimura and Jutting (2009), Cantarero and Pascual (2008), Jiménez and Smith (2005), Habibi et al. (2013), and Robalino et al. (2001).

1.2 Literature Review

Public sector decentralization has been largely discussed in the economic literature, particularly since early 2000s. The most relevant goal of such works is the study of the possible positive effects of decentralizing reforms on the quality of the services provided to the population[2]. These effects could be evaluated for the most relevant sectors of public interest. Among the others, the most cited sectors are education (Martinez-Vazquez and McNab, 2003; Faguet and Sanchez, 2008) and school economic resources (Ahlin and Mörk, 2008), the provision of general public services (Aslam and Yilmaz, 2011), and the general concept of "subjective well-being", which includes political, economic, institutional and cultural sectors (Bjørnskov et al., 2008).

However, together with education, the health care is the most analyzed sector so far, for its social relevance and its weight on the general welfare public expenditure, especially among developed countries (Hansjörg and Junghun, 2016). In this field, several works are based on empirical analysis, estimating the relationship between the level of decentralization of the health care system and the population's quality of health. More specifically, the concept of decentralization is normally used in its "fiscal" version, that is as the ratio of the local over the total public expenditure. The local public expenditure is generally defined at a province level (Bossert and Mitchel, 2011; Yee, 2001), at a regional or state (in case of a federation) level (Uchimura and Jutting, 2009; Jiménez and Smith, 2005; Habibi et al., 2003) or with different aggregations at supranational level (Jiménez-Rubio, 2011b; Robalino et al., 2001; Ebel and Yilmaz, 2001). Conversely, in some other cases decentralization is defined according to different criteria, still usually with a broader "economic" definition, as local autonomy for tax definition and enforcement (Prieto and Lago-Peñas, 2012; Jiménez-Rubio, 2011b), presence of a regulatory authority for local taxation and public expenditure (Khaleghian, 2004), or local political autonomy measured as local elections' frequency (Mahal et al., 2000).

Almost regardless of the type of aggregation and adopted geographic granularity, it clearly prevails the result suggesting that broader decentralization of the national health system leads to some forms of benefit to citizens' health. Indeed, greater decentralization generates a reduction in infant mortality (Jiménez-Rubio, 2011b, Uchimura and Jutting, 2009, Jiménez and Smith, 2005, Robalino et al., 2001, Habibi et al., 2003, Yee, 2001 and

[2] Another interconnected research stream deals with the study of the strategic determination of local spending in decentralized contexts (see, among the others, Bordignon and Turati (2009)).

Mahal et al., 2000). Other researchers suggest that the countries whose health systems are more decentralized are those in which children under 12 are more immune to DPT and measles, as stated by Khaleghian (2004) for developing countries and by Ebel and Yilmaz (2001) for middle-income countries. Moreover, according to Reayat et al. (2014) and Yee (2001) a more decentralized health system is related to an increase in the availability of hospital beds.

This result seems to hold validity within different geographic and economic contexts (Robalino et al., 2001), both for subsets of countries as developed countries (Cavaliere and Ferrante (2016), Prieto and Lago-Peñas (2012), Jiménez-Rubio (2011a), Jiménez and Smith (2005), respectively, for Spain, Canada and OECD countries), emerging markets (Uchimura and Jutting (2009), Yee (2001) for China; Mahal et al. (2000) for India), developing countries (Reayat et al. (2014) for Pakistan; Habibi et al. (2003) for Argentina; Ebel and Yilmaz (2001) and Khaleghian (2004) for different subsets of developing countries). As already said, the results also appear robust to the use of different proxies of the quality of health and of the health system, although the proxy of infant and child mortality is the most adopted.

Therefore, overall the economic literature has mainly been focused on the study of an econometric or empirical relationship of the effects on the populations' health of fiscal decentralization of the health system. The results are almost uniformly in favor of the existence of a positive relationship between the two variables, that is a larger fiscal decentralization appears to match a relative improvement of the population's health.

While institutional or political measures of decentralization have been adopted to assess, among others, the impact on life-satisfaction (Bjørnskov et al., 2008), income inequality (Tselios et al., 2012; Rodriguez-Pose and Ezcurra, 2009), corruption (Fan et al., 2009) and social capital (De Mello, 2004), there is a limited number of empirical works analyzing the effects of "non-fiscal" forms of decentralization on the quality of health care systems (Mitchell and Bossert, 2010; Kristiansen and Santoso, 2006). With this work, we aim to provide our contribution to this stream of analysis.

1.3 The empirical analysis: pooled OLS estimation

We implement a revised version of the models adopted by Jiménez-Rubio (2011b; 2011a), Uchimura and Jutting (2009), Jiménez and Smith (2005) and Robalino et al. (2001). These models observe the effect of fiscal decentralization on infant mortality rate as a proxy of health status, controlling for each country of the panel the national economic level and for some other structural indicators involving demography and health-specific risk factors.

We use annual country-level panel data for the period 1995-2013. The original pool is composed of 25 units: Austria, Belgium, Bulgaria, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Luxembourg, Malta, the Netherlands, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden and the United Kingdom. The other EU countries are not included in the pool mainly due to the lack of data for the whole period.

We adopt as dependent variable the infant mortality rate in country *i* at year *t*. Indeed, infant mortality is generally considered as the most relevant proxy of health quality (Cantarero and Pascual, 2008) and is widely adopted in empirical works. Specifically, representing children and pregnant women's health, it implicitly describes the overall health-care development level of a country (Jiménez-Rubio and García-Gómez, 2017), associated to the more general state of economic development and social well-being (Reidpath and Allotey, 2003). Moreover, its common adoption in empirical models is mainly due to its sensitiveness to health-care system reforms such as decentralization (Jiménez-Rubio, 2011a) and to the large availability of data for different countries in several years (Bambra, 2006).

As already mentioned, in most cases in the economic literature the measure of the centralization of health systems was conditioned by its leveling toward the fiscal definition. It follows that generally the adopted variable to provide a description of health decentralization is the "vertical balance" (as, for instance, in Jimenez-Rubio (2011.a), Uchimura and Jutting (2009), Cantarero and Pascual (2008), Robalino et al. (2001)), that is the ratio between the local government spending in health (attributed to regions, provinces and municipalities) and the total public expenditure on health (the local plus the central one). In some fewer cases, other alternative fiscal decentralization measures are adopted, that is, for instance, the local share of tax revenues (Jimenez-Rubio, 2011.b), and the ratio of local spending to central spending (Zhang and Zou, 1998). Concerning the main

regressor accounting for fiscal decentralization, in this work we adopt the standard ratio between local and total public expenditure on health. This data is consistently available from the COFOG-Eurostat dataset for 25 EU countries from 1995 to 2013[3].

The variables we use for the construction of the control are the Gross Domestic Product, the birth rate, total life expectancy and alcohol consumption by adult in litres. Alcohol is a known risk factor for health, being expected to show a negative impact on health quality. At the same time, we expect the level of income to show a positive impact on infant mortality, considered that wealthier societies should have easier access to better diets and health care. Life expectancy is included as a proxy of population progressive aging, in need of increasing health care. Hence, we control for it to check whether infant mortality is negatively affected by decentralization, also in the case of possible significant shifts of economics resource allocations towards the eldest share of population. Finally, socio-demographic features of the countries are described by birth rate, which is used in our model as a proxy of women fertility.

Table 1.1: Descriptive statistics

	Obs	Mean	Std. Dev.	Min	Max
Infant Mortality Rate	475	5.6	3.4	1.6	22.3
Fiscal decentralization	468	0.29	0.36	0	0.99
GDP pc	475	21553	14595	964	86585
Birth Rate	475	10.7	1.6	7.6	16.7
Life Expectancy	465	77.6	3.2	67.7	83.2
Alcohol consumed	476	10.7	2.0	5.6	14.7

Table 1.1 reports descriptive statistics of our dataset. The infant mortality rate sees variations across countries and over years. Specifically, the lowest level of infant mortality rate is for Cyprus in 2013 while the highest is for Romania in 1996. We observe large variability also in fiscal decentralization. Indeed, observations in the dataset cover almost the whole spectrum, from 0 - occurring, for instance, for Malta and Cyprus for the whole period - to about 99% for Denmark in 2013. Moreover, also control variables show differences among countries and years.

Coming to the econometric analysis, our FE model is estimated as follows:

$$IMR_{it} = \alpha_0 + \alpha_1 FIN_{it} + \alpha_2 X_{it} + \phi_i + \phi_t + \epsilon_{it}, \qquad (1)$$

[3] Figures for Bulgaria from 1995 and 1997 and for Slovenia from 1995 to 1998 are not available.

where *IMR* is the infant mortality rate and *FIN* is fiscal decentralization, that is the share of local expenditure on the total public expenditure on health. Moreover, *X* is the set of control variables, which includes "Gross Domestic Product" (per capita), the "Birth Rate" "Total Life Expectancy" at birth, the recorded amount of "Alcohol Consumed per Adult" in one year in litres. Being performed on a panel dataset, the estimation includes country (φ_i) and annual (φ_t) fixed effects.

Tab. 1.2 shows the first results of the analysis.

Table 1.2: FE model estimation

Infant Mortality	**(1)**
Fiscal Decentralization	-0.59 (1.25)
Gross Domestic Product pc	-0.04 (0.08)
Birth Rate	-0.07 (0.13)
Total Life Expectancy	-1.20 ** (0.44)
Alcohol Consumed per Adult	-0.16 (0.12)
Yearly Fixed Effects	+
N	456
Groups	25
R^2	0.67

*Note: all the estimations are performed with robust standard errors (in parenthesis). * Significant at the 10% ** Significant at the 5% *** Significant at the 1%. Missing observations for Fiscal decentralization (7), Life expectancy (10) and Alcohol consumed (2) lead to a total sample size of 456.*

According to this first estimation, we do not find a significant effect of fiscal decentralization on the level of infant mortality. Indeed, its effect on infant mortality rate is negative (-0.59), but not statistically significant. Hence, according to this first econometric estimate, it seems that an increasing level of health system's fiscal decentralization is not associated to a lower level of infant mortality rate.

However, in this model we have tested the effects of decentralization on health outcomes, uniquely adopting its fiscal definition. Conversely, we have not taken into account that

there may exist some institutional factors that, influencing fiscal decentralization, may have an indirect impact on health outcomes. For instance, the level of local expenditure (and its share on total spending) may be determined in two alternative ways: as the result of a mere execution of spending decisions taken at the central level and then cascaded to local cost centers, or conversely as a conscious strategic choice of the local entity itself, as an accountable subject fully responsible for its own activities and results. In this first case an increase in the share of local expenditure (and so fiscal decentralization) can be paradoxically interpreted as an increase of the overall level of decentralization of the health care system, while actually being the result of a central decision. Analogously, looking at the same phenomenon from the opposite perspective, even in the case in which the central authority decides to make local entities accountable for the health care services' provisioning, if local entities are not ultimately entitled to decide on the expenditure, they would end up not having any concrete tool to conduct their own strategy, which will be *de facto* guided by the central authority. In other terms, researchers and policy-makers could sometimes fall into a misinterpretation of the real effects of a decentralization policy, due to mismeasurement of the comprehensive concept of health care system decentralization, which may not be always aligned with that the definition of fiscal decentralization.

Therefore, for these reasons, we may argue that we are in presence of a mismeasurement problem (Fisman and Gatti, 2002), which can result in a bias of the OLS estimation[4].

Accordingly, our empirical strategy is to adopt a set of two-stage least squares models to address the endogeneity bias due to the mismeasurement of health care sector decentralization, when proxied by the sole fiscal decentralization (Angrist and Imbens, 1995), using some proxies for delegation of institutional and administrative powers and accountability as instrumental variables.

[4] In addition, we cannot exclude the possibility that our estimation might suffer of endogeneity due to the omission of relevant variables accounting for political-institutional factors (Martinez-Vazquez and McNab, 2003; De Mello and Barenstein, 2001).

1.4 The empirical analysis: two-stage least square estimation

1.4.1 Instrumental variables

Since fiscal decentralization, our explanatory variable, may be correlated with the error term due to the mismeasurement of health care system decentralization in the estimation, we need to identify one or more instrumental variable to set our two-stage least square model with the aim of addressing endogeneity (Angrist and Krueger, 2001). In order to be correctly used, our instrumental variables should be positively correlated with the explanatory variable, and only through the latter should influence the outcome variable.

As already mentioned, to correct this potential endogeneity bias, we want to instrument fiscal decentralization with a set of categorical variables, resulting from our own elaborations. In particular, we identified the level of delegation of powers to local entities in the health sector and the management and property of hospitals allocated at the local level as possible instruments. For the sake of brevity, later in this work we will call these variables respectively "Accountability and Legislation" and "Property and Management" of the hospitals. The collection of a strictly quantitative proxy for both these variables is not straightforward. Therefore, we moved to the adoption of a qualitative approach, comparing the EU countries' performances by means of a common acknowledged framework, specifically the "Health Systems in Transition" report, which is provided for all our panel countries by the "European Observatory on Health Systems and Policies", a partner of the World Health Organization[5].

The "Accountability and Legislation" instrumental variable was constructed attributing a higher score to those countries for whom we identified law and reforms introduced with the goal of transferring powers and accountability towards local authorities. This approach allows to provide a "Accountability and Legislation" delegation score for each country and year within the panel. Table 1.3 shows the adopted metrics for this instrument.

[5] See Appendix 1.1 for a detailed discussion by single country.

Table 1.3: Accountability and Legislation

Score	Description
3	Full delegation of powers to local authorities
2.5	The central authority has only a supervision power on local authorities
2	Delegation of powers prevails over concentration
1.5	Mixed system
1	Concentration of powers prevails over delegation
0.5	Only some residual task are delegated to local authorities
0	Full concentration of powers on central authority

From a theoretical standpoint, the categorical variable "Accountability and Legislation" can be expected to perform well as instrument for fiscal decentralization in an estimation involving the infant mortality rate as dependent variable. To confirm this hypothesis, we should show that these variables are a condition for effective fiscal decentralization, without having a direct impact on infant mortality.

Concerning the first part of the assumption, the underlying intuition is that in the presence of a high level of institutional delegation, the accountability of the local political class is larger, due to the proximity to the public good demand from the population, encouraging the increase of local expenditure also to ensure larger political consensus (Brinkerhoff, 2004). We should further notice that several scholars claimed that, in order to make decentralization working, it is required the existence of local governments with institutional constraints towards the central government to be respected, for which they are accountable. For instance, according to Enikolopov and Zhuravskaya (2007) political institutions play a relevant role in determining fiscal decentralization to the extent that larger delegation of powers to local authorities (also expressed in the form of a democratic election) may provide them with political incentives to guarantee fiscal decentralization. This concept is supported by some works confirming that local authorities are more directly accountable toward citizens than central governments (see, for instance, Seabright (1996) and Persson and Tabellini (2000)).

With regards to the second part of the assumption, from a theoretical point of view the delegation of authority to local institutions in healthcare does not include among its main goals to have a direct impact on the reduction of infant mortality, especially for developed countries for which this indicator generally shows low values. In particular, delegation of powers seems rather to be primarily the result of political agreements between central and local authorities to divide powers and responsibilities. Indeed, in some countries it is essentially overwhelmed by the general political-institutional set-up. Specifically, federal countries and confederations of countries are physiologically more inclined to organize according to a logic of larger institutional delegation, regardless of specific policies oriented to increase the quality of public goods or services' provision. For instance, this is the case of Austria and Germany, whose organization in *Länder* pervades the entire public sphere (see, Hofmarcher (2013) for Austria, and Busse and Blume (2014) for Germany). Analogously, some countries are more inclined towards a system that excludes or minimizes institutional delegation due to of historical and ideological reasons. This is the case of countries formerly belonging to the Soviet Union bloc, especially during the 1990s. Moreover, many of the reforms leading a change in the level of institutional delegation are intended to revise a wider range of public sectors and not only the health one (as in the Italian case (Ferrè et al., 2014)) or are explicitly introduced by the central authorities to deal with increasing autonomist trends (as in the Spanish case (Antón et al., 2014)). Even geographical factors may impact on the delegation of power to local institutions, being at the same time exogenous with respect to the quality of health. Indeed, small countries as Cyprus, Malta or Luxembourg the concept of delegation of powers to local entities is not even applicable due to the size of the country (see, Theodorou et al. (2012) for Cyprus, Azzopardi Muscat et al. (2017) for Malta, and Belcher et al., (2015) for Luxembourg).

Let us now discuss the second instrument. The "Property and management" of the hospital instrument was built as a categorical variable, providing full score when both the management and the property of the hospitals are attributed to local authorities and a null score when they are both concentrated to the central authority (therefore allowing for the possibility of mixed results), as shown in Table 1.4.

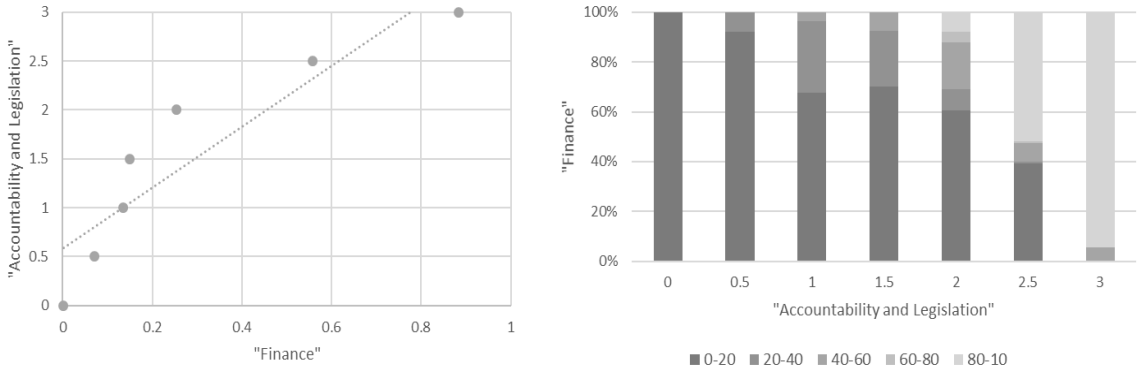
Table 1.4: Property and management of the health structures

Score	Description
2	Both management and property of the hospitals belong to local authorities
1	One among management and property of the hospitals belongs to local authorities
0	Both management and property of the hospitals belong to central authorities

We now analyze the relationship between the "Property and Management of the hospitals" instrument and fiscal decentralization. The key intuition behind the choice of this instrument is that the more hospitals are managed locally, the more adequate is the ability to understand population's "bottom-up" demand and, consequently, to generate a larger budget request to the competent central authority, for expenditure to be realized locally. Consistently, some studies in public administration suggest that the ability of local authorities' management and administration to respond to population's demand is the underlying condition for fiscal decentralization to positively affect the quality of public goods and services (see, for instance, Rondinelli et al. (1989) and Grindle (2007)). Moreover, according to Mitchell and Bossert (2010) larger population involvement becomes an incentive for local authorities to require an adequate assignment of financial resources from central authorities. At the same time, this variable does not seem to be able to directly affect infant mortality or other health outcomes. Indeed, according to Villela (2004) managerial mandates locally assigned by central authorities without adequate underlying funding may inhibit the overall decentralization effectiveness.

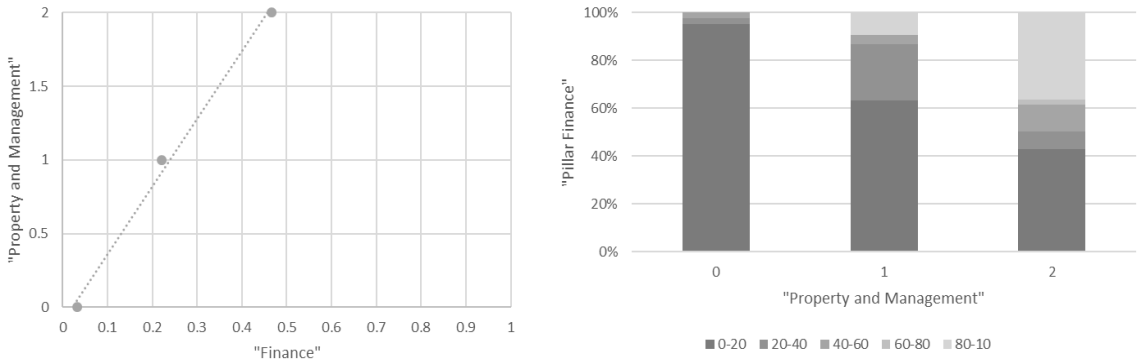
Along with these theoretical motivations, both these variables perform well as instruments from a statistical perspective. Indeed, countries scoring a high level of "Accountability and Legislation" are also those with the higher average portion of local public expenditure in health. Specifically, as shown in Figure 1.1 among countries with the maximum score in "Accountability and Legislation" (i.e., 3/3), the 88% shows a portion of fiscal decentralization larger than 80%. Conversely, less than 1% of countries with the minimum score in the same instrument (i.e., 0/3) shows the same large level of fiscal decentralization. Moreover, Fig. 1.1 also shows the positive relationship between these two decentralization definitions.

Figure 1.1: Validity of "Accountability & Legislation" as instrument for "Finance"



The statistical description of our dataset also confirms the validity of "Property and Management" instrument, being positively related to fiscal decentralization. Indeed, as shown in Figure 1.2 the 46% of countries with the maximum score in according to this variable (i.e., 2/2) also shows a larger than 80% level of fiscal decentralization. Conversely, the share of strongly fiscal decentralized countries with the minimum score in this variable (i.e., 0/2) is quite low (3%). Figure 1.2 graphically shows also the positive relationship between these two decentralization definitions.

Figure 1.2: Validity of "Property and Management" as instrument for "Finance"



In order to provide a further check on the validity of both instruments, we run two sets of regressions to assess the relationship between both instruments with respect to infant mortality rate. Therefore, we first replicate the estimation of model (1) substituting fiscal decentralization with, respectively, "Accountability and Legislation" and "Property and Management" variables. Table 1.5 shows these results.

Table 1.5: **Test on the validity of the instruments - correlation with the dependent variable**

Infant mortality rate	(1)	(2)
Accountability and Legislation	-0.61 (0.42)	-
Property and Management	-	-0.51 (0.37)
Gross Domestic Product pc	-0.06 (0.06)	-0.04 (0.07)
Birth Rate	-0.08 (0.14)	-0.05 (0.16)
Total Life Expectancy	-1.19 *** (0.40)	-1.05*** (0.32)
Alcohol Consumed per Adult	-0.22 ** (0.11)	-1.05 * (0.32)
Yearly Fixed Effects	+	+
N	463	463
Groups	25	25
R^2	0.68	0.68

*Note: all the estimations are performed with robust standard errors (in parenthesis). * Significant at the 10% ** Significant at the 5% *** Significant at the 1%*

As shown in columns 1 and 2, we find that none of the two instruments has a significant relationship with infant mortality rate, confirming first requisite for being a good instrument.

1.4.2 Model and results

Provided that the selected variables are potentially good instruments for "Finance" decentralization both for theoretical and statistical reasons, we now perform the 2-Stage Least Square regression. In particular, we first use the "Accountability and Legislation" variable as an instrument for fiscal decentralization, as expressed in the following model:

$$IMR_{it} = \beta_0 + \beta_1 FIN^*_{it} + \beta_2 X_{it} + \phi_i + \phi_t + u_{it}, \quad (2.A)$$

$$FIN^*_{it} = \gamma_0 + \gamma_1 LAW_{it} + \gamma_2 X_{it} + \phi_i + \phi_t + \xi_{it}, \quad (2.B)$$

where *IMR* is the infant mortality rate and *FIN** is the instrumented share of local expenditure on the total public expenditure on health, and *LAW* is our "Accountability and Legislation" variable, used in equation 2.B as instrument for *FIN*. Moreover, *X* is the set of control variables, which includes the "Gross Domestic Product" (per capita), the "Birth Rate" "Total Life Expectancy" at birth, the recorded amount of "Alcohol Consumed per Adult" in one year in litres. Being performed on a panel dataset, the estimation includes country (φ_i) and annual (φ_t) fixed effects. Finally, u_{it} and ξ_{it} are the error terms.

The same model will be then estimated adopting "Management and Property" of the health structures variable as instrument for fiscal decentralization, according the following specification:

$$IMR_{it} = \beta_0 + \beta_1 FIN^*_{it} + \beta_2 X_{it} + \phi_i + \phi_t + u_{it}, \quad (3.A)$$

$$FIN^*_{it} = \gamma_0 + \gamma_1 MAN_{it} + \gamma_2 X_{it} + \phi_i + \phi_t + \xi_{it}, \quad (3.B)$$

To conclude, we replicate the analysis for the third time including in the second stage both the identified instruments to test for over-identification. The model is specified as follows:

$$IMR_{it} = \beta_0 + \beta_1 FIN^*_{it} + \beta_2 X_{it} + \phi_i + \phi_t + u_{it}, \quad (4.A)$$

$$FIN^*_{it} = \gamma_0 + \gamma_1 LAW_{it} + \gamma_2 MAN_{it} + \gamma_3 X_{it} + \phi_i + \phi_t + \xi_{it}, \quad (4.B)$$

We now estimate the first-stage regressions (models 3.A, 4.A and 5.A). Table 1.6 shows these results.

Table 1.6: First-stage estimation

Fiscal decentralization (I stage)	(1)	(2)	(3)
Accountability and Legislation	0.19 *** (0.03)	-	0.16 *** (0.02)
Property and Management	-	0.11 *** (0.02)	0.04 *** (0.01)
Gross Domestic Product pc	0.01 (0.01)	0.01 (0.01)	0.01 (0.01)
Birth Rate	-0.02 *** (0.01)	-0.03 *** (0.01)	-0.03 *** (0.01)
Total Life Expectancy	-0.04 *** (0.01)	-0.09 *** (0.02)	-0.05 *** (0.01)
Alcohol Consumed per Adult	0.02 *** (0.01)	0.02 ** (0.01)	0.02 *** (0.01)
Yearly Fixed Effects	+	+	+
F-test	55.6	37.21	30.55
N	456	456	456

*Note: all the estimations are performed with robust standard errors (in parenthesis). * Significant at the 10% ** Significant at the 5% *** Significant at the 1%*

Columns 1 and 2 of Table 1.6 illustrate that, respectively, both instruments are positively and significantly correlated with fiscal decentralization, further confirming their goodness. The identified instruments are eligible to be adopted as instrument in our following estimations.

Tab. 1.7 synthetizes the second stage of the models (equations 2.A, 3.A and 4.A).

Table 1.7: 2SLS estimation instrumenting fiscal decentralization

Infant Mortality (II Stage)	(1)	(2)	(3)
Fiscal Decentralization (instrumented)	-3.11 *** (1.02)	-4.18 *** (1.47)	-3.34 *** (1.06)
Gross Domestic Product pc	-0.03 (0.11)	-0.02 (0.11)	-0.03 (0.11)
Birth Rate	-0.13 (0.08)	-0.16 * (0.09)	-0.14 * (0.08)
Total Life Expectancy	-1.36 *** (0.20)	-1.43 *** (0.22)	-1.38 *** (0.21)
Alcohol Consumed per Adult	-0.13 * (0.08)	-0.12 (0.08)	-0.13 * (0.08)
Yearly Fixed Effects	+	+	+
N	456	456	456
Overidentification test p-value (Hansen J)	-	-	0.24

*Note: elaborations performed with "xtivreg2" STATA® command (Schaffer, 2010). All the estimations are performed with robust standard errors. * Significant at the 10% ** Significant at the 5% *** Significant at the 1%*

Column 1 of Table 1.7 shows the results coming from the estimation of model 2. First of all, from the first stage of the estimation, we find that "Accountability and Legislation" is a good instrument for "Finance" decentralization from a statistical perspective. Indeed, as already shown, our instrument is significantly related to fiscal decentralization, with a positive sign (+0.19). Hence, a higher degree of "Accountability and Legislation" is significantly associated with higher levels of fiscal decentralization. This result, combined with the large F-test statistics (55.6) shown in Table 1.6, confirms that our instrument is not weak. Moreover, from the second stage of the analysis we obtain that decentralization has a strong and significant negative relationship with infant mortality rate (-3.11). The other estimated coefficients are consistently significant only in the case of total life expectancy which is negatively related to infant mortality. These first findings suggest that

the effect of fiscal decentralization on the citizens' health occurs as long as the central authority has also delegated political-institutional powers - and their relative accountability - to local authorities. In other terms, we confirm the institutional delegation to local authorities is an enabling factor for the effectiveness of fiscal policy at the local level.

Column 2 of Table 1.7 shows the results of the estimation of model 3. As previously shown, the variables are significantly and positively related (+0.11). The F-test statistics (37.21) shown in Table 1.6, combined with the significance of the coefficient in the first stage estimation, confirms that the "Management and Property" variable emerges a strong instrument for fiscal decentralization.

From the second stage of the analysis, we get that fiscal decentralization still has negative and significant relationship with infant mortality rate (-4.18), consistent with our previous results. Even according this model, the only strongly significant coefficient is the total life expectancy (again negatively related to infant mortality). Thus, we can conclude that overall fiscal decentralization of the health system shows a negative effect on infant mortality rate, provided that local management received adequate delegated powers and autonomy to operate and autonomously spend the hospitals' financial budget.

Column 3 of Table 1.7 shows the results of the estimation of model 4, which includes both instruments in the first stage of the estimation. This is our preferred version of the model, because it takes into account both institutional and administrative determinants of fiscal decentralization in the health-care sector. Moreover, using two instruments for fiscal decentralization allows to test for over-identification of the model.

The high F-test (30.55) shown in Table 1.6 suggests that, even used as joint instruments, our instruments are good predictors for fiscal decentralization. In the second stage we get that fiscal decentralization still has negative and significant relationship with infant mortality rate, whose magnitude (-3.34) is within the range of coefficients estimated in model 2 and 3. Results coming from the estimation of this model are quite similar to those of model 2. This finding suggests that the overall effect is guided by the "Accountability and Legislation" instrument, as also emerging from the first stage of model 3[6].

Moreover, since the Hansen J over-identification statistics is sufficiently large, the null hypothesis is not rejected, suggesting that overidentification restrictions is valid, together

[6] We have also verified that, in all the versions of the model, fiscal decentralization suffers from an endogeneity bias. Indeed, the Hausman endogeneity tests show a <0.01 p-value for all three models.

with instruments. Hence, we can conclude that the difference between the OLS and the IV estimates is systematic, suggesting that the OLS estimation including only fiscal decentralization as main regressor was actually suffering from endogeneity bias, which we were able to correct having introduced our instruments in the estimations.

To conclude, we showed that the effective transfers of political-institutional and administrative powers and accountability to local authorities is a key prerequisite to allow fiscal decentralization having a significant impact on the improvement of the health outcomes.

1.4.3 Robustness tests

In order to test the robustness of our 2-SLS analysis, we replicate the estimations replacing in the first stage our "Accountability and Legislation" and "Property and Management" categorical variables, with as many dummy variables as the respective categories are. Specifically, we disaggregate instruments into dummy variables and we substitute in models 2, 3 and 4 the categorical variable *LAW* with six dummies assuming value "1", respectively for 0.5, 1, 1.5, 2, 2.5, and 3, and "0" otherwise, and the categorical variable *MAN* with two dummies assuming value "1", respectively for 1 and 2, and "0" otherwise. Tab. 1.8 shows the results of this analysis.

Table 1.8: 2SLS estimation: fiscal decentralization instrumented with dummy variables representing "Accountability and Legislation" (1), "Property and Management" (2), and both variables (3)

Infant Mortality (II Stage)	(1)	(2)	(3)
Fiscal Decentralization (instrumented)	-2.23 ***	-3.94 **	-2.49 ***
	(0.76)	(1.27)	(0.76)
Gross Domestic Product pc	-0.03	-0.02	-0.03
	(0.11)	(0.11)	(0.11)
Birth Rate	-0.11	-1.15 *	-0.12
	(0.08)	(0.09)	(0.08)
Total Life Expectancy	-1.31 ***	-1.42 ***	-1.32 ***
	(0.19)	(0.08)	(0.19)
Alcohol Consumed per Adult	-0.14 **	-0.12	-0.14 *
	(0.07)	(0.08)	(0.08)
Yearly Fixed Effects	+	+	+
N	456	456	456
Overidentification test p-value (Hansen J)	0.01	0.65	0.01

*Note: elaborations performed with "xtivreg2" STATA® command (Schaffer, 2010). All the estimations are performed with robust standard errors. * Significant at the 10% ** Significant at the 5% *** Significant at the 1%*

First of all, from the first stage of the estimation, we should note that in all the models, the dummy variables representing respectively "Accountability and Legislation" and "Property and Management" are good instruments for fiscal decentralization, as shown in Table 1.8 by the F-test statistics on the significance of the instrument in first-stage regression, even though their values are lower than the ones obtained in the general results. Moreover, we obtain that fiscal decentralization still has negative and significant relationship with infant mortality rate in all the three specifications of the models (respectively, -2.23, -3.94 and -2.49). Nevertheless, the null hypothesis of Hansen J over-identification statistic is not rejected only for model (2). This result suggests that the restrictions implied by the existence of more than one instrument – and consequently their coherence – is valid only in the case of "Property and Management". However, this result should not cast a shadow

on the validity of "Accountability and Legislation" as relevant instrument for fiscal decentralization *per se* (Parente and Santos Silva, 2012)[7].

We can conclude that, overall, our instruments are stronger when used in their continuous version. Nevertheless, the second-stage coefficients, obtained after having instrumented fiscal decentralization with either the continuous or the discrete instruments in the first stage, are consistent with each other in magnitude, as well as being statistically significant.

1.5. Conclusive remarks

In this work, we analyzed the effects of decentralization of the health care system on the quality of citizens' health for a large subset of European Union countries. In the related literature, the focus has mainly been on the effects of a higher concentration of public expenditure at the local level. Consistently, we first replicate one of the most popular models in economic literature to investigate the correlation between fiscal decentralization and infant mortality rate, having as base for the analysis a panel of 25 EU countries for 19 years, from 1995 to 2013.

The fixed-effects OLS main results show that the sole fiscal decentralization seems to have no statistically significant effect on reducing the infant mortality rate, adopted as a proxy of the quality of citizens' health. Thus, we speculate that this result may be mainly affected by the mismeasurement of health-care system decentralization, when proxied by the sole fiscal decentralization. Indeed, it may be the case that the share of local on total public expenditure on health is determined and decided by the central authority and only executed at the local level. Hence, in other terms, the sole fiscal decentralization may not be sufficient to describe whether a health care system is decentralized. Consequently, the obtained OLS coefficient could have been affected by a mismeasurement bias.

Hence, also following the Committee of the Regions of the EU's (2012) framework we constructed a set of instrumental variables to deal with the possible endogeneity bias, due to mismeasurement of health-care system decentralization, proxied by fiscal decentralization. This integration is motivated by the fact that, on one side, these factors may not be caught by the sole fiscal decentralization, and, on the other side, that such

[7] Indeed, according to Parente and Santos Silva (2012) the over-identification test "checks the coherency of the instruments rather than their validity", since it is a check for whether or not all the instruments identify the same vector of parameters.

elements may result institutional pre-conditions so that local government's expenditure is effectively addressed to improve citizens' health.

We identified the level of delegation of powers to local entities in the health sector and the management and property of hospitals allocated at the local level, as two possible instruments. Due to the qualitative nature of the new definitions, we have introduced two specific dedicated metrics/scores, reflecting the geographical comparisons, using as common source the European set of thematic reports produced by the European Observatory on Health Systems and Policies in partnership with the WTO. Having theoretically discussed the reasons behind which the exclusion of restriction for our instruments may be satisfied and having verified with theory and statistical tests the power of both instruments, we performed a set of 2SLS estimations, instrumenting fiscal decentralization with them.

First, we estimated the 2SLS model using the only "Accountability and Legislation" variable as instrument for fiscal decentralization. The results from the first stage of the estimation confirms that this variable behaves as a good instrument for fiscal decentralization. Moreover, once instrumented for "Accountability and Legislation", the second-stage relationship between fiscal decentralization and infant mortality rate emerges as negative and statistically significant.

In a second version of the model we replicated the analysis using the "Property and Management" variable as instrument. Even in this case, "Property and Management" is confirmed to be a good instrument for fiscal decentralization. Moreover, having instrumented fiscal decentralization with "Property and Management", in the second stage it emerges a negative significant impact of fiscal decentralization on infant mortality rate.

Then, we ran our favorite version of the model, which includes both the instruments in the first stage of the estimation. This estimation confirmed the goodness of the joint adoption of both instrumental variables, and the significant negative impact of instrumented fiscal decentralization on infant mortality rate. Moreover, this result is closer to the one obtained for the first version of the 2SLS model, suggesting that the overall effect is guided by the "Accountability and Legislation" instrument.

Our findings conducted to two complementary interpretations. On the one hand, the positive effects of fiscal decentralization on the citizen's health occur in institutional contexts in which central authorities have also delegated political powers and made local

authorities operating in the health sector. At the same time, also the property and the administration of the health structures play a role in the improvement of the health services provided to the citizens to the extent that fiscal decentralization may positively affect the health care systems' quality only when the local management is sufficiently autonomous to put into practice its own spending strategy for the hospital. On the other hand, when these political-institutional and administrative requirements are absent the sole fiscal decentralization is not a guarantee of a real improvement for citizens' health.

To conclude, this work intended to incorporate in the current debate on the advantages of decentralization on the quality of the health care system two main related aspects. First, the complexity of its definition (Saltman and Bankauskaite, 2006), which cannot be synthetized with the fiscal one, and whose impact on infant mortality cannot be fully evaluated without considering other underlying institutional and administrative factors. Second, the fact that political-institutional and administrative factors – that is the effective delegation powers and accountability to local authorities – are key prerequisites for fiscal decentralization to improve the health care system quality; otherwise fiscal decentralization would be reduced to the mere accounting transfer of spending centers to local authorities, while the strategic and operational decisions (and consequent responsibilities) would remain at the central government level.

Chapter 2

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

2.1 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 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 within its own structure 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.[8] 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.

[8] 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.

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 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 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, 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.

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.

2.2 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. 2.1 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 2.1: EU 28 Government (and Local) Expenditure by category as a % of GDP

EU 28 Government (and Local) Expenditure	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**
Health	**6.2**	**6.4**	**6.4**	**6.5**	**6.6**	**6.5**	**6.7**	**7.4**	**7.3**	**7.1**	**7.2**	**7.2**	**7.2**	**7.2**
	(1.4)	**(1.5)**	**(1.5)**	**(1.4)**	**(1.4)**	**(1.4)**	**(1.5)**	**(1.6)**	**(1.6)**	**(1.6)**	**(1.5)**	**(1.6)**	**(1.5)**	**(1.5)**
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 table reports the allocation of expenditure by function as a % of GDP. The share spent at the local level is indicated in brackets.*

The same phenomenon also occurs for Italy (see Tab. 2.2), where expenditure on health is the third largest category of expenditure (7.1% of GDP).

Table 2.2: Italy Government (and Local) expenditure by category as % of GDP

Italy Government (and Local) Expenditure	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Health	**6.3**	**6.3**	**6.6**	**6.8**	**6.9**	**6.7**	**7**	**7.5**	**7.4**	**7.1**	**7.2**	**7.2**	**7.2**	**7.1**
	(6.1)	**(6.1)**	**(6.5)**	**(6.7)**	**(6.8)**	**(6.6)**	**(6.9)**	**(7.3)**	**(7.3)**	**(7.0)**	**(7.0)**	**(7.0)**	**(7.0)**	**(7.0)**
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. The table reports the allocation of expenditure by function as a % of GDP. The share spent at the local level is indicated in brackets.*

However, differently from EU-28 where the expenditure is mainly concentrated at the central level authority, as shown in Tab. 2.2 Italian expenditure on the health-care sector is mainly allocated to local authorities (7.0% of GDP in 2015 with respect to a total expenditure equal to 7.1% of the GDP).

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 with specific local laws, introducing CPBs within their systems.

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[9], 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[10], second, in June 2013[11] 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[12] 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)[13].

[9] As for Art. 23, paragraph 5 of Decree Law 201/2011.
[10] As for Art. 29m paragraph 11-ter of Decree Law 216/2011.
[11] As for Law n.71 ("Emergency provisions relating to Expo 2015, waste and seismic events")
[12] As for January, 15th 2014 regional law ("Provisions for formation of the annual and multiannual budget of the Region" - Financial Law 2014)
[13] See Appendix 2.1 for a comprehensive view of the evolution of the legal framework behind the introduction of CPBs among the Italian Regions.

We provide here a first graphic synthetic representation (Fig. 2.1), 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.

Figure 2.1: 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.

2.3. Empirical Analysis

2.3.1 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 grouped the balance sheet lines of the first two schemes to make them consistent with the structure of 2012 scheme. Concerning the second issue, we managed to represent all the regional organizational changes which led to aggregation of local ALSs[14]. 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.

2.3.2 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 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. 2.1), 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.

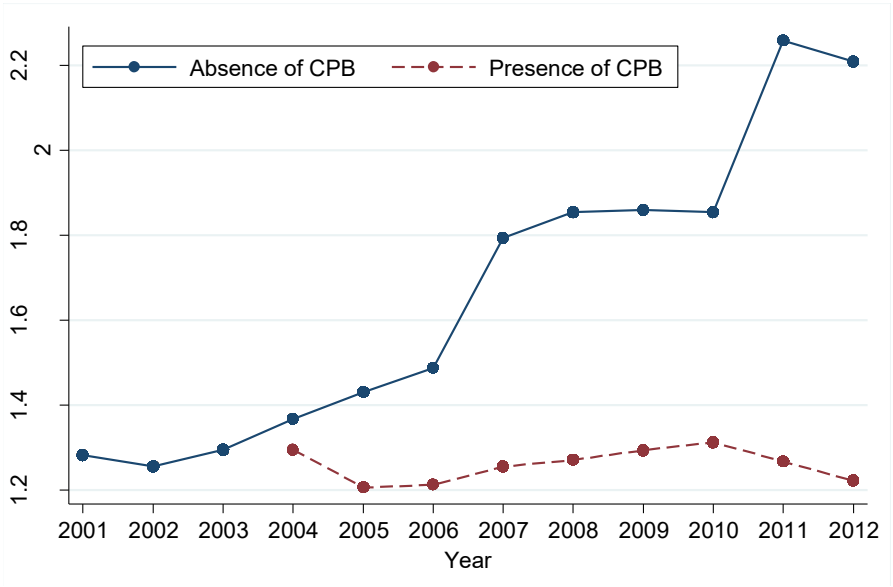
[14] Abruzzo went from 6 to 4 ASLs from 2010, Basilicata from 5 to 2 from 2008, Bolzano from 4 to 1 from 2007, Calabria went from 11 to 6 from 2008 and to 5 since 2011, Campania from 13 to 7 from 2009, Emilia-Romagna from 13 to 11 from 2004, Marche from 13 to 1 from 2006, Molise from 4 to 1 from 2006,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

2.3.3 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.[15] 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, house assistance, social rehabilitation assistance and other services provided by specialists and advisories 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 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 2.2 shows a preliminary description of the differences in terms of total expenditure by ASL operating in the presence or absence of a regional CPB.

[15] See Appendix 2.2 and 2.3 for further details on the aggregation of single balance sheet lines into the four macro-categories.

Figure 2.2: Per capita expenditure on health and non-health goods and services (total expenditure) by Italian ASLs in the presence or absence of regional CPBs



Note: 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.

Tab. 2.3 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 2.3: 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	
Total expenditure per capita	1420.26	1509.95	1261.55	-0.248 ***
	(45.22)	(70.17)	(14.58)	
Expenditure on health goods pc	146.17	138.60	159.57	0.021 ***
	(2.21)	(2.87)	(3.34)	
Expenditure on health services pc	1177.88	1270.38	1014.22	-0.256 ***
	(41.95)	(64.97)	(15.79)	
Expenditure on non-health goods pc	10.54	11.70	8.50	-0.003 ***
	(0.21)	(0.29)	(0.25)	
Expenditure on non-health services pc	85.66	89.28	79.25	-0.010 **
	(2.45)	(3.70)	(1.78)	

*Note: standard errors are in parenthesis. Column "difference" shows the result of a mean-comparison t-test. Values are expressed in per capita euros. * Significant at the 10% ** Significant at the 5% *** Significant at the 1%.*

From this representation two main aspects emerge. First, per capita ASL's total expenditure is equal to approximately 1,420€, of which the most relevant part derives from expenditure on health services (about 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. 2.4 shows the difference between the health outcome variables by ASLs in presence or not of a regional CPB.

Table 2.4: Health supply variables (per 100 inhabitants) by ASL, purchasing or not through a CPB

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

*Note: standard errors are in parenthesis. Column "difference" shows the result of a mean-comparison t-test. * 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 supply variables, did not significantly differ depending on the presence of a CPB.

2.3.4 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.

2.3.5 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:

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

where *THE* is the natural log of the per capita Total amount of Health Expenditure generated by the ASLs. Moreover, dI_{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 (φ_i) and temporal (φ_t) fixed effects. We then estimate again the model adopting as dependent variables the four components of the total amount of ASL's expenditure.

2.4 Empirical results

2.4.1 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 (Talosaga and Wink, 2014).

More specifically, we conduct four 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 2.5: Common trend assumption test on total ASLs' expenditure

Independent variables	1	2	3	4
CPB adoption	-0.02	-0.03	0.03	0.02
	(0.01)	(0.02)	(0.02)	(0.02)
Population 0-5 years	-	-9.39	-	-8.5
		(5.75)		(5.65)
Population >64 years	-	0.17	-	-0.77
		(1.78)		(1.67)
Households	-	-0.29	-	0.03
		(1.04)		(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. 2.5 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 2.6: Common trend assumption test on ASLs' expenditure by sub-categories

Independent variables	5 - HG	6 - HS	7 - NHG	8 - NHS	9 - HG	10 - HS	11 - NHG	12 - NHS
CPB adoption	0.02	-0.04	0.02	0.02	0.05	0.03	0.08	0.05
	(0.03)	(0.03)	(0.04)	(0.03)	(0.03)	(0.03)	(0.05)	(0.04)
Population 0-5 years	-30.44***	-4.65	-21.62 *	-15.98 **	-29.78 ***	-3.40	-20.57 *	-15.36 **
	(8.57)	(6.50)	(12.35)	(6.89)	(8.32)	(6.49)	(12.10)	(6.69)
Population >64 years	-3.58	1.81	-0.34	-0.16	-4.18	0.48	-1.31	-0.74
	(2.97)	(2.37)	(4.83)	(2.53)	(2.97)	(2.06)	(4.90)	(2.51)
Households	0.75	-0.98	-4.72 *	-1.57	0.96	-0.53	-4.38 *	-1.37
	(2.36)	(1.16)	(2.41)	(1.88)	(2.31)	(1.10)	(2.36)	(1.86)
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 2.6 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 provide a first hint on the validity of common trend assumption[16].

2.4.2 General Analysis

We provide in Tab. 2.7 the results of the first set of two regressions estimated using as dependent variable the per capita total expenditure.

[16] Other approaches to test the common trend assumption are possible and might be taken into consideration in further developments of this work.

Table 2.7: Basic specification – OLS DiD and FE on the entire panel

Independent variables	1	2
CPB adoption	-0.03 ***	-0.04 ***
	(0.01)	(0.01)
Population 0-5 years	-	-9.02
		(5.69)
Population >64 years	-	0.28
		(1.72)
Households	-	-0.40
		(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%.

2.4.3 Analysis by category of expenditure

Tab. 2.8 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 2.8: OLS DiD and FE on the entire panel by sub-category of expenditure

Independent variables	**3**	**4**	**5**	**6**
CPB adoption	0.04	-0.04 ***	0.03	0.02
	(0.03)	(0.02)	(0.04)	(0.03)
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 (2), health services (3), non-health goods (4) and non-health services (5). 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. 2.9 shows the second set of estimations expressed from model (1), which includes the set of demographic control variables.

Table 2.9: Specification including demographic controls – OLS DiD and FE on the entire panel

Independent variables	**7**	**8**	**9**	**10**
CPB adoption	0.02	-0.06 ***	0.02	0.02
	(0.03)	(0.02)	(0.04)	(0.02)
Population 0-5 years	-30.65***	-4.09	-21.87 *	-16.20 **
	(8.65)	(6.51)	(12.37)	(6.96)
Population >64 years	-3.56	1.92	-0.31	-0.22
	(2.93)	(2.23)	(4.77)	(2.49)
Households	0.77	-1.12	-4.69 *	-1.51
	(2.37)	(1.13)	(2.43)	(1.87)
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 show the results of the estimation of the models including demographic controls, where the regressors are respectively natural log of per capita expenditure on health goods (7), health services (8), non-health goods (9) and non-health services (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.

2.4.4 Check on the supply 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. 2.10 shows the results of this analysis,

Table 2.10: Check on the supply of health services

Independent	First Aid		Physicians		Nurses		Ordinary beds		Day-hospital beds	
variables	1	2	3	4	5	6	7	8	9	10
CPB adoption	-0.00	-0.01	-0.04	-0.06	-0.07	-0.09**	0.01	0.01	0.06	0.05
	(0.03)	(0.03)	(0.03)	0.04	0.04	(0.04)	(0.02)	(0.02)	0.06	(0.06)
Population 0-5 years	-	7.98	-	19.62***	-	9.34	-	5.77	-	-17.84
		(6.93)		(6.41)		(7.14)		(3.50)		(15.55)
Population >64 years	-	4.36	-	8.87***	-	12.46 **	-	1.90	-	3.33
		(3.28)		(3.06)		(4.79)		(1.57)		(7.91)
Households	-	1.65	-	-1.28	-	-0.94	-	-0.63	-	5.81
		(1.93)		(2.92)		(3.48)		(0.83)		(3.99)
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[17]. 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.

2.5 Robustness checks

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 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

[17] “Roma B”, “Roma C”, “Roma D”, “Roma E” and “Torino 2”.

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:

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

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 (φ_i) and year (φ_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. 2.11 shows the results of these analysis.

Table 2.11: Robustness test

Independent variables	1	2
CPB adoption and no ASL Aggregation	-0.04 ***	-0.05 ***
	(0.01)	(0.02)
Aggregation	-0.09 **	-0.10 ***
	(0.03)	(0.04)
Population 0-5 years	-12.88 **	-8.69
	(5.62)	(6.47)
Population >64 years	-0.44	1.06
	(1.76)	(2.24)
Households	-0.33	-1.04
	(1.00)	(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[18], 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.

[18] 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.

2.6. 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.

Chapter 3

The Impact of 1974 Budget Act on U.S. Spending and Debt: a synthetic control approach

3.1 Introduction

The U.S. public spending allocation rules have been subject to several changes over the last decades since the end of World War II. Phases of sudden changes alternated with phases of relative stability in the rules defined by the Executive and the Congress (Baumgartner and Jones, 1993). Specifically, Jones et al. (1998) identified two main related turning points in the second half of the 20th century.

The first is 1956 which marked the beginning of the "Eisenhower's Peace Dividend", characterized by the conversion of public spending previously allocated to defense into domestic spending, particularly devoted to infrastructure development (Dodd, 1994). More generally, it signed the beginning of a season devoted to a strong expansive public spending policy.

The second turning point is 1974 precisely when the “Budget and Impoundment Control Act” was adopted, being the culmination of a longer period known as the "7 Year Budget War" (Kiewiet and McCubbins, 1991) started in the early 1970s and characterized by a general will to limit and restrain public spending. According to Schick (1995), it was precisely President Nixon’s 1972 proposal of a wider use of impoundment power of congressional appropriations which led to the introduction of the Budget Act. Indeed, the 1974 Budget Act has often been interpreted as an agreement between the President and the Congress to balance a trade-off between the presidential will to restrain public spending and the Congress will to operate with minor presidential interference (Fisher, 1982).

There is a limited agreement in the literature on the correct metrics to choose for the proper measurement of the impact of this reform (Kamlet and Mowery, 1985). Indeed, a first possible perspective is to verify the benefits of greater efficiency and effectiveness of the renewed budget definition procedure (Schick, 1980). However, this work fits into a second parallel search path, that is to verify the impact of 1974 Budget Act mainly on public spending and on debt.

The quantitative estimates of contemporary observers of that time generally showed a positive growth trend of these variables since 1974 (see, for example, LeLoup (1980), Ellwood (1983) and Kamlet and Mowery (1985)). However, in all these works the possibility that the failure to introduce the Budget Act would have led to a further increase in public spending and debt is not explored. More recently, Jones at al. (1998) evidenced a statistically significant reduction in public spending growth after the introduction of Budget Act 1974; their estimated ARIMA model allowed to verify that the public spending growth rate after 1976 was significantly reduced of approximately 6% compared to the 1956-1974 period.

Given more than 40 years of dysfunction and increased expenditures, deficits, and debt, the question arises: what role has the 1974 Budget Act played in these trends? More specifically, what would have happened without the Act? Congressional budgeting, after all, was originally intended to stem rising deficits and debt, but the situation afterward has been far from restrained.

At the best of our knowledge there is only the work of Duncan et al. (2015) estimating the impact of the 1974 Budget Act on public expenditure and deficit; by using a time series analysis they find the correlation between the 1974 Budget Act reform and their outcome dependent variables is tenuous.

In our work, we test the effectiveness of the 1974 Budget Act in constraining debt and expenditure growth by using a synthetic control approach (Abadie and Gardeazabal, 2003; Abadie et al., 2010, 2015) where U.S. debt and expenditure trend before and after 1974 is compared with the trend of a synthetic nation (a weighted average of appropriately chosen representative countries) which did not experiment with budget reforms in the years around 1974.

We find that the introduction of the Budget Act has increased both public debt-to-GDP and public expenditures-to-GDP, but less than what would have happened without the Act.

The paper is organized as follows. Section 2 outlines the Institutional framework, Section 3 describes the empirical methodology, Section 4 discusses the data sample and the empirical strategy Section 5 describes the results, Section 6 concludes. Finally, the Appendix show the placebo tests which give robustness to synthetic control analysis

3.2 Institutional Framework

Early in the 20th century, a rise in federal spending and budget deficits was a major reason that Congress sought a more coherent means of making fiscal decisions. Under the 1921 Budget and Accounting Act, the President was required for the first time to submit his proposed budget to Congress annually. The Act also created two new federal agencies: the Bureau of the Budget (later renamed the Office of Management and Budget, or OMB) to assist the President in carrying out his budgetary responsibilities; and the General Accounting Office (later renamed the Government Accountability Office, or GAO), to assist Congress as the principal auditing agency of the federal government.

In 1946, Congress attempted further budgetary consolidation under the Legislative Reorganization Act. This legislation included a brief section requiring the House and Senate's spending and tax committees to report their own budget resolution before February 15th, recommending a revenue total and a spending ceiling that would govern taxing and spending for the upcoming fiscal year. Additionally, the Act increased the total number of committee seats while reducing the number of committees in both chambers.

There were problems during the very first budget debate, which led to disputes between the President and the new Republican majority in Congress. The House and Senate could not agree on a compromise budget resolution, and proceeded to enact fiscal bills relying on the President’s budgetary guidance. The next year, Congress passed its first budget resolution, which was summarily ignored, after which the Congressional budget process was essentially forgotten until the 1970s.

Heading into the 1970s, there were again calls for wide-scale budget process reform, and concern over executive power and rising deficits created the vacuum from which the 1974 Budget Act came to be law. According to Hogan (1985), the main reason for the introduction of this reform should be reconducted to the Congress desire to recover the power of purse lost during the years of Nixon's administration. In other terms, the Congress decided to approve the 1974 Budget Act by bipartisan vote in response to the Executive's intrusion into the Congress budget process (Pfiffner, 1979). The impoundment power had been used by Presidents throughout history, but appropriators were concerned with what they saw as President Nixon’s excessive use of it to block Congressional priorities, and so a major provision of the 1974 Act was restricting that power. This behavior further aggravated during the 1972 presidential campaign when President Nixon

proposed that the Executive should have had the power to cut federal spending at its discretion below a level identified for 1973 at 250bn$ (Joint Committee on the Organization of Congress, 1993).

Another major purpose was the introduction of a formal budgeting process and the definition of a specific timeline of activities to be formally developed during the fiscal year to obtain budget approval (Jones et al., 2011). The 1974 Budget Act sought to remedy these problems by creating several institutions and procedures that changed the relationship between Congress and the President. It established the House and Senate Budget Committees, which were responsible for setting overall tax and spending levels, as well as the Congressional Budget Office (CBO) to provide budgetary information and analysis to Congress independent of OMB. The Budget Act also established deadlines for action on related budget legislation.

At the same time, the introduction of the 1974 Budget Act called for an institutional agreement between the Congress and the Executive, according to which the President would renounce his impoundment powers and the Congress would commit itself to avoid excesses in public spending (Fisher, 1982). Hence, according to Schick (1980) the reform would not have been "neutral" in relevant public policy decisions such as the reduction of public spending, deficit and, ultimately, debt.

Consequently, one primary effect of this Act was its establishment of centralized spending and revenue decisions being made by Congress, instead of the President. Where before, Congressional appropriators had considered requests on a one-off basis and let the topline levels be determined at the end of the process, Congress now had to approve its own budget resolution establishing revenue and spending levels that would guide all authorization and appropriation committees. Before the 1974 Budget Act, congressional budgeting was generally piecemeal and driven by Presidential proposals. There was little topline coordination between Congressional authorizing committees, House and Senate appropriation committees, House Ways and Means, and Senate Finance committees. These bodies were largely influenced by the needs of executive agencies, rather than broader congressional concerns about economic consequences.

Under this old status quo, the total budget was the end result after appropriations bills were passed, not the starting point. Congress did not have a budget committee or its own skilled

experts who could challenge the President's budget proposal, and so it largely functioned to enact the executive agenda.

The 1974 Budget Act also created the concurrent budget resolution, setting total budgetary authority, budget outlays, and revenues for the upcoming year, within which the appropriations committees had to operate. The spending and revenue levels established were implemented by separate but distinct mechanisms. The first method is via allocations to the authorizing and appropriations committees, and, where appropriate, reconciliation directives to the authorizing committees. The second is when allocations for discretionary spending are assigned in lump sum to the Appropriations Committee that is then required to divide the funds among its subcommittees.

Importantly, non-discretionary – or mandatory – spending is not annually voted upon. As required by section 302 (a), the budget resolution assigns allocations for this non-discretionary spending to the authorizing committees that have jurisdiction on these types of programs, like Social Security and Medicare.

This resolution may also provide reconciliation instructions to authorizing committees to achieve specified deficit reduction targets. These directives usually include the amount of desired change, the period during which it is to occur, and a deadline for authorizing committees to report legislation. Important in recent years for its role both in passing and in attempts to repeal parts of the Affordable Care Act (ACA), reconciliation is subject to limited debate, cannot be filibustered, and requires only a simple majority.

3.3 Empirical methodology

In this section, we use a synthetic control technique to test how the 1974 Budget Act impacted U.S. spending and public debt as a share of GDP. Synthetic models use the mixed method of Abadie et al. (2010; 2015) and is a dual quantitative and qualitative approach. First used by Abadie and Gardeazabal (2003), synthetic controls are based on the principle of building a reference comparison unit as an “artificial counterfactual” (otherwise called synthetic control) which is then used as a reference for comparison to the real treated unit.

In particular, a set of units with the same features of the treated one constitutes a “donor pool” for the construction of an artificial unit, built as a weighted average of some pre-

intervention characteristic variables chosen to resemble the treated unit before the intervention of a certain policy, whose weights are then applied to the outcome variable under analysis for the whole period of interest. As a result, the performances of the synthetic control after the year of intervention represent the behavior of the treated unit in the counterfactual case; that is to say, the performance of the control group represents the performance of the treated unit if the intervention in the real-life case had not occurred.

Here, we seek to measure the effect of a policy intervention on post-intervention outcomes. Analytically, and following the approach of Abadie et al. (2015), we take a sample of $K+1$ units, indexed by k, where $k = 1$ is the "case of interest" or "treated unit" and $k = 2, \ldots, K+1$ are the "potential comparisons," which compose the donor pool. The units are observed at the same time periods t, $\forall t = 1, \ldots, T$, with a pre- and a post-intervention period. The synthetic control is the weighted average of the units in the donor pool; so, it is a $(K \times 1)$ vector of weights $W = (w_2, \ldots, w_{K+1})$, with $0 \leq w_k \leq 1$ for $k = 2, \ldots, K$ and s.t. $w_2 + \ldots + w_{J+1} = 1$.

We let $X_1 = (s \times 1)$ be the vector of the values for the pre-intervention characteristics of the treated unit and $X_0 = (s \times K)$ the matrix collecting the values of the same variable for all the other units in the donor pool. These variables are chosen in order to be good predictors of the outcome variable within vector X_1 and pre-intervention values of the outcome variable may be included themselves. We select a synthetic control, W^*, such that the size of the difference between the pre-intervention characteristics of the treated unit and the other units of the donor pool $(X_1 - X_0W)$ is minimized. In this way, we establish that the unit representing the case in question and the synthetic control unit have similar behaviors over the period prior the intervention.

We further let $Y_1 = (T_1 \times 1)$ be the vector of the post-intervention's values of the outcome for the treated unit and $Y_0 = (T_1 \times K)$ the matrix collecting the values of the same variables for all the units in the donor pool. Hence, the synthetic control estimator of the effect of the treatment is given by $(Y_1 - Y_0W^*)$.

Since we construct a synthetic control unit with similar behaviors to the treated unit in the pre-intervention period, a discrepancy in the outcome variable after the intervention is interpreted as the true effect of the intervention itself.

Compared to a regression-based approach, the synthetic control method has the fundamental advantage of explicitly showing what each unit has contributed to the

counterfactual being analyzed (Abadie et al., 2010; 2015). In our case, a direct comparison of the United States' performance with that of another single country may not be sufficiently accurate, since it may capture the effects not only of the Budget Act reform, but also those from other different reforms, budgetary and otherwise, which may have impacted public debt or expenditures. Conversely, the synthetic control is represented as a combination of units rather than only one, making explicit the contribution of each comparison unit to the counterfactual in question. In our case, it may be that no single country can approximate the values of the United States, but that a weighted average can provide a close approximation.

3.4 Data sample and empirical strategy

In order to apply a synthetic control approach, we first must identify an appropriate counterfactual for the United States. We begin with a pool of OECD countries, since they are most similar to the U.S. in terms of demographics and economic development. Given that our period of study is not recent, we then address a trade-off between building a long historical series and having adequate panel width.

Because there is a lack of a complete time series for the outcome and control variables prior to 1966, taking as reference the treatment year, we restrict our period of analysis to eight years before and after 1974, in order to ensure a balanced pool, following Abadie et al. (2010) approach. Therefore, we obtain an historical series of 17 years from 1966 to 1982. This ensures that we have a sufficiently large number of countries within the donor pool, and the constructed panel is the longest historical series available.

The original pool is composed of 18 units: Australia, Austria, Belgium, Canada, Denmark, France, Germany, Greece, Ireland, Italy, Japan, the Netherlands, New Zealand, Portugal, Spain, Switzerland, Turkey and the United Kingdom.

The other OECD countries are not considered in the pool, mainly because of the lack of data for the entire time period we studied. Moreover, since we are interested in finding a synthetic version of the United States, which was not affected by a relevant budget reform until 1974, the final donor pool does not contain countries that implemented such reforms during the period of analysis. For this reason, we excluded Australia, Belgium, Canada,

Denmark, France, Greece, Italy, the Netherlands, Spain and the United Kingdom from the donor pool.[19]

Extrapolating from both the *Perspectives on Public Expenditure Management* report by the OECD (1995) and the analysis of Wanna et al. (2010), no other countries in the donor pool introduced budgetary reforms until 1982. Therefore, we truncated our series at this year in order to obtain a "clean" panel, that is, to ensure that we did not include observations from countries that introduced budget process reforms in our period of analysis. The result is annual country-level panel data for eight countries from 1966 to 1982. Since the U.S. reform occurred in 1974, our examination consists of both a pre-intervention and a post-intervention period of eight years.

We run two iterations of the synthetic control model, using as outcome variables, first, U.S. public debt-to-GDP, as provided in the IMF's Historical Public Debt Database (Abbas et al., 2010), and second, U.S. public expenditures-to-GDP (source: IMF, 2016).

In order to find the most reliable approximation of the U.S., we need to find a set of variables that accurately approximates it in the pre-intervention period. More technically, we identify the synthetic control as the matrix of weights that minimizes the differences between the units of the donor pool and the same variables for the treated unit in the pre-intervention period.

For this reason, we adopt six demographic variables as predictors for U.S. pre-intervention characteristics: the share of population under 15 years old, over 64 years old, and between

[19] Specifically, Australia experienced in 1976 the formal separation of functions between the Department of Treasury (ministry responsible for economic development affairs) and the Department of Finance (ministry responsible for the budget affairs) (Hawke and Wanna, 2010). In 1980, Belgium was affected by a major public reform which introduced new levels of public administrations (i.e., Communities and Regions) having autonomous fiscal powers (OECD, 1995). Canada considered several reforms during the period from 1960-1978 that led to the introduction of the Planning, Programming and Budgeting System, through which the Canadian government embraced a program budgeting approach (Good and Lindquist, 2010). As for Denmark, during the 1970s the Ministery of Finance established a Center of Expenditure Politics, positioning itself as a central pivot integrating and monitoring national and local government finances, also increasing its influence over government policy-making thereafter (Jensen and Fjord, 2010). From 1968 to mid-1980s, France was interested by the application of the "*Rationalisation des choix budgétaires*", the French parallel for the U.S. "Planning Programming Budget System", whose goal was the optimization of budgetary choices by better evaluating and monitoring the results of the administrative action (Perret, 2006). In Greece, the new 1975 Constitution introduced a major reform in budgeting, regulating the timeline and relationships between the Government and the Parliament in the process of budget definition and authorization (OECD, 1995). In Italy in 1978, the "*Legge Finanziaria*" introduced the concept of a multiyear budget approach and centralized several decisions on taxation and spending in a single document, providing the first binding frame on the Italian annual economic program (proposed by the Government subject to the approval of the Parliament) (Stolfi et al., 2010). In Netherlands, a structural public expenditure curtailing reform ("Reconsideration Procedure") was introduced in 1981 (OECD, 1995). Between 1976 and 1979, together with the new democratic Constitution post-Franco regime, even though without a holistic approach, Spain introduced some *ex ante* assessment on major "development plans" which were subject to a cost/benefit analysis and whose budget was *a priori* limited to restraint public expenditure (Ballart and Zapico, 2010). In the U.K., the introduction of Public Expenditure Survey Committee system inserted constraints on budget expenditure (Thain, 2010), as the evaluation of available resources in the economy in a medium-term perspective, a more extensive financial control by the Treasury and a stronger collective decision-making in Cabinet (Lowe, 1997).

15 and 64 years old, life expectancy at birth, age dependency ratio and fertility rate (source: OECD, 2016). We include these demographic variables for both conceptual and practical reasons. First, the variables are exogenous and not influenced by the treatment under analysis. Second, public expenditure and eventually public debt can be heuristically thought of as affected by changes in the selected categories (e.g., healthcare spending for the elderly cohort or education for the younger demographic). Lastly, and more practically, these series are available for the countries in our pool.

In addition, following Abadie et al. (2010), we also include the "Public Debt-to-GDP" variable taken in for three years of the pre-intervention series (i.e., 1966, 1969 and 1973) as pre-intervention control variables. Once the synthetic control weights are obtained, they are then applied to the outcome variables for the whole period of analysis, in order to obtain the counterfactual post-treatment U.S. behavior. Finally, the synthetic control is compared with the observed data, in order to correctly test the relevance of the treatment.

We build the synthetic control unit that minimizes the Root Mean Squared Predicted Error (RMSPE) during the pre-intervention period. These predicted errors are equal to the difference between our outcome variables for the treated (U.S.) and synthetic control before the treatment.

3.5 Results

The synthetic United States emerges as a combination of Ireland, Japan, New Zealand and Switzerland. In particular, Ireland accounts for more than two thirds of the value (72.1%), Japan for 17.2%, New Zealand for 5.8% and Switzerland for the residual part (4.7%). The other four countries in the donor pool obtain a null weight (i.e., Austria, Germany, Portugal and Turkey).

These weights are summarized in Table 3.1.

Table 3.1: Synthetic weights for the U.S. – Public Debt / GDP case

Country	Weight
Austria	0.0%
Germany	0.0%
Ireland	72.1%
Japan	17.2%
New Zeland	5.8%
Portugal	0.0%
Switzerland	4.7%
Turkey	0.0%

In Table 3.2, we compare the values of the nine pre-intervention variables of the U.S. to those of its synthetic version.

Table 3.2: Predictor of Public Debt / GDP for Treated versus Synthetic U.S.

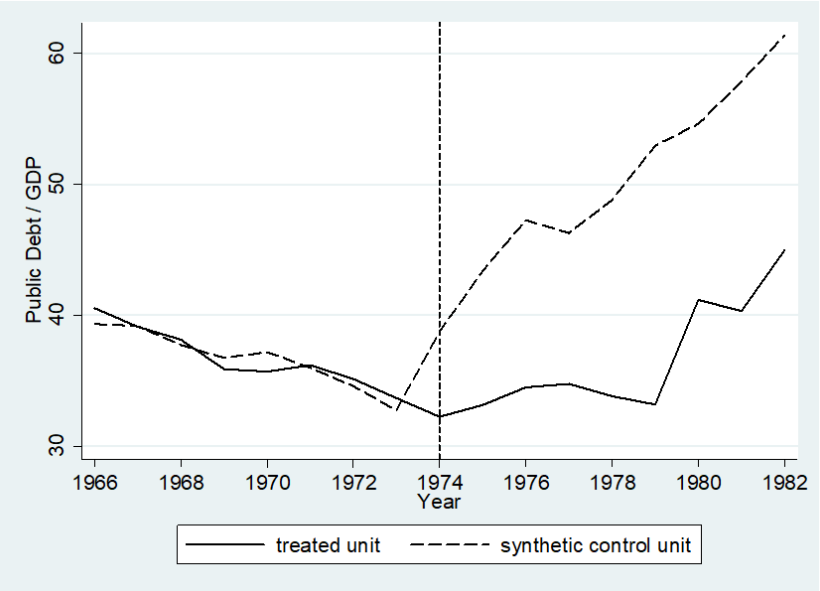
Predicting variables	Treated	Synthetic	% Difference	Abs. Difference
Population < 15 years old	28.27	29.34	3.8%	1.1
Population between 15 and 64 years old	61.95	60.39	-2.5%	-1.6
Population > 64 years old	9.78	10.17	4.0%	0.4
Age depency ratio	61.44	66.02	7.4%	4.6
Fertility rate	2.36	3.41	44.8%	1.1
Life expectancy at birth	70.71	71.23	0.7%	0.5
Public Debt / GDP (1966)	40.53	39.33	-3.0%	-1.2
Public Debt / GDP (1969)	35.90	36.74	2.3%	0.8
Public Debt / GDP (1973)	33.66	32.74	-2.7%	-0.9

Note: Reported are the means of each predictor for the U.S. (treated) and its synthetic match.

Public debt over GDP, in its treated version for 1966, 1969 and 1973, is similar to the synthetic showing a difference of maximum +/-3%. For all the demographic variables, the percentage difference is similar, and still lower than 8%. The only exception occurs for fertility rate, due to the limited scale of the variable (however, the absolute difference is quite narrow). The relatively small difference between the treated and synthetic versions of the predicting variables means that the variables are appropriate for replicating our analyzed outcomes for the (synthetic) United States.

Figure 3.1 compares the performances of the synthetic control U.S. with the treated U.S. for the period 1966-1982.

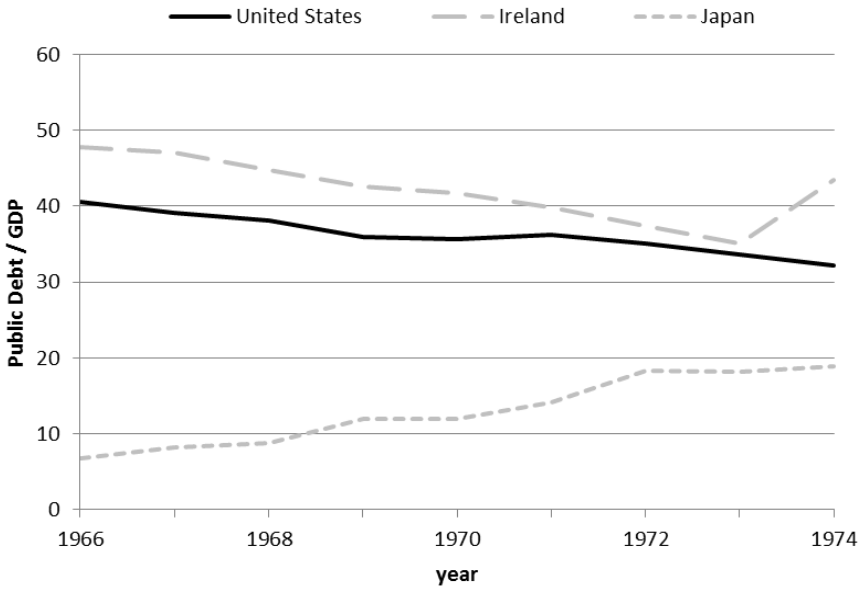
Figure 3.1: Treated versus Synthetic U.S. – Public Debt / GDP case



According to the graphical analysis, the synthetic control closely reproduces U.S. public debt-to-GDP before 1974, but shows a clear difference in the trend after 1974. Indeed, U.S. public debt-to-GDP is shown to grow less than it would have in the absence of the 1974 reform. In other words, we can infer that the Act contained the rate of debt growth more than the alternative of not introducing reform.

The fact that the estimated weights are not homogenously distributed across the potential donor countries is precisely one of the advantages of the synthetic control methodology (Abadie et al., 2010). However, it may appear surprising finding Ireland as the most relevant contributor of the U.S. synthetic control, considering the features of the two countries. Nevertheless, as shown in Figure 3.2, the U.S. pre-intervention outcome clearly emerges as a combination of the two major contributors (i.e., Ireland and Japan), where the first would have overestimated and the second underestimated the U.S. Public Debt-to-GDP whether they would have been singularly taken as unique comparison reference.

Figure 3.2: Public Debt / GDP in the United States and selected donor Countries, before 1974 Budget Act



This result can be more accurately interpreted by observing the model's predictors weights.

Table 3.3: Synthetic US Predictor Weights

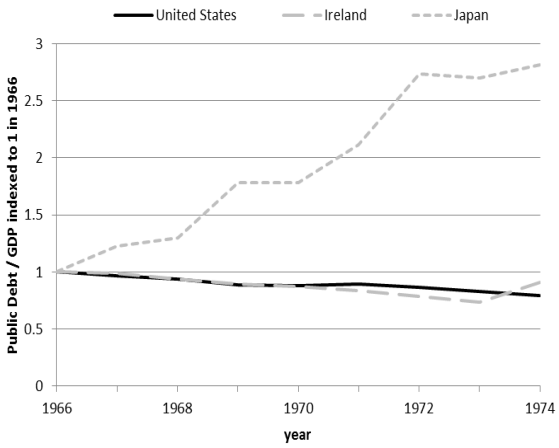
Variable	Weight
Population < 15 years old	2.45%
Population between 15 and 64 years old	3.01%
Population > 64 years old	0.22%
Age depency ratio	0.32%
Fertility rate	0.00%
Life expectancy at birth	11.68%
Public Debt / GDP (1966)	41.05%
Public Debt / GDP (1969)	37.49%
Public Debt / GDP (1973)	3.78%

As reported in Table 3.3, describing the weights attributed within the synthetic control to single predictors, according to this estimation the lagged variable “Public debt-to-GDP (1966)” receives more than 41% of the weight and the same lagged variable for 1969 accounts for more than 37%. The other predictors represent approximately the residual 22%. In other terms, in order to find the best fitting between the actual and the treated U.S., the synthetic control model selects countries from the donor pool predominantly basing the optimization on the two lagged Public debt-to-GDP variables for 1966 and 1969. Similar results mainly based on a limited set of predictors are not unusual (see, for instance, McClelland and Gault (2017) re-assessing Abadie et al. (2010) work). The relationship

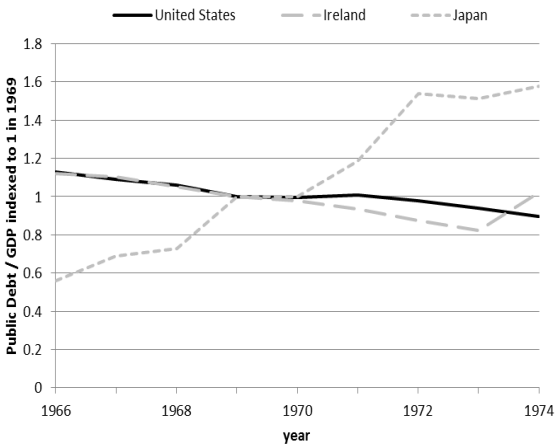
between the construction of the synthetic control and the lagged variables is then further explicated in Figure 3.3.

Figure 3.3: Public Debt / GDP in the United States and selected donor Countries indexed to 1in 1966 (3.A) and 1969 (3.B), before Budget Act 1974

3.3.A



3.3.B



Figures 3.3.A and 3.3.B show how it would have been the pre-treatment matching if we had used the lagged "Public Debt-to-GDP" as the only variable of the synthetic control models, both for 1966 and 1969. In both cases, the Irish and U.S. paths seem to be quite close, in particular for the period 1966-1970. Hence, we can conclude that Ireland takes a large weight in the prediction of the U.S. synthetic outcome, due to the strong similarity of the "Public Debt-to-GDP" lagged variable with the U.S. one. In particular, the Irish path is more appreciably approximating the pre-treatment behavior of the U.S. with a strong reliance on the lagged "Public debt-to-GDP" variable for 1966 and 1969.

We perform a complementary analysis investigating whether the synthetic control approach reaches a different conclusion if we use public spending as our dependent variable.

Table 3.4 shows the new synthetic weights under this analysis.

Table 3.4: Synthetic weights for the U.S. – Public Spending / GDP case

Country	Weight
Austria	0.0%
Germany	0.0%
Ireland	43.8%
Japan	25.4%
New Zealand	30.8%
Portugal	0.0%
Switzerland	0.0%
Turkey	0.0%

In this case, the synthetic United States emerges again as a combination of Ireland, Japan and New Zealand, while Switzerland gets a null weight, together with Austria, Germany, Portugal and Turkey. In particular, Ireland accounts for less than half of the value (43.8%), New Zealand for 30.8%, and Japan for the residual part (25.4%).

In Table 3.5, we compare the values of the seven pre-intervention variables of the U.S. to those of its synthetic version. We include as predictors the same variables of the public debt analysis, only excluding fertility rate and age dependency ratio thus obtaining a better pre-treatment fit.

Table 3.5: Predictor of Public Spending / GDP for Treated versus Synthetic U.S.

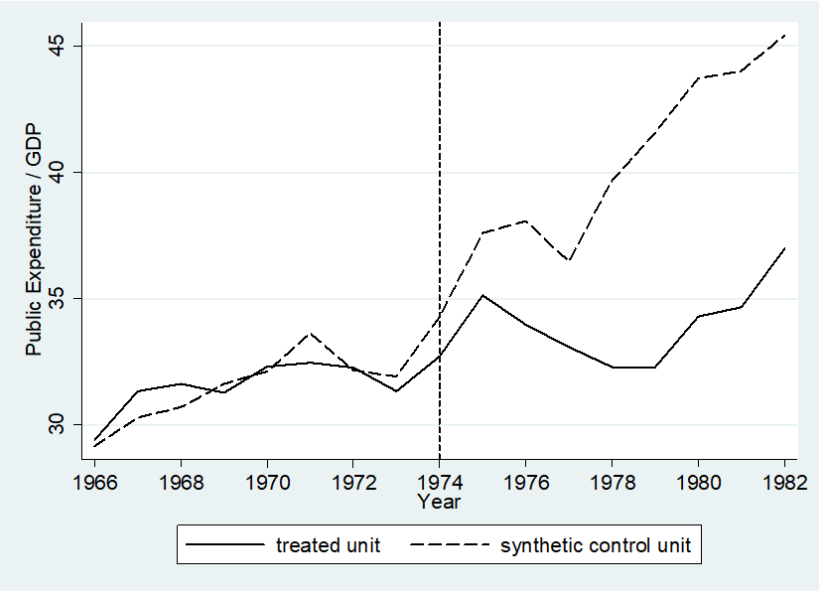
Predicting variables	Treated	Synthetic	% Difference	Abs. Difference
Population < 15 years old	28.27	29.45	4.2%	1.18
Population between 15 and 64 years old	61.95	61.36	-1.0%	-0.59
Population > 64 years old	9.78	9.19	-6.0%	-0.59
Life expectancy at birth	70.71	71.44	1.0%	0.73
Public Debt / GDP (1966)	40.53	40.54	0.0%	0.01
Public Debt / GDP (1969)	35.90	40.96	14.1%	5.06
Public Debt / GDP (1973)	33.66	33.63	-0.1%	-0.03

Note: Reported values are the means of each predictor for the U.S. (treated) and its synthetic match.

For most of the predicting variables, the difference between the treated and synthetic version is lower than 5%, with the only exceptions being the public debt over GDP for 1969 and population >64 (for which the difference is still reasonable).

Figure 3.4 compares the performances of the synthetic U.S. with the treated U.S. for the period 1966-1982.

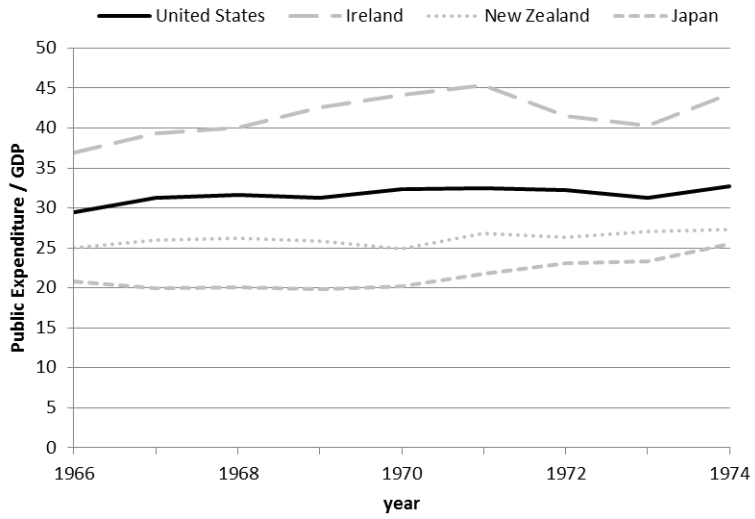
Figure 3.4: Treated versus Synthetic U.S. – Public Spending / GDP case



The graphical analysis illustrates that the synthetic control quite closely replicates U.S. public spending as a share of GDP before 1974. From 1974 onwards, the synthetic control result is always higher than the treated unit, and the difference between the trends increases following 1976-1977. Similar to the result obtained using public debt as our dependent variable, the synthetic counterfactual describes a trajectory where public spending would have been higher if the reform had never been introduced. This result is evidence that the passage of the 1974 Budget Act served to constrain the growth of public spending in the years immediately after its passage.

In Figure 3.5, we compare public spending-to- GDP of the three major donor countries with the U.S.

Figure 3.5: Public Spending / GDP in the United States and selected donor Countries, before 1974 Budget Act



Even in this case, the U.S. "Public spending-to-GDP" variable may be represented as a combination of the Japan and New Zealand performance, which underestimate the U.S. outcome, and of Ireland, which overestimates it. Table 6 shows the predictors weights.

Table 3.6: Synthetic United States Predictor Weights

Variable	Weight
Population < 15 years old	0.00%
Population between 15 and 64 years old	0.06%
Population > 64 years old	0.01%
Life expectancy at birth	0.05%
Public Debt / GDP (1966)	70.18%
Public Debt / GDP (1969)	0.03%
Public Debt / GDP (1973)	29.67%

In this case, the "Public debt-to-GDP (1966)" receives more than 70% of the weight, the same variable for 1973 accounts for less than 30%, while the other predictors represent less than 1% residual. Therefore, the synthetic control model selects the countries from the donor pool basing the estimation on these two variables. The link between the construction of synthetic control and the lagged variable thus emerges in Figure 3.6.

Figure 3.6: Public Spending / GDP in the United States and selected donor Countries indexed to 1 in 1966 (A) and 1973 (B), before Budget Act 1974

3.6.A

3.6.B

Even in the case of public spending, Ireland's path is better approximating the pre-treatment behavior of the U.S. with a strong reliance on the 1966 and 1979 lagged public debt-to- GDP.

In both the estimations, the synthetic control is mainly driven by a sub-set of the countries from the donor pool. In order to check whether considering the whole set of OECD countries as control the results still hold, we conduct a robustness test performing a Difference-in-Difference analysis, comparing the effects of the treatment on the U.S. outcomes with those of the OECD average. In other terms, we compare both U.S. public debt and spending over GDP pre- and post-1974 with the OECD countries average.

Table 3.7: Difference in Difference analysis comparing public debt and expenditure over GDP

Outcome variables		Public Debt over GDP	Public Expenditure over GDP
Before			
	Control	32.32	28.95
	Treated	36.28	31.64
	Diff	3.97 **	2.69 ***
	(Treated - Control)	(1.76)	(0.87)
After			
	Control	37.55	39.41
	Treated	36.98	34.09
	Diff	-0.57	-5.32 ***
	(Treated - Control)	(2.04)	(1.09)
Diff-in-Diff		-4.54 *	-8.01 ***
		(2.70)	(1.39)
N. Obs.		323	323

*Note: Robust standard errors are shown in parenthesis. *** significant at 1%; ** significant at 5%; * significant at 10%.*

Table 3.7 shows that until 1974 both the levels of public debt and spending over GDP are significantly higher for the U.S. (i.e., "Treated") with respect to the average of the OECD countries (i.e., "Control"), while they become lower after 1974 even though they increased in absolute terms. Moreover, the Diff-in-Diff coefficient is negative and statistically significant, suggesting that U.S. public debt and spending over GDP actually increased less than they would have increased without the introduction of the 1974 Budget Act. Hence, this result confirms the previous synthetic control analysis.[20]

Appendix further stress test the results of our analysis with placebo tests of our synthetic control model

[20] A close work to ours is that where Duncan et al. (2015) study the impact of the 1990 Budget Enforcement Act reforming the 1974 Budget Act. The model we construct is consistent with their preferred inclusion of exogenous control variables, but with even tighter constraints for synthetic control estimations. Our donor pool is more homogeneous and consistent with the pre-intervention characteristics of the United States, as it is composed only of OECD countries (following an approach similar to Abadie et al. (2015) adopted for West Germany), while Duncan et al. (2015) also include 14 non-OECD countries. We also adopt a somewhat different approach from Duncan et al. (2015) in our definition of outcome variables, which we define in terms of share of GDP and not in per capita terms. This specification allows us to compare post-intervention results in reference to economic output, and it also achieves a stronger similarity between the synthetic and real U.S, The model estimated in Duncan et al. (2015) using per capita public expenditure as an outcome variable does not generate the lowest possible pre-intervention RMSPE among those generated within the geographic placebo test, while our estimation for the U.S. shows the lowest RMSPE within the entire panel (see Appendix I for further details). Therefore, the interpretation of the difference between the real and synthetic U.S. behaviors after the treatment appears as more robust in our empirical setting.

3.6 Conclusions

The passage of the 1974 Budget Act was a pivotal moment for the legislative framework of the United States. Congress became independent from the President in designing the annual budget and fixing the overall level of spending, because of the institution of the House and Senate Budget Committees.

A major reason such fundamental reform was able to pass in the first place was widespread concern that the pre-1974 status quo had contributed to higher spending and public debt. However, the years since have hardly been characterized by fiscal restraint.

Seeking to test whether the 1974 Budget Act improved the situation, kept it unchanged, or made it worse, we set out to quantitatively test its effects, with a synthetic counterfactual. The evidence suggests that the immediate impact (in the period along eight years after 1974) of the Act was to reduce U.S. spending and debt with respect to the case the Act had not been approved, even if US spending and debt were increasing in absolute terms.

Concluding remarks

In this work, we analyzed and discussed the impacts of three policy reforms in public finance adopted by local or national governments: health-care system decentralization within the European Union, the introduction of Central Purchasing Bodies in the Italian health-care sector and the 1974 Budget Act affecting the United States Presidential and Congress public spending framework.

In Chapter 1, we tested the effects of health-care sector decentralization on the quality of citizens' health within 25 EU countries between 1995 and 2013.

In the economic literature the definition of decentralization of health care sector is typically proxied by fiscal decentralization, that is the ratio between local and total expenditure in the health care sector. Consistently, in the first part of the chapter we replicated one of the most widespread econometric model to test the impact of this variable on infant mortality, a proxy for the quality of public health. Our findings suggest that fiscal decentralization is not significantly related with the infant mortality rate. Following Fisman and Gatti (2012), we then discussed the possible endogeneity of our model, which we speculate may be biased due to the mismeasurement of health care decentralization, when it is proxied using the sole fiscal decentralization. Indeed, since decisions on expenditure can be taken centrally, but executed at the local level, the fiscal decentralization ratio might not be fully representative of the overall level of health care system decentralization.

In the second part of the chapter, we therefore decided to correct the endogeneity of the model, running a set of two-stage least square regressions. Consequently, we had to adopt a set of relevant instrumental variables. More specifically, we identified the degree of transfer of powers to local entities ("Accountability and Legislation") and the "Property and Management" of hospitals at the local level. Having a non-quantitative nature, we introduced two dedicated metrics to account for these factors, using as reference for cross-unit and cross-year comparison WHO reports available for all the analyzed countries.

After having checked the goodness of these variables as instruments for fiscal decentralization, we proceeded to the actual two-stage least square estimations. The first stage of the analysis confirmed that our variables are powerful instruments for fiscal decentralization, both taken singularly and jointly. In addition, in the second-stage the

relationship between the instrumented fiscal decentralization and the infant mortality rate came to be negative and statistically significant in all our estimations.
These results suggested that fiscal decentralization can positively affect the quality of the health care system only when is in place a certain degree of delegation of accountability and managerial powers towards local authorities.

To conclude, the contribution of this chapter is twofold. First, we showed that decentralization in health-care is a complex set of policy, which cannot be synthetized with the increase of the ratio between local and total expenditure. Second, we obtained that the delegation of accountability and managerial powers to local authorities is an essential prerequisite for public expenditure to have a positive impact on the quality of public health. Indeed, if these conditions are not verified, the mere fiscal decentralization was shown not to have direct significant impacts on reducing the infant mortality rate. Hence, within this framework fiscal decentralization would result in a mere transfer of spending powers from central to local governments.

The aim of Chapter 2 was to study the impact of the local authorities' purchase centralization on their total expenditure, by adopting a counterfactual empirical approach. More specifically, we studied the impact of the introduction of "Centrali Uniche di Acquisto" (i.e., Central Purchasing Bodies) on all the Italian local hospitals' expenditure, over the period 2001-2012, using a difference in difference model. Our contribution with this chapter is twofold. On the one hand, we extended the policy impact evaluation approach based on counterfactual methods from aggregation of local authorities to purchase centralization policies, which have been less studied in literature. On the other hand, we provided and empirical measure of this impact for the health care sector in Italy, which has not been estimated so far.

In the first part of the chapter, we constructed the premises for the following empirical analysis. Hence, after having identified the year of the introduction of CPBs within the Italian regional health-care systems, we produced a treatment variable describing whether a local hospital was operating or not within a Region where a health CPB was introduced. Moreover, we built our dependent variable (i.e., health expenditure) using as source the local hospitals' official balance-sheets.

In the second part of the chapter, after having checked its statistical requirements (i.e., the common trend assumption), we adopted the difference-in-difference model to identify the causal effect of the introduction of regional CPBs operating in the health-care system (represented by the treatment variable) on health expenditure (our dependent variable). Our main finding is that where the local hospital is supplied through a regional CPB, its per capital total expenditure is reduced to a range of 3-4%, according to different specifications of the model. In particular, this reduction is mainly driven by one sub-category of expenditure, that is health services expenditure which includes for instance medical and other professional consultancies in the health sector. Conversely, we have not found any significant impact on other sub-categories of expenditure (health goods, non-health goods and non-health services) provided by the introduction of CPBs. In addition, we obtained that the introduction of CPBs was not associated to a significant downsizing of local health services provided to the population, suggesting that the health expenditure reduction was not achieved renouncing to an adequate quality of the health care system. Our main results are confirmed by robustness test on the inclusion of a dummy accounting for aggregation of hospital as control variable, which confirmed that the purchase centralization keeps having a role in health expenditure reduction even controlling for the mergers of local hospitals.

In Chapter 3 we conducted the impact evaluation of 1974 Budget Act, one of the most relevant reforms in budget definition and authorization in the history of the U.S. In that historical context, the first objective of this reform required by the President was to contain the share of public spending under the Congress approval. Although the data suggests an increase in public spending and debt after 1974, the impact of this reform has never been fully addressed from a counterfactual perspective. In order to fill this gap, in this chapter we aimed to answer the question of what would happen to public spending and debt if the 1974 Budget Act had never been approved.

The first part of the chapter was devoted to the analysis of the features, goals and historical contextualization of the Act. From the review of the literature of the time, it emerged that the introduction of the Budget Act was above all a political compromise between the President and the Congress: on the one hand, President Nixon aimed to limit public spending of the Congress and, on the other hand, the Congress wanted to operate by

minimizing the interference of the Government. Nonetheless, in this work we focused our discussion on the reform's effects on public finance outcomes.

Therefore, in the second part of the chapter we discussed the impact of the reform on public spending and debt, adopting a synthetic control model to understand what would have happened to public spending and debt without the 1974 Budget Act. First, we identified the pool of possible donors for the reference comparison unit among those OECD countries which had not adopted similar reforms around 1974. Second, using some demographic variables as predictors, we obtained from the donor pool a synthetic control closely reproducing the U.S. real performance in terms of public spending and debt before 1974. Third, we used the "synthetic U.S." as a reference for comparison to the real treated unit, in order to test whether a discrepancy in the outcome variable (spending or debt) after the intervention occurred. If that would have been the case, this result could have been interpreted as the effect of the intervention itself.

Our synthetic control analysis suggested that both public debt and public spending increased after 1974 in the eight years after its introduction, but less than what would have happened without the Act. This result survived a set of robustness tests: in particular, both the geographical and the chronological placebo tests conducted for public debt and spending did not show significant results. Hence, these findings further confirmed that the immediate impact of the Act was to reduce U.S. spending and debt with respect to the case the Act had not been approved, even though U.S. spending and debt were increasing in absolute terms.

Reference Chapter 1

Ahlin, Å., & Mörk, E. (2008). Effects of decentralization on school resources. Economics of Education Review, 27(3), 276-284.

Akin, J. S., Hutchinson, P., & Strumpf, K. S. (2001). Decentralization and government provision of public goods: the public health sector in Uganda. USAID.

Alexa, J., Recka, L., Votapkova, J., van Ginneken, E., Spranger, A., & Wittenbecher, F. (2015). Czech Republic: Health System Review. Health systems in transition, 17(1), 1-165.

Albreht, T., Brinovec, R. P., Jošar, D., Poldrugovac, M., Kostnapfel, T., Zaletel, M., ... & Maresso, A. (2016). Health systems in transition. *Health, 18*(3).

Albreht, T., Turk, E., Toth, M., Ceglar, J., Marn, S., Brinovec, R. P., & Schäfer, M. (2009). Health Systems in Transition.

Anell, A., Glenngard, A. H., & Merkur, S. M. (2012). Sweden: Health system review. *Health systems in transition*, *14*(5), 1-159.

Angrist, J. D., & Imbens, G. W. (1995). Two-stage least squares estimation of average causal effects in models with variable treatment intensity. *Journal of the American statistical Association*, 90 (430), 431-442.

Angrist, J. D., & Krueger, A. B. (2001). *Instrumental variables and the search for identification: From supply and demand to natural experiments.* National Bureau of Economic Research, 2001.

Antón, J. I., De Bustillo, R. M., Macías, E. F., & Rivera, J. (2014). Effects of health care decentralization in Spain from a citizens' perspective. *The European Journal of Health Economics, 15*(4), 411-431.

Apostolov, M., & Ivanova, P. (1998). History of medicine and nursing. *Sofia: Gorex Press*.

Aslam, G., & Yilmaz, S. (2011). Impact of decentralization reforms in Pakistan on service delivery—An empirical study. *Public Administration and Development*, *31*(3), 159-171.

Azzopardi Muscat, N., Calleja, N., Buttigieg, S., & Merkur, S. (2017). Malta: Health system review. *Health Systems in Transition, 19*(1), 1-137.

Azzopardi, M. N., Calleja, N., Calleja, A., & Cylus, J. (2013). Malta: Health system review. *Health systems in transition*, *16*(1), 1-97.

Bambra, C. (2006). Health status and the worlds of welfare. *Social Policy and Society, 5*(1), 53-62.

Barros, P. P., de Almeida Simões, J., Allin, S., & Mossialos, E. (2007). Health systems in transition. *Health*, *9*(5).

Belcher, P., Busse, R., Figueras, J., Holland, W., Le Grand, J., Lessof, S., ... & Palm, W. (2015). Senior Editorial Team. *Eurohealth*, *21*(2).

Bergman, S. E. (1998). Swedish models of health care reform: a review and assessment. *The International journal of health planning and management*, 13(2), 91-106.

Bjørnskov, C., Drehe, A., & Fischer, J. A. (2008). On decentralization and life satisfaction. *Economics Letters*, *99*(1), 147-151.

Bossert, T. J., & Mitchell, A. D. (2011). Health sector decentralization and local decision-making: decision space, institutional capacities and accountability in Pakistan. *Social Science & Medicine*, *72*(1), 39-48.

Boyle, S. (2011). *Health Systems in Transition: United Kingdom (England): Health System Review*. European Observatory on Health Systems and Policies.

Bordignon, M., & Turati, G. (2009). Bailing out expectations and public health expenditure. *Journal of health economics, 28*(2), 305-321.n

Brinkerhoff, D. W. (2004). Accountability and health systems: toward conceptual clarity and policy relevance. *Health policy and planning*, 19(6), 371-379.

Bryndová, L., Pavlokova, K., Roubal, T., Rokosova, M., & Gaskins, M. (2009). Czech Republic. *Health system review. Health systems in transition, 11*(1).

Busse, R., & Blumel, M. (2014). Germany: Health System Review, European Observatory on Health Systems and Policies. *Health Systems in Transition*, *16*(2), 1-296.

Busse, R., & Riesberg, A. (2004). Health care systems in transition: Germany.

Cantarero, D., & Pascual, M. (2008). Analyzing the impact of fiscal decentralization on health outcomes: empirical evidence from Spain. *Applied Economics Letters*, 15(2), 109-111.

Cavalieri, M., & Ferrante, L. (2016). Does fiscal decentralization improve health outcomes? Evidence from infant mortality in Italy. *Social Science & Medicine, 164*, 74-88.

Chevreul, K., Brigham, B., Durand-Zaleski, I., & Hernández-Quevedo, C. (2015). France: health system review 2015. *Health systems in transition, 17*(3), 1-218.

Chevreul, K., Durand-Zaleski, I., Bahrami, S., Hernández-Quevedo, C., & Mladovsky, P. (2010). Health system review. *Erasmus*, *12*, 93-103.

Committee of the Regions of the European Union (2012). The management of health systems in the EU Member States - The role of local and regional authorities.

Corens, D., Merkur, S., Jemiai, N., Palm, W., & World Health Organization. (2007). Health systems in transition: Belgium: health system review.

Cylus, J., Richardson, E., Findley, L., Longley, M., O'Neill, C., & Steel, D. (2015). Health Systems in Transition. *Health, 17*(5).

de Almeida, S. J., Figueiredo, A. G., Fronteira, I., & Hernandez-Quevedo, C. (2017). Portugal: Health System Review. *Health systems in transition, 19*(2), 1.

De Mello Jr, L. R. (2004), Can fiscal decentralization strengthen social capital?. *Public Finance Review*, 32(1), 4-35.

De Mello Jr, L. R. & Barenstein, M. (2001), Fiscal Decentralisation and Governance: A Cross-Country Analysis. *IMF Working Paper No. 01/71*, Fiscal Affairs Department.

Dimova, A., Rohova, M., Moutafova, E., Atanasova, E., Koeva, S., Panteli, D., & van Ginneken, E. (2012). Health Systems in Transition. *Health*, *14*(3).

Ebel, R., & Yilmaz, S. (2001). Fiscal decentralization: Is it happening? How do we know?. In *Conference in Honor of Richard Bird, Conference at Georgia State University, Atlanta, April* (pp. 4-6).

Economou C. (2010). Greece: Health system review. Health Systems in Transition, 12(7):1–180.

Enikolopov, R., & Zhuravskaya, E. (2007). Decentralization and political institutions. *Journal of public economics, 91*(11), 2261-2290.

Faguet, J. P., & Sanchez, F. (2008). Decentralization's effects on educational outcomes in Bolivia and Colombia. *World Development*, *36*(7), 1294-1316.

Fan, C. S., Lin, C., & Treisman, D. (2009). Political decentralization and corruption: Evidence from around the world. *Journal of Public Economics*, 93(1), 14-34.

Ferré, F., de Belvis, A. G., Valerio, L., Longhi, S., Lazzari, A., Fattore, G., ... & Maresso, A. (2014). Italy: Health system review.

Ferrè, F, Cuccurullo, C, and Lega, F. "The challenge and the future of health care turnaround plans: evidence from the Italian experience." *Health Policy* 106.1 (2012): 3-9.

Fisman, R., & Gatti, R. (2002). Decentralization and corruption: evidence across countries. *Journal of Public Economics, 83*(3), 325-345.

Gaàl, P., Szigeti, S., Csere, M., Gaskins, M., & Panteli, D. (2010). Hungary health system review. *Health Systems in Transition*, *13*(5), 1-266.

Gaál, P. (2004). Health care systems in transition: Hungary.

García-Armesto, S., Abadía-Taira, M. B., Durán, A., Hernández-Quevedo, C., & Bernal Delgado, E. (2010). Spain: Health system review. Health Systems in Transition, 2010, 12 (4): 1–295. *World Health Organization*.

Garman, C., Haggard, S., & Willis, E. (2001). Fiscal decentralization: A political theory with Latin American cases, *World Politics*, 53(2), 205-236.

Georgieva, L., Salchev, P., Dimitrova, R., Dimova, A., Avdeeva, O., & World Health Organization. (2007). Health systems in transition: Bulgaria: health system review.

Gerkens, S., & Merkur, S. (2010). Belgium: Health system review. *Health Systems in Transition*, *12*(5), 1-266.

Golna, C., Pashardes, P., Allin, S., Theodorou, M., Mossialos, E., Merkur, S., & World Health Organization. (2004). Health care systems in transition: Cyprus.

Grindle, M. S. (2007). Going local: decentralization, democratization, and the promise of good governance. Princeton University Press.

Habibi, N., Huang, C., Miranda, D., Murillo, V., Ranis, G., Sarkar, M., & Stewart, F. (2003). Decentralization and human development in Argentina. *Journal of Human Development*, 4(1), 73-101.

Häkkinen, U., & Lehto, J. (2005). Reform, change, and continuity in Finnish health care. *Journal of Health Politics, Policy and Law*, *30*(1-2), 79-96.

Hansjörg, B., & Junghun, K. (Eds.). (2016). Fiscal Federalism 2016: Making Decentralisation Work. OECD Publishing.

Hofmarcher, M. M., Rack, H. M., Röhrling, G., & Riesberg, A. (2013). Health Systems in Transition. *Health*, *15*(7).

Hofmarcher, M. M., Rack, H., Riesberg, A., & World Health Organization. (2006). Health care systems in transition: Austria 2006.

Hooghe, L., Marks, G. N., & Schakel, A. H. (2010). *The rise of regional authority: A comparative study of 42 democracies*. Routledge.

Järvelin, J., Rico, A., Cetani, T., & World Health Organization. (2001). Health care systems in transition: Finland.

Jervis, P., & Plowden, W. (2003). The impact of political devolution on the UK's health services. *London: The Nuffield Trust*.

Jimenez, D., & Smith, P. C. (2005). Decentralisation of health care and its impact on health outcomes. *Discussion Papers in Economics*, *10*.

Jiménez-Rubio, D., & García-Gómez, P. (2017). Decentralization of health care systems and health outcomes: Evidence from a natural experiment. *Social Science & Medicine, 188*, 69-81.

Jimenéz-Rubio, D. (2011.a). The impact of decentralization of health services on health outcomes: evidence from Canada. *Applied Economics*, *43*(26), 3907-3917.

Jiménez-Rubio, D. (2011.b). The impact of fiscal decentralization on infant mortality rates: Evidence from OECD countries. *Social Science & Medicine*, *73*(9), 1401-1407.

Jommi, C., & Fattore, G. (2003). Regionalization and drugs cost-sharing in the Italian NHS. *Euro Observer*, 5(3), 1-4.

Khaleghian, P. (2004). Decentralization and public services: the case of immunization. *Social Science & Medicine*, *59*(1), 163-183.

Koppel, A., Kahur, K., Habicht, T., Saar, P., Habicht, J., & van Ginneken, E. (2008). *Health Systems in Transition: Estonia: Health System Review*. European Observatory on Health Systems and Policies.

Koulaksazov, S., Todorova, S., Tragakes, E., & Hristova, S. (2003). *Health care systems in transition: Bulgaria*. European Observatory on Health Care Systems.

Kristiansen, S., & Santoso, P. (2006). Surviving decentralisation?: Impacts of regional autonomy on health service provision in Indonesia. *Health Policy*, *77*(3), 247-259.

Kroneman, M., Boerma, W., van den Berg, M., Groenewegen, P., de Jong, J., & van Ginneken, E. (2016). Netherlands: Health System Review. *Health systems in transition, 18*(2), 1-240.

Lai, T., Habicht, T., Kahur, K., Reinap, M., Kiivet, R., & van Ginneken, E. (2012). Estonia: health system review. *Health systems in transition*, *15*(6), 1-196.

Lo Scalzo, A., Donatini, A., Orzella, L., Profili, S., Cicchetti, A., & Maresso, A. (2009). Health systems in transition: Italy: Health system review 2009. *In Health systems in transition: Italy: Health system review 2009*.

Mahal, A., Srivastava, V., & Sanan, D. (2000). *Decentralization and public sector delivery of health and education services: The Indian experience* (No. 20). ZEF discussion papers on development policy.

Martinez-Vazquez, J., & McNab, R. M. (2003). Fiscal decentralization and economic growth. *World development*, *31*(9), 1597-1616.

Martinez-Vazquez, J., Lago-Peñas, S. & Sacchi, A. (2016). The impact of fiscal decentralization: A survey. *Journal of Economics Surveys*.

McDaid, D., Wiley, M., Maresso, A., & Mossialos, E. (2009). Health systems in transition Ireland: health system review.

Mitchell, A., & Bossert, T. J. (2010). Decentralisation, Governance and Health-System Performance:'Where You Stand Depends on Where You Sit'. *Development Policy Review*, *28*(6), 669-691.

Mitenbergs, U., Taube, M., Misins, J., Mikitis, E., Martinsons, A., Rurane, A., & Quentin, W. (2012). Health Systems in Transition. *Health*, *14*(8).

Oates, W. E. (1999). An essay on fiscal federalism. *Journal of economic literature*, *37*(3), 1120-1149.

Olejaz, M., Juul, A., Rudkjøbing, A., Birk, H. O., & Krasnik, A. (2012). *Denmark: Health system review: health systems in transition*. World Health Organization.

Parente, P. M., & Silva, J. S. (2012), A cautionary note on tests of overidentifying restrictions, *Economics Letters*, 115(2), 314-317.

Persson, T., & Tabellini, G. (2000) Political Economics: Explaining Economic Policy, MIT Press, Cambridge, MA.

Prieto, D. C., & Lago-Peñas, S. (2012). Decomposing the determinants of health care expenditure: the case of Spain. *The European Journal of Health Economics*, *13*(1), 19-27.

Reayat, N., Ahmad, I., Khalil, J., & Rahim, T. (2014). *Fiscal decentralisation and its effects on the health sector in Pakistan* (No. 2014-16). Economics Discussion Papers.

Reidpath, D. D., & Allotey, P. (2003). Infant mortality rate as an indicator of population health. *Journal of Epidemiology & Community Health, 57*(5), 344-346.

Robalino, D. A., Picazo, O. F., & Voetberg, A. (2001). *Does Fiscal Decentralization Improve Health Outcomes?* (Vol. 2565). World Bank Publications.

Rodriguez-Pose, A., & Ezcurra, R. (2009). Does decentralization matter for regional disparities? A cross-country analysis. *Journal of Economic Geography*, 10(5), 619-644.

Rondinelli, D. A., McCullough, J. S., & Johnson, R. W. (1989). Analysing decentralization policies in developing countries: a political-economy framework. *Development and change, 20*(1), 57-87.

Saltman, R., Bankauskaite, V., & Vrangbaek, K. (2007). *Decentralization in health care, European observatory on health systems and policies series*.

Saltman, R., & Bankauskaite, V. (2006). Conceptualizing decentralization in health care systems: a functional perspective. *Health Economics, Policy and Law*, 1(2), 127-147.

Saltman, R., Busse, R., & Figueras, J. (2006). *Decentralization in health care: strategies and outcomes*. McGraw-Hill Education (UK).

Schaffer, M. (2010). Xtivireg2: stata module to perform extended iv/2sls, gmm and ac/hac, liml and k-class regression for panel data models. Statistical software components, Boston College, Department of Economics.

Schäfer, W., Kroneman, M., Boerma, W., Berg, M. V. D., Westert, G., Devillé, W., & Ginneken, E. V. (2010). The Netherlands: health system review. *Health systems in transition*, *12*(1), xxvii-1.

Seabright, P. (1996). Accountability and decentralisation in government: An incomplete contracts model. *European economic review, 40*(1), 61-89.

Smatana, M., Pazitny, P., Kandilaki, D., Laktisova, M., Sedlakova, D., Paluskova, M., ... & Spranger, A. (2016). Slovakia: Health System Review. *Health systems in transition, 18*(6), 1.

Strandberg-Larsen, M., Nielsen, M. B., Vallgårda, S., Krasnik, A., Vrangbæk, K., & Mossialos, E. (2007). Health systems in transition. *Health, 14*(2), 1-164.

Szalay, T., Pazitný, P., Szalayova, A., Frisova, S., Morvay, K., Petrovic, M., & van Ginneken, E. (2010). Slovakia health system review. *Health Systems in Transition*, *13*(2), v-xxiii.

Theodorou, M., Charalambous, C., Petrou, C., & Cylus, J. (2012). Health Systems in Transition. *Cyprus: World Health Organization on behalf of the European Observatory on Health Systems and Policies*.

Tragakes, E., Brigis, G., Karaskevica, J., Rurane, A., Stuburs, A., Zusmane, E., ... & World Health Organization. (2008). Health systems in transition: Latvia: health system review.

Tselios, V., Rodriguez-Pose, A., Tomaney, J., Torrisi, G. (2012). Income inequality, decentralisation, and regional development in Western Europe. *Environment and Planning A*, 44(6), 1278-1301.

Uchimura, H., & Jütting, J. P. (2009). Fiscal decentralization, Chinese style: good for health outcomes?. *World Development*, *37*(12), 1926-1934.

Villela, L. (2004) 'Fiscal Decentralization in Latin America and the Caribbean' in I. Licha (ed.)*, Citizens in Charge: Managing Local Budgets in East Asia and Latin America*. Washington, DC: Inter-American Development Bank.

Vlădescu, C., Scîntee, G., Olsavszky, V., Allin, S., & Mladovsky, P. (2008). Romania: Health system review. *Health systems in transition*, *10*(3), 1-172.

Vlădescu, C., Scîntee, S. G., Olsavszky, V., Hernández-Quevedo, C., & Sagan, A. (2016). Romania: Health system review. *Health systems in transition, 18*(4), 1-170.

Vuorenkosky, L., Mladovsky, P., & Mossialos, E. (2008). Finland: Health system review. *Health systems in transition*, *10*(4), 1-168.

Yee, E. (2001). The Effects of Fiscal Decentralization on Health Care in China. *University Avenue Undergraduate Journal of Economics*, *5*(1), 5.

Zhang, T., & Zou, H. F. (1998). Fiscal decentralization, public spending, and economic growth in China. *Journal of public economics*, 67(2), 221-240.

Reference Chapter 2

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., & Vandenbempt, 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.

Talosaga, T., & Vink, M. (2014). *The effect of public pension eligibility age on household saving: evidence from a New Zealand natural experiment* (No. 14/21). New Zealand Treasury.

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.

Reference Chapter 3

Abadie, A., Diamond, A., & Hainmueller, J. (2010). Synthetic control methods for comparative case studies: Estimating the effect of California's tobacco control program. Journal of the American statistical Association, 105(490), 493-505.

Abadie, A., Diamond, A., & Hainmueller, J. (2015). Comparative politics and the synthetic control method. American Journal of Political Science, 59(2), 495-510.

Abadie, A., & Gardeazabal, J. (2003). The economic costs of conflict: A case study of the Basque Country. The American Economic Review, 93(1), 113-132.

Abbas, S., Belhocine, N., ElGanainy, A. A. & Horton, M. A., (2010). A historical public debt database. International Monetary Fund.

Ballart, X., & Zapico, E. (2010). 11. Budget reforms in Spain: anything else beyond budget discipline?. The Reality of Budgetary Reform in OECD Nations: Trajectories and Consequences, 240.

Baumgartner, F. R., & Jones, B. D. (1993). Agendas and instability in American politics. University of Chicago Press.

Congress, U. S. Joint Committee on the Organization of Congress. 1993. In Background Materials: Supplemental Information Provided to Members of the Joint Committee on the Organization of Congress (Vol. 103, pp. 103-55).

Duncan, D. R., Mikesell, J. L., & Ross, J. M. (2015). Does the Federal Budget Process Promote Fiscal Sustainability?. Unpublished manuscript, Indiana University.

Dodd, L. C. (1994). Political learning and political change: Understanding development across time (pp. 331-64). Boulder: Westview Press.

Ellwood, J. W. (1983). The great exception: the congressional budget process in an age of decentralization: 'in LC Dodd and BI Oppenheimer (eds.), Congress Reconsidered, Washington, DC: Congressional Quarterly Press.

Fisher, L. (1982). The Budget Act of 1974: Its impact on spending. In paper delivered at the Conference on the Congressional Budget Process, Carl Albert Congressional Research and Studies Center, University of Oklahoma, (pp. 12-13).

Good, D. A., & Lindquist, E. (2010). Discerning the consequences and integrity of Canada's budget reforms: A story of remnants and resilience. The Reality of Budgetary Reform in OECD Nations: Trajectories and Consequences, 91-121.

Hawke, L., & Wanna, J. (2010). Australia after budgetary reform: a lapsed pioneer or decorative architect?. The reality of budgetary reform in OECD nations: Trajectories and consequences, 65-90.

Hogan, J. J. (1985). Ten years after: The US congressional budget and impoundment control act of 1974. Public Administration, 63(2), 133-149.

Jensen, L., & Fjord, D. (2010). Budget reforms in Denmark: Unheralded but nevertheless effective. The Reality of Budgetary Reform in OECD Nations: Trajectories and Consequences, 193-220.

Jones, B. D., Baumgartner, F. R., & True, J. L. (1998). Policy punctuations: US budget authority, 1947-1995. The Journal of Politics, 60(1), 1-33.

Jones, L. R., Candreva, P. J., & DeVore, M. R. (2011). Financing national defense: Policy and process. IAP.

Kamlet, M. S., & Mowery, D. C. (1985). The first decade of the Congressional Budget Act: Legislative imitation and adaptation in budgeting. Policy Sciences, 18(4), 313-334.

Kiewiet, D. R., & McCubbins, M. D. (1991). The logic of delegation. University of Chicago Press.

LeLoup, L. T. (1980). The first half-decade: Evaluating congressional budget reforms. The Congressional Budget Process: Some Views from the Inside. St. Louis: Center for the Study of American Business.

Lowe, R. (1997). The Core Executive, Modernization and the Creation of PESC, 1960-64. Public Administration, 75(4), 601-615.

McClelland, R., & Gault, S. (2017). The Synthetic Control Method as a Tool to Understand State Policy.

Organisation for Economic Co-operation and Development. (1995). Budgeting for Results: perspectives on public expenditure management, OECD Publishing.

Perret, B. (2006). De l'échec de la rationalisation des choix budgétaires (RCB) à la loi organique relative aux lois de finances (LOLF). Revue française d'administration publique, (1), 31-41.

Pfiffner, J. P. (1979). The President, the Budget, and Congress: Impoundment and the 1974 Budget Act. Westview Press.

Schick, A. (1980). Congress and Money: Budgeting, Spending and Taxing. Washington DC: American Enterpires Institute, 568-73.

Schick, A. (1995). The Federal Budget: Politics, Process and Policy. Washington, DC: Brookings Institute.

Stolfi, F., Goretti, C., & Rizzuto, L. (2010). 12. Budget reform in Italy: importing 'enlightened'ideas in a difficult context. The Reality of Budgetary Reform in OECD Nations: Trajectories and Consequences, 260.

Thain, C. (2010). Budget Reform in the United Kingdom: The Rocky Road to Controlled Discrection. The Reality of Budget Reform: Counting the Consequences, 11, 35-64.

Wanna, J., Jensen, L., & de Vries, J. (Eds.). (2010). The reality of budgetary reform in OECD nations: Trajectories and consequences. Edward Elgar Publishing.

Appendix to Chapter 1

Appendix 1.1

"Accountability and Legislation" and "Property and Management" of the hospitals the analyzed EU countries

Austria (Hofmarcher, 2013; Hofmarcher and Rack, 2006)

In terms of "Accountability and Legislation", during mid-90's Länders were fully autonomous (Hofmarcher, 2013). However, in 1997 the DRG[21]-based hospital budget allocation introduced a stronger budget control by the Federal central authorities, which sensibly reduced the autonomy of local entities. The push towards a slight re-concentration of powers kept occurring with the 2005 reform: a Federal Health Agency and Federal Health Commission were established at the central level (Hofmarcher and Rack, 2006). Overall, the activities remain highly delegated, but more controls at central level were gradually introduced, with the aim of increasing efficiency.

In terms of "property and management" of the health structures, federal authorities have both the role of administration of the personnel and of monitoring compliance with requirements for medical staff. Moreover, the property of the hospitals mainly belongs to the Länders (Hofmarcher and Rack, 2006).

Belgium (Gerkens and Merkur, 2010)

In terms of "accountability and legislation", Belgium has a historical devolved structure of health system, resulting from revisions of the Constitutions (last one occurring in 1993). However, the federal authorities determine the legislative framework of the health system and define the budgets (Gerkens and Merkur, 2010). Nevertheless, among the other responsibilities, local communities define priorities in terms of investments, inspection and closure of health structures and define accreditation standards for hospitals and for elderly and mental health services. The 2003 "Reform of the Office for Medical Evaluation and

[21] Diagnosis-related groups

Control health" has further increased the level of delegation of powers in the country, since the Government made health care providers individually accountable (Corens, 2007).

Concerning management and property of the hospitals, Belgian public hospitals are mainly owned by a municipality, a province or another local entity (Corens, 2007). Moreover, the management of the activities and the disposal of the available budget is borne by the hospitals themselves, which are fully responsible.

Bulgaria (Dimova et al., 2012; Georgieva et al., 2007; Koulaksazov et al., 2003)

Until the dissolution of the Soviet Union, the Bulgarian health system was completely controlled by the State (Apostolov and Ivanona, 1998). However, from the "Accountability and Legislation" perspective the phenomenon has evolved in a more complex way. In the first 5 years of the 90's some decentralization maneuvers paved the wing road before the 1997 health reform, which abolished the state of monopoly in the health system, reintegrating the private sector (Dimova et al., 2012; Georgieva et al., 2007). However, first in 2002 and then in 2009, two amendments to Health Insurance Act progressively reduced the autonomy of local authorities progressively providing to the government more control over the activities of the hospitals (Dimova et al., 2012).

The ownership of hospitals belongs to local authorities - and not to the central state - since 1998, as a result of "Health care Establishment Act". The management of the health facilities, after an initial phase of State direct control (until 1996) has been delegated due to an amendment to the "Law on Health" of 1997 (Koulaksazov et al., 2003) and then re-concentrated at the central level with the 2002 reform (Georgieva et al., 2007).

Cyprus (Theodorou et al., 2012)

For organizational reasons, mainly dictated by geography, Cyprus is a country in which the delegation of powers is not applicable (Theodorou et al., 2012). Nevertheless, from an administrative point of view, the strategic plan 1999-2003 has introduced a minimum level of accountability to the districts (Golna et al., 2004), though not changing the overall structure.

Regarding “Property and Management” of the health structures, the central State owns the majority of the hospitals. The hospital management directly reports to the central authorities, despite the attempt of 2007 to approve the “National Reform Programme of Cyprus” which should have entrusted a local legal entity other than the Government to manage hospitals. However, the delayed implementation of the reform is not driving a real delegation of powers within the health system (Theodorou et al., 2012).

Czech Republic (Alexa et al., 2015; Bryndová et al., 2009)

The health care system of the Czech Republic has undergone some major changes over the analyzed period. From the “accountability and legislation” point of view, until the end of the 90s the system was mixed: neither delegation nor concentration policies prevailed (Alexa et al., 2015). A major change occurred in 2003 when it was created a system with 14 regional governments which replaced the former districts directly controlled by the central state (Bryndová et al., 2009). This “light” delegation process, which had minor effects from a political point of view in terms of accountability of the decisions on the health system, conversely showed significant effects on the administrative level. Indeed, the ownership of hospitals moved at the local level (regions and, for smaller facilities, municipalities), as well it did the management (Alexa et al., 2015).

Denmark (Olejaz et al., 2012; Strandberg-Larsen et al., 2007)

On the political-institutional side, the Danish health care system is oriented toward delegation of powers to local authorities (Strandberg-Larsen et al., 2007): the counties and the municipalities have responsibility for the budget and for the coordination of the plans for the health care services, although always under the supervision of the central state authority. In 2007 an administrative reform structurally changed the administrative apparatus of the country, replacing the previous Counties with five regions and reducing the number of municipalities from 271 to 98 (Olejaz et al., 2012). The new allocation of responsibility is a clear push towards concentration of powers to the central authority, even though accountability and powers mostly remain under local authorities.

With regard to the administrative structure, the management of hospitals is the responsibility of the local authorities, with the exception of a few "National Hospital"

called "Rigshospitalet" which are centrally managed (Strandberg-Larsen et al., 2007). Moreover, generalist hospitals are also owned by local authorities, in particular, Counties before and regions after 2007 (Olejaz et al., 2012).

Estonia (Lai et al., 2013; Koppel et al., 2008)

In political terms, Estonia's health system has changed considerably during the last three decades. The early 90s were interested by several reforms with a significant degree of delegation (Koppel et al., 2008). However, in 1994 with the establishment of the Central Sickness Fund it began a period of progressive re-concentration of responsibilities. This process had also a gradual acceleration during the 90's and with the last 2012 health reform (Lai et al., 2013).

Concerning the administration of hospitals, the ownership belongs to the central state until 2000 (Koppel et al., 2008). However, since 2001 most hospitals moved under the responsibility of the local authorities. The management of health structures is centralized on the National Health Board. However, since 2008, an amendment of the Health Services Organization Act provided the municipalities the right to manage the movement of family doctors at the local level, de facto attributing to local authorities the management of hospitals (Lai et al., 2013).

Finland (Vuorenkoski, 2008; Järvelin, 2001)

Finland is a country whose health care system is delegation of powers is mainly due to the large size of the territory, which is also sparsely populated, whose inhabited centers are distant one from each other (Vuorenkoski, 2008). Häkkinen and Lehto (2005) argue that public accountability in Finland is probably the most delegated worldwide. Municipalities are responsible for organizing, providing and financing health services for residents of local communities (Järvelin, 2001). Since 2005 the Ministry of Social Affairs and Health provides nationwide guidelines, based on a change in legislation. However, this reform did not affect the highly delegated structure of the Finnish health care system (Vuorenkoski, 2008).

Concerning the administrative aspects, in Finland public hospitals are mostly owned by local districts (Vuorenkoski, 2008). In addition, their management to municipal level is a

primary responsibility of the health facility itself, as required by the Primary Health Care Act (Järvelin, 2001).

France (Chevreul et al., 2015; Chevreul et al., 2010)

France is a country that has shown a form of "reluctance" towards political and administrative delegation, also in the health sector (Chevreul et al., 2015). However, the central authority granted a certain form of autonomy to Regions in 90s by creating the regional authority called "*Agence régionale de l'hopitalisation*" (Regional Hospital Agency), which in 1996 took the responsibility of hospital capacity planning from the State, and of the "*Direction Régionale des Affaires Sanitaires et Sociales*" (Regional Directorate of Health and Social Affairs), which were thought as subsidiaries of the Ministry of Health at the regional level, having responsibilities on budget allocations to hospitals (Chevreul et al., 2010). A further slight boost in delegation of powers is the introduction of the "*Groupement Régional de Santé Publique*" (Regional Public Health Group) in 2004, which was chaired by the Regional Prefect (a State official) and oversaw the design and implementation of public health planning (Chevreul et al., 2010). It follows that, despite an attempt to give broader accountability to local authorities, the control of the health system is de facto concentrated within the central authority

From an administrative point of view, public hospitals are owned by the government, while the management is local responsibility since 2003. Indeed, by the ordinance n. 2003-850 the authorizations for hospital activities and the sourcing of medical material were delegated to local authorities (Chevreul et al., 2010). In 2009 the management control of hospitals was further granted to local authorities with the "Hospital, Patients, Health and Territories Act" which created regional health agencies to improve the quality of care and to modernize the organization of hospitals (Chevreul et al., 2015).

Germany (Busse and Blumel, 2014; Busse and Riesberg, 2004)

In terms of legislation and accountability, the peculiar German federalism implies a relative degree of delegation of powers (Busse and Blumel, 2014). Indeed, on the one side the overall powers wielded by the *Länder* within the federal state represent an example of devolution of powers, despite in recent years *Länder* have passed back to federal

government some powers and responsibilities in the health care management. Conversely, on the other side, decentralization of the German system is based on the delegation of the government to corporatist institutions, which have a mixed nature since are composed of representatives of federal associations at the local level (Busse and Riesberg, 2004).

From the organizational point of view, the ownership and management of the hospitals belongs to *Länder* and corporatist institutions (Busse and Blumel, 2014; Busse and Riesberg, 2004).

Greece (Economou, 2010)

Greece has a highly concentrated health system from the political and administrative point of views (Economou, 2010).

In legislative terms, the Law 1397 of 1983 introduced in the creation of regional health authorities with delegated powers. However, these regional councils have never become operational and the system has remained completely controlled by the central authority until the late 90s. With the health reforms n. 2889 of 2001 and 3106 of 2003, it began a process of effective delegation of political powers towards the regions, despite the strong control of the central authority, which kept the responsibility to implement the operative proposals. The slow process of delegation of powers has suffered a further setback with law 3329 of 2005 which abolished the previous regulation and reduced the number of local authorities.

On the managerial side, the ownership of public hospitals belongs to the central state (Economou, 2010). Until the 2001 reform the hospitals were also managed centrally. From 2001 to 2005, the local management has enjoyed more autonomy, which was then totally reverted in most recent years (Economou, 2010).

Hungary (Gaál et al., 2011; Gaál, 2004)

Hungary has a mixed health system that has undergone an evolution over the analyzed period (Gaál et al., 2011). At the legislative and accountability level, until the end of the 90s local authorities had a certain level of autonomy: indeed, the National Health Insurance

Fund Administration was controlled by delegation from the Health Insurance Self-Government at the local level. However, in 1998 the delegation was withdrawn, and the central authority has essentially maintained a broad control for other five years (Gaal, 2004). In 2003, the new government gave the opportunity to local authorities to construct and implement regional health plans on a voluntary basis, overall making the system neither centralized nor decentralized. However, in 2007 the regulation of the medical profession was re-concentrated at the central level, when the government abolished compulsory registration for physicians at the Hungarian Medical Chamber (a body to which it had previously delegated discretionary powers) (Gaál et al., 2011). Therefore, today the system is mixed.

Administratively, the ownership of hospitals belongs to local authorities, while the management of the structures has been attributed to the local level in the 1999-2008 period: during this period a pilot project (i.e., "Care Coordination System") was launched, introducing mechanisms to monitor the local health service quality (Gaál et al., 2011). The project was later abandoned in most recent years.

Ireland (McDaid et al., 2009)

In terms of "Accountability and Legislation", during the 1995-2013 period Ireland has re-concentrated to the central authority most of the powers previously delegated to local authorities (McDaid et al., 2009). This phenomenon is due to the Irish government health care reform, approved in 2005, which abolished the Eastern Regional Health Authority and other local agencies, concentrating decision-making and spending in a single National Health Service Executive.

This reform has also had an impact in terms of management of the structures which are centrally managed since 2005, also accordingly to the ownership of the hospitals which is concentrated at the central level (McDaid et al., 2009).

Italy (Ferrè et al., 2014; Lo Scalzo et al., 2009)

Due to the constitutional structure which provides Regions with specific spending powers, including in health matters, Italy has always strongly delegated powers in the health system at the local level (Ferrè et al., 2014). The Constitutional reform of 2001 set a "quasi-

federal" institutional structure (Ferrè et al., 2014). However, in 2004 a set of legislative measures have included compulsory financial recovery plans, to be implemented in case of financial imbalances, which are defined and monitored by the central authorities (Ferrè et al., 2012), though not changing the overall structure of delegated powers.

From the administrative point of view, in the analyzed period, the property of the health structures always belonged to the local authority (i.e., "Regioni") which also define the management of hospitals and monitor the quality of its performance (Lo Scalzo et al., 2009).

Latvia (Mitenbergs et al., 2012; Tragakes et al., 2008)

Until the beginning of the 90s, in Latvia, a former USSR member, the health system was controlled centrally, while with the dissolution of the Soviet Union, the country has begun a process of delegation of powers to local authorities that has reached its peak in the mid-90s (Tragakes et al., 2008). Over the following years instead there has been a gradual, but steady, re-concentration of powers that led the country into a current condition (Mitenbergs et al., 2012). This path is particularly evident from the legislative point of view. Indeed, in 1997 due to some drawback related to the sudden delegation of powers to local authorities, the 35 local sickness funds were gathered in only eight units. In 2002, these facilities were further concentrated in one State Compulsory Health Insurance Agency. In 2009 purchasing power and pooling functions were re-concentrated in a central authority (i.e., the Health Payment Centre or HPC). Eventually, in 2011 the HPC was also entitled of the implementation of national policies in the health sector.

From the administrative point of view, the hospitals in Latvia have different ownerships depending on the size and the number of patients: the larger ones belong to the central authority, the smaller ones to local authorities (Mitenbergs, 2012). The management of hospitals was governed at the local level up to the reform of 1997 (Tragakes et al., 2008).

Luxembourg (Belcher et al., 2015)

Due to its nature of "city-state", Luxembourg is by definition a country where delegation of power is not applicable. From the legislative point of view, the direct responsible of

citizens' health is the Ministry of Health (Belcher et al., 2015). From the administrative point of view, the hospitals are owned by the State and the management is monitored centrally.

Malta (Azzopardi Muscat et al., 2017; Azzopardi Muscat et al., 2014)

Like Luxembourg, also in Malta political and administrative powers are generally concentrated at the central level (Azzopardi Muscat et al., 2017).

Concerning the "Accountability and Legislation", the responsibility for the health of citizens directly belongs to the Ministry of Health.

With respect to "Property and Management" of the health structures, apart from daily operations, the most relevant managerial decisions are taken centrally, also because the ownership of public hospitals belongs to the central State (Azzopardi Muscat et al., 2014).

the Netherlands (Kroneman et al., 2016; Schäfer et al., 2010)

From the late 80s onwards, the Netherlands has begun a period of delegation of powers within the health system which led the Ministry of Health to play only the role of guarantor and controller of the activities of local authorities (Schäfer et al., 2010). Regarding the "Accountability and Legislation", the system has undergone a process of increasing delegation of powers towards municipalites, marked by the reform known as the "Health Insurance Act" of 2006 and by the "Social Support Act" of 2015 (Krnoneman et al., 2016).

From the administrative point of view, public hospitals are owned by local authorities and are run by locally appointed managers, even though the overall regulation on the operation of hospitals is still centralized (Schäfer et al., 2010).

Portugal (de Almeida Simões et al., 2017; Pita Barros et al., 2011)

From the legislative point of view, the Portoguese health care system was subject to several recent changes towards a certain degree of delegation of powers. One reform of 2005 introduced some elements of entrepreneurship within the activities of hospitals, providing to the Ministry the role of supervisor and evaluator of the results achieved (Pita

Barros et al., 2011). Nevertheless, the hospital budget is defined and allocated mainly on the advice of the central authority, revealing the substantial concentrated nature of the Portuguese system (de Almeida Simões et al., 2017).

From an administrative point of view, hospitals and health facilities are owned by the central authority. Concerning the management of the health structure, whether before 2005 managers were appointed directly by the Ministry, with the 2005 reform a new form of hospital ("*Hospitais EPE*") with a more entrepreneurial structure linked to specific geographic context was introduced (de Almeida Simões et al., 2017).

Romania (Vlădescu et al., 2016; Vlădescu et al., 2008)

Being one of the former Soviet Union countries, until the end of the 90s decision concerning the health-care system in Romania were taken centrally (Vlădescu et al., 2008). Later, it began a slow and still incomplete process of delegation of powers (Vlădescu et al., 2016). With regards to accountability and legislation, the first reform towards delegation of powers passed in 1998 and introduced several actors different from the Ministry, also at the local level, with responsibilities on financing providers. This process continued in 2002 when it was approved a reform which provided the District Health Insurance Fund the role of collecting resources for the district-level health care system, by subtracting the charge from the National Health Insurance Fund, which used to have the same role at the national level (Vlădescu et al., 2008).

Concerning the administrative aspects, public hospitals were state-owned until 2002, when the property was transferred to the local district councils. However, at managerial level, since 1998 the health care reform had introduced a local decision-making layer, to be close to the national level one for the management of health care facilities (Vlădescu et al., 2008).

Slovakia (Smatana et al., 2016; Szalay et al., 2011)

From the legislative and accountability point of view, Slovakia institutional set-up evolved over the years. Indeed, in 1990 the State administration has been delegated by assigning

several powers at the Municipalities level (Smatana et al., 2016). In addition, the process was further boosted in 2002 when it was created a regional intermediate layer with spending powers (Szalay et al., 2011).

From the administrative point of view, since 2003 the ownership of public health structures passed to the autonomous Regions and Municipalities (Smatana et al., 2016). Beside the ownership, even the management's responsibility passed to local authorities: primary care hospitals are managed at the municipal level, while secondary care hospitals at the regional level (Szalay et al., 2011).

Slovenia (Albreht et al., 2016; Albreht et al., 2009)

In Slovenian the health care system is essentially guided centrally. From the accountability and legislation point of view, some maneuvers towards delegation of powers were carried out, without providing significant responsibilities to local administration (Albreht et al., 2016).

Administrative and regulatory functions are allocated at the central level, while at the local level remain the executive functions (Albreht et al., 2009). From the facilities' ownership perspective, most hospitals are controlled by the central state, although some smaller hospitals may have a locally appointed management (Albreht et al., 2016).

Spain (García-Armesto et al., 2010)

From the "Accountability and Legislation" perspective, Spain since the 80s has transferred decision powers from the central authorities to the 17 Autonomous Communities between 1979 and 1981 (García-Armesto et al., 2010). With the 2001 reform (Law 21), however, this process experienced a further boost: indeed, the funding activities were allocated directly to the regions which, for the first time, were able to decide independently their funding (García-Armesto et al., 2010).

From the administrative standpoint, in the analyzed period the management and property of the health structures has always belonged to the local authority, even though most of Spanish hospitals are private (García-Armesto et al., 2010).

Sweden (Anell et al., 2012)

Regarding "Accountability and Legislation", the Swedish local self-government has a long historical tradition in Sweden and operates not only between State and Councils, but also within the Council level (Anell et al., 2012). Even though since 2006 the "Öppna jämförelser" reform introduced a form of comparison between councils at central national level (by the National Board of Health), the system is strongly oriented towards delegation of powers to local authorities.

From the administrative point of view, hospitals are directly owned and operated by county councils (Anell et al., 2012).

the United Kingdom (Cylus et al., 2015; Boyle, 2011)

The health care system in the UK has a mixed nature in terms of decision powers. Overall the system has been relatively centralized until 2007: policy implementations in health matters were local, but only from an organizational and operational point of view, while decisions were essentially taken at the central level, especially in England (Cylus et al., 2015). In 2007 the "Local Government and Public Involvement in Health Act" created the conditions for the need of assessment of the health system, jointly with local authorities (Boyle, 2011). Therefore, currently the system is balanced.

From the administrative point of view, since 1990 hospitals have semi-independent and autonomous bodies which do not directly respond to central authorities. Moreover, the 2003 "Health and Social Care" Act further increased the autonomy of local management (Boyle, 2011).

Appendix to Chapter 2

Appendix 2.1

Evolution of the Italian national and local legal framework for CPBs' adoption from later 90s to 2015

Tab. A.2.1: Evolution of the Italian national and local legal framework for CPBs' adoption from later 90s to 2015 (1/4)

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

Tab. A.2.1: Evolution of the Italian national and local legal framework for CPBs' adoption from later 90s to 2015 (2/4)

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

Tab. A.2.1: Evolution of the Italian national and local legal framework for CPBs' adoption from later 90s to 2015 (3/4)

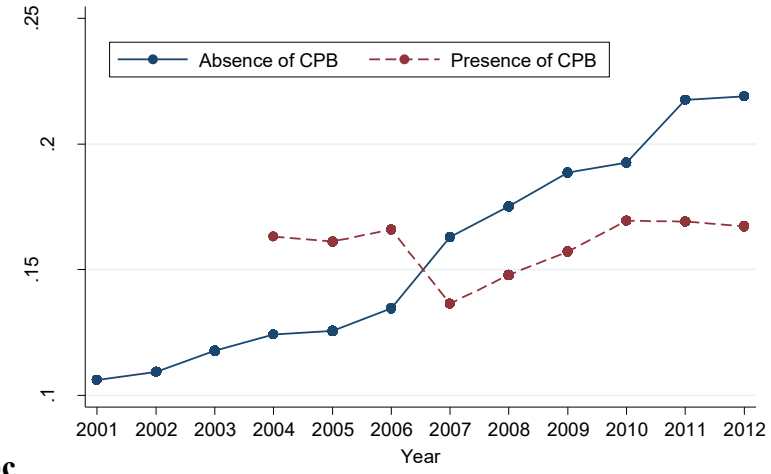
Puglia	1	Empulia	2007	Disciplia per l'utilizzo della piattaforma telematica EmPULIA	Mixed (including health)	Art. 445 L. n.296 - 27/12/2006
	1 (substituting the previous institution)	InnovaPuglia	2014	Art. 20 L. R. n. 37 - 1/08/2014	Mixed (including health)	Art. 9 D.L n. 66 - 2014
	2	Città Metropolitana 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

Tab. A.2.1: Evolution of the Italian national and local legal framework for CPBs' adoption from later 90s to 2015 (4/4)

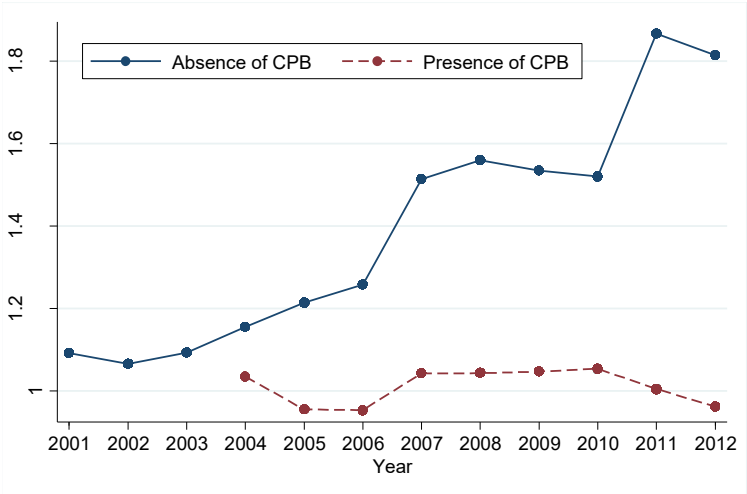
Trento	1	AGENS	2009	Art. 39-bis L.P. n. 3 - 16/06/2006	Non-health	Art. 445 L. n.296 - 27/12/2006
	1 (substituting the previous institution)	APAC	2012	Art. 39-bis L.P. n. 3 - 16/06/2006	Non-health	Art. 445 L. n.296 - 27/12/2006
	1 (changing perimeter of expediture)	APAC	2015	Art. 39-bis L.P. n. 3 - 16/06/2006	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 expediture)	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	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 2.2

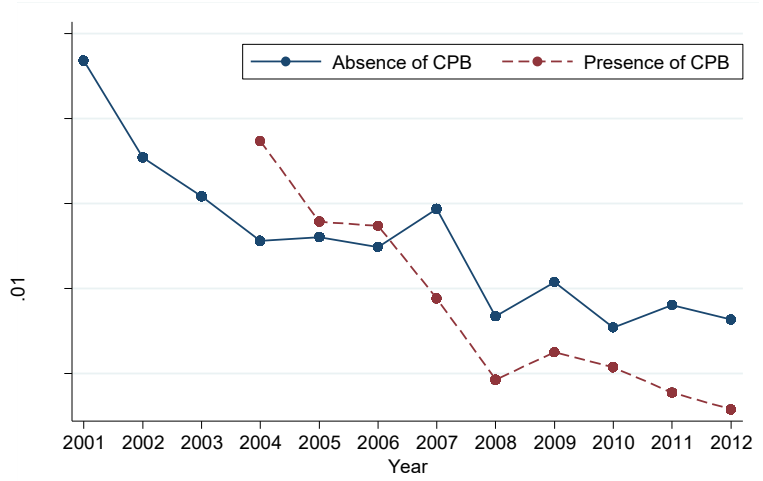
Figure A.2.1: per capita expenditure on health and non-health goods and services by Italian ASLs in the presence or absence of regional CPBs



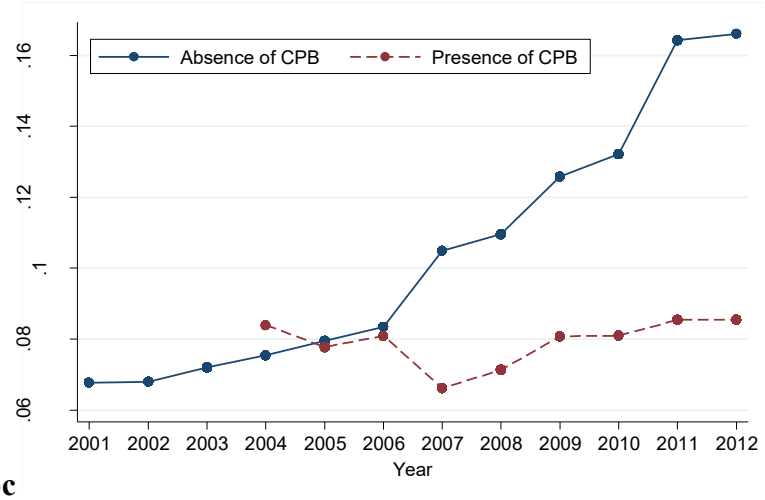
Health Goods pc



Health Services pc



Non-Health Goods pc



Non-Health Services pc

Appendix 2.3

Table A.2.2: 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
	B.1.A) Purchases of health goods	ba0020	B.1.A.1) Pharmaceuticals and blood products	ba0030	B.1.A) Purchases of health goods	b01005	B.1.A.1) Pharmaceuticals and blood products	b01010	B.1.a) Pharmaceuticals aproducts	b0020
			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.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.3.1) Dispositivi medici	ba0220			B.1.A.7) Surgical and medical products	b01040	B.1.f) Surgical and medical products	b0070
			B.1.A.3.3) *In vitro* diagnostic medical devices	ba0240						
			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
	B.1.B) Purchase of non-health goods	ba0310	B.1.B.1) Alimentary products	ba0320	B.1.B) Purchase of non-health goods	b01070	B.1.B.1) Alimentary products	b01075	B.1.j) Alimentary products	b0110
			B.1.B.2) Wardrobe, cleaning and cohabitation materials	ba0330			B.1.B.2) Wardrobe, cleaning and cohabitation materials	b01080	B.1.k) Wardrobe, cleaning and cohabitation materials	b0120
			B.1.B.3) Fuels and lubricants	ba0340			B.1.B.3) Fuels and lubricants	b01085	B.1.l) Fuels and lubricants	b0130
			B.1.B.4) IT supports and stationery	ba0350			B.1.B.4) IT supports and stationery	b01090	B.1.m) IT supports and stationery	b0140
			B.1.B.5) Mantainance materials	ba0360			B.1.B.5) Mantainance materials	b01095	B.1.n) Mantainance materials	b0150
			B.1.B.6) Other non-health goods and products	ba0370			B.1.B.6) Other non-health goods and products	b01100	B.1.o) Other	b0200
			B.1.B.7) Non-health goods by public health authorities of the Region	ba0380			B.1.B.7) Non-health goods by public health authorities of the Region	b01105		

Non-Health Services	2012				2008-2011				2001-2007	
	line	code	sub-line	sub-code	line	code	sub-line	sub-code	line	code
	B.2.B) Purchase of non-health services	ba1560	B.2.B.1) Non-health services	ba1570	B.2.B) Purchase of non-health services	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
	B.2.A) Purchase of health services	ba0400	B.2.A.1) Purchase of health services for primary care	ba0410	B.2.A) Purchase of health services	b02005	B.2.A.1) 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 to Chapter 3

Appendix 3.1

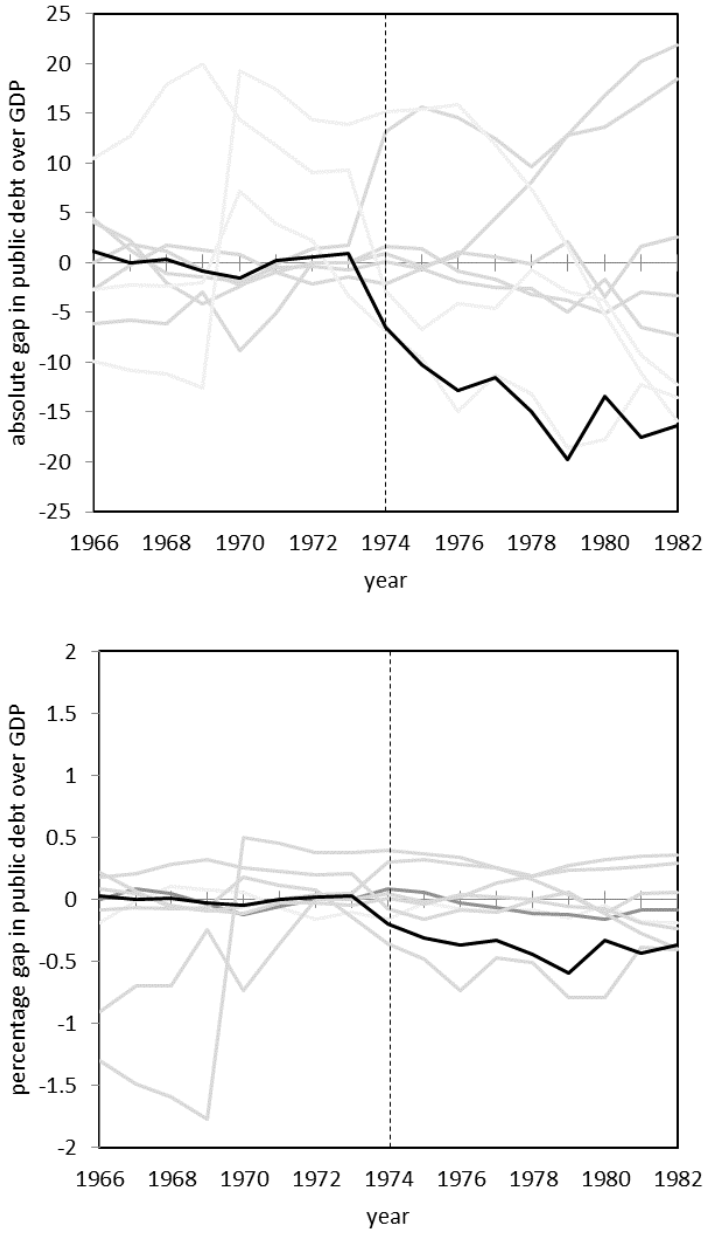
Placebo Tests of the Synthetic Control Model

In this section, we stress test the results of our synthetic control model by conducting a set of "placebo tests" (Abadie et al., 2015), with the goal of analyzing whether our results are statistically significant. We conduct placebo tests following two parallel approaches: geographical and chronological. The geographical placebo tests whether our observed impact of the 1974 Budget Act in the U.S. could also have been obtained by applying the model to the other countries where the reform did not happen and so including U.S. in the donor pool. In the chronological placebo, we test whether the treatment in a different year (say, 1973) would have generated an identical result. We conduct these analyses for both versions of the model (i.e., on public debt and public spending).

3.1.1 Geographical Placebo

We perform this test by running our main synthetic control model on different treated units. In other words, we run the model under the assumption that the reformed country is any of the 8 countries of the donor pool. The included variables and the adopted techniques remain the same, making the analysis fully comparable with the original U.S. model. We compare the correct model with the 8 placebo versions in the following two figures.

Figure A.3.1: Geographical placebo, absolute and percentage gap among the models



Note: The darker line shows the public debt over GDP gap for the USA, while the gray lines show the gap for the constituent countries.

In Figure A.31.1, the absolute and percentage gaps between the synthetic controls and the real public debt-to-GDP are presented. Gray lines represent the placebo models run on each non-U.S. country, while the black line represents the original U.S. model. The trends in Figure A1.1 show that the treatment effect for the U.S. model does not appear strongly different from those of the other countries. In other words, the gaps between the real and synthetic models for the U.S. seem not to be significantly larger than the original model.

However, when we analyze the RMSPE of the countries, the differences between the models becomes starker, as the values estimated for the other countries in the donor pool are much larger than that of the U.S.

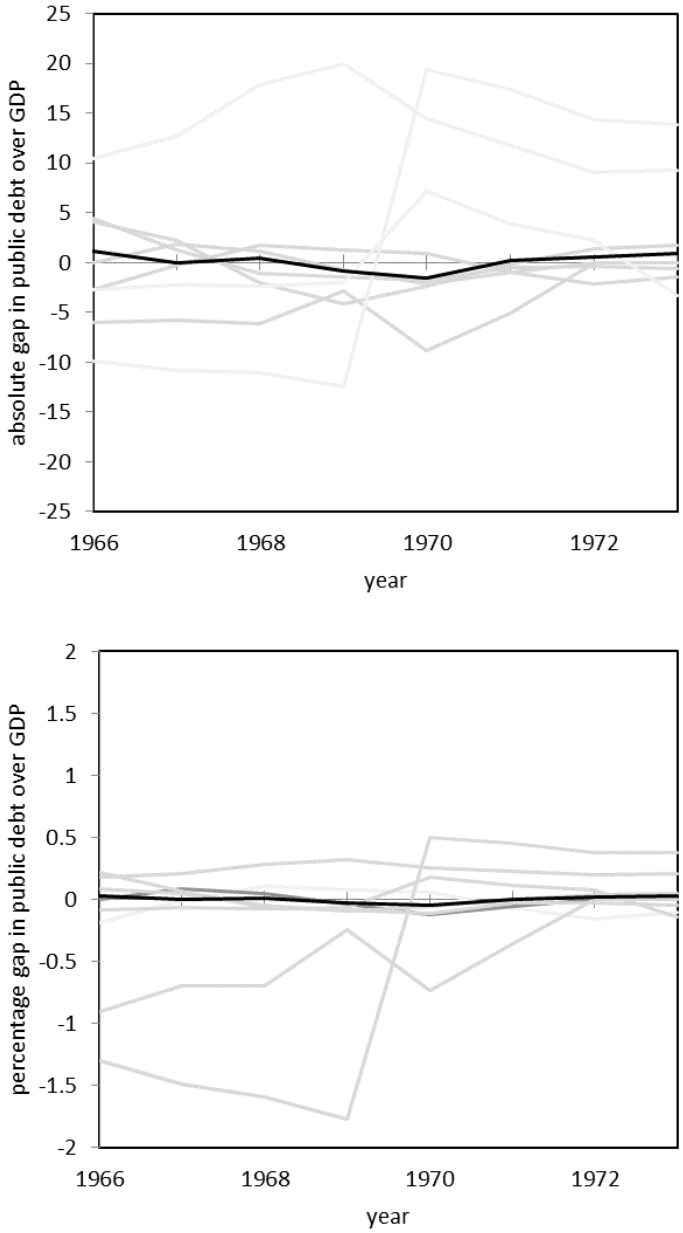
Table A.3.1 shows that the RMSPE for the U.S. is equal to 0.849, while all the other countries show a higher RMSPE than the U.S., with five countries showing a value more than three times the U.S., and two more than ten (i.e., New Zealand and Switzerland). The fit we obtained for the U.S. model is, therefore, considerably more accurate than that of the other countries of the donor pool.

Table A.3.1: Comparison of the RMSPEs among models

Country	RMSPE	Times 1974
Austria	1.574	1.9
Germany	1.168	1.4
Ireland	2.605	3.1
Japan	5.222	6.2
New Zealand	13.686	16.1
Portugal	1.898	2.2
Switzerland	14.017	16.5
Turkey	3.630	4.3
United States	0.849	-

This result is further confirmed in Figure A.3.2 by zooming in on the absolute and percentage gaps in the pre-intervention period. The darker line representing the U.S. almost perfectly coincides with the x-axis, while all other countries have a trend which deviates from zero.

Figure A.3.2: Pre-intervention absolute and percentage gaps

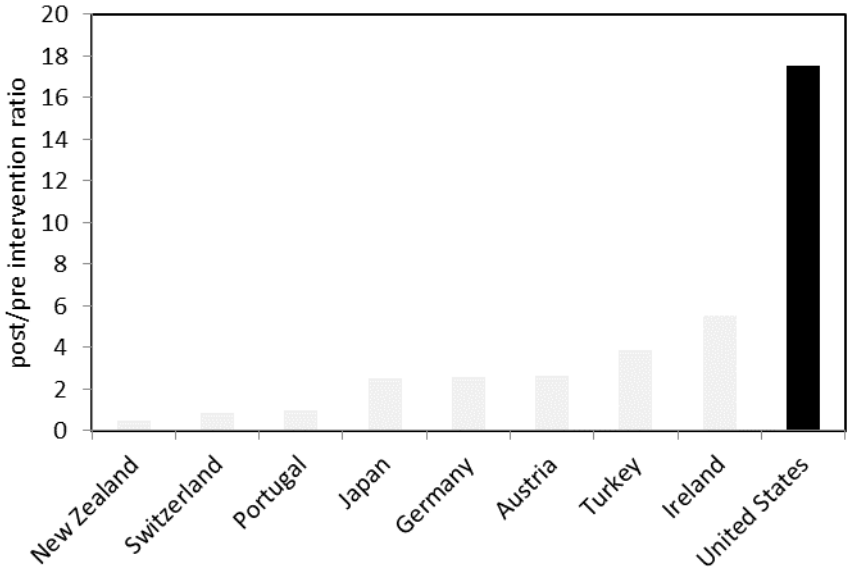


Note: The darker line shows the public debt over GDP gap for the USA while the gray lines show the gap for the donor countries.

It is important to note, however, that neither a large post-intervention nor a low pre-intervention RMSPE necessarily implies a significant effect from the intervention (i.e. enactment of the 1974 Budget Act). Indeed, the two effects should ideally coexist as evidence for the reform's significance.

Following Abadie et al. (2015), we compute the ratio between the pre- and post-intervention levels of the RMSPE in order to make the results comparable for all the countries' performances. In Figure A.3.3, the U.S. ratio is substantially larger than that of the others, which provides further evidence for the robustness of the U.S. model. The U.S. ratio of 17.5 is significantly larger than that of the other eight countries; the second largest ratio, that of Ireland, is still less than one third of the U.S.

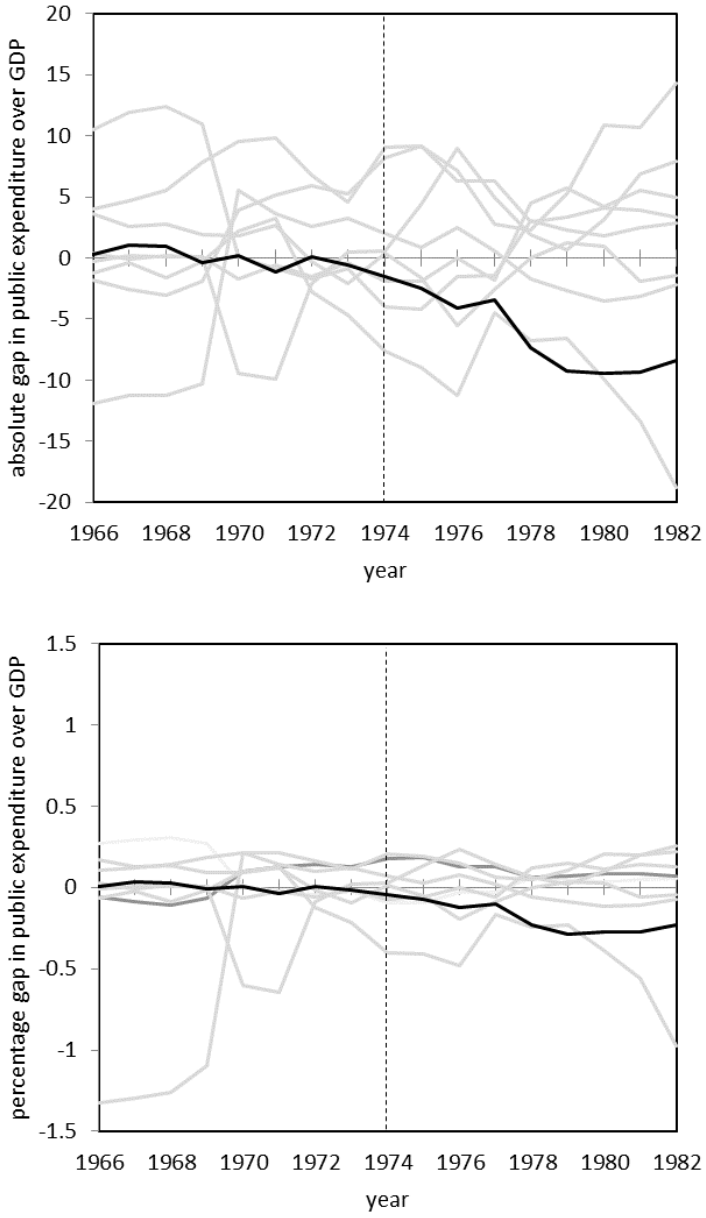
Figure A.3.3: Geographical placebo – RMSPE post/pre-intervention ratio



We conduct the same geographic placebo analysis the model with public expenditure-to-GDP as our outcome variable. In this case, we compare the U.S. with the behavior of the other eight countries.

In Figure A.3.4, we show the absolute and percentage gaps between synthetic and real public spending-to-GDP. The treatment effect identified for the U.S. (darker line) does not appear dramatically different from the other donor pool countries, but again, comparing the RMSPEs in Table A.3.2, we find that the error in the U.S. model is significantly less than all others.

Figure A.3.4: Geographical placebo – absolute and percentage gap among the models



Note: The darker line shows the public spending over GDP gap for the USA, while the gray lines show the gap for the donor countries.

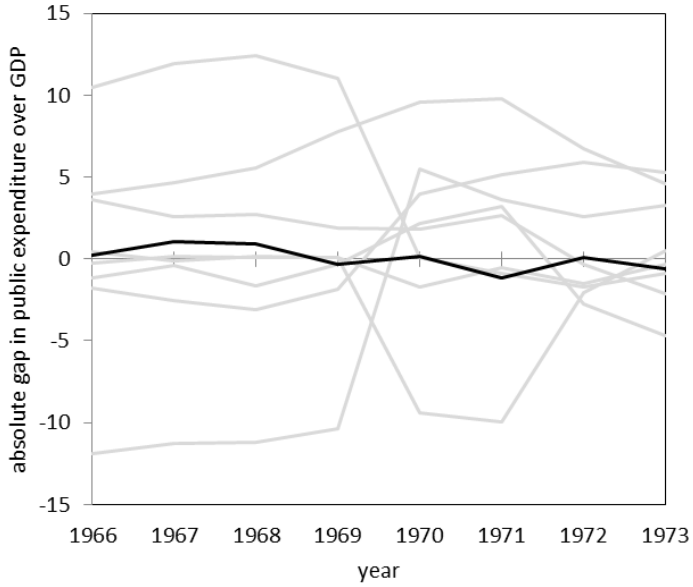
In the public spending-to-GDP case, the RMSPE for the U.S. is equal to 0.694, while seven of the other countries show a value more than three times the U.S. one and two countries show a ten times larger value (i.e., Ireland and Switzerland).

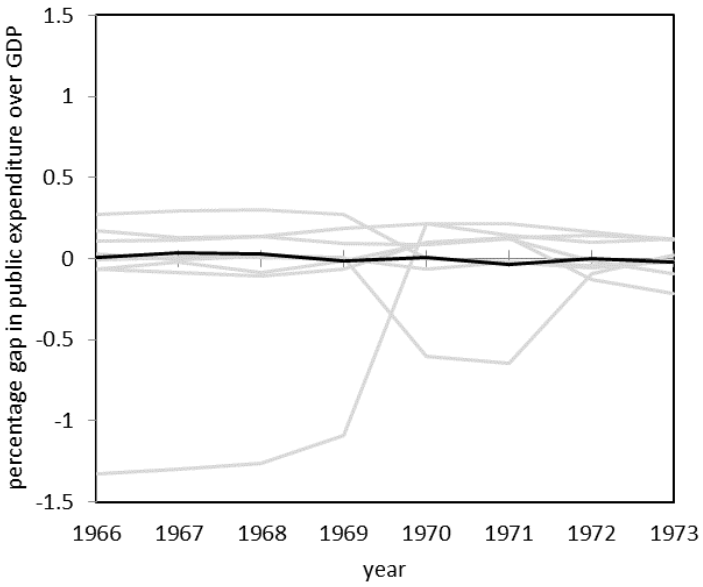
Table A.3.2: Comparison of the RMSPEs among models

Country	RMSPE	Times 1974
Austria	8.155	11.7
Germany	3.994	5.8
Ireland	6.916	10.0
Japan	2.386	3.4
New Zealand	0.838	1.2
Portugal	4.902	7.1
Switzerland	8.374	12.1
Turkey	2.475	3.6
United States	0.694	-

The fit obtained for the U.S. model appears far more reasonable than for any other countries of the donor pool. This result is confirmed in Figure A.3.5, by observing more closely the absolute and percentage gaps in the pre-intervention period.

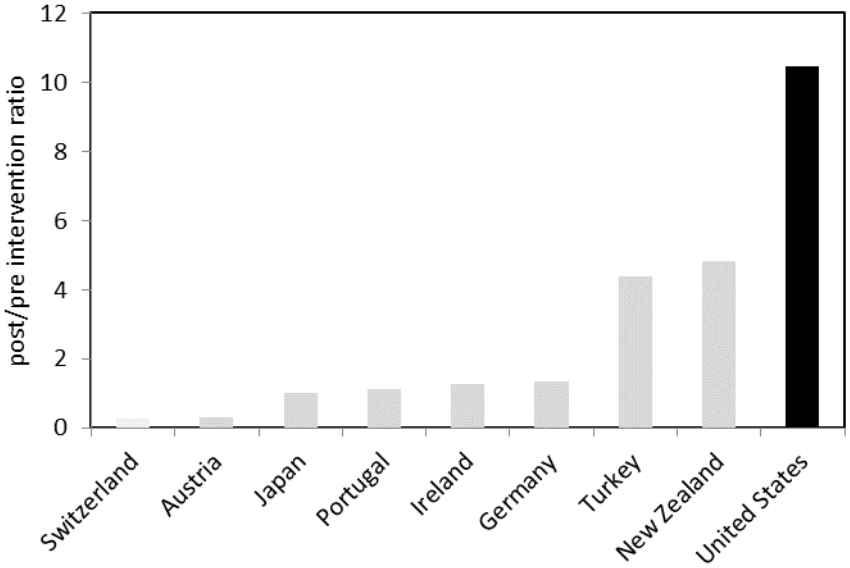
Figure A.3.5: Pre-intervention absolute and percentage gaps





A comparison of the ratio between the pre- and post-intervention levels of the RMSPE in Figure A.3.6 shows a U.S. ratio significantly larger than that of the other countries.

Figure A.3.6: Geographical placebo – RMSPE post/pre-intervention ratio



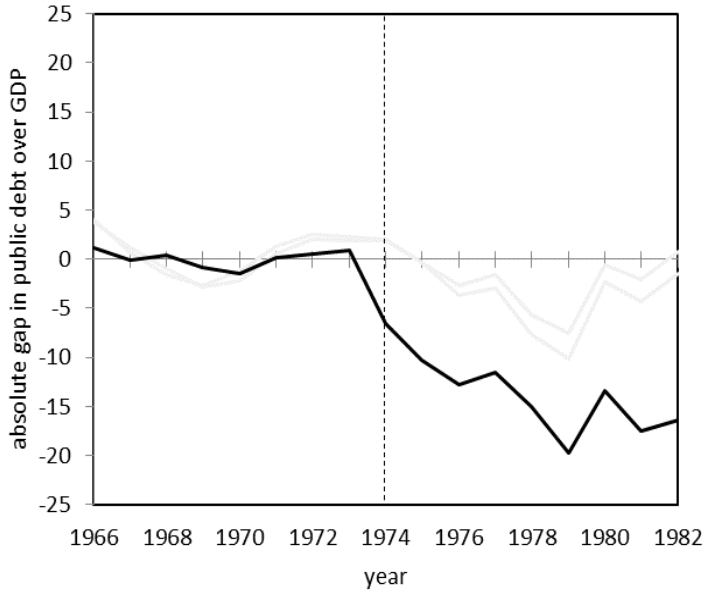
In this case, the U.S. ratio is 10.5, and those of the other eight countries represent at least less than 50% of the U.S.'s estimated effect. This is quite relevant evidence that the treated U.S. and its synthetic control are significantly different, confirming our original analysis.

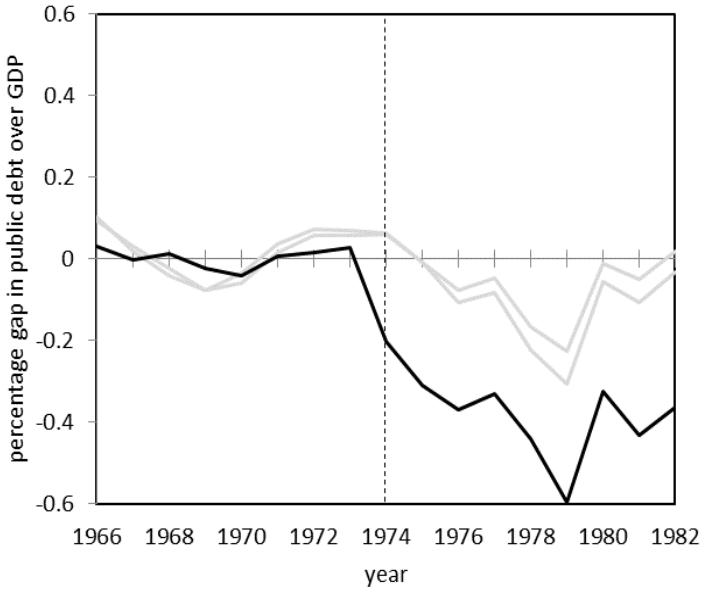
3.1.2 Chronological Placebo

In this section, we run the synthetic control model, considering the U.S. as the treated unit under the assumption that the intervention year is anticipated of one (1973) and two years (1972). We then compare the 1974 and the 1972-1973 results.

In Figure A.3.7, the absolute and percentage gaps between synthetic and real public debt-to-GDP is represented. Comparing the lines describing the models of intervention as occurred in 1974 (darker line) and 1972-1973 (gray line), there are no apparent substantial differences in the behaviors, although in the case of the two anticipated models, public debt-to-GDP shows somewhat disparate behavior over the period of analysis. The gap is positive during 1974, roughly zero in 1975 and then negative for the other years of analysis, even though with lower values than 1974 in absolute terms. In the 1974 model, the gap is always negative from the year of intervention onward.

Figure A.3.7: Chronological placebo – absolute and percentage gap among the models





Note: The darker line shows the public debt-to-GDP gap for 1974, while the gray line shows the gap for 1973.

Table A.3.3, however, shows that the RMSPE in the 1974 model is more than two times less than that of the 1972 and 1973 specifications. This implies that the fit obtained by the 1974 model is better than the 1972 and 1973 ones.

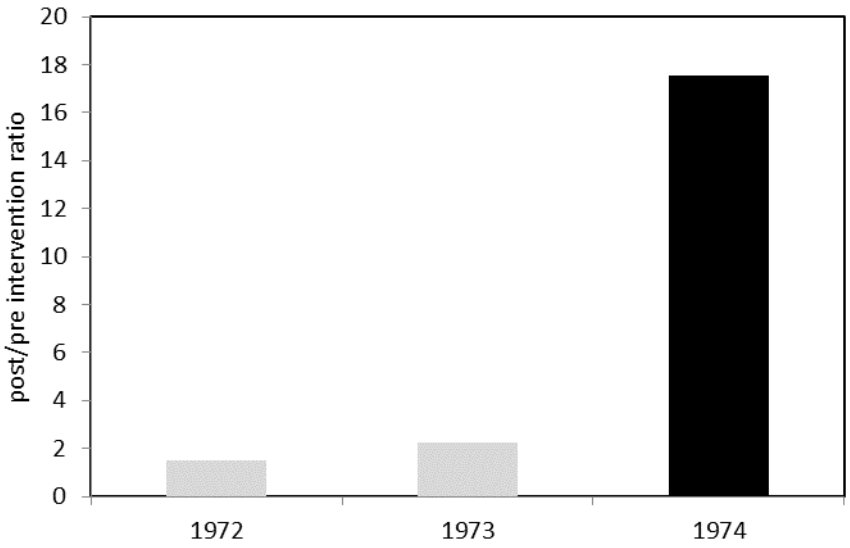
Table A.3.3: Comparison of the RMSPEs among models

Period of intervention	RMSPE	Times 1974
1973	2.175	2.6
1972	2.241	2.6
1974	0.849	-

Further evidence for the strength of the 1974 specification in Figure A.3.8, where we compare the pre- and post-intervention RMSPE ratios for the models. Again, the U.S. ratio is significantly larger in the 1974 model.

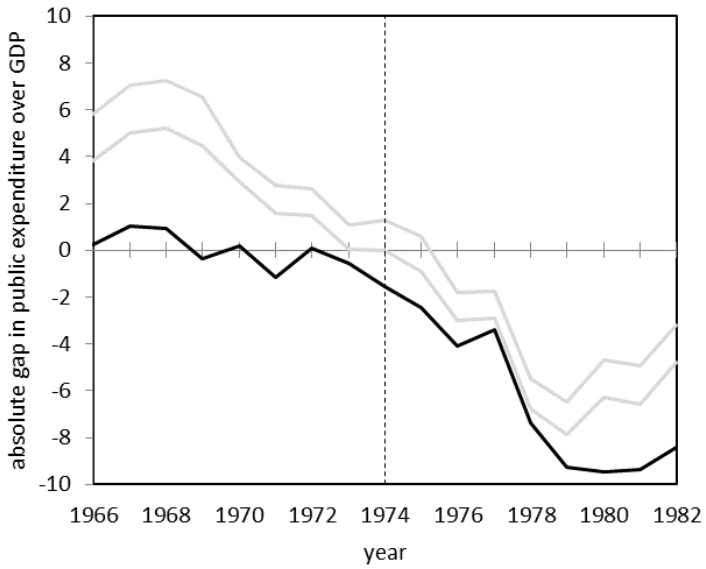
The ratio for the 1972 and 1973 models are respectively equal to 1.5 and 2.4, in contrast to 17.5 for 1974. For these reasons, we conclude that the treatment effect observed for 1974 is significantly different from that obtained for 1972 and 1973. In other words, the chronological placebo test confirms our main results.

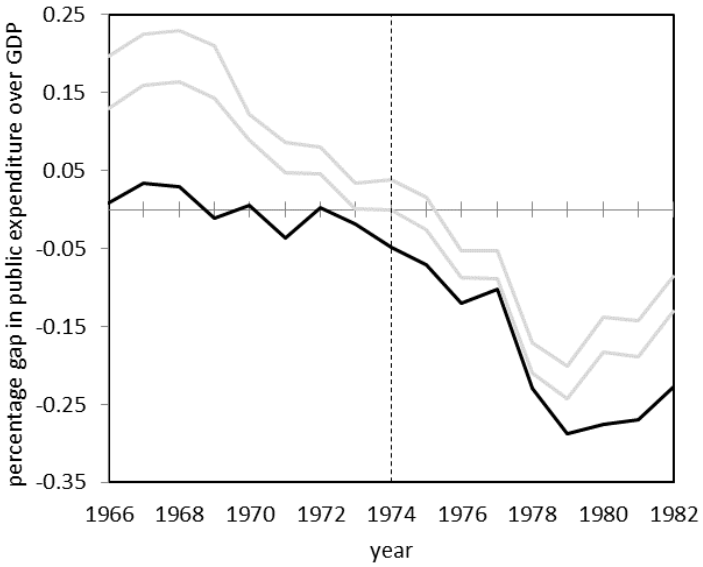
Figure A.3.8: Chronological placebo – RMSPE post/pre-intervention ratio



Finally, we conduct a chronological analysis for the public spending-to-GDP case. In Figure A.3.9, the absolute and percentage gaps between synthetic and real public expenditure-to-GDP show quite different results for the two specifications. The 1974 specification shows a more accurate pre-intervention fit than 1972 and 1973 models. Moreover, anticipated models show a smaller post-treatment negative gap (both in absolute and percentage terms).

Figure A.3.9: Chronological placebo – absolute and percentage gap among the models





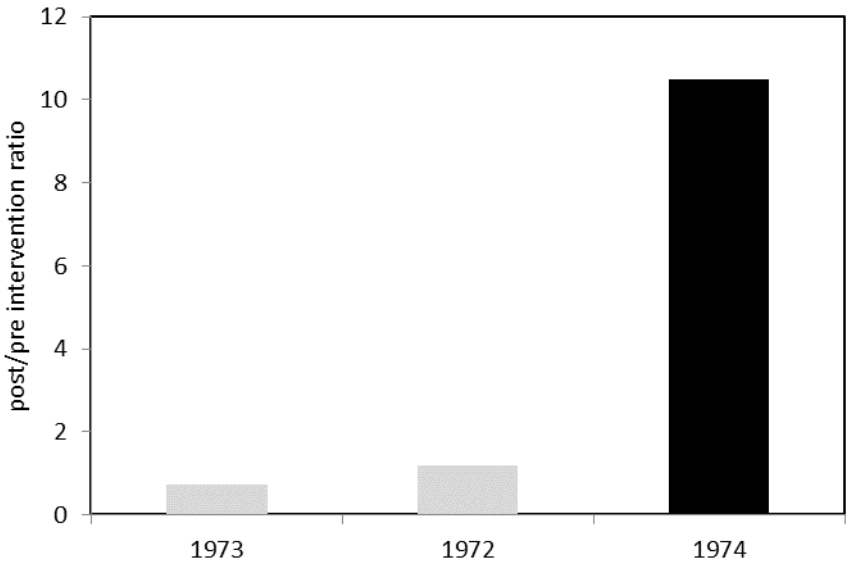
In Table A.3.4, the RMSPE for both the 1972 and 1973 models is more than 5 times that of 1974.

Table A.3.4: Comparison of the RMSPEs among models

Period of intervention	RMSPE	Times 1974
1973	5.469	7.9
1972	4.028	5.8
1974	0.694	-

Furthermore, comparing the post/pre-intervention ratio for the three models in Figure A.3.10 shows a much greater ratio for the 1974 model. The 1974 specification shows a ratio of respectively more than 8 and 14 times the 1973 and 1972 specifications.

Figure A.3.10: Chronological placebo – RMSPE post/pre-intervention ratio



Therefore, we conclude that our chronological placebo tests confirm the validity of our results obtained from the original model estimated for 1974.