Do electoral rules and elections matter in expenditure fragmentation? Empirical evidence from Italian regions

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Abstract: The empirical literature shows that incumbent politicians move expenditure from one budget item to another before elections and under different electoral systems in order to capture voter consensus and gain re-election. However, little attention has been paid to measurement of the degree of spending items manipulation by incumbents in these circumstances. The aim of this paper is therefore to fill this gap by conducting an empirical investigation on a panel of Italian regions. Measuring the degree of spending items manipulation with the Hirschman-Herfindahl index of fragmentation, I find that total public expenditure is more fragmented when the regional electoral system moves from a proportional towards a mixed electoral system. In the panel dynamic analysis, the manipulation of regional spending items is on average 15%. Weak evidence is also found for more fragmented expenditure before regional elections. In this case, the manipulation is about 6-7%. I refine the analysis by considering only the fragmentation of current and capital expenditure. The results confirm that a shift towards a mixed electoral system produces more expenditure fragmentation in Italian regions. No robust evidence is found for expenditure concentration when regional elections are forthcoming.

JEL Classification: D72; H72.

Key words: Total expenditure fragmentation; Current and capital expenditure fragmentation; Electoral rule; Electoral cycle.

1. Introduction

The literature shows that electoral rules and elections have a significant impact on the composition of public expenditure. Incumbent politicians move expenditure from one budget item to another under different electoral systems (Persson and Tabellini, 1999; Lizzeri and Persico, 2001; Milesi-Ferretti, Perotti and Rostagno, 2002; Ticchi and Vindigni, 2010) and in the run-up to elections (Rogoff, 1990; Khemani, 2004; Drazen and Eslava, 2010) in order to capture voter consensus and gain re-election. However, little attention has been paid to measurement of the degree of spending items manipulation by incumbent politicians in these circumstances. The aim of this paper is therefore to fill this gap by measuring the degree of spending items manipulation with the Hirschman-Herfindahl index of fragmentation. I thus obtain the total expenditure fragmentation index and, therefore, information on the entire change in spending composition.

Some plausible hypotheses on the nexus between total expenditure fragmentation and electoral rules can be formulated by drawing on the existing literature. In terms of spending composition, a move from a proportional to a majoritarian system involves a cut in 'universal' type of expenditure in favour of a geographically targetable expenditure. Under proportional system, political competition takes place in a larger voting district that includes all voters in the population. Therefore, to capture voters consensus, incumbent politicians need to target spending redistribution programmes on a greater variety of group interests in the population. As

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a result, the universal type of spending probably should represent the largest share of total public expenditure under a proportional system.[2] By contrast, under a majoritarian system, candidates compete in a smaller district by targeting spending redistribution programmes on the local interests of a smaller group (Persson and Tabellini, 1999; Milesi-Ferretti, Perotti and Rostagno, 2002). A shift from a proportional to a majoritarian system produces a 'universal' type of cut in spending in favour of geographically targetable spending. This may imply a greater fragmentation in total public expenditure due to a redistribution of public resources in favour of spending programs of other kinds. In this case, it is possible to formulate the following hypothesis: *a shift from a proportional system to a majoritarian one implies an increase in the degree of total expenditure fragmentation.*

Spending composition can be also modified by incumbents before elections only in order to gain votes. Models of the budget cycle have shown that the composition of public expenditure is manipulated in favour of consumption expenditure (Rogoff, 1990) or capital expenditure (Khemani, 2004; Drazen and Eslava, 2010). Rogoff (1990) shows that: 'the incumbent leader has an incentive to bias preelection fiscal policy toward easily observed consumption expenditures, and away from government investment' (1990, p. 21). By contrast, other studies (Khemani, 2004; Drazen and Eslava, 2010) show that incumbents mainly manipulate capital spending because voters are more sensitive to this type of expenditure and it is easily targetable on their preferences before elections. Drazen and Eslava (2010) test this hypothesis on Colombian municipalities. In their empirical analysis, different types of infrastructure spending are considered targetable, whereas some types of current expenditure (like general payments, personnel expenditure and current transfers) are defined as non-targetable expenditure. They find that infrastructure expenditures tend to increase in pre-election periods to the detriment of the other types of current expenditure. Further empirical studies draw similar conclusions for different geographical areas (Kneebone and McKenzie, 2001; Gonzalez, 2002; Khemani, 2004; Veiga and Veiga, 2007). By contrast, there is little empirical evidence of a shift in favour of current expenditure at the expense of public investments in line with the Rogoff (1990) type model.[3]

The empirical evidence suggests that the electoral cycle is engaged on the type of expenditure that is easily targetable on voters' preferences and highly visible to them. In developed countries, for example, local incumbent politicians may prefer to engage electoral competition on capital expenditure. This may happen because local public investments are more visible to voters because they require a short time for complementation and can be easily coordinated with the timing of elections. Moreover, it is easier to ascertain the responsibility for their complementation. On the other hand, central governments may prefer to engage electoral competition on the current type of expenditure (such as, for example, family allowances and unemployment benefits) because it is immediately visible to voters (Vergne, 2004). Overall, the composition of spending can be changed in favour of visible and targetable expenditure before election times. This may give rise to *an increase in total expenditure fragmentation in the run-up to elections*. However, it is not possible to exclude the opposite effect because changes in the total expenditure fragmentation depend on the share of each spending category on total expenditure and on the direction of the shift among spending items. For example, if the total expenditure consists of current and capital expenditure and the former type of spending represents its smaller part, a shift of resources to capital expenditure produces a decrease in total expenditure fragmentation.

When the electoral system is taken into account, predictions on the impact of the electoral cycle on the total expenditure fragmentation seem to become clearer. Although there is no theoretical model which accounts for the impact of the electoral system on the electoral budget

[2] "it is plausible to expect a stronger expansion of broad programs around elections under proportional electoral rules than under majoritarian electoral rules", (Persson and Tabellini, 2002, p. 3).

[3] For developing countries, Block (2001) shows that this happens when elections are particularly competitive. Recently, Vergne (2009) has found empirical evidence in favour of a shift towards more visible current expenditure (in particular, wages and subsidies) and away from public investments for developing countries, while Katsimi and Sarantides (2010) report similar results for developed countries. Schuknecht (2000) shows that the political budget cycle affects capital much more than current expenditure in developing countries.

cycle, there is empirical evidence in this regard. Persson and Tabellini (2002) argue that the electoral cycle differs according to the type of electoral rule: under proportional systems, incumbent politicians engage in electoral competition by directing much more spending to welfare-state spending programmes before election time in order to gain consensus among a broad range of voters. Empirical evidence confirms this hypothesis by showing a significant expansion in welfare spending before elections in countries with proportional rules (Persson and Tabellini, 2002).[4] This reflects a significant change in the composition of expenditure towards welfare-state programs (pensions, unemployment transfers, social transfers, etc.) that favour larger groups of voters in the population under a proportional electoral system. According to this evidence, *before elections, total expenditure fragmentation may be lower under a proportional electoral system.*

The aim of this paper is to estimate the degree of spending items manipulation by incumbent politicians under different electoral systems and before elections. These hypotheses are tested on a panel data of 19 Italian regions from 1984 to 2004. Italy is a good case study because in the 1990s the electoral system moved from being a proportional system towards a mixed-electoral system at both the national and regional levels of government. Measuring electoral rule changes by means of the Gallagher (1991) index and the degree of spending items manipulation by the Hirschman-Herfindahl index of fragmentation, I find that the total public expenditure fragmentation of Italian regions is higher in a mixed electoral system than in a proportional system. In particular, the panel dynamic analysis shows that the manipulation of regional spending items is on average 15% when the regional electoral system moves towards a majoritarian system. Weaker evidence is also found of more fragmented expenditure before a regional election. In this case, the manipulation is about 6-7%. I refine the analysis by considering only the fragmentation of current and capital expenditure. The results confirm that a shift towards a mixed electoral system produces more fragmentation in Italian regional expenditure. In regard to the electoral cycle, weak evidence of expenditure concentration is found when regional elections are forthcoming. This result could imply that regional governments compete on current expenditure rather than on capital expenditure to capture voters' consensus before elections.

The rest of the paper is organized as follows. Section 2 presents an overview on the Italian electoral system. Section 3 presents data and variables. Section 4 describes the empirical models and methodology of estimation. Section 5 presents the estimation results. Section 6 concludes.

2. An overview on the Italian electoral system

The Italian Constitution provides for a central government and three local governments articulated into 20 regions, 109 provinces, and over 8,000 municipalities (art. 114). The highest level of local government is the region, whereas the lowest is the municipality. Each region has its own statute regulating the form of government and the basic principles of its organization and functioning (art. 123). Most Italian regions approve their own statutes by a regional law (art. 123) and they are known as the '*Ordinary Statute Regions*'[5] (OSR). Only 5 regions adopt a special statute approved by the Constitutional Law (art. 116): Friuli Venezia-Giulia, Sardinia, Sicily, Trentino Alto-Adige[6], Valle D'Aosta. These are called the '*Special Statute Regions*' (SSR). By virtue of their special statutes, these regions have greater autonomy in terms of legislative and fiscal powers than the Ordinary Statute Regions.[7]

The government of each region is articulated into three bodies (art. 121): a *council*, which exercises legislative powers; an *executive committee*, which exercises executive powers; the

[4] "… proportional electoral rules induce politicians to seek support among broad coalitions of voters, while majoritarian electoral rules instead induce them to target spending to smaller (geographical) groups, one we assume that these incentives are particularly strong at election time" (Persson and Tabellini, 2002, p. 11).

[5] Piedmont, Lombardy, Veneto, Emilia-Romagna, Tuscany, Liguria, Marche, Umbria, Abruzzo, Lazio, Molise, Basilicata, Campania, Apulia, Calabria.

[6] The Trentino-Alto Adige region comprises the two Autonomous Provinces of Trento and Bolzano (art. 116).

[7] The institution of the Special Statute Regions is motivated by the presence of ethno-linguistic differences, geographical border problems and/or secessionist movements.

President of the executive committee, who is accountable for the region's government. The electoral-system legislation of the regional governing bodies is quite different between the Ordinary and Special Statute Regions. Before the 1990s, members of the council of the Ordinary Statute Regions were elected by a pure proportional system and they remained in office for five years (L. 108/1968, art. 3). Law 43/1995 enacted a reform which introduced a mixed electoral system: 4/5 of regional council members are elected from *provincial lists* by a proportional system, while 1/5 are elected by a majoritarian system from a *regional list* (called the '*listino*') linked to a group of provincial lists. In practice, the majoritarian system consists in a sort of '*majority bonus'* because 1/5 of seats are assigned to the 'winning regional list', *i.e.*, which obtains the largest share of votes and is linked to a group of provincial lists with an overall percentage of seats under 50% (L. 43/1995, art. 15). In fact, if the group of provincial lists has a percentage of seats equal to or above 50%, the majority bonus is shared in the following way: 1/10 of seats are assigned to the 'winning regional list' and 1/10 to the other groups of provincial lists not linked with it. This bonus should guarantee a larger majority and the greater stability of the regional government.

Another important reform of the electoral system of the Ordinary Statute Regions was made by Constitutional Law 1/1999. This law introduced the direct election of the President of the executive. The elected President has received the largest share of votes in the regional lists[8] (C.L. 1/1999, art. 5).[9] This reform gives the President greater responsibility for executive decisions as well as the power to appoint and to remove members of the executive committee. Another novelty introduced by Law 1/1999 concerns implementation of a regional electoral system upon approval of a regional electoral law and new statutory dispositions in this regard. In the absence of the regional law and new statutory dispositions, elections in the Ordinary Statue Regions are held in accordance with laws 108/1968 and 43/1995. The regional elections of the Ordinary Statute Regions held in 2000[10] were conducted in accordance with these two national laws.

The election of the governing bodies of the Special Statute Regions requires separate discussion. The regional council and executive were elected according to a proportional system until 2000. After enactment of Constitutional Law 2/2001, the regions *Friuli Venezia-Giulia* (C.L. 1/1963), *Sardinia*[11] (C.L. 3/1948) and *Sicily* (Regio.D.L. 455/1946; C.L. 2/1948) adopted the same mixed electoral system as the Ordinary Statute Regions (L. 108/1968, l. 43/1995). This disposition is valid until these three regions have approved their own regional electoral laws that include dispositions of C.L. 2/2001 concerning the direct election of the President of the executive and his/her power to appoint and remove the executive members. In practice, from 2001 to 2004, the election of the regional governing bodies of these three regions took place under the same electoral rules as those of the Ordinary Statute Regions.[12] The mixed electoral system was not imposed on the regions of *Valle D'Aosta* and *Trentino Alto-Adige*. The legislator's intention was probably to guarantee ethnic-linguistic representation within the regional governing bodies of these two regions. However, Valle D'Aosta has recently approved regional law 22/2007 which provides for the introduction of a majority bonus. As regards Trentino Alto-Adige (C.L. 5/1948), a mainly proportional system was adopted in this region. However, a major change has been introduced into the election of the regional council by Constitutional Law 2/2001 (art. 4, comma f). This law provides that the regional council of the Trentino Alto-Adige region must be formed of elected members of provincial councils. Since the election of 2003, therefore, regional elections have been replaced by provincial elections.

The complex electoral system of the Italian regions can be summarized as follows. Until 1995, the Ordinary Statute Regions adopted a proportional system for the election of regional councils; afterwards, a proportional system accompanied by a majority bonus was introduced in

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[8] One seat is assigned to the candidate as President of the executive who has obtained a number of valid ballots immediately below those of the candidate declared President elect (C.L. 1/1999, art. 5).

[9] Before this law, the President and the executive committee were appointed by the regional council.

[10] The election of the Molise region was annulled in 2000 and repeated in 2001.

[11] The Sardinia regional elections of 1994 and 1999 of were held in accordance with the provisions of regional law 16/1992. This law provides for a proportional distribution of seats accompanied by a second ballot.

[12] The Sardinia regional election of 2009 was also held in accordance with laws 108/1968 and 43/1995.

each of them. In the case of the Special Statute Regions, a proportional system was adopted until 2000; afterwards, the regional councils of Sicily and Friuli Venezia-Giulia were elected in 2001 and 2003, respectively, according to the same mixed electoral system as the Ordinary Statute Regions. Similar provisions of the law applied to the election of the regional council of Sardinia in 2004 and 2009. The regions of Valle D'Aosta and Trentino Alto-Adige have adopted a proportional system, although the former region introduced a mixed electoral system in 2007.

Overall, the 1990s represented a turning point in the Italian electoral system, not only for regional government but also for central government. Electoral reforms were introduced in concurrence with the notorious 'Tangentopoli' scandal when many Italian parliamentarians were investigated for alleged involvement in bribery. The scandal changed the Italian political scenario and important changes were made to the rules regulating the election of Italian members of parliament. Before the referendum of 18 April 1993, members of the Italian parliament, which consists of the Senate and the Chamber of Deputies, were *de facto* elected by a proportional electoral system. Deputies were elected according to a pure proportional system (l. 26/1948, art.1; D.P.R. 361/1957), and Senators were elected on a regional basis by a voting majority rule (l. 29/1948, art. 17): the candidate obtaining more than 65% of votes was elected. Since this *quorum* was too much high, few senators were elected in this way, while most of them were elected by the proportional system (l. 29/1948, art. 19). In spite of some timid attempts to introduce the majoritarian system (law 148/1953), parliamentary seats were proportionally distributed among parties until 1992. Only after the referendum of April 1993 did the Italian electoral system move from a proportional system towards a mixed-electoral system. In particular, laws 276/1993 and 277/1993 introduced the mixed electoral system in the following form: 3/4 of 315 senators were elected for regional districts by a majoritarian system and 1/4 by a proportional one; similarly, 75% of 630 deputies were elected by a majoritarian system and 25% by a proportional one. In the 2000s, a backwards step towards the proportional system was made for both chambers by law 270/2005, although it was accompanied by a majority bonus. Another interesting electoral reform in this period was intended to capture the votes of Italian citizens living abroad. Constitutional laws 1/2000 and 1/2001 provide that such citizens can vote for 12 deputies and 6 senators in foreign constituencies (Const., art. 56, 57).

3. Data

This study considers time series cross-sectional data for 19[13] Italian regions from 1984 to 2004. To measure the degree of spending items manipulation by regional government, it uses the index of total public expenditure fragmentation (*EXPFRAG*):[14]

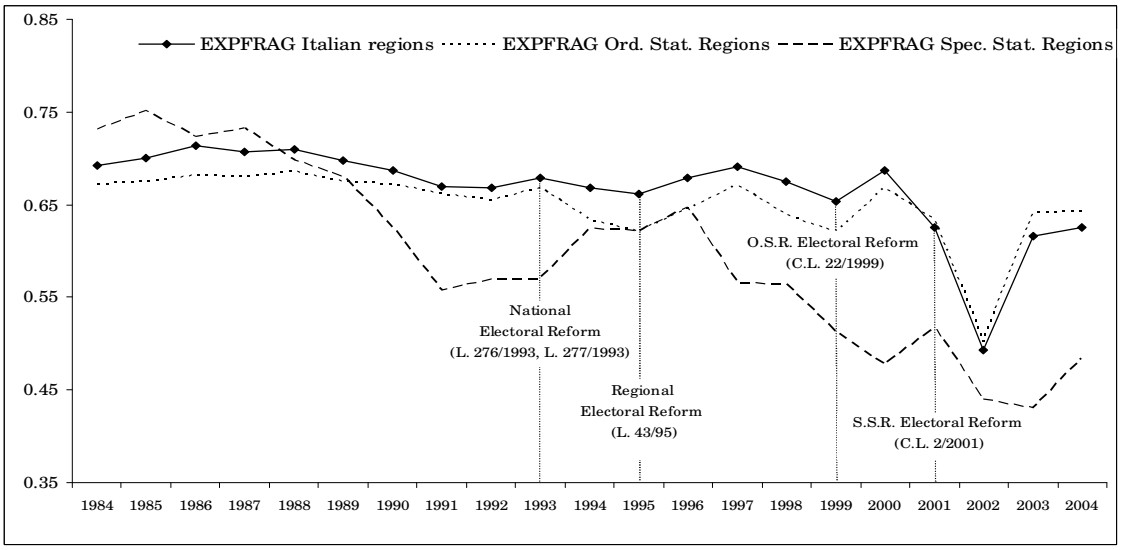
$$EXPFRAG_{it} = 1 - \frac{n\sum_{j=1}^{n}\left(\frac{Exp_{ijt}}{TotExp_{it}}\right)^2 - 1}{(n-1)}$$

where *Exp* is the *j*-th type of public expenditure ($j = 1,\ldots,n$) in region *i* ($i = 1, \ldots, m$) and $TotExp_i$ corresponds to total public expenditure in region *i* at time *t*. The total expenditure fragmentation index assumes values between 0 and 1 inclusive. When the index assumes value zero this means that only one type of spending is funded; *vice versa*, when the score of the index is close to one, this means that total public spending is equally distributed among *n* types of spending.

[13] Only the Trentino Alto-Adige region is excluded from the sample because the computation of the disproportionality index for this region is not easy for the years 2003 and 2004, and it is probably less comparable with those of the other regions. In fact, since 2003, the regional council has been formed by candidates elected from rounds of voting in the two Special Autonomous provinces of Trento and Bolzano (C.L. 2/2001, art. 4, comma f).

[14] For better interpretation of this index, it uses a normalised version of the Hirschman-Herfindahl index of fragmentation. For details see the Appendix.

Fig. 1 Total expenditure fragmentation index for Italian regions (1984-2004)



Note: The index is calculated on aggregate data for 20 Italian regions.
Data source: ISTAT, Bilanci consuntivi delle regioni e delle province autonome; ISTAT, Finanza locale: entrate e spese dei bilanci consuntivi (comuni, province e regioni)-anni 2001-2002.

According to the regional budget classification, I computed the index of fragmentation considering the following five spending items in which the total public expenditure is shared: 1) total current expenditure; 2) total investment spending; 3) loans and borrowing refunding; 4) expected deficit; 5) '*partite di giro*[15]'. Total current expenditure is the main component of total public expenditure in Italian regions, standing at about 66.7% in 2004. By contrast, capital expenditure is only 7.1%, while loans and borrowing refunding and expected deficit are 4.2% and 0%, respectively. The percentage of '*partite di giro'* on total public expenditure is 22%.

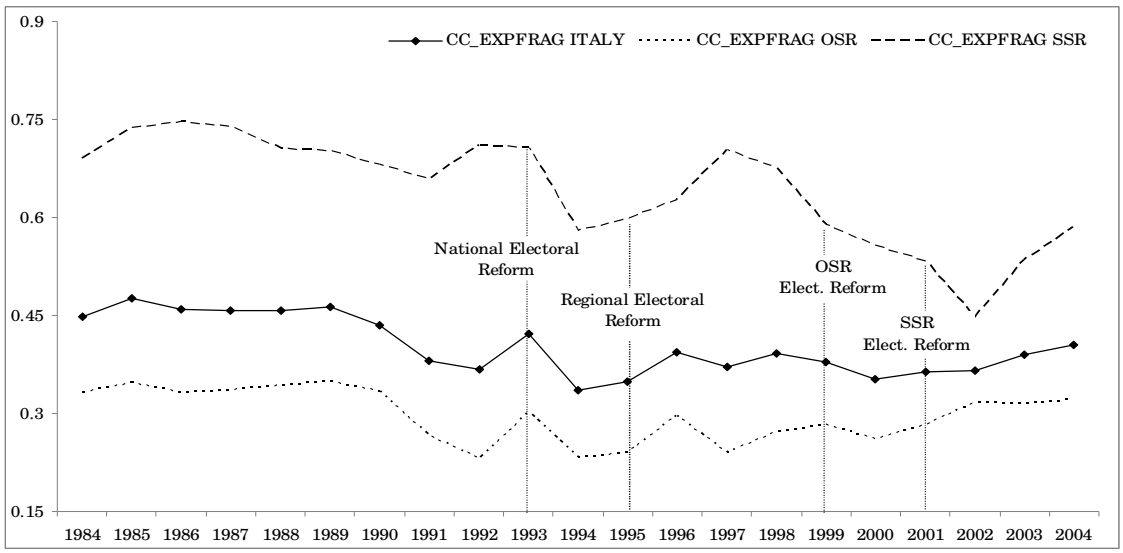
Figure 1 illustrates the tendency of the total expenditure fragmentation index for Italian regions for the full period 1984-2004. After the regional electoral reforms, the total expenditure fragmentation of the Italian regions tends to be more cyclical. A similar tendency is observed for the Ordinary Statute Regions, which represent the majority of the sample. Higher variability in total expenditure fragmentation after the introduction of a mixed electoral system could be consistent with the hypothesis of the exacerbation of electoral competition under a majoritarian system which strengthens the electoral cycle (Persson and Tabellini, 1999, 2003; Persson, 2002). As regards the Special Statute Regions, total expenditure fragmentation gradually decreases throughout the period analysed: in 1984, the total expenditure fragmentation of these regions was around 73% while in 2004 it was only 48%. Although before the 1990s these regions had a degree of total expenditure fragmentation higher than that of regions with an ordinary statute, they thereafter tended to concentrate spending in a few budget items.

I refine the investigation by focusing only on the fragmentation of current (*CurrExp*) and capital (*CapExp*) expenditure. In this way, categories that do not even represent government spending or are not strictly targetable — such as deficit, loans and borrowing refunding, '*partite di giro'* — are excluded from computation of the additional index of fragmentation called *CC_EXPFRAG*. This index is more accurate than *EXPFRAG* because it includes only targeted and broad types of spending directly manipulated by regional governments. It therefore seems more appropriate for testing the theoretical hypotheses formulated in section 1.

$$CC\_EXPFRAG_{it} = 1 - \left\{ 2\left[\left(\frac{CurrExp_{it}}{CurrExp_{it} + CapExp_{it}} \right)^2 + \left(\frac{CapExp_{it}}{CurrExp_{it} + CapExp_{it}} \right)^2 \right] - 1 \right\}$$

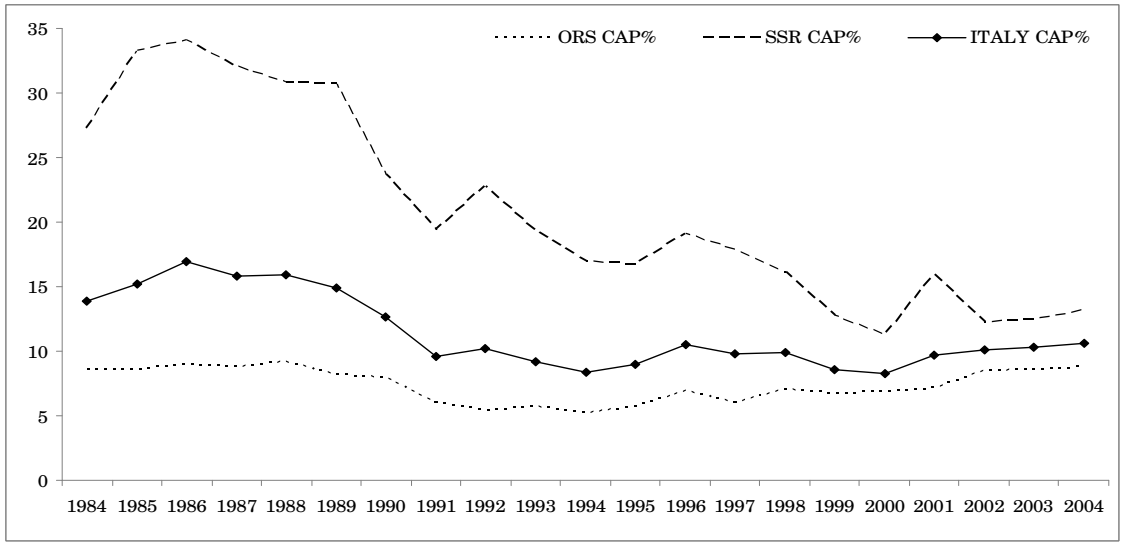
[15] This item consists in deposits in the current account of the Italian state treasury and in a sort of transfer entry. This type of expenditures is a sort of payment on behalf of a third party.

Fig. 2 Current and capital expenditure fragmentation index for Italian regions (1984-2004)



Note: The index is calculated on aggregate data for 20 Italian regions.
Data source: ISTAT, Bilanci consuntivi delle regioni e delle province autonome; ISTAT, Finanza locale: entrate e spese dei bilanci consuntivi (comuni, province e regioni)-anni 2001-2002.

Fig. 3 The percentage of capital expenditure on current and capital expenditure for Italian regions (1984-2004)



Note: CAP%= CapExp/(CurrExp+CapExp)*100 is calculated on aggregate data for 20 Italian regions.
Data source: ISTAT, Bilanci consuntivi delle regioni e delle province autonome; ISTAT, Finanza locale: entrate e spese dei bilanci consuntivi (comuni, province e regioni)-anni 2001-2002.

Figure 2 shows the tendency of the *CC_EXPFRAG* index for the Ordinary and Special Statute Regions. In general, the Special Statute Regions show a higher degree of current and capital expenditure fragmentation than do the Ordinary Statute regions. However, during the 20-year period, they tend to reduce expenditure fragmentation, allocating more resources to current expenditure (see Fig. 3). By contrast, the Ordinary Statue Regions exhibit an increase in expenditure fragmentation mainly after the introduction of electoral reforms in the mid-1990s (Fig. 2). As shown by figure 3, an increase in expenditure fragmentation of the OSR involves an increase in capital spending.

In order to measure the degree of electoral system changes, I used the Gallagher (1991) index. Each index was calculated in relation to Senate elections (*Senate GHI index*), because the seats of senators are distributed on a regional basis, and to regional elections (*Regional GHI index*). The Gallagher (GHI) index is a disproportionality index and corresponds to:

$$GHI_i = \sqrt{\frac{1}{2}\sum_{j=1}^{k}\left(V_{ij}\% - S_{ij}\%\right)^2}$$

where V% is the share of votes (*per cent*) obtained by party *j* (*j=1, …, k*) in region *i* (*i=1, …, m*) and S% is the share of seats (*per cent*) assigned to party *j* in region *i*. The GHI index ranges from 0 to 100. It describes a pure proportional system when it is close to zero. By contrast, the degree of disproportionality increases when the GHI index tends to 100.

The GHI index was therefore computed for national and regional elections. In this way, I evaluated the impact of national and regional electoral system reform on total expenditure fragmentation. However, computation of the GHI index at regional level is rather problematic because account must be taken of the majority bonus introduced in 1995. In fact, if the majority bonus is not included in the computation of the index, the degree of disproportionality may be underestimated. The bonus consists in 1/5 of seats assigned to the regional list obtaining the highest share of votes and that is linked to a group of provincial lists with an overall share of seats below 50%. In fact, if the group of provincial lists obtains a share of seats of 50% or more, the linked regional list takes only 1/10 of extra seats and the remaining 1/10 is distributed among provincial lists not linked with it. The remaining 4/5 of seats is proportionally distributed among provincial lists. Since there are two lists (i.e. provincial and regional), it is not trivial to compute the Gallagher index. I tried to solve this problem by calculating an extended version of this index which accounted for the majority bonus. Firstly, I computed the GHI index for the provincial lists (GHI^P) and for regional lists (GHI^R). In order to have a single disproportionality index, the GHI^R and GHI^P indexes were weighted for the percentage α of seats distributed by regional lists and for the percentage (*1*-α) of seats distributed by provincial lists, respectively. In this way, I obtained a single index that I call the *Adjusted Regional GHI index*. This accounts for a mixed electoral system based on a proportional system accompanied by a majority bonus. The formula of the revisited GHI index follows:

$$GHI_i^{ADJ} = (1-\alpha)\cdot GHI_i^P + \alpha \cdot GHI_i^R =$$
$$= (1-\alpha)\cdot\sqrt{\frac{1}{2}\sum_{s=1}^{S}\left(V_{is}^P\% - S_{is}^P\%\right)^2} + \alpha\cdot\sqrt{\frac{1}{2}\sum_{h=1}^{H}\left(V_{ih}^R\% - S_{ih}^R\%\right)^2}$$

where

- $\alpha \in [0,1)$ corresponds to the percentage of seats distributed to regional lists and (*1*-α) to provincial lists;
- $V^P\%$ is the percentage of votes obtained by provincial party-list *s* (*s=1,…,S*) in region *i* (*i=1,…, m*);
- $S^P\%$ is the percentage of seats assigned to provincial party-list *s* (*s=1,…,S*) in region *i*;
- $V^R\%$ is the percentage of votes obtained by regional party-list *h* (*r=1, …,H*) in region *i*;
- $S^R\%$ is the percentage of seats assigned to regional party-list *h* (*r=1, …,H*) in region *i*.

The *Adjusted GHI index* ranges from 0 to 100. It describes a pure proportional system when the share of votes corresponds to the share of seats (*V%=S%*) and α is 0. By contrast, the degree of disproportionality increases when the *Adjusted Regional GHI index* moves towards 100.

I also controlled for the presence of an electoral cycle by considering regional government elections. In detail, I used two dummy variables, *ELECTION* and *PRELECTION*, which assumed value 1 in the year of election and pre-election of the regional council and zero otherwise. There is no problem of endogenous elections in Italy because they are prescribed by law.

Tab. 1 Data sources and descriptive statistics

Variable	Data source	Obs.	Mean	Std. Dev.
EXPFRAG (dependent variable)	ISTAT, Bilanci consuntivi delle regioni e delle province autonome; ISTAT, Finanza locale: entrate e spese dei bilanci consuntivi (comuni, province e regioni) anni 2001-2002.	390	0.59	0.16
CC_EXPFRAG (dependent variable)	ISTAT, Bilanci consuntivi delle regioni e delle province autonome; ISTAT, Finanza locale: entrate e spese dei bilanci consuntivi (comuni, province e regioni) anni 2001-2002.	390	0.41	0.24
Senate GHI	Ministero dell'Interno.	399	13.98	10.57
Regional GHI	Ministero dell'Interno, the Regions of Friuli Venezia-Giulia, Sardegna, Sicilia, Valle D'Aosta.	399	3.41	1.23
Adjusted Regional GHI	Ministero dell'Interno, the Regions of Friuli Venezia-Giulia, Sardegna, Sicilia, Valle D'Aosta.	399	5.87	4.08
POP	ISTAT, http://demo.istat.it/	399	2944742	2244889
% POP 65 +	ISTAT, http://demo.istat.it/	399	16.89	3.93
% POP 0-15	ISTAT, http://demo.istat.it/	399	16.92	3.51
GDP (per capita; euros; constant price)	ISTAT, Conti Economici Regionali 1980-2004, Ed. 2005.	399	15425	4192
GRANTS (per capita; euros)	ISTAT, Bilanci consuntivi delle regioni e delle province autonome; ISTAT, Finanza locale: entrate e spese dei bilanci consuntivi (comuni, province e regioni) anni 2001-2002.	390	949.1	953.1
ELECTION (1= if regional government is in election year; 0= otherwise)	Ministero dell'Interno.	399	0.20	0.40
PRE-ELECTION (1= if regional government is in pre-election year; 0= otherwise)	Ministero dell'Interno.	399	0.23	0.42

Finally, in the panel data analysis, I also accounted for control variables which generally affect public expenditure decisions: *i)* the size of the population (POP); *ii)* young and elderly people aged 0-15 (%POP 0-15) and 65 and over (%POP 65+), respectively; *iii)* per capita gross domestic product (GDP); *iv)* per capita state transfers (GRANTS). Table 1 gives descriptive statistics for all variables.

3. Econometric models and methodology

In this section, I present dynamic specifications for testing the impact of electoral rules and electoral cycle on the total expenditure fragmentation of regional governments. A positive effect is expected in regard to the impact of the electoral system on total expenditure fragmentation. In the absence of a clear hypothesis on electoral systems, the impact of elections on total expenditure fragmentation may be ambiguous because it depends on the direction of the shift among spending items and the share of each type of expenditure on the total expenditure. However, a significant impact of elections on the total expenditure fragmentation suggests the presence of electoral manipulation in spending composition by incumbents, and therefore the presence of opportunistic behaviours during election. In this case, the empirical analysis of this paper represents a starting point.

At first, dynamic panel data model (1) with fixed v_i and time t_t effects is considered in the empirical analysis. The dependent variable *EXPFRAG* is a *Nx1* vector of the total public expenditure fragmentation index in region i ($i=1,\ldots,N$) at time t ($t=1,\ldots,T$). A *1xK* vector $x'_{it}=(x^1_{it}, \ldots, x^K_{it})$ of control variables and a constant term a_0 are included in the model, as well as an error term ε normally distributed with zero mean and constant variance. The key-variable *GHI* corresponds to a *Nx1* vector associated with the disproportionality index computed for

national and regional elections. The *ELECTION* and *PRE-ELECTION* dummies are used to estimate the impact of the electoral cycle on the degree of spending items manipulation.

$$EXPFRAG_{it} = a_0 + v_i + \tau_t + \rho EXPFRAG_{it-1} + \delta GHI_{it} + \\ + \varphi ELECTION_{it} + + \delta PRELECTION_{it} + \beta x_{it}^{'} + \varepsilon_{it} \quad (1)$$

When fragmentation on current and capital expenditure is considered in the empirical analysis, model (2) is estimated.

$$CC\_EXPFRAG_{it} = a_0 + v_i + \tau_t + \rho CC\_EXPFRAG_{it-1} + \delta GHI_{it} + \\ + \varphi ELECTION_{it} + \delta PRELECTION_{it} + \beta x_{it}^{'} + \varepsilon_{it} \quad (2)$$

Instrumental variables (IV) could be a valid solution. Anderson and Hsiao (1981, 1982) suggest the IV estimator for estimating a dynamic model with variables transformed into first differences. They show that the dynamic process produces the problem of correlation between the first-differenced lagged dependent variable Δy_{it-1} and the first-differenced error term $\Delta\varepsilon_{it}$. To remedy this problem, they use Δy_{it-2} and exogenous variables in first-differences as instruments.[16] Estimators based on the generalised method of moments (GMM) have been found to be more efficient than the Anderson and Hsiao (A-H) estimator. In particular, I refer to the first-differenced (DIFF-) GMM developed by Arellano and Bond (1991), which uses the lagged levels of the dependent variable as instruments for the dynamic equation transformed into first differences. However, the DIFF-GMM estimator suffers from a weak instruments problem when the coefficient of the lagged depend variable is close to unity and when the relative variance of the fixed effects increases (Blundell and Bond, 1998). In this case, an extended version of this estimator helps solve the problem. It is called the System (SYS-) GMM estimator (Arellano and Bover, 1995; Blundell and Bond, 1998). The SYS-GMM estimates equations in levels and in differences employing the lagged differences of the dependent variable as instruments for equations in levels and the lagged levels of the dependent variable as instruments for equations in first differences. Blundell and Bond (1998) show that the SYS-GMM estimator is generally more efficient than the DIFF-GMM estimator. However, the consistency of both estimators depends on the presence of the second-order autocorrelation in the differenced residuals. This condition is detected with the specification test developed by Arellano and Bond (1991) and called the AB-AR2 test in current empirical analysis. The presence of the first order autocorrelation (Arellano and Bond, 1991) is also investigated by a test which this paper calls the AB-AR1 test.

A weakness of the A-H and GMM estimators is that they perform poorly when a small number of cross-sectional units are considered in the empirical analysis. With a small *N* and large *T*, the estimation results may be less precise and biased (Judson and Owen, 1999). Another weakness is that non-stationary data may make unbiased estimations. A signal of this problem occurs when the coefficient of the lagged dependent variable estimated by these estimators is close to unity.

4. Estimation results

In this section I present dynamic estimation results with data transformed in logarithmic form. In this case, the estimation results must be interpreted in terms of elasticity. Since the group-wise heteroschedasticity was detected by running the Modified Wald (MW-)GWH test (Greene, 2000) in a static model, the estimation results of the dynamic model were corrected for robust standard errors.[17] The estimation results of dynamic model (1) are reported in tables 2.1 and 2.2. Table 2.1 presents the estimation results with only fixed effects, whereas those in table 2.2 are

[16] Arellano (1989) shows that y_{it-2} is a better instrument than Δy_{it-2} for the Anderson and Hsiao estimator.
[17] The MW-GWH test results are available from the author upon request.

with both fixed and time effects. Estimation results are reported with collapsed and not collapsed instrumental variables. In fact, in columns 1-7 of each table, the p-values of the Hansen test and the Difference-in-Hansen test are close to 1.00. This is a signal of the presence of an instruments proliferation problem that weakens the performance of Hansen tests used to detect instruments validity (Roodman, 2009). In particular, the Hansen test checks the validity of the full set of instrumental variables, while the Difference-in-Hansen test checks the validity of the sub-set instruments used in the level equations. Although both tests are consistent in the presence of heteroskedasticity and autocorrelation in the error terms, they are weaker when too many instrumental variables are used in panel regressions. In this circumstance, although the validity of instruments is confirmed, «the potential for false-positive results is serious» (Roodman, 2009, p. 156). In order to remedy this problem, Roodman (2009, p. 156) suggests that: «Researchers should report the number of instruments generated for their regressions. In system GMM, difference-in-Hansen tests for the full set of instruments for the levels equation, as well as the subset based on the dependent variable, should be reported. Results should be aggressively tested for sensitivity to reductions in the number of instruments […]». The instrumental variables can be reduced by collapsing instruments and limiting lag length (Roodman, 2009). This solution was therefore adopted in the analysis reported here to check robustness results.

The estimator adopted for the dynamic panel models was the SYS-GMM estimator, which is consistent on observing the p-values of the AB-AR2 test in tables 2.1-3.2.[18] The coefficient of $EXPFRAG_{t-1}$ and $CC\_EXPFRAG_{t-1}$ are always statistically significant, showing that the panel dynamic model is a correct specification. Moreover, it does not assume values close to 1, signalling the absence of non-stationary problems in the dependent variable.

Starting with the estimation results of empirical model (1), table 2.1 shows that regional disproportionality impacts significantly on total expenditure fragmentation. In particular, the coefficient of the *Adjusted Regional GHI index* is positive and statistically significant (+0.08-0.13). On the other hand, the coefficient of the *Regional GHI index* (+0.53) becomes significant only when instruments are collapsed in order to test robustness. Overall, these results suggest that regional total expenditure fragmentation increases when a regional electoral system shifts from a proportional towards to a majoritarian system. By contrast, the national electoral system does not have a significant impact on the budget spending manipulation of regional governments because the coefficient of the *Senate GHI index* is never statistically significant. This finding suggests that regional electoral reform has more impact than national electoral reform on regional total expenditure fragmentation. With time year dummies added in the regression analysis, table 2.2 shows that the electoral system significantly affects the total expenditure fragmentation of regions. However, only the coefficient of the *Regional GHI index* assumes positive values in the range 0.12-0.15 when instruments are not collapsed. In fact, since the p-values of the Hansen tests are close to 1.00, it is preferable to re-run regressions, collapsing instrumental variables in order to keep the proliferation problem under control and, therefore, to be more sure that results are not "false-positive". Estimation results with collapsed instruments confirm the positive impact on total expenditure fragmentation of the regional index of disproportionality. The coefficient of the *Regional GHI index* is 0.22.[19] Although I collapse instrumental variables, I observed that the proliferation problem was not always solved and became more severe when time dummies were introduced into the short-panel regressions.

In regard to the electoral cycle, regional total expenditure fragmentation tends to increase during electoral campaigns. The estimation results in table 2.1 confirm the presence of manipulation of spending items during regional elections only when instrumental variables are

[18] The null-hypothesis of the AB-AR2 test is the absence of the second-order autocorrelation in the differenced residuals.

[19] I re-ran the regressions using different combinations of the lags of dependent and control variables. Generally, I observed that the coefficients of the regional disproportionality indexes were statistically significant when instruments were not collapsed. After the collapse, they frequently lost statistical significance although the p-values of the Hansen tests were close to 1.00. Probably, the smaller size of the panel units (*N=20*) used in the empirical analysis contributed to weakening the ability of the Hansen tests to detect the instruments validity in the GMM-SYS estimations with both time and fixed effects.

collapsed. In particular, the degree of regional spending items manipulation is 6-7% in pre-electoral years. With time dummies added in the panel regressions, the coefficients of *ELECTION* and *PRELECTION* are not statistically significant. Probably, time dummies remove the effects of the electoral cycle on total expenditure fragmentation. It is therefore not possible to draw any robust conclusion in this regard.

Some categories of expenditure included in the *EXPFRAG* index do not even represent government spending or are not strictly targetable, and therefore directly manipulable, by regional governments. For this reason, I refined the empirical analysis by testing model (2) relative to the impact of electoral rules and the electoral cycle on the expenditure fragmentation of current and capital spending (i.e., on *CC_EXPFRAG*). This kind of analysis could add information on the category of public expenditure in which political competition is engaged. If current expenditure represents the larger part over time, a decrease in the *CC_EXPFRAG* index by electoral competition could imply that regional governments compete much more on current than on capital expenditure. This involves that current spending could be more visible to voters.

Tables 3.1 and 3.2 summarize the estimation results. Table 3.1 shows a significant increase in capital and current expenditure fragmentation when the national electoral system moves towards a mixed electoral system. The coefficient of the *Senate GHI index* is positive and statistically significant (+0.15-0.16). This result shows that the allocation of resources between current and capital spending items seems to be more sensitive to national electoral system changes. However, this result is not robust because the coefficient associated with the *Senate GHI index* lost significance when instrumental variables are collapsed. The inclusion of time dummies in panel regressions (see Tab. 3.2) does not subvert the results on the positive impact of a mixed electoral system on expenditure fragmentation. As regards the coefficients associated with the *Senate GHI index* (+0.11-0.18) and the *Adjusted Regional GHI index* (+0.13-0.17), these are positive and statistically significant in the case of collapsed and non-collapsed instrumental variables.[20]

In regard to the electoral cycle, table 3.1 shows a significant concentration of expenditure before elections (-0.08-0.10). For Italian regions, this involves an increase in current spending to the detriment of capital spending before elections. Although contrary to previous evidence on total expenditure fragmentation, this result does not contradict it. In fact, it suggests the presence of a strategy in the manipulation of budget spending items by regional governments. This result, although interesting, is not robust when the instruments are collapsed, as well as when time effects are included in the panel regressions (see Tab. 3.2).

As regards the demographic control variables, an increase in *POP* leads to a concentration of resources in a few spending categories (Tabs. 3.1-3.2). An increase in the size of the population is reflected in a higher demand for public goods and services. To satisfy this demand, regional governments subtract resources allocated to other spending programmes (see Tabs. 3.1-3.2). The age structure of the population significantly affects both kinds of expenditure fragmentation. When the share of elderly and young people increases in the population, regions tend to redistribute more spending in their favour in order to satisfy their demand for public services. An opposite and significant effect for young people on *CC_EXPFRAG* is only found when the instruments are collapsed and time dummies are not included in the regressions (see Tab. 3.1). On the side of the economic control variables, intergovernmental transfers (*GRANTS*) produces a significant increase in budget resources towards current expenditure in Italian regions. Local governments have low tax autonomy in Italy and transfers from the central government are resources of fundamental importance for financing this kind of expenditure. Finally, *GDP* has a significant negative impact on *CC_EXPFRAG*. An increase in *GDP* produces an increase in the public revenues of regional governments which is likely to be employed for funding current expenditure.

[20] However, using different combinations of instrumental variables, I observe that statistical significance of the coefficient of the *Senate GHI index* is more robust than the coefficient of the *Adjusted Regional GHI index*.

Tab. 2.1 Dynamic estimation results on the impact of the electoral system and election on total expenditure fragmentation

Senato GHI index	0.06			0.05	0.06	0.02			0.02	0.03
	(-0.97)			(0.91)	(0.97)	(0.35)			(0.24)	(0.40)
Region GHI index		0.25		0.24			**0.53****		**0.53****	
		(1.40)		(1.45)			**(2.14)**		**(2.18)**	
Adjusted GHI index			**0.08***		**0.08***			**0.13*****		**0.13*****
			(1.69)		**(1.75)**			**(2.87)**		**(2.82)**
POP	**-0.08****	**-0.10*****	**-0.12*****	**-0.09***	**-0.10****	**-0.10****	**-0.11***	**-0.14****	-0.11	**-0.13***
	(-1.99)	**(-2.64)**	**(-2.89)**	**(-1.86)**	**(-2.14)**	**(-2.53)**	**(-1.65)**	**(-2.04)**	(-1.50)	**(-1.89)**
% POP 0-15	-0.50	-0.46	-0.52	-0.46	-0.52	-0.43	-0.31	-0.40	-0.30	-0.37
	(-1.08)	(-0.88)	(-1.06)	(-0.88)	(-1.05)	(-1.28)	(-0.73)	(-0.98)	(-0.70)	(-0.94)
% POP ≥ 65	**-0.71****	**-1.08*****	**-1.04*****	**-1.17*****	**-1.15*****	**-0.68***	**-1.71*****	**-1.41*****	**-1.73*****	**-1.46****
	(-2.12)	**(-3.28)**	**(-2.77)**	**(-3.03)**	**(-2.69)**	**(-1.81)**	**(-2.96)**	**(-2.67)**	**(-2.78)**	**(-2.49)**
GDP	0.08	0.16	0.17	0.19	0.20	0.13	0.38	0.37	0.393	0.39
	(0.27)	(0.48)	(0.51)	(0.54)	(0.59)	(0.48)	(1.12)	(1.21)	(1.11)	(1.23)
GRANTS	-0.02	0.02	0.01	0.01	-0.005	-0.02	0.07	0.03	0.06	0.03
	-0.33	(0.40)	(0.10)	(0.21)	(-0.09)	(-0.33)	(1.10)	(0.52)	(1.05)	(0.43)
ELECTION	0.05	0.03	0.04	0.03	0.03	**0.06****	-0.001	0.02	-0.003	0.02
	(1.51)	(0.85)	(1.02)	(0.68)	(0.81)	**(2.25)**	(-0.03)	(0.75)	(-0.07)	(0.58)
PRE-ELECTION	0.03	0.06	0.05	0.05	0.04	0.03	**0.07***	**0.06***	**0.07***	**0.06***
	(0.96)	(1.23)	(1.24)	(1.22)	(1.22)	(1.22)	**(1.73)**	**(1.74)**	**(1.83)**	**(1.83)**
$EXPFRAG_{t-1}$	**0.33*****	**0.29*****	**0.28*****	**0.30*****	**0.28*****	**0.30*****	**0.26*****	**0.24****	**0.26*****	**0.24****
	(3.20)	**(2.98)**	**(2.91)**	**(3.02)**	**(2.96)**	**(3.19)**	**(2.69)**	**(2.43)**	**(2.68)**	**(2.45)**
constant	3.33	3.43	3.87	3.13	3.52	2.94	2.12	2.66	1.94	2.33
	(0.77)	(0.71)	(0.84)	(0.66)	(0.78)	(0.90)	(0.51)	(0.73)	(0.47)	(0.65)
Wald χ^2	0.000	0.000	0.000	0.000	0.000	63.98***	74.85***	81.31***	76.63***	124.16***
AB-AR1 test	0.007	0.006	0.006	0.007	0.007	0.009	0.012	0.009	0.013	0.010
AB-AR2 test	0.568	0.482	0.459	0.421	0.385	0.551	0.296	0.265	0.285	0.238
Hansen J test	1.000	1.000	1.000	1.000	1.000	0.472	0.442	0.482	0.378	0.399
Diff-in-Hansen test[(a)]	1.000	1.000	1.000	1.000	1.000	1.000	0.426	1.000	0.920	0.340
Diff-in-Hansen test[(b)]	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	0.670	1.000
Instruments Nr.	60	60	60	60	60	24	24	24	24	24
Instr. collapsed	*no*	*no*	*no*	*no*	*no*	*yes*	*yes*	*yes*	*yes*	*yes*
Time-effects	*no*	*no*	*no*	*no*	*no*	*no*	*no*	*no*	*no*	*no*

Note: EXPFRAG is the dependent variable; *Fixed effects are included in all regressions*; coefficient significant at level *** 1%, ** 5%, * 10%; z-value in parenthesis; results of the tests are reported in p-value. Instruments for first differences equation: $EXPFRAG_{t-2}$; Instruments for levels equation: $\Delta EXPFRAG_{t-1}$, POP_{t-1}, GDP_{t-1}, constant, time dummies. Observations Nr. 366; Groups Nr. 19. [(a)] Exogeneity test for the sub-set of instruments for level equation. [(b)] Exogeneity test for the sub-set of instruments based on the dependent variable.

Tab. 2.2 Dynamic estimation results on the impact of electoral system and election on the total expenditure fragmentation

Senate GHI index	-0.02			0.16	0.18	-0.07			0.59	0.53
	(-0.11)			(0.93)	(0.95)	(-0.20)			(1.26)	(1.14)
Regional GHI index		**0.12***		**0.15****			0.09		**0.22***	
		(1.83)		**(2.31)**			(1.30)		**(1.71)**	
Adj. Regional GHI index			0.18		0.17			0.10		0.13
			(1.38)		(1.34)			(0.75)		(0.94)
POP	-0.12	**-0.13****	**-0.15****	-0.08	-0.09	-0.11	-0.10	**-0.10***	0.08	0.06
	(-1.32)	**(-2.07)**	**(-2.25)**	(-0.79)	(-0.89)	(-0.80)	(-1.49)	**(-1.65)**	(0.47)	(0.35)
% POP 0-15	-0.62	-0.81	-1.00	-1.47	**-1.72***	-0.25	-0.66	-0.67	-3.19	-2.93
	(-0.76)	(-1.09)	(-1.26)	(-1.58)	**(-1.66)**	(-0.21)	(-0.81)	(-0.91)	(-1.63)	(-1.59)
% POP ≥ 65	-0.65	-0.86	-1.11	**-1.18***	**-1.43***	-0.36	-0.67	-0.71	**-1.97***	**-1.80***
	(-1.04)	(-1.26)	(-1.44)	**(-1.76)**	**(-1.87)**	(-0.52)	(-0.85)	(-0.97)	**(-1.79)**	**(-1.91)**
GDP	0.07	-0.01	-0.06	-0.34	-0.43	0.15	-0.03	-0.04	-1.28	-1.15
	(0.18)	(-0.05)	(-0.25)	(-0.73)	(-0.89)	(0.24)	(-0.12)	(-0.18)	(-1.30)	(-1.24)
GRANTS	-0.13	-0.14	-0.12	-0.14	-0.11	-0.08	-0.10	-0.07	-0.08	-0.04
	(-1.25)	(-1.45)	(-1.36)	(-1.43)	(-1.26)	(-0.66)	(-0.81)	(-0.71)	(-0.74)	(-0.40)
ELECTION	0.12	0.17	0.02	0.16	-0.01	-0.004	0.07	-0.06	0.02	-0.09
	(0.96)	(1.17)	(0.14)	(1.30)	(-0.06)	(-0.02)	(0.37)	(-0.37)	(0.11)	(-0.38)
PRE-ELECTION	0.03	0.12	0.08	0.12	0.08	-0.16	-0.03	-0.08	0.09	0.03
	(0.17)	(0.63)	(0.45)	(0.66)	(0.43)	(-0.59)	(-0.12)	(-0.37)	(0.31)	(0.13)
$EXPFRAG_{t-1}$	**0.47*****	**0.45*****	**0.44*****	**0.44*****	**0.43*****	**0.54*****	**0.52*****	**0.55*****	**0.51*****	**0.52*****
	(3.15)	**(3.12)**	**(2.94)**	**(3.24)**	**(3.07)**	**(3.46)**	**(3.73)**	**(4.18)**	**(5.49)**	**(5.18)**
constant	5.27	7.01	8.73	11.73	13.81	2.49	5.72	5.80	**24.07***	21.92
	(0.80)	(1.09)	(1.21)	(1.55)	(1.62)	(0.29)	(0.80)	(0.88)	**(1.65)**	(1.62)
Wald χ^2	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
AB-AR1 test	0.001	0.001	0.001	0.002	0.002	0.002	0.001	0.002	0.007	0.007
AB-AR2 test	0.712	0.624	0.591	0.500	0.474	0.520	0.607	0.400	0.520	0.552
Hansen J test	1.000	1.000	1.000	1.000	1.000	0.999	1.000	1.000	0.997	0.830
Diff-in-Hansen test[(a)]	1.000	1.000	1.000	1.000	1.000	0.892	1.000	1.000	0.935	0.542
Diff-in-Hansen test[(b)]	1.000	1.000	1.000	1.000	1.000	0.991	1.000	1.000	0.997	0.830
Instruments Nr.	62	62	62	62	62	32	32	32	32	32
Instr. collapsed	*no*	*no*	*no*	*no*	*no*	*yes*	*yes*	*yes*	*yes*	*yes*
Time-effects	*yes*	*yes*	*yes*	*yes*	*yes*	*yes*	*yes*	*yes*	*yes*	*yes*

Note: EXPFRAG is the dependent variable; *Fixed effects are included in all regressions*; coefficient significant at level ***1%, **5%, *10%; z-value in parentheses; results of the tests are reported in p-values. Instruments for first differences equation: $EXPFRAG_{t-2}$; instruments for levels equation: $\Delta EXPFRAG_{t-1}$, Region GHI $index_t$ (Adj. Region GHI $index_t$ for estimations in columns 4, 6, 9, 11), $POP_{t-3,\ldots,t-8}$, $OLD_{t-3,\ldots,t-8}$, $YOUNG_{t-3,\ldots,t-8}$, $GDP_{t-3,\ldots,t-8}$, $GRANTS_{t-2,\ldots,t-7}$, constant. Observations Nr. 223; Groups Nr. 18. [(a)] Exogeneity test for the sub-set of instruments for level equation. [(b)] Exogeneity test for the sub-set of instruments based on the dependent variable.

Tab. 3.1 Dynamic estimation results on the impact of electoral system and election on current and capital expenditure fragmentation

Senato GHI index	**0.16****			**0.15***	**0.15****	0.06			0.06	0.06
	(2.00)			**(1.94)**	**(1.98)**	(0.84)			(0.83)	(0.82)
Region GHI index		0.11		0.07			0.03		0.03	
		(0.97)		(0.67)			(0.15)		(0.14)	
Adjusted GHI index			0.10		0.09			0.07		0.07
			(1.52)		(1.47)			(1.21)		(1.25)
POP	**-0.08***	**-0.13*****	**-0.15*****	**-0.08***	**-0.10****	**-0.17*****	**-0.19*****	**-0.21*****	**-0.17*****	**-0.19*****
	(-1.73)	**(-2.93)**	**(-3.90)**	**(-1.85)**	**(-2.56)**	**(-2.61)**	**(-3.15)**	**(-3.69)**	**(-2.65)**	**(-2.89)**
% POP 0-15	0.37	0.44	0.50	0.37	0.44	**1.24***	**1.29***	**1.46****	**1.25***	**1.42****
	(0.65)	(0.74)	(0.94)	(0.66)	(0.83)	**(1.91)**	**(1.90)**	**(2.19)**	**(1.92)**	**(2.19)**
% POP ≥ 65	-0.005	0.10	-0.20	-0.13	-0.46	0.65	0.72	0.45	0.60	0.33
	(-0.01)	(0.21)	(-0.31)	(-0.30)	(-0.74)	(1.39)	(1.04)	(0.69)	(1.04)	(0.57)
GDP	0.12	0.09	0.22	0.14	0.27	0.26	0.25	0.39	0.27	0.42
	(0.59)	(0.48)	(1.09)	(0.71)	(1.29)	(0.84)	(0.72)	(1.00)	(0.78)	(1.05)
GRANTS	**-0.21*****	**-0.17*****	**-0.15*****	**-0.20*****	**-0.18*****	**-0.16*****	**-0.14****	**-0.12****	**-0.15****	**-0.13****
	(-2.93)	**(-2.68)**	**(-2.68)**	**(-2.78)**	**(-2.71)**	**(-2.84)**	**(-2.43)**	**(-2.16)**	**(-2.53)**	**(-2.28)**
ELECTION	0.002	0.01	-0.01	-0.004	-0.02	-0.01	-0.01	-0.03	-0.02	-0.04
	(0.04)	(0.13)	(-0.27)	(-0.08)	(-0.55)	(-0.29)	(-0.24)	(-0.69)	(-0.43)	(-0.85)
PRE-ELECTION	**-0.10****	-0.07	-0.05	**-0.09***	**-0.08***	-0.05	-0.03	-0.02	-0.04	-0.03
	(-2.08)	(-1.28)	(-1.12)	**(-1.84)**	**(-1.68)**	(-1.05)	(-0.68)	(-0.37)	(-0.86)	(-0.57)
$CC\_EXPFRAG_{t-1}$	**0.75*****	**0.72*****	**0.70*****	**0.75*****	**0.73*****	**0.52*****	**0.49*****	**0.46*****	**0.52*****	**0.48*****
	(6.25)	**(5.98)**	**(6.15)**	**(6.18)**	**(6.32)**	**(3.45)**	**(3.21)**	**(3.23)**	**(3.47)**	**(3.40)**
constant	-0.31	0.16	-0.20	-0.28	-0.59	-4.93	-4.83	-5.91	-5.00	-6.09
	(-0.08)	(0.04)	(-0.06)	(-0.07)	(-0.17)	(-1.00)	(-0.99)	(-1.18)	(-1.00)	(-1.18)
Wald χ^2	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
AB-AR1 test	0.001	0.001	0.001	0.001	0.001	0.012	0.013	0.015	0.012	0.015
AB-AR2 test	0.896	0.993	0.977	0.912	0.911	0.881	0.905	0.887	0.886	0.873
Hansen J test	1.000	1.000	1.000	1.000	1.000	0.297	0.383	0.582	0.330	0.522
Diff-in-Hansen test[(a)]	1.000	1.000	1.000	1.000	1.000	0.043	0.672	0.248	0.581	0.296
Diff-in-Hansen test[(b)]	1.000	1.000	1.000	1.000	1.000	0.211	0.812	0.658	0.446	0.772
Instruments Nr.	58	58	58	58	58	24	24	24	24	24
Instr. collapsed	*no*	*no*	*no*	*no*	*no*	*yes*	*yes*	*yes*	*yes*	*yes*
Time effects	*no*	*no*	*no*	*no*	*no*	*no*	*no*	*no*	*no*	*no*

Note: CC_EXPFRAG is the dependent variable; *Fixed effects are included in all regressions*; coefficient significant at level *** 1%, ** 5%, *10%; z-value in parenthesis; results of the tests are reported in p-value. Instruments for first differences equation: $CC\_EXPFRAG_{t-3}$; instruments for levels equation: $\Delta CC\_EXPFRAG_{t-2}$, POP_{t-1}, GDP_{t-1}, constant, time dummies. Observations Nr. 366; Groups Nr. 19. [(a)] Exogeneity test for the sub-set of instruments for level equation. [(b)] Exogeneity test for the sub-set of instruments based on the dependent variable.

Tab. 3.2 Dynamic estimation results on the impact of electoral system and election on current and capital expenditure fragmentation

Senato GHI index	**0.17****			**0.18****	0.05	0.08			**0.11***	0.02
	(2.20)			**(2.46)**	(0.72)	(1.43)			**(1.68)**	(0.23)
Region GHI index		-0.01		0.06			0.06		0.10	
		(-0.06)		(0.66)			(0.59)		(0.90)	
Adjusted GHI index			**0.15***		**0.13***			**0.17****		**0.17****
			(1.88)		**(1.73)**			**(1.99)**		**(2.04)**
POP	-0.05	**-0.10****	**-0.06****	-0.05	-0.05	-0.02	-0.05	-0.06	-0.02	-0.06
	(-1.26)	**(-2.35)**	**(-1.96)**	(-1.17)	(-1.58)	(-0.64)	(-1.57)	(-1.26)	(-0.64)	(-0.98)
% POP 0-15	**-1.41*****	**-0.70***	-0.41	**-1.52*****	-0.64	**-0.74****	**-0.41***	-0.61	**-0.97*****	-0.68
	(-2.65)	**(-1.86)**	(-1.12)	**(-3.18)**	(-1.30)	**(-2.08)**	**(-1.69)**	(-1.12)	**(-2.67)**	(-1.49)
% POP ≥ 65	**-1.41*****	**-1.03****	**-0.72****	**-1.52*****	**-0.85****	**-0.75****	**-0.63****	-0.87	**-0.98*****	**-0.91***
	(-3.04)	**(-2.43)**	**(-2.54)**	**(-3.59)**	**(-2.34)**	**(-2.40)**	**(-2.01)**	(-1.60)	**(-2.94)**	**(-1.92)**
GDP	**-0.55*****	**-0.20***	**-0.24****	**-0.60*****	**-0.35***	**-0.39****	**-0.22****	**-0.30***	**-0.49****	**-0.34****
	(-2.61)	**(-1.86)**	**(-2.20)**	**(-3.20)**	**(-1.95)**	**(-2.33)**	**(-2.41)**	**(-1.83)**	**(-2.47)**	**(-2.19)**
GRANTS	**-0.13***	**-0.13***	0.01	**-0.13***	0.003	-0.02	-0.02	-0.0002	-0.03	-0.0005
	(-1.82)	**(-1.77)**	(0.11)	**(-1.90)**	(0.04)	(-0.36)	(-0.49)	('-0.00)	(-0.62)	(-0.01)
ELECTION	-0.03	0.004	0.18	0.01	0.14	0.02	0.12	0.28	0.12	0.25
	(-0.16)	(0.02)	(1.38)	(0.04)	(0.86)	(0.11)	(0.53)	(1.37)	(0.50)	(0.99)
PRE-ELECTION	0.11	0.13	0.12	0.11	0.08	0.03	0.08	0.25	0.03	0.24
	(0.53)	(0.68)	(0.96)	(0.56)	(0.64)	(0.13)	(0.27)	(1.08)	(0.12)	(1.00)
$CC\_EXPFRAG_{t-1}$	**0.84*****	**0.85*****	**0.84*****	**0.84*****	**0.84*****	**0.85*****	**0.85*****	**0.86*****	**0.84*****	**0.85*****
	(14.49)	**(14.49)**	**(14.29)**	**(14.22)**	**(14.5)**	**(12.64)**	**(11.29)**	**(9.13)**	**(10.07)**	**(9.59)**
constant	**14.18*****	**8.88*****	**5.87****	**15.15*****	**7.73***	**8.05****	**5.75****	7.32	**10.19*****	**7.91***
	(2.97)	**(2.32)**	**(1.96)**	**(3.60)**	**(1.89)**	**(2.38)**	**(2.12)**	(1.37)	**(2.93)**	**(1.84)**
Wald χ^2	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
AB-AR1 test	0.000	0.001	0.002	0.001	0.002	0.010	0.011	0.006	0.009	0.005
AB-AR2 test	0.424	0.439	0.963	0.426	0.888	0.679	0.621	0.981	0.679	0.997
Hansen J test	1.000	1.000	1.000	1.000	1.000	0.865	0.949	0.999	0.520	0.990
Diff-in-Hansen test[(a)]	1.000	1.000	1.000	1.000	1.000	0.258	0.397	0.773	0.133	0.735
Diff-in-Hansen test[(b)]	1.000	1.000	1.000	1.000	1.000	0.527	0.698	0.959	0.323	0.944
Instruments Nr.	63	63	62	63	62	33	33	33	33	33
Instr. collapsed	*no*	*no*	*no*	*no*	*no*	*yes*	*yes*	*yes*	*yes*	*yes*
Time effects	*yes*	*yes*	*yes*	*yes*	*yes*	*yes*	*yes*	*yes*	*yes*	*yes*

Note: CC_EXPFRAG is the dependent variable; *Fixed effects are included in all regressions*; coefficient significant at level *** 1%, ** 5%, * 10%; z-value in parentheses; results of the tests are reported in p- values. Instruments for first differences equation: $CC\_EXPFRAG_{t-3}$; Instruments for levels equation: $\Delta CC\_EXPFRAG_{t-2}$, Region GHI $index_{t-1}$, Senate GHI $index_{t-2}$, $POP_{t-2,\ldots,t-7}$, $OLD_{t-1,\ldots,t-6}$, $YOUNG_{t-2,\ldots,t-7}$, $GDP_{t-2,\ldots,t-7}$, $GRANTS_{t-2,\ldots,t-7}$, constant. For estimations in columns 4, 6, 9, 11: instruments for first differences equation: $CC\_EXPFRAG_{t-4}$; instruments for levels equation: $\Delta CC\_EXPFRAG_{t-3}$, Adj. Reg.GHI $index_{t-1}$, Senate GHI $index_{t-1}$, $POP_{t-2,\ldots,t-7}$, $OLD_{t-2,\ldots,t-7}$, $YOUNG_{t-2,\ldots,t-7}$, $GDP_{t-2,\ldots,t-7}$, $GRANTS_{t-2,\ldots,t-7}$, constant. Observations Nr. 240; Groups Nr. 18. [(a)] Exogeneity test for the sub-set of instruments for level equation. [(b)] Exogeneity test for the sub-set of instruments based on the dependent variable.

4. Conclusion

In this paper I have estimated the degree of regional spending items manipulation by incumbent politicians under different electoral regimes and when elections are forthcoming. The degree of spending manipulation has been measured by the total expenditure fragmentation index.

Dynamic panel estimations have shown that when a regional electoral system moves towards a mixed electoral system, total public expenditure is more fragmented. The degree of regional spending items manipulation estimated in the dynamic panel analysis is on average 15%. This result confirms that the kind of fiscal policies implemented by incumbents may differ substantially under different electoral systems and be more fragmented under a mixed electoral system.

Further results have concerned the impact of the electoral cycle on the total expenditure fragmentation of Italian regions. During pre-election years, the total expenditure seems to be more fragmented among spending budget items. The degree of spending items manipulation is 6-7% before elections. However, this result is not particularly robust because it emerged only in the dynamic regression analysis and when time effects were not included. Probably, the introduction of time dummies removed the electoral cycle, so that identification of this effect was problematic in the empirical analysis.

I refined the empirical investigation by focusing on the fragmentation of current and capital expenditure. The estimation results confirm previous findings on the positive impact of a mixed electoral system on expenditure fragmentation. On the side of the electoral cycle, the results provide weak evidence in favour of expenditure concentration. This evidence suggests that regional governments could engage in electoral competition by manipulating current expenditure.

Summing up, for Italian regions, the panel analysis shows that regional governments manipulate spending budget items under different electoral rules. As regard the electoral cycle, I only observe weaker evidence in favour of more fragmentation in total public expenditure and more concentration on current expenditure before elections. The results on the electoral cycle, although opposite, are not contradictory because they are more likely due to a manipulation strategy engaged by incumbents on spending budget items. These aspects represent an original investigation, and I trust that these findings warrant further empirical investigation and discussion.

Appendix

Since the Hirschman-Herfindahl index (HHI) of fragmentation HHI-F is equal to (1-HHI) and $\text{HHI} \in \left[\frac{1}{n},\ 1\right]$, it follows that $\text{HHI-F} \in \left[0, \frac{(n-1)}{n}\right]$. Subtracting $\frac{1}{n}$ from HHI and dividing it by $\frac{n-1}{n}$, we obtain the normalised version of $\text{HHI}^{*} = \frac{\text{HHI} - \frac{1}{n}}{\frac{n-1}{n}} = \frac{n\text{HHI}-1}{n-1} \in [0,\ 1]$. Replacing HHI^{*} in HHI-F, it follows that:

$$\text{HHI-F}^{*} = 1 - \text{HHI}^{*} = 1 - \frac{n\text{HHI}-1}{n-1} \in [0,\ 1].$$

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