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**WHERE ARE WE NOW? PROPORTIONALITY,
GOVERNABILITY, AND THE (RE)DESIGN OF THE ELECTORAL
SYSTEM FOR THE PORTUGUESE PARLIAMENT**

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Abstract:

The Electoral System for the Portuguese Parliament (ESPP) was able to strike a balance between proportionality and governability since its creation. However, the increase in the number of low-magnitude districts and in the number of wasted votes has increased the system's disproportionality. We conducted a thorough literature review and performed simulations to conclude that the introduction of a 12-MPs National Compensation Circle (NCC) would increase proportionality without significant costs in terms of governability. If the scale effect caused by the entry of more parties in the ESPP is significant, a 1% electoral threshold can be jointly introduced with the NCC.

Keywords:

Proportionality; Governability; Voting; Election

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Introduction

Two of the most common objectives of an electoral system are proportionality (having a more accurate conversion between a party's vote share and its parliamentary seat share) and governability (having government stability with single-party majorities where accountability is easier to attribute). Even though these objectives are, to a large extent, incompatible, the trade-off between them may be seen as curvilinear (Carey and Hix, 2009), implying that an electoral system can pursue proportionality without necessarily forsaking governability.

Even though the Electoral System for the Portuguese Parliament (ESPP) has performed well in terms of governability and proportionality (Fernandes, 2022; Freire, 2015), the proportionality degree of the two last elections was considerably lower than the average. This resulted from (i) a higher number of low-magnitude districts and (ii) the increase in the number of wasted votes, fostered by the appearance of parties unable to elect MPs in low-magnitude districts, even though they had a high share of national votes. As both factors seem to have a permanent nature, the ESPP will tend to produce systematically less proportional results if nothing is done.

In this context, this project tries to see how the ESPP can increase its proportionality degree without considerable costs in terms of governability. To this end, two main suggestions are proposed: (i) introducing a national compensation circle (NCC) of 12 MPs and (ii) introducing a NCC with 12 MPs alongside a 1% electoral threshold. As most suggestions to reform the ESPP have put the focus solely on proportionality, without considering the potential costs to governability, we consider that this project presents an innovative approach to the reform of the ESPP, which is particularly relevant in this context, where the proportionality degree of the system appears to be decreasing.

1. Proportionality and Governability

An electoral system is defined by both the main goals it aims to accomplish, and the instruments used to achieve such goals. Since different goals are incompatible to some extent, designing a system must involve a conscious choice. One important choice in the design of electoral systems concerns the trade-off between proportionality (“the representation of voters’ preferences”, Carey and Hix, 2009: 4) and governability (“the accountability of governments”, Carey and Hix, 2009: 4). The first concept deals with the “inclusion of parties reflecting diverse interests and identities in the legislature” (Carey and Hix, 2009: 4), whilst the second concept targets government stability, by fostering single-party governments where accountability is easier to attribute. The standard view in political science is that this trade-off is linear (Carey and Hix, 2009)

There are two extreme electoral systems, each one assuming one of the sides of the trade-off as the goal it tries to accomplish. Proportionality is better achieved in a proportional representation (PR) system where there is a more accurate conversion between a party’s vote share and its parliamentary seat share. This means that the main goal of a PR system is to ensure that a party with $\alpha\%$ of the votes gets a share of parliament seats as close to α as possible. This necessarily reduces the minimum vote share that a party has to have in order to get a seat, leading to the election of more parties to the parliament. Therefore, PR systems allow the inclusion of a wider range of partisan views in the parliament and tend to map more closely the median member of the parliament (on a left-right ideological scale) and the median member of the electorate (Huber and Powell, 1994). Conversely, governability is better achieved with majoritarian systems, where the party that has a higher vote share tends to reap a bonus in the vote-seat conversion. This means that election winners are likely to become overrepresented in the parliament, whilst losing parties tend to become underrepresented. As a result, majoritarian systems are likely to

produce majority single-party governments, even in the cases where the winning party fails to get half of the votes (Carey and Hix, 2009).

This analysis aims to determine to what extent proportionality and governability are desirable features to target when designing an electoral system. Concerning proportionality, the appeal of having a parliament which translates society's ideological views in a more accurate way has its costs, among which are the following¹:

- (1) Slower Decision-Making** – the election of a higher number of parties increases the probability of coalition governments (as parties are less likely to achieve the majority of the seats in the parliament). This means that the government decisions will have to result from a consensus between parties which may have different views. This slows down the decision-making process.
- (2) Disproportional Power for Minorities** – in a PR system, government coalitions may include parties with a relatively low vote share that, however, are still needed to ensure that the government has most of the seats. The awareness that the existence of a government relies on them, may lead such minority parties to force the leading party to cave in multiple issues, which gives them more power than their vote share would allow for.
- (3) More Instability** – the increase of the number of parties in government heightens the risk of instability.
- (4) More Asymmetric Information** – in some cases, voters do not know *ex-ante* (that is, prior to the election) with which parties their preferred party can form a coalition *ex-post* (after the election), whilst parties know internally with which parties they would be willing to form a government with.

¹ The highlighted costs of both proportional and majoritarian systems result from the analysis conducted by Freire (2015), Carey and Hix (2009) and Alfano and Baraldi (2014).

(5) Loss of Accountability – in coalition governments with multiple parties it is harder to know who is to blame for a given outcome, making the parties in the government less accountable for their actions.

The more proportional a system is the more likely these costs become. This means that if one tries to design an electoral system which favours governability over proportionality, these costs become less relevant. However, systems targeting governability, namely majoritarian ones, have also their own costs, including:

(1) Minority Exclusion – the less proportional a system is, the less likely is the election of parties which represent minorities, meaning that achieving governability may imply the exclusion of minorities from the political system.

(2) Artificial Majorities – in order to increase the likelihood of single-party majority governments, systems which target governability tend to give a bonus to the party that wins the election when converting votes into seats. This ends up creating governments that control the majority of the parliament seats, without representing the majority of voters.

(3) Authoritarianism and Social Conflicts – single-party majority governments have considerable power to impose their own policies, as they control the majority of the parliament. This can lead to a situation where governments systematically disregard the views of the other parties, which leads minority parties to find alternative ways to pressure the government, namely through social protests and turmoil.

Therefore, if the trade-off between proportionality and governability is linear, one will have to choose between the inefficient outcomes of PR and those of majoritarian systems. The question now is whether this classical idea that the trade-off between proportionality and governability is linear actually holds. Carey and Hix (2009) introduce the idea of a non-linear trade-off between accountability (governability) and representation

(proportionality), supporting this view on the notion that “electoral proportionality is subject to diminishing returns in the properties of electoral systems that foster it” (Carey and Hix, 2009: 7), that is, the added benefits in terms of proportionality when we design a more representative system will be lower the more proportional the system is initially. This aligns with the idea that “the trade-off is consequently curvilinear rather than linear” (Carey and Hix, 2009: 7).

Once we see the trade-off between proportionality and governability as non-linear, we open space for the design of a mixed system, which combines features of PR and majoritarian systems. This combination of features can originate voting systems that foster better outcomes, not only in terms of the minimization of the trade-off between proportionality and governability, but, for instance, in what concerns economic growth. In this regard, Alfano and Baraldi (2014) estimate a non-linear relationship between the Gallagher proportionality index (the measure that we will use to study proportionality, as explained in the next section) and the growth rate of GDP per capita, finding not only that the degree of proportionality of a system is significant for economic growth, but also that mixed systems are associated with higher levels of growth.

The question now is whether there is some way to design an optimal system – which, in this case, translates into designing a system that would maximize the net benefits of proportionality. Brams and Fishburn (2002: 225) conclude that “there is no perfect voting procedure”. In fact, the notion of optimality will always rely on how the system behaves *vis-à-vis* the goals that its designer had when creating it (for instance, enhance economic growth, reduce voter inequality or improve government performance).

Overall, these examples show that the design of an electoral system has to start with a clear notion of its goals. If such goals move beyond pure proportionality or governability, the designed system should be mixed, including both elements of PR and of majoritarian

systems. But should a system move beyond the extremes? Following Alfano and Baraldi (2014), there is an ever-growing consensus that mixed systems are a way to minimize the trade-off between proportionality and governability. This makes sense given that one can design a mixed system with most of the proportionality gains without losing a considerable amount of governability.

Therefore, this analysis will move beyond the extreme systems, trying to see to what extent the Electoral System for the Portuguese Parliament (ESPP) can reap most of the benefits associated with proportionality without significant costs in terms of governability.

2. Measuring Proportionality and Governability

In section 1, we introduced the idea that disproportionality is minimized with proportional representation. However, as there are different methods to create a PR system, it would be useful to compare the proportionality degree in each case. The problem is that “each method of PR minimizes disproportionality according to the way it defines disproportionality, and thus each in effect generates its own measure of disproportionality” (Gallagher, 1991: 49). Therefore, proportionality measures have a bias towards the electoral system that originate them, which poses a problem when one tries to use the same measure to evaluate different systems.

Following the analysis of Michael Gallagher (1991), we have chosen to use the Least Squares Index (also known as the Gallagher Index) to measure proportionality, as it is also the standard method used in literature to compare proportionality across systems (Alfano and Baraldi, 2014). We have that:

$$LSQ = \sqrt{\frac{\sum_{i=1}^n (V_i - S_i)^2}{2}}$$

This means that the LSQ corresponds to the square root of half of the sum of the squared vote-seat differences across all parties (V_i is the vote share of party i and S_i is the share of parliament seats won by party i). The higher the LSQ the more disproportional the system.

On the other hand of the trade-off, the effective number of parties (also referred as the Laakso and Taagepera Index) is often used as a measure for governability (Fernandes, 2022). This indicator illustrates the degree of political fragmentation of a system, which, following Carey and Hix (2009), is inversely related with governability. The index accounts for the number of parties in a given election, weighting them according with their electoral results with the following formula (Laakso and Taagepera, 1979):

$$ENP = \frac{1}{\sum_{i=1}^n P_i^2}$$

Therefore, the effective number of parties will correspond to the inverse of the sum of the squared proportion of seats (or votes) across all parties. For comparability reasons, this analysis will always compute the ENP using parties' seat shares, to restrict the sample to the parties that are elected to the parliament in a given election.

3. Proportionality and Governability in the ESPP

The electoral systems are defined by several components that shape the institutional framework, setting the incentives and restrictions to voters' behaviour and to the formation of governments (Gallagher and Mitchell, 2018). Jorge Fernandes (2022) considers that the ESPP is shaped by four main features:

- (1) District Magnitude:** The ESPP has 22 multi-member districts: the 18 administrative districts of Continental Portugal, the two autonomous regions (Azores and Madeira) and the two emigration districts (which aggregate the votes

of Portuguese emigrants in Europe and Outside of Europe). The ESPP is one of the most heterogeneous systems in what concerns district magnitude (Fernandes, 2022), as it has many very small districts (which elect 2/3 MPs) and two very large districts (Lisbon, electing 48 MPs, and Porto, electing 40 MPs).

(2) Parliamentary Seats: There are currently 230 MPs in the Portuguese Parliament (*Assembleia da República*), which implies that Portugal has a slightly lower parliamentary dimension comparing with the EU average (Fernandes, 2022).

(3) Types of Party List: Portugal is one of the few European nations where the electoral system does not promote intra-partisan competition (Fernandes, 2022). Therefore, Portugal has a closed list system that awards party leaders the power to choose the ranking of the party's candidates in each district.

(4) Vote-Seat Conversion Method: The ESPP uses the D'Hondt Method to convert votes into parliamentary seats. Cox (1997) considers this method to be the least proportional of all PR methods, as it implies a greater share of wasted votes (votes that are not converted into seats). As a result, the D'Hondt Method incentivises the concentration of votes in the two main parties of the system (Fernandes, 2022).

Therefore, Portugal has a proportional system with closed lists, which puts the focus on political parties (Fernandes, 2022). Proportionality is, in fact, inscribed in the Portuguese Constitution (article 113) as one of the general principles of the electoral law ("The conversion of votes into seats shall be done according with the principle of proportional representation", *Constituição da República Portuguesa*). That is why both the distribution of MPs per district and the vote-seat conversion within each district are done according with the D'Hondt Method.

Regarding the within-district vote-seat conversion, the D'Hondt Method implies that the S_j parliamentary seats that district j elects will be attributed to the parties that have the S_j

highest divisors when we consider the number of votes that each party had in the district. As a result, only larger parties will be able to elect MPs in districts with a medium-low magnitude. According with Jalali (2007), this bias towards major parties explains why the D'Hondt Method was chosen for the Portuguese system: it would maximize the seats granted to moderate parties², thus avoiding a highly fragmented parliament where extreme parties would have a relevant share of seats.

As previously stated, the D'Hondt Method is considered the least proportional amongst the PR methods, given that it tends to give a higher bonus to the winning parties in the vote-seat conversion. Regardless, the ESPP seems to be less disproportional than the OECD average (Fernandes, 2022), which seems to indicate that, historically, the bonus has not been that high. However, in the 2022 Parliamentary Election, the proportionality degree of the Portuguese system was, for the first time, lower than the OECD average (Fernandes, 2022), thus resulting in a higher LSQ index (higher proportionality degrees correspond to lower a lower LSQ index, and vice-versa).

According to the sources of disproportionality identified by Gallagher (1991), the disproportionality in the ESPP can be mostly attributed to a combination of the vote-seat conversion method with the district magnitude. The discrepancy between the low-magnitude districts [where there are only one/two parties with actual chances of being elected] and the high-magnitude districts [where there are four/five “viable parties” (Fernandes, 2022: 250)] implies that the ESPP is highly heterogeneous across districts. This is clear when we look at the LSQ per district: higher-magnitude districts are, on average, more proportional (Fernandes, 2022). This heterogeneity leads both parties and voters to employ different electoral strategies in different districts, which ends up creating

² In the Portuguese system, the two parties that have consistently the higher vote shares (PS and PSD) can be seen as moderate in ideological terms: PS is a centre-left party, whilst PSD is a centre-right party.

a cleavage between voters of low and high-magnitude districts (Rickard, 2018; Jurado and León, 2017). Even though the full analysis of the consequences of this heterogeneity is outside the scope of this project, it should not be neglected: as Fernandes (2022) points out, it is important to assess to what extent Portugal may be converging into a “one nation, two systems” model.

Figure 1 presents the evolution of the LSQ in the Elections for the Portuguese Parliament between 1976 and 2022, showing that the system was more proportional in its first elections (the minimum value for the LSQ index was achieved in 1983 with 2,97). Apart from the 1987 elections, which can be seen as an outlier (as the winner of the election – PPD/PSD - benefited from a bonus in the vote-seat conversion higher than what usually happens³), the ESPP became less proportional when the house size changed from 250 MPs (from 1979 to 1987) to 230 MPs (from 1991 onwards)⁴. This conclusion aligns with the idea that proportionality is expected to increase if the house size increases (analogous to the idea that higher district magnitudes will lead to a higher proportionality in the district). Finally, in 2019 and 2022, the LSQ index has reached its historical-maximum values (7,59 and 7,56, respectively), because of the large difference between PS’ vote and seat share⁵.

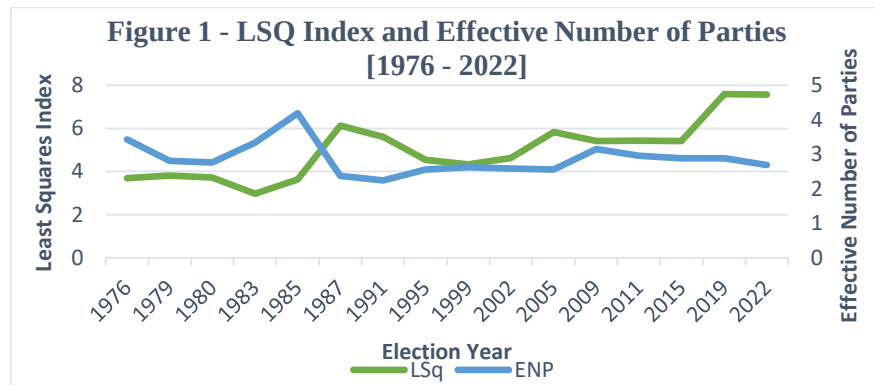
Regarding governability, an analysis conducted by Freire *et al* (2009) concluded that Portugal had one of the least fragmented party systems of the EU. It seems that this idea has resisted the passing of time, as “the effective number of parties in Portugal [as measured by the Laakso and Taagepera Index] has remained consistently below the OECD average” (Fernandes, 2022: 246). In fact, in a context where advanced

³ In 1987, PPD/PSD won 59% of the seats, but only had 51% of the votes.

⁴ Average LSQ index [1979-1987]: 4,05 | Average LSQ Index [1991-2022]: 5,63

⁵ In 2019, PS won 47% of the seats with 38% of the votes, and, in 2022, PS won 52% of the seats with less than 43% of the votes. These were the two highest vote-seat differences ever recorded in the ESPP.

democracies seem to have more electoral volatility and more fragmented systems (Fernandes, 2022), Portugal has remained with fairly constant values in what concerns the effective number of parties, especially since 1987, as shown in Figure 1.



Source: Own Calculations. Note: this analysis does not consider the emigration districts' results

4. The (re)Design of the Portuguese Electoral System⁶

4.1 Background and Motivation

Literature on the ESPP suggests that the system has performed well in terms of stability, governability, and proportionality (Fernandes, 2022; Freire, 2015; Freire *et al*, 2008). Nevertheless, several structural reforms have been proposed over the years, though none has been implemented (Freire, 2015; Fernandes, 2022). There have been, however, some changes to the system, in what concerns the number of MPs and the introduction of the possibility of having single-member districts (Freire, 2003; Fernandes, 2022).

The goal of this section is to present potential changes to the ESPP. Given that the focus of this project is on the trade-off between proportionality and governability, we will consider changes with a direct impact on these concepts. Therefore, we will not analyse

⁶ The methodology used to develop the simulations referred in this section is described in the Appendix.

changes that are not directly linked to proportionality and governability, namely the introduction of intra-partisan competition between a party's district candidates.

The analysis presented in this section has, however, one clear limitation. The impact on the proportionality and governability indicators of the changes proposed in this study will be measured by recalculating the LSQ and ENP for the several elections assuming that the changes were in place. This is a strong assumption, as it implies that voters would have had the same party preferences in a context where the system was designed in a different way. However, it is the only way that we have to assess the impact of the changes in terms of proportionality and governability.

As mentioned before, disproportionality in the ESPP is mainly driven by a combination of the vote-seat conversion method with district magnitude. Given that it is not possible to look at all system components in this analysis, we have chosen to hold the number of members of the parliament constant, as it is not seen as one of the main disproportionality sources. Furthermore, we have also held constant the dimension of the electoral districts⁷, as redesigning to a large extent the district size could pose further challenges to the assumption of making simulations based on previous elections' outcomes.

It is also relevant to mention that, throughout the simulations, we are only applying the changes to the national districts, which elect 226 MPs in total (the results of the emigration districts are assumed to be exogeneous, and thus do not appear in the simulations).

In section 3, we have shown that the degree of proportionality, as measured by LSQ, was fairly stable between 1991 and 2015, with an average index of 5,15 and a standard

⁷ By district dimension, we are referring to the size of each district, which is still assumed to coincide with Portugal's 18 administrative districts and two autonomous regions. The fact that the district dimension is held constant does not imply that the district magnitude (number of MPs elected in each district) is constant.

deviation (S_Dev) of 0,52. If we include the 2019 and 2022 elections, the average LSQ increases to 5,63 and the S_Dev goes to 1,08, which shows how relatively higher these values were compared to what usually happened. As previously explained, the higher indexes in 2019 and 2022 have resulted from the bonuses that PS has received in the vote-seat conversion. Even though bonuses have not reached this magnitude in previous elections, the 2019 and 2022 results highlight how the D'Hondt Method may sometimes produce outcomes which reassemble more a majoritarian system than a PR one.

The question now is whether the 2019 and 2022 were an exception to the pattern or the beginning of a new pattern. We lean to the second option, for two main reasons:

- ❖ Over the last decades, the rural districts have lost a considerable number of citizens, which implies that the district magnitude (which is determined by the number of citizens in the district) has been decreasing in these areas. Given that districts with lower magnitude tend to have less proportional outcomes (as analysed in section 3), the appearance of more low-magnitude districts is expected to have a negative impact in the overall proportionality degree.
- ❖ Over the last elections, there was the introduction of new parties in the system, which have achieved a considerable share of national votes. However, such parties are still unable to elect MPs in low magnitude districts, even though they have a high share of votes in some cases⁸. This increases the number of wasted votes⁹, which further causes a negative impact on the proportionality degree.

Both tendencies seem to have a permanent nature, which leads to the conclusion that the ESPP will tend to produce systematically less proportional results if nothing is done. This

⁸ For instance, CHEGA did not elect any MP in Portalegre in 2022, though it won 7,18% of the votes.

⁹ “O Meu Voto” Portal estimates that 730 000 votes were wasted in the 2022 election, corresponding to 13% of the voters.

is why we believe that there is room to implement changes to increase the proportionality of the system. However, the focus is not on decreasing the LSQ to its minimum level: as analysed in section 1, it is not necessarily desirable to have a system as proportional as possible. To choose our proportionality target, we have started by creating a classification system to apply to the several indexes:

- ❖ Type 1 (T1) – values that are, at most, one S_Dev away from the mean.
- ❖ Type 2 (T2) – values, not in T1, that are, at most, two S_Dev away from the mean.
- ❖ Type 3 (T3) – values that are not included in neither T1 nor T2

We have then created a subsample of elections including those which occurred between 1991 and 2015 (after the parliament changed to 230 MPs and before LSQ started increasing). Having in mind the average and the S_Dev of the LSQ indexes in these elections, the T1 interval is [4,59; 5,71], whilst the T2 intervals are [4,03; 4,59[and]5,71; 6,26].

Following the analysis conducted by Freire *et al* (2008), we can consider that the ESPP performed well in terms of proportionality in the period from 1991 to 2015¹⁰, meaning that is reasonable to target proportionality indexes included in the interval [4,03; 6,26]. However, that is not enough. This analysis tries to propose sustainable solutions, meaning that the suggested changes should produce a system that is still able to keep the desirable proportionality indexes (within the joint T1-T2 interval) even if the external factors influencing proportionality change. That is why we have calibrated the proposed changes in a way that, under the new design of the ESPP, the LSQ indexes for the 2019 and 2022 elections fall within the T1 interval whenever possible.

¹⁰ Even though the analysis conducted by Freire *et al* only covers the period until 2008, we can extrapolate the conclusion to the 2009, 2011 and 2015 elections, as the LSQ indexes followed similar trends to what happened before 2008.

However, following the analysis developed in section 1, we should not forget that increasing proportionality may have a negative impact on governability. The ENP has been fairly stable in the previous elections, and so we will try to keep it so. This implies targeting ENP values within the T1 (or the T2) intervals, given the numbers recorded in the elections from 1991 to 2015¹¹.

4.2 Introduction of a National Compensation Circle

The (re)design of the ESPP proposed in this project includes the introduction of a National Compensation Circle (NCC) that would apply to voters in all districts (apart from the emigration ones). Following Freire *et al* (2008)¹², this analysis proposes that the ESPP is transformed to include two independent segments: the **district circles (DC)** which would work in the exact same way as they do today (same size, number and election method) and the **national compensation circle (NCC)**, which would include all the voters in the district circles and that would compensate for the disproportionality created in the DC.

As analysed in section 3, district magnitude is one of the main sources of disproportionality in the Portuguese system. The introduction of a NCC aims to compensate for some of the disproportionality created in the DC (and not all, as the goal is not to make the system as proportional as possible, as previously explained). The decrease in the average district magnitude (as the overall number of MPs is the same) is expected to lead to an increase in the disproportionality created by the district circles but will also lead to a higher connection between electors and politicians (Freire *et al*, 2008).

The introduction of a NCC appears to be a positive approach to meet our proportionality targets for several reasons. Firstly, it can be introduced without any changes to the

¹¹ The T1 interval is [2,41; 2,98], whilst the T2 intervals are [2,12; 2,41[and]2,98; 3,27]

¹² The reform presented in Freire *et al* has many dimensions that are outside the scope of this project. The only element that both proposals of reform have in common is the creation of the two segments.

Portuguese Constitution: since the Constitutional Revision of 1989, the possibility of introducing a NCC is included in Article 149. Secondly, it does not remove the district component of the ESPP: voters would still have the possibility to elect their district representatives, and such representatives would still be able to care for their region's issues (something which seems to be particularly relevant in the Portuguese case, following Fernandes, 2022). And, finally, the number of wasted votes would be reduced, as all votes (apart from the emigration ones) would count for the NCC, meaning that voters can still contribute for the election of their preferred party even if they do not think that the party has real chances of electing a MP in their district.

We have conducted simulations for NCCs with a range between 10 and 14 MPs, as those cases would be the ones which would put the modified proportionality indexes for 2019 and 2022 closer to our goal. Figure 2 shows the LSQ and ENP indexes that resulted from each of the simulations. Values in green belong to T1, values in orange belong to T2 and values in red belong to T3.

Figure 2 – LSQ and ENP after introducing a NCC of 10-14 MPs

Code	LSQ			ENP		
	2019	2022	Average (2009-2022)	2019	2022	Average (2009-2022)
Baseline	7,59	7,56	6,28	2,88	2,69	2,91
NCC_10	5,49	6,09	4,54	3,17	2,86	3,13
NCC_11	5,2	5,73	4,25	3,21	2,90	3,16
NCC_12	4,89	5,41	4,06	3,24	2,93	3,18
NCC_13	4,7	5,09	3,81	3,27	2,97	3,21
NCC_14	4,37	4,93	3,56	3,3	2,98	3,24

As figure 2 shows, introducing a NCC of 12 or 13 MPs would allow for both the 2019 and 2022 elections to have a LSQ index within the T1 interval, without a considerable cost in terms of ENP. To decide between the two options, we have simulated the results of the last five elections in both scenarios (NCC_12 and NCC_13) and then took the average LSQ and ENP in each of the cases. These averages are presented in figure 2, and the LSQ indexes computed for the elections of 2009, 2011 and 2015 are presented in

figures A1 and A2¹³. In NCC_12, the average LSQ across the five elections is 4,06 (included in T2), whilst the average LSQ in the NCC_13 case is 3,81 (included in T3). That is why we consider that a NCC of 12 MPs (with 214 MPs elected through the district circles) is the best solution. Under this scenario, the average ENP is 3,18 (within T2), whilst the average ENP given in the actual elections between 2009 and 2022 was 2,91 (within T1). Even though party fragmentation increases (as was expected), we do not consider that such change poses a high enough cost. This goes with along the reasoning developed in section 1 regarding the fact that there is a non-linear trade-off between proportionality and governability.

In figure A3, we compare the vote-seat conversion in the 2022 election with the vote-seat conversion that would have prevailed had the system included a NCC with 12 MPs. As previously mentioned, in 2022, PS has received a higher-than-usual bonus in the vote-seat conversion, which justifies the proportionality index of 7,56. The introduction of a NCC of 12 MPs decreases this index to 5,41, and such decrease is mostly justified by the decrease in PS' bonus: in the baseline scenario, PS won 117 seats (51,8%) with 42,6% of the votes, whilst under NCC_12, it “only” obtains 111 seats (49,1%). Furthermore, the increase in proportionality is also justified by the fact that CDS-PP (which, despite having 1,64% of the national votes, had not received any seats) wins two seats under the new system, which reduces the number of wasted votes. Overall, NCC_12 benefits medium-low sized parties, at the expense of the largest parties. This trend is verified in other elections, as shown in figures A4 to A7. This contributes as well to reduce partially the wasted votes generated in the DC.

¹³ All figures referred as “A_” are on the appendix.

On December 15th 2023, IL presented a proposal to introduce a 40-MPs NCC to the ESPP. In the light of this study, the main limitation of this proposal is the fact that it tries to increase proportionality as much as possible, regardless of the costs in terms of governability. In the appendix, we describe this proposal, looking at its consequences in terms of proportionality and governability.

4.3 Introduction of a National Compensation Circle with an Electoral Threshold

The introduction of a NCC with 12 MPs does not seem to pose a significant cost in terms of governability: as shown in figures 2, A1 and A2, the ENP index of the four previous elections (2011 to 2022) would still be within the joint T1-T2 interval under NCC_12. However, as the ENP is higher in the case with the NCC *vis-à-vis* the baseline, it is relevant to analyse what is driving this change.

Since 2015, there has been a scale effect concerning new parties in the ESPP (which will be referred as “newcomers”): apart from LIVRE (L) – which elected one MP both in 2019 and in 2022 – all other newcomers have been able to increase the number of MPs in the elections following their arrival to Parliament¹⁴. Therefore, the fact that ENP is not that much higher in the election when we introduce the NCC does not imply that it would not grow considerably in subsequent elections, as newcomers elected via the NCC are likely to benefit from this scale effect. As shown in the first column of figure A8, introducing a NCC of 12 MPs increases the number of parties in Parliament in all elections. This is particularly relevant in the 2015 and 2019 elections, as the number of new parties in parliament would increase, respectively, in four and three. This future loss in governability is a potential limitation of NCC_12. Assuming that there would be more relevant parties in the elections after the introduction of the NCC, the costs associated

¹⁴ PAN elected one MP in 2015 and four in 2019. CH elected one MP in 2019 and twelve in 2022. IL elected one MP in 2019 and eight in 2022.

with PR systems (introduced in section 1) would more likely appear: more relevant parties in a system imply, not only, that broad government coalitions become more likely, but also that single-party majority governments become less likely.

Does this apparent limitation imply that one should forsake the idea of the NCC? We do not think so. This component has still multiple benefits, as introduced in 4.2, which should not be neglected. Therefore, we believe that the NCC should still be introduced, though considering this potential limitation. One way to do so is through the imposition of an electoral threshold for election given the national votes.

An electoral threshold corresponds to the minimum vote share that a party has to have in order to be eligible to win parliament seats. EU countries have different views about thresholds: whilst some countries have a considerable electoral threshold (namely Germany with 5%), Portugal has constitutional provisions against electoral thresholds. This implies that the changes proposed in 4.3 are harder to implement than those of 4.2, as they would require a Constitutional Revision.

One of the reasons that may justify Portugal's constitutional opposition to electoral thresholds is the fact that the ESPP has high "natural thresholds", a concept that refers to the district vote share that a party must have in order to elect an MP in that district. The combination of the D'Hondt vote-seat conversion method with the district magnitude, one of the main sources of disproportionality in the ESPP, generates high "natural thresholds" in some districts which "deprive minor/new parties of accurate or any representation just as effectively as legal thresholds" (Council of Europe, 2010: 11).

Therefore, if our goal is increasing proportionality, it does not make sense to introduce an electoral threshold alone. In fact, thresholds favour governability by limiting the number of parties elected to the parliament (thus avoiding excess fragmentation). This

has proportionality costs (Gallagher, 1991), as it increases the number of wasted votes. However, this is not necessarily a problem: throughout this analysis, we have shown that one should not try to maximize either proportionality or governability. Taking advantage of the non-linear trade-off presented by Carey and Hix (2009), one can increase proportionality without considerable losses in terms of governability, and vice-versa. Therefore, the joint introduction of a NCC (which favours proportionality) with an electoral threshold (which favours governability) can still allow us to achieve our main goal of increasing proportionality without considerable costs in terms of governability.

Following an analysis by Pukelsheim (2014), 3% and 5% electoral thresholds are the most common among EU countries. Therefore, we ran simulations introducing these thresholds to the NCC_12 model. However, the results were not promising: the 5% threshold would lead to a LSQ of 8,95 in 2022 (a higher value than the recorded one) and a 3% threshold would imply that parties that have won a seat in the elections (LIVRE and PAN in 2022) would not be eligible to win seats. We have, then, run a simulation using a 1% electoral threshold which produced LSQ and ENP indexes within the joint T1-T2 intervals in 2019 and 2022 without removing parliamentary representation to parties that have won a seat in the baseline case. That is why we have settled on the 1% threshold. The results of these simulations are presented in figure A9¹⁵.

The question now is whether the introduction of the electoral threshold minimizes the scale effect, that is, whether the number of new parties in Parliament decreases in this setting (NCC with 12 MPs and a 1% threshold) *vis-à-vis* the scenario where we only introduce the NCC of 12 MPs. As shown in the second column of figure A8, the number of newcomers would decrease or stay the same in the past five elections. The most

¹⁵ The results for the simulations with a 2% threshold were omitted as they were equal to NCC_12_3.

remarkable case is the 2019 election, as none of the three parties that would be elected under NCC_12 would be elected if there was a 1% electoral threshold. Therefore, even though the scale effect does not go away (there would still be newcomers in three of the five elections), the imposition of an electoral threshold reduces such effect.

Furthermore, comparing NCC_12_1 with NCC_12, the introduction of the electoral threshold seems to have little impact in terms of proportionality, as the average LSQ between 2009 and 2022 is similar to the one recorded under NCC_12. There are also similar results in terms of governability, though the introduction of the threshold slightly reduces party fragmentation, as expected. The main results are shown in figure 3.

Figure 3 – LSQ and ENP in NCC_12 vs NCC_12_1

Code	LSQ			ENP		
	2019	2022	Average (2009-2022)	2019	2022	Average (2009-2022)
NCC_12	4,89	5,41	4,06	3,24	2,93	3,18
NCC_12_1	4,70	5,55	4,05	3,23	2,82	3,12

In figure A10, we show that the best proportionality and governability outcomes in the models with a NCC and a threshold of 1% are achieved precisely under NCC_12_1. Overall, the introduction of the electoral threshold seems to reduce the scale effect whilst posing no significant proportionality cost, and so may combine the “best of two worlds”. However, it has the limitation of requiring a Constitutional Revision.

4.4 Overview on Changes to the Vote-Seat Conversion Method

As previously stated, the ESPP uses the D’Hondt Method both in the allocation of MPs per district and in the vote-seat conversion. However, there are other conversion methods (Gallagher, 1991). Therefore, we ran additional simulations to see how the LSQ and ENP would change if the ESPP had a “largest remainders method” instead of an “highest average method” (such as D’Hondt’s). Following an analysis by Demange (2011), we have chosen to run simulations using Hare’s Method (also known as the Hamilton

Method)¹⁶. We have performed two types of simulations: (1) Hare Method to assign MPs to districts, and the D'Hondt Method to convert votes into seats in each district; (2) D'Hondt Method to assign MPs to districts, and Hare's to convert votes to seats in each district. The full results are presented in figures A11 and A12.

Regarding simulation (1), the results in terms of proportionality and governability are close to the ones that only use D'Hondt's method. However, as shown in figures A13 and A14, the D'Hondt Method tends to allocate more MPs to the districts with a higher magnitude (whose outcomes are, as previously explained, more proportional). Therefore, we would expect that, on average, the LSQ is higher in the models that use the Hare Method to allocate MPs per district. On average, the simulations confirm this tendency.

Regarding simulation (2), we found that changing the vote-seat conversion method from D'Hondt to Hare increases proportionality in an extreme way. This goes along with Cox's (1997) reasoning that D'Hondt is the least proportional method among all PR's methods. Even without introducing a NCC and with a 1% threshold, the LSQ falls to values never seen in the ESPP (in 2022, the LSQ falls from 7,56 to 2,81), whilst the ENP increases to the highest values in our simulations (in 2022, it increases from 2,69 to 3,32).

Conclusion

The ESPP took into account the trade-off between proportionality and governability since its creation: if, on the one hand, Constitutional Law determined that the conversion of votes into seats should be done according to PR methods; on the other hand, the designers of the system chose the D'Hondt Method to convert votes into seats, the least proportional of all PR methods. This recognition that the system should not favour one of the extremes

¹⁶ The methodology used to develop the simulations with the Hare Method is described in the Appendix.

at the expense of the other explains the good performance that the ESPP has had in terms of both proportionality and governability.

Since the 1991 election, the proportionality and governability indexes displayed rather constant values. However, the 2019 and 2022 elections changed the proportionality trend. Given that the factors driving the higher disproportionality in the system seem to have a structural nature, we consider that it is important to redesign the ESPP, so that the proportionality index returns to values around its historical mean without considerable costs in terms of governability. To this end, two main suggestions were proposed: (i) the introduction of a NCC with 12 MPs, and (ii) the introduction of a NCC with 12 MPs alongside a 1% electoral threshold. Both suggestions ensure that we meet our targets regarding proportionality and governability, that is, the LSQ of the 2019 and 2022 elections would fall within the joint T1-T2 interval under both alternative models without a significant cost in terms of governability.

The choice between proposals (i) and (ii) depends, in our view, on the likelihood of the scale effect. Previous elections' results show that newcomers tend to increase the number of MPs in the election after their arrival to Parliament. A stronger scale effect implies a decrease in the system's governability in the elections that follow the entry of the newcomers. As the introduction of an electoral threshold limits the scale effect, we would recommend proposal (ii) if this effect is found to be significant. Otherwise, proposal (i) should be favoured, as it is easier to implement (the introduction of a NCC is allowed under the Portuguese Constitution, unlike the introduction of an electoral threshold).

We consider that this project presents an introduction to reforms to the ESPP that do not favour proportionality over governability (and vice-versa). In our view, going forward, it could be relevant to apply this method to other potential reforms of the ESPP not discussed in detail in this project but that are supported by some parties, namely changing

the vote-seat conversion method (mainly in the allocation of MPs per district), changing the number of MPs in Parliament or changing the district size. However, such analysis is likely to require alternative simulation methods (instead of using previous elections' results), to make the results more robust. The fact that we have performed simulations using previous electoral outcomes is a limitation of this analysis, as it requires the assumption that voters would have had the same vote patterns under different electoral rules. Nonetheless, we do not consider that this assumption has biased our results, as the main conclusions go along with what we would expect given the existing literature.

According to previous legislative positions, there seems to be some consensus regarding the idea of the NCC. However, there has been a clash: whilst medium-smaller parties want to increase the proportionality of the system (with a higher-magnitude NCC), the two major parties (PS and PSD) do not want to reduce considerably the relevance of the district circles – where they have a clear advantage. So, is the introduction of a NCC doomed? Not necessarily. In fact, Plescia *et al* (2020) found that voters tend to support electoral rules that favour proportionality, even beyond party performance. Therefore, PS and PSD's voters may end up putting pressure on the parties to allow for the introduction of the NCC, which could contribute to an agreement. We believe that, unlike the 40-MPs NCC proposed by IL, our 12-MPs proposal could strike a balance between the stances of major and smaller parties, as governability would not be put in jeopardy.

Whether it is through the introduction of a NCC or other reform suggestions, it is important that parties recognize that the ESPP is being affected by structural changes that are increasing disproportionality, a tendency which started in 2019 and that will continue in the 2024 election. Therefore, we believe that one of the goals of the next Parliament should be the redesign of the ESPP, increasing proportionality without significant costs to governability. And, in our view, this project has presented a first step towards that goal.

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Appendix

Analysis of IL's Proposal to Create a National Compensation Circle with 40 MPs

Iniciativa Liberal (IL) presented in the Portuguese Parliament a proposal to introduce a 40-MPs NCC to the ESPP, in response to the loss in proportionality verified in the last elections¹⁷. Such proposal would result in a LSQ of 1,24 in the 2022 election, and in a ENP of 3,46. Therefore, we would have the most proportional system ever, at the cost of a record-high party fragmentation level. And, as the Parliament size was held constant, this proposal would result in a considerable decrease in the district magnitude of smaller districts (even though a threshold was imposed, so that no district would be left with less than 2 MPs), which would remove some of the regional dimension of the ESPP. This proposal was rejected by PS and PSD (which alleged that they would not agree with changes to the electoral system a few months before a Legislative Election) and PCP (that was against the reduction in the district magnitude of rural districts).

In light of our study, the main limitation of this proposal is the fact that it does not consider the trade-off between proportionality and governability. As we have shown throughout this analysis, we should favour increases in proportionality that do not cause considerable costs in terms of governability, instead of favouring one at the expense of the other. Otherwise, the costs associated with PR systems are very likely to appear, which may make the ESPP ungovernable. That is why we believe that potential reforms to the ESPP should favour a 12-MPs NCC instead of the one suggested by IL.

¹⁷ IL chose to measure proportionality with the Proportionality Deviation Index (sum of the absolute values of the differences between the national vote share of a party and the national seat share of that party) and with the number of wasted votes. The conclusions regarding the evolution of proportionality are, nonetheless, similar to those yielded by LSQ.

Methodological Procedures

1. Data

The simulations performed in this project used the electoral results in the Portuguese Elections from 1976 to 2022, extracted from the CNE Database. For each election, we have extracted the number of votes that each party i had (V_i), the distribution of the votes per district, and each districts' population (according with the official map that CNE publishes for every electoral act).

2. Baseline Case

The process described in this point refers to the procedures that we have used to compute the proportionality and governability indexes for each election. We will use the case of the 2022 as an example. As explained in the analysis, we have not considered the emigration districts, and so all the procedures apply only to 226 MPs.

Firstly, we have allocated the MPs per district, using the D'Hondt Method: the 226 MPs were given to the 226 highest divisors across all districts. Secondly, we have used the D'Hondt Method to convert votes into seats. The method was applied as follows: if district j has S_j seats, those seats will be given to the parties which have the S_j highest divisors in that district.

With the party seat distribution per district, we were able to find the total number of seats that each party i had in the election (S_i). With S_i and V_i , we have computed the LSQ and the ENP, using the formulas presented in Section 2.

3. Model with a National Compensation Circle

We will explain the process behind the simulations with the National Compensation Circle using the example of NCC_12, which had a NCC of 12 MPs and 214 MPs elected

through district circles. To allocate the MPs per district, we have followed a similar process as the one described in point 2 but attributing the seats to the 214 highest divisors. We have then applied the vote-seat conversion per district, as described in point 2, under the new distribution of MPs per district. That allowed us to see how many MPs each party would get through the district circles.

Regarding the NCC, we have used the votes that each party had at the national level (excluding the emigration circles). The 12 MPs of the NCC were attributed to the 12 highest divisors that did not yield a seat through the district circles, that is, if a party won x seats through the district circles, we have removed its x highest divisors. Then, we attributed the 12 seats of the NCC to the remaining 12 highest divisors.

Joining the seats through the district circles and those from the NCC, we got S_i . Then, we computed the LSQ and the ENP as previously described.

4. Model with a National Compensation Circle and an Electoral Threshold

For this point, we will use the example of NCC_12_1. The imposition of the electoral threshold implies that we have to look at parties' vote shares to see whether they are eligible to win seats. Therefore, we started by defining the parties that would be eligible (those whose vote share was higher than 1%). In the 2022 case, this constraint removed from contention 12 out of the 21 parties.

The allocation of MPs per district was done in the exact same way as the one described in point 3. Then, we have converted the votes of the eligible parties in district seats, as previously described and allocated the NCC seats as explained in point 3.

The simulations with thresholds posed one additional challenge. There were cases where parties formed a coalition in a specific district (especially in the Azores or Madeira), which did not exist at the national level. In 2022, for example, the coalitions that PSD

formed with CDS-PP and PPM in the Autonomous Regions yielded seats in those regions but failed to get 1% at the national level. To overcome this limitation, we have joined the votes that the coalitions had to PSD's national vote count, as the MPs elected through those coalitions were all from PSD. Once we had the seats allocated in the district circles and in the NCC we were able to compute the indexes, as in the previous simulations.

5. *Hare's Procedure*

In this last point, we will explain how we have applied the Hare Method. We will use the case of the allocation of MPs per district as an example. The vote-seat conversion in each district using Hare's Method was performed in a procedure similar to the one that we will describe in this point.

To allocate the MPs per district, we computed the population share of each district, excluding the emigration districts. That allowed us to compute Hare's Quota, which corresponds to the number of seats that each district should receive (if a district has $x\%$ of the national population, it should receive $x\%$ of the 226 seats). This poses a problem, as the quotas are not, in general, integer numbers, whilst the seats are. Therefore, we have computed the integer of each quota, and assigned those seats to the respective districts. This allowed us to allocate 218 out of the 226 seats.

The remaining 8 seats were assigned as follows: for each district, we computed the difference between the quota and the integer of the quota. The 8 highest differences got the 8 remaining seats. That has allowed us to allocate the 226 seats. In the cases with a NCC (namely NCC_12), the process was similar, though we have only allocated 214 seats in total instead of 226.

Figures

Figure A1 – LSQ (2009-2022) after introducing a NCC of 10-14 MPs

Code	LSQ				
	2009	2011	2015	2019	2022
Baseline	5,41	5,42	5,41	7,59	7,56
NCC_10	3,46	4,11	3,54	5,49	6,09
NCC_11	3,19	3,90	3,22	5,2	5,73
NCC_12	3,19	3,60	3,22	4,89	5,41
NCC_13	2,97	3,39	2,92	4,7	5,09
NCC_14	2,72	3,06	2,73	4,37	4,93

Figure A2 – LSQ (2009-2022) after introducing a NCC of 10-14 MPs¹⁸

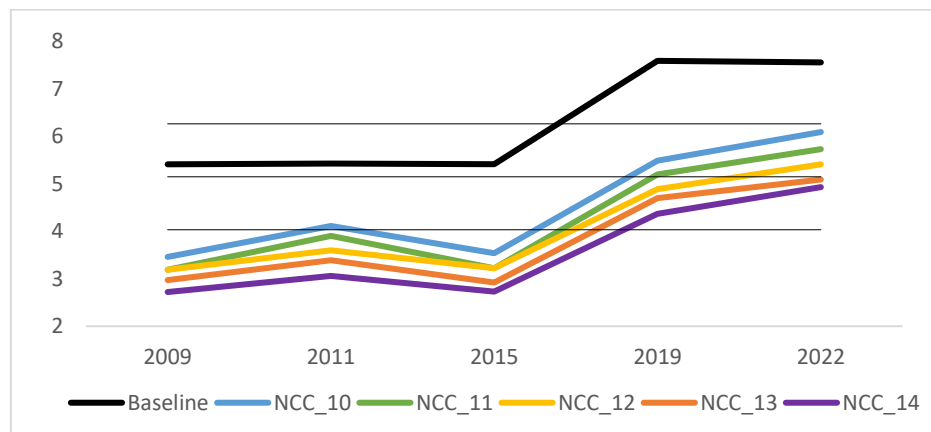


Figure A3 – Vote-Seat Conversion in 2022 (Baseline vs NCC_12)¹⁹

Party	Vote Share	Seat Share Baseline	Seat Share NCC_12	Vote-Seat Difference Baseline	Vote-Seat Difference NCC_12	VSD Baseline vs NCC_12
B.E.	4,6%	2,2%	3,5%	2,3%	1,0%	1,3%
CDS-PP	1,6%	0,0%	0,9%	1,6%	0,8%	0,9%
CH	7,3%	5,3%	5,3%	2,0%	2,0%	0,0%
IL	5,1%	3,5%	3,5%	1,5%	1,5%	0,0%
L	1,3%	0,4%	0,9%	0,9%	0,4%	0,4%
PAN	1,6%	0,4%	0,9%	1,1%	0,7%	0,4%
PCP-PEV	4,5%	2,7%	3,1%	1,8%	1,4%	0,4%
PPD/PSD	28,4%	31,4%	30,5%	-3,0%	-2,1%	-0,9%
PPD/PSD.CDS-PP	1,0%	1,3%	1,3%	-0,4%	-0,4%	0,0%
PPD/PSD.CDS-PP.PPM	0,5%	0,9%	0,9%	-0,3%	-0,3%	0,0%
PS	42,6%	51,8%	49,1%	-9,2%	-6,6%	-2,7%

¹⁸ The horizontal lines represent the limits of the joint T1-T2 interval, and the average LSQ (1991-2015)

¹⁹ In figures A3 to A7, the light blue rows represent parties that were not elected to the parliament in the baseline case, but that would be elected under NCC_12.

Figure A4 – Vote-Seat Conversion in 2019 (Baseline vs NCC_12)

Party	Vote Share	Seat Share Baseline	Seat Share NCC_12	Vote-Seat Difference Baseline	Vote-Seat Difference NCC_12	VSD Baseline vs NCC_12
A	0,8%	0,0%	0,4%	0,8%	0,4%	0,4%
B.E.	10,1%	8,4%	8,4%	1,7%	1,7%	0,0%
CDS-PP	4,4%	2,2%	3,5%	2,2%	0,9%	1,3%
CH	1,4%	0,4%	0,9%	0,9%	0,5%	0,4%
IL	1,3%	0,4%	0,9%	0,9%	0,5%	0,4%
L	1,1%	0,4%	0,9%	0,7%	0,3%	0,4%
PAN	3,4%	1,8%	2,7%	1,7%	0,8%	0,9%
PCP-PEV	6,8%	5,3%	5,3%	1,4%	1,4%	0,0%
PCTP/MRPP	0,7%	0,0%	0,4%	0,7%	0,3%	0,4%
PPD/PSD	29,1%	34,1%	32,3%	-4,9%	-3,2%	-1,8%
PS	38,3%	46,9%	43,8%	-8,6%	-5,5%	-3,1%
R.I.R	0,7%	0,0%	0,4%	0,7%	0,3%	0,4%

Figure A5 – Vote-Seat Conversion in 2015 (Baseline vs NCC_12)

Party	Vote Share	Seat Share Baseline	Seat Share NCC_12	Vote-Seat Difference Baseline	Vote-Seat Difference NCC_12	VSD Baseline vs NCC_12
B.E.	10,6%	8,4%	9,3%	2,2%	1,3%	0,9%
L/TDA	0,8%	0,0%	0,4%	0,8%	0,3%	0,4%
PAN	1,4%	0,4%	0,9%	1,0%	0,6%	0,4%
PCP-PEV	8,6%	7,5%	7,5%	1,1%	1,1%	0,0%
PCTP/MRPP	1,2%	0,0%	0,9%	1,2%	0,3%	0,9%
PDR	1,2%	0,0%	0,9%	1,2%	0,3%	0,9%
PNR	0,5%	0,0%	0,4%	0,5%	0,1%	0,4%
PPD/PSD	1,6%	2,2%	2,2%	-0,6%	-0,6%	0,0%
PPD/PSD.CDS-PP	38,2%	43,8%	41,6%	-5,6%	-3,4%	-2,2%
PS	33,6%	37,6%	35,8%	-4,0%	-2,2%	-1,8%

Figure A6 – Vote-Seat Conversion in 2011 (Baseline vs NCC_12)

Party	Vote Share	Seat Share Baseline	Seat Share NCC_12	Vote-Seat Difference Baseline	Vote-Seat Difference NCC_12	VSD Baseline vs NCC_12
B.E.	5,4%	3,5%	4,9%	1,9%	0,5%	1,3%
CDS-PP	12,2%	10,6%	10,6%	1,6%	1,6%	0,0%
PAN	1,1%	0,0%	0,9%	1,1%	0,2%	0,9%
PCP-PEV	8,3%	7,1%	7,1%	1,2%	1,2%	0,0%
PCTP/MRPP	1,2%	0,0%	0,9%	1,2%	0,3%	0,9%
PPD/PSD	40,2%	46,5%	44,2%	-6,2%	-4,0%	-2,2%
PS	29,2%	32,3%	31,4%	-3,1%	-2,2%	-0,9%

Figure A7 – Vote-Seat Conversion in 2009 (Baseline vs NCC_12)

Party	Vote Share	Seat Share Baseline	Seat Share NCC_12	Vote-Seat Difference Baseline	Vote-Seat Difference NCC_12	VSD Baseline vs NCC_12
B.E.	10,2%	7,1%	9,3%	3,1%	0,9%	2,2%
CDS-PP	10,8%	9,3%	9,7%	1,5%	1,1%	0,4%
PCP-PEV	8,1%	6,6%	7,1%	1,5%	1,1%	0,4%
PCTP/MRPP	1,0%	0,0%	0,4%	1,0%	0,5%	0,4%
PPD/PSD	30,0%	34,5%	32,7%	-4,5%	-2,7%	-1,8%
PS	37,7%	42,5%	40,7%	-4,8%	-3,0%	-1,8%

Figure A8 – Newcomers in the 2009-2022 Elections (NCC_12 vs NCC_12_1)

Election	NCC_12	NCC_12_1
2009	1	0
2011	2	2
2015	4	2
2019	3	0
2022	1	1

Figure A9 – LSQ and ENP applying different thresholds to NCC_12²⁰

Code	LSQ			ENP		
	2019	2022	Average (2009-2022)	2019	2022	Average (2009-2022)
Baseline	7,59	7,56	6,28	2,88	2,69	2,91
NCC_12_1	4,70	5,55	4,05	3,23	2,82	3,12
NCC_12_3	5,25	5,36	4,07	3,11	2,78	3,06
NCC_12_5	6,89	8,95	5,12	2,84	2,37	2,93

Figure A10 – LSQ and ENP with a 1% threshold and a NCC of 11-14 MPs

Code	LSQ			ENP		
	2019	2022	Average (2009-2022)	2019	2022	Average (2009-2022)
Baseline	7,59	7,56	6,28	2,88	2,69	2,91
NCC_11_1	5	5,86	4,23	3,19	2,79	3,10
NCC_12_1	4,70	5,55	4,05	3,23	2,82	3,12
NCC_13_1	4,54	5,23	3,79	3,25	2,85	3,14
NCC_14_1	4,23	5,05	3,58	3,29	2,87	3,17

²⁰ In figures A9 and A10, the highlighted rows represent the chosen model.

Figure A11 – LSQ and ENP (Hondt_Hondt vs Hare_Hondt)²¹

Simulation	Model	LSQ		ENP	
		2019	2022	2019	2022
No NCC and No Threshold	Baseline	7,59	7,56	2,88	2,69
	Hare_Hondt	7,50	7,64	2,89	2,69
NCC_12 and No Threshold	Baseline	4,70	5,55	3,23	2,82
	Hare_Hondt	5,36	5,61	3,20	2,92
NCC_12 and 1% Threshold	Baseline	4,70	5,55	3,23	2,82
	Hare_Hondt	5,14	5,75	3,18	2,94

Figure A12 – LSQ and ENP (Hondt_Hondt vs Hondt_Hare_1)²²

Code	LSQ		ENP	
	2019	2022	2019	2022
Baseline	7,59	7,56	2,88	2,69
Hondt_Hare_1	2,67	2,81	3,56	3,32

Figure A13 – MPs per District (2022 under NCC_12): Hare vs D'Hondt

District	MPs per District (Hare)	MPs per District (D'Hondt)	Difference (Hare vs D'Hondt)
Aveiro	15	15	0
Beja	3	2	1
Braga	18	18	0
Bragança	3	3	0
Castelo Branco	4	3	1
Coimbra	9	8	1
Évora	3	3	0
Faro	9	9	0
Guarda	3	3	0
Leiria	9	9	0
Lisboa	44	46	-2
Portalegre	2	2	0
Porto	37	38	-1
Santarém	9	9	0
Setúbal	17	17	0
Viana do Castelo	5	5	0
Vila Real	5	5	0
Viseu	8	8	0
Madeira	6	6	0
Açores	5	5	0

²¹ Hondt_Hondt are the baseline simulations, using the D'Hondt Method both to assign MPs to districts and to convert votes into seats. Hare_Hondt simulations use the Hare Method to assign MPs to districts and the D'Hondt Method to convert votes into seats.

²² Hondt_Hondt are the baseline simulations, using the D'Hondt Method both to assign MPs to districts and to convert votes into seats. Hondt_Hare_1 simulation uses the D'Hondt Method to assign MPs to districts and the Hare Method to convert votes into seats, under an electoral threshold of 1%.

Figure A14 – MPs per District (2019 under NCC_12): Hare vs D'Hondt

District	MPs per District (Hare)	MPs per District (D'Hondt)	Difference (Hare vs D'Hondt)
Aveiro	15	15	0
Beja	3	2	1
Braga	18	18	0
Bragança	3	3	0
Castelo Branco	4	4	0
Coimbra	9	9	0
Évora	3	3	0
Faro	9	8	1
Guarda	3	3	0
Leiria	9	9	0
Lisboa	44	45	-1
Portalegre	2	2	0
Porto	37	38	-1
Santarém	9	9	0
Setúbal	17	17	0
Viana do Castelo	5	5	0
Vila Real	5	5	0
Viseu	8	8	0
Madeira	6	6	0
Açores	5	5	0

List of Abbreviations

BE – *Bloco de Esquerda*

CDS-PP – *CDS-Partido Popular*

CH – *Partido CHEGA*

CNE – *Comissão Nacional de Eleições*

DC – District Circles

ENP – Effective Number of Parties

ESPP – Electoral System for the Portuguese Parliament

EU – European Union

GDP – Gross Domestic Product

IL – *Iniciativa Liberal*

L – *Partido LIVRE*

LSQ – Least Squares Index

MPs – Members of Parliament

NCC – National Compensation Circle

OECD – Organization for Economic Cooperation and Development

PAN – *Partido Pessoas Animais Natureza*

PCP – *Partido Comunista Português*

PPD/PSD – *Partido Popular Democrático/Partido Social Democrata*

PPM – *Partido Popular Monárquico*

PR – Proportional Representation

PS – *Partido Socialista*

PSD – *Partido Social Democrata*

S_Dev – Standard Deviation

T1 – Type 1 Interval

T2 – Type 2 Interval

T3 – Type 3 Interval