# THE IMPACT OF THE MIXED-MEMBER SYSTEM ON DISPROPORTIONALITY IN ELECTION RESULTS IN POST-COMMUNIST COUNTRIES: HUNGARY, LITHUANIA, UKRAINE AND GEORGIA

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**Abstract**
The article studies mechanical effects of the mixed-member electoral system on disproportionality – the difference between votes gained by parties and their shares of seats – in four post-communist countries in Europe: Georgia, Hungary, Lithuania, and Ukraine. The article relies on the quantitative analysis of 32 elections, including those held in 2024. The study indicates that the role of the majoritarian component is more significant in increasing the overall level of disproportionality. This in turn, is mostly due to overrepresented seats gained by the winning parties. On the other hand, high level of legal threshold in the PR component raises the level of disproportionality, which is also reflected in a total indicator. In this regard, votes gained by parties that fail to meet the threshold also influence the level of disproportionality. Moreover, the study reveals that the elections held under the linked (compensatory) mixed-member system exhibited lower level of disproportionality than the ones held under the unlinked (parallel) system.

***Key words:*** SMD and PR Components, legal threshold, linked and unlinked systems, disproportionality, wasted votes.

## INTRODUCTION

After the collapse of communism in the early 1990s, some post-communist and post-Soviet countries in Central and Eastern Europe adopted mixed electoral

systems for electing their legislative bodies. The rationale supporting this was that it would eliminate the shortcomings of both majoritarian and proportional systems while allowing their advantages to complement each other. However, it is debatable to what extent mixed systems represent "the best of both worlds" [Shugart & Wattenberg 2001]. Some countries that initially opted for a mixed-member system later replaced it with a proportional representation (PR) electoral system (Albania, Armenia, Bulgaria, Croatia, Georgia, and North Macedonia). Currently, among the post-Soviet and post-communist countries of East-Central Europe, a mixed-member electoral system is used to elect the legislative bodies in Hungary, Lithuania, Tajikistan, Russia and Ukraine. Until the last (2024) elections, the Parliament of Georgia was also elected using a mixed system.

A mixed electoral system combines the opposing principles of proportional and majoritarian systems for the election of a single body [Massicotte & Blais 1999: 345]. Under this system, seats should be distributed nominally at one level, and at the second level according to lists [Shugart & Wattenberg 2001:10]. Accordingly, a mixed-member system allows the voter to cast two votes: one for a party list in the PR component and another for a candidate in the corresponding single-member district (SMD) [Moser & Scheiner 2004: 576]. In a mixed system, two main internal types are distinguished based on which primary electoral system it leans towards and whether it compensates for the majoritarian element with party list seats: Mixed-member proportional (MMP) and Mixed-member majoritarian (MMM), also known as parallel, systems. The mixed system used in all post-communist countries is of the parallel type.

The issue of disproportionality resulting from the dominant role of the majoritarian principle in post-communist countries, along with other effects of the mixed system, is a topic of active interest among researchers. According to Gallagher, disproportionality implies the difference between the share of votes a party receives and the share of seats (mandates) it gains. Disproportionality is observed when the share of votes received by parties participating in elections does not exactly correspond to the share of mandates they obtain [Gallagher 2005: 602]. Accordingly, a certain level of disproportionality is observed in virtually all elections. According to Moser and Scheiner [2004], who analyzed mixed-member systems in 24 elections of 13 countries and of two sub-units of a country,[1] the PR and SMD components of mixed electoral systems have independent effects on

[1] Among them, the authors studied ten elections held in post-communist European countries: Armenia (1998), Croatia (1995), Hungary (1990, 1994, 1998), Lithuania (1996), Macedonia (1998), Russia (1993, 1995, 1999), and Ukraine (1998).

disproportionality. The authors further argue that mixed systems with linked components reduce the level of disproportionality compared to those where the majoritarian and proportional elements operate independently [Moser & Scheiner 2004: 586]. Moser and Scheiner identify the legal threshold as a third factor causing disproportionality in mixed-member systems. An early study of the impact of legal threshold on disproportionality is made by Lijphart [1994]. According to the theory, a high level of legal threshold leads to a high level of disproportionality [Moser & Scheiner 2004: 581].

The aim of this study is to examine the impact of mixed electoral systems on the disproportionality of election results in post-communist countries. The research questions are: what impact does the proportional and majoritarian components of a mixed-member system have on the disproportionality of election results, what effect does the size of the legal threshold have on the disproportionality of PR and overall results, and how does the nature of the relationship between the components of a mixed-member system affect the level of disproportionality? In response to these questions, the following hypotheses are proposed:

**$H_1$:** In mixed-member systems, the majoritarian (SMD) component leads to a higher level of disproportionality than the PR component;

**$H_2$:** The higher the legal threshold of the PR component, the higher the level of disproportionality;

**$H_3$:** An unlinked mixed-member electoral system produces a higher level of disproportionality than a linked (compensatory) system.

## 1. RESEARCH METHODOLOGY AND OPERATIONALIZATION OF VARIABLES

The study examined 31 primary and one repeated elections of the supreme representative bodies held with mixed-member systems in four countries – Georgia, Hungary, Lithuania, and Ukraine, up to and including 2024. These included nine parliamentary elections held in Hungary between 1990–2022 and nine – in Lithuania between 1992–2024. All nine parliamentary elections held between 1990–2020 were studied in the case of Georgia too, except the elections of November 2, 2003, which were partially invalidated by the Supreme Court after the “Rose Revolution”. The repeated elections held on March 28, 2004, which determined only mandates for the proportional system, were analyzed in this component according to the distribution of the seats, and not taking into account the full composition of the parliament. Unlike the countries listed above, Ukraine, as of 2024, has held only five elections based on a mixed-member system (1998, 2002, 2012, 2014, 2019).

Accordingly, this article is limited to examining only these five elections in the case of Ukraine.

The study conducted a quantitative analysis of the official election results. The results recorded by the electoral subjects participating in the elections were gathered from results protocols of the Central Election Commissions (CEC) of Georgia, Hungary, Lithuania, and Ukraine. In some cases, alternative archival databases were used. In some cases, the official percentage distribution of votes in the election results was given not according to the valid votes, but including invalid ballots; in addition, in the 1998 and 2002 elections in Ukraine, voters had option to vote against all candidates on a ballot. The analysis presented in this article is based on weighted data, and in all elections the percentage of votes received by the electoral subjects in total equals 100 %.

In this study, three independent variables were identified: components of the mixed-member system, legal threshold, and the nature of the relationship between majoritarian and proportional components. The first variable considers the rules of voting under the principles of proportional representation and majoritarian (single-member districts). Also, the PR component in the case of a two-tier system (Lithuania, Ukraine, Georgia, Hungary since 2014) takes into account the results of voting in single nationwide or regional multi-member districts. In this article, the PR component of the Hungarian three-tier system of 1990–2010 refers only to the results of the distribution of regional lists. National compensation lists are not considered in a PR component. The stage of compensatory seats was excluded from the PR component as the SMD component, due to its dependence on the results, might have caused error when making a comparison. The second variable, the legal threshold, refers to the minimum percentage of PR votes, as stipulated by law, that parties and pre-electoral coalitions (PECs, electoral blocs) must obtain to qualify for mandates. The third variable, the nature of the connection between the components of a mixed-member system, is determined by whether the electoral system provides for compensation of seats for electoral subjects with a national list. According to Moser and Scheiner [2004], an unlinked system is a non-compensatory mixed-member majoritarian (MMM) system, and a linked system is a mixed-member proportional (MMP) system or the Hungarian model, including the 2010 elections.

The dependent variable in the study is the disproportionality between the share of votes received by electoral subjects and the share of seats they won, which is measured using the Least Square (LSq) Index developed by Michael Gallagher [1991]. The LSq index expresses the overall level of difference between the shares of

votes received by electoral subjects and the shares of seats they obtain and is calculated using the following formula:

$$\mathrm{LSq} = \sqrt{\frac{1}{2}\sum_{i=1}^{n}(s_i - v_i)^2} \quad (1)$$

Where $s_i$ represents the percentage of seats won by candidates from each party/PEC/initiative group participating in the elections, and $v_i$ is the percentage of votes received for each electoral subject (i=1…n).[2] The LSq Index is calculated based on the overall election results ($LSq_{OV}$), as well as based on the PR ($LSq_{PR}$) and SMD ($LSq_{SMD}$) components.

In addition to the independent variables, the study also identified two intermediate variables that experience the mechanical effects of the legal threshold in the SMD and the PR components and cause disproportionality. The maximum deviation (MD) index is an intermediate variable between the majoritarian component and the Gallagher disproportionality index, which in this article describes the bonus received by the most overrepresented party/PEC in the SMD component and is calculated by the formula:

$$\mathrm{MD} = \mathrm{Max}_{i=1}^{n} \left| s_i - v_i \right| \quad (2)$$

Where $s_i$ is the percentage of seats won by candidates from each party/PEC/initiative group in the SMD component, and $v_i$ is the percentage of votes won for each electoral subject (i=1…n).

The intermediate variable between the legal threshold and disproportionality is wasted votes ($V_{wasted}$). This variable was measured by summing the share of votes received by parties and PECs in the PR component that failed to overcome the legal threshold:

$$V_{wasted} = \sum_{i=1}^{n} v_i \quad (3)$$

Where $v_i$ is the share of votes received by the $i$ party/PEC that cannot overcome the legal threshold, and $n$ is the number of electoral subjects remaining without seats in the PR component.

## 2. DETERMINANTS OF DISPROPORTIONALITY: A THEORETECAL REVIEW

The range of factors that explain the disproportionality between votes and seats received by electoral subjects is broad in the existing scientific literature on electoral studies. Most of the studies examining disproportionality focus on the types of electoral systems. However, it is also relevant to consider other dimensions

[2] The minimum value of the LSq index can be 0, which means absolute proportionality, and the maximum value – 100, indicates absolute disproportionality. However, in practice, absolute proportionality or disproportionality is never observed.

of the electoral system that affect disproportionality such as: legal threshold, electoral formula, district magnitude, and effective threshold.

Various authors have shown that the level of disproportionality of election results is higher in majoritarian electoral systems than in proportional ones [Jackson & Rose 1991; Lijphart 1994; Gallagher et al. 1995]. For example, according to Pippa Norris, the largest deviation (winner's bonus) in elections held under the majoritarian system is 12.5 % on average. In mixed electoral systems, this figure is 7.4 % points, while in proportional systems the average deviation is only 5.7 %. Thus, in majoritarian systems, a party that receives more than 37.5 % of the vote can often win a majority in parliament [Norris 1997: 307]. It is worth noting that the presented maximum deviation indicators exhibit disproportionality only in the case of the most overrepresented party and ignore the disproportionality of votes and mandates of other electoral subjects. A better way to compare types of electoral systems is to use the Gallagher LSq index, which takes into account the results of all parties participating in the elections. A study conducted by Lijphart [1994] using this index showed that the disproportionality index in majoritarian systems was 10.9, in proportional systems – 4.4, and in mixed systems – 6.9 [Lijphart 1994, in Gallagher 2005: 546].

As Moser and Scheiner demonstrate, the majoritarian and proportional components of a mixed electoral system, despite being combined into a one electoral system, retain its independent effects. However, this finding applies to countries with developed party systems. These authors also believe that different levels of institutionalization of political parties balance the mechanical effects of a mixed system and can lead to unexpected consequences, such as proliferation of candidates in the SMD tier. According to Moser and Scheiner, the psychological effect of the SMD component is more pronounced in systems that do not offer a compensatory relationship between the majoritarian and proportional tiers. Also, this effect is stronger under conditions of a high ratio of majoritarian to proportional seats and the use of a plural formula [Moser & Scheiner 2004: 590].

Bedock and Sauger showed that in a mixed-member system, the level of party bipolarization limits the rate of disproportionality caused by the majoritarian bonus [Bedock & Sauger 2014, in Bedock 2017: 8–9]. Later, Bedock studied this system again, in France and Italy. She analyzed the correlation between the changing format of the electoral competition and the level of disproportionality. According to Bedock's study, the strengthening of the third axis in tripolar party systems results in an increase in the level of disproportionality [Bedock 2017].

Bochsler, based on a study of six elections in Hungary, concluded that the level of disproportionality in mixed systems depends on the number of compensatory seats

and the fragmentation of the party system [Bochsler 2014, in Bedock 2017: 9]. A similar conclusion was reached by Manow, who studied the German MMP electoral system. As a result of this study, Manow concluded that in SMDs, where many parties with small number of supporters nominate candidates, the PR component of elections can increase disproportionality, since these entities do not have the power to achieve victory [Manow 2011].

In explaining the determinants of disproportionality under PR systems, some researchers focus on the district magnitude – the number of mandates to be allocated in a constituency [Rae 1969; Sartori 1986; Taagepera & Shugart 1989; Jones 1993; Lijphart 1994; Cox 1997; Powel Jr & Vanberg 2000]. In this regard, researchers agree that the district magnitude has a strong effect on the level of disproportionality. A small district also determines a high effective threshold, which is an equivalent limiting factor to the threshold established by law. The latter, in turn, contributes to an increase in the level of disproportionality [Taagepera & Shugart 1989; Lijphart 1994; Powel Jr & Vanberg 2000].

Lijphart also linked district size to the legal threshold. He argued that both factors work equally against small parties and limit their representation [Lijphart 1997]. The impact of the legal threshold on disproportionality in post-communist countries was also demonstrated by Moraski and Loewenberg in a study of 13 elections [Moraski & Loewenberg 1999].

When studying disproportionality under PR systems, some researchers also focus on the impact of the electoral formula. It is worth noting that the existing literature on this issue largely contradicts one another. For example, while Blondel considered the largest remainder method to be the most disproportional formula [Blondel 1969: 191), Loosemore and Hanby named it the most proportional [Loosemore & Hanby 1971, in Lijphart 2003: 171]. However, most researchers agree that under the D'Hondt formula, disproportionality favors large parties, while the largest remainder method is more proportional and favorable to small parties [Van den Bergh 1955; Mackenzie 1958; Lakeman 1974; Berrington 1975; Bon 1978; Nohlen 1978, in Lijphart 2003: 171–172].

## 3. MAIN RESULTS

### 3.1. Independent and combined effects of proportional and majoritarian components on disproportionality

Among the four countries studied, the number of seats allocated to the proportional and majoritarian components of the mixed-member system has not changed in

Lithuania since 1992 until the last parliamentary elections. Of the 141 seats in the country's Seimas, 71 are allocated to SMDs, and 70 to single nationwide multi-member district. The specified ratio of SMD and PR seats (225/225) was also symmetrical in all elections held under the mixed electoral system in Ukraine, although all seats in the majoritarian component were filled only in the 2002 and 2012 elections. In 1998, the results of five SMDs were annulled due to irregularities. In 2014 and 2019, elections failed to be held in more than 25 SMDs due to Russia's annexation of the Autonomous Republic of Crimea and the control of pro-Russian separatists in districts in the Luhansk and Donetsk regions.

Unlike Lithuania and Ukraine, both the defined ratio of proportional and majoritarian seats and the overall composition of the legislative body changed in Georgia and Hungary during the studied period. The maximum share of seats in the SMD component was observed in the last three elections of the Hungarian National Assembly (53.27 %), and the minimum share was observed in the 2020 elections of the Georgian Parliament (20 %).

For the 1990 elections to the Supreme Council of Georgia (a legislative body back then), proportional and majoritarian mandates were distributed in equal numbers (125/125), and from 1992 to the 2008 elections, the composition of the Georgian Parliament was calculated with 150 proportional and 85 majoritarian seats, although in reality, instead of 85, the elections were held in only 73–75 SMDs, and the remaining seats remained vacant due to the political context and/or were awarded to members of the Parliament (MP) elected from the territory of Abkhazia in 1992. Based on the results of the referendum of November 2, 2003, the composition of the Georgian Parliament was reduced to 150 from 2008. In these elections, half of the MPs were elected on the basis of the PR system, and the other half on the basis of the majoritarian system. In 2012–2016, 77 MPs were elected under the PR component and 73 under the SMD one. In 2020, 120 seats in the Georgian Parliament were filled from party lists and 30 from single-member districts.

The Hungarian National Assembly consisted of 386 members from 1990 to 2010, elected in three-tier elections. 176 seats were allocated to SMDs; the remaining 210 seats were divided into regional seats from multi-member constituencies and national compensatory seats. The number of mandates allocated to regional and national seats varied. The number of regional seats would increase in size with each subsequent election, while the number of compensatory seats would be reduced. Following amendments to the Hungarian Constitution and the Electoral Code, the National Assembly was reduced to 199 seats from the 2014 elections, with

106 seats allocated to SMDs and 93 seats to the single nationwide multi-member district. In addition, the aggregate national list no longer provides for compensation (see Table 1).

*Table 1*

**Distribution of seats and disproportionality indices in the 32 elections studied**

| Country | Elections | SMD Component | | PR Component | | Compen-satory Seats | | Disproportionality | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | N of Seats[A] | % | N of Seats[A] | % | N | % | $LSq_{Ov}$ | $LSq_{PR}$ | $LSq_{SMD}$ | MD[B] |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| Lithuania | 2024 | 71 | 50.35 | 70 | 49.65 | - | - | 13.28 | 9.27 | 21.87 | 29.05 (2/1) |
| | 2020 | 71 | 50.35 | 70 | 49.65 | - | - | 8.86 | 8.62 | 12.89 | 13.87 (1/1) |
| | 2016 | 71 | 50.35 | 70 | 49.65 | - | - | 12.52 | 8.83 | 23.29 | 30.15 (2-1) |
| | 2012 | 71 (70) | 50.35 | 70 | 49.65 | - | - | 8.99 | 5.53 | 17.06 | 16.56 (1-1) |
| | 2008 | 71 | 50.35 | 70 | 49.65 | - | - | 11.09 | 8.42 | 16.05 | 18.46 (1-1) |
| | 2004 | 71 | 50.35 | 70 | 49.65 | - | - | 5.17 | 4.40 | 7.72 | 5.32 (3-3) |
| | 2000 | 71 | 50.35 | 70 | 49.65 | - | - | 7.33 | 10.52 | 11.51 | 10.10 (1/1) |
| | 1996 | 71 (67) | 50.35 | 70 | 49.65 | - | - | 14.99 | 14.22 | 20.41 | 25.57 (1/1) |
| | 1992 | 71 | 50.35 | 70 | 49.65 | - | - | 6.22 | 7.02 | 13.20 | 17.13 (1/1) |
| Georgia | 2020 | 30 | 20 | 120 | 80 | - | - | 8.72 | 2.62 | 40.45 | 50.21 (1/1) |
| | 2016 | 73 | 48.67 | 77 | 51.33 | - | - | 21.46 | 10.05 | 40.76 | 50.7 (1/1) |
| | 2012 | 73 | 48.67 | 77 | 51.33 | - | - | 2.99 | 2.92 | 3.27 | 2.91 (1/1) |
| | 2008 | 75 | 50 | 75 | 50 | - | - | 15.63 | 4.77 | 26.34 | 33.09 (1/1) |
| | 2004 | - | - | 150 | - | - | - | - | 15.66 | - | - |
| | 1999 | 85 (73) | 36.17 | 150 | 63.83 | - | - | 11.99 | 12.20 | 22.3 | 28.67 (1/1) |
| | 1995 | 85 (75) | 36.17 | 150 (146) | 63.83 | - | - | 19.72 | 29.35 | ND[C] | ND[C] |
| | 1992 | 85 (75) | 36.17 | 150 | 63.83 | - | - | 4.52 | 3.62 | ND[C] | ND[C] |
| | 1990 | 125 (121) | 50 | 125 | 50 | - | - | 8.13 | 9.74 | ND[C] | ND[C] |

*The End of the Table1*

| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Ukraine | 2019 | 225 (199) | 50 | 225 | 50 | - | - | 21.84 | 10.62 | 25.10 | 32.46 (1/1) |
| | 2014 | 225 (198) | 50 | 225 | 50 | - | - | 9.27 | 9.27 | 17.87 | 13.03 (2/1) |
| | 2012 | 225 | 50 | 225 | 50 | - | - | 10.31 | 2.90 | 20.81 | 21.36 (1/1) |
| | 2002 | 225 | 50 | 225 | 50 | - | - | 12.26 | 7.42 | 12.21 | 13.37 (1/1) |
| | 1998 | 225 (220) | 50 | 225 | 50 | - | - | 4.50 | 9.53 | 15.18 | 1.37 (9/4) |
| Hungary | 2022 | 106 | 53.27 | 93 | 46.73 | - | - | 11.00 | 5.50 | 25.15 | 29.28 (1/1) |
| | 2018 | 106 | 53.27 | 93 | 46.73 | - | - | 13.61 | 6.84 | 31.52 | 37.95 (1/1) |
| | 2014 | 106 | 53.27 | 93 | 46.73 | - | - | 17.42 | 5.85 | 38.11 | 46.46 (1/1) |
| | 2010 | 176 | 45.60 | 146 | 37.82 | 64 | 16.58 | 11.97 | 6.06 | 36.53 | 44.32 (1/1) |
| | 2006 | 176 | 45.60 | 146 | 37.82 | 64 | 16.58 | 4.37 | 6.69 | 12.09 | 15.38 (2/1) |
| | 2002 | 176 | 45.60 | 140 | 36.27 | 70 | 18.13 | 7.56 | 8.51 | 12.18 | 14.58 (2/1) |
| | 1998 | 176 | 45.60 | 128 | 33.16 | 82 | 21.24 | 8.51 | 10.16 | 20.73 | 25.14 (2/1) |
| | 1994 | 176 | 45.60 | 125 | 32.28 | 85 | 22.02 | 16.13 | 8.52 | 39.96 | 53.36 (1/1) |
| | 1990 | 176 | 45.60 | 120 | 31.09 | 90 | 23.32 | 13.87 | 9.37 | 30.54 | 40.87 (1/1) |

**A note:** A) The number of seats determined by the constitution/law. In cases where fewer seats were filled as a result of the elections, the corresponding number is given in brackets; B) Maximum Deviation in SMD component - the first number in brackets reflects the party/PEC's position according to the number of votes in the majoritarian component, and the second number reflects its position according to the seats won in single-member districts; C) No data.

**Source:** Author's calculation according to results protocols of election.

According to the overall results of the disproportionality of the 31 elections studied, the average level of the Gallagher SLq index was higher in Georgia, Hungary, and Ukraine. In Lithuania, the disproportionality between the votes and seats received by political parties and PECs was relatively low (see Table 2). The most disproportionate were the 2019 elections to the Rada of Ukraine and the 2016 elections to the Parliament of Georgia. The LSq index exceeded 20 in both cases (see Table 1).

*Table 2*

**Average disproportionality rates in the countries studied**

| Country | $LSq_{Ov}$ | | $LSq_{PR}$ | | $LSq_{SMD}$ | |
|---|---|---|---|---|---|---|
| | **Arithmetic Mean** | **Standard Deviation** | **Arithmetic Mean** | **Standard Deviation** | **Arithmetic Mean** | **Standard Deviation** |
| Georgia | 11.65 | 6.37 | 10.10 | 8.05 | 26.62 | 13.82 |
| Ukraine | 11.64 | 5.71 | 7.95 | 2.73 | 18.23 | 4.46 |
| Hungary | 11.60 | 3.98 | 7.50 | 1.58 | 27.42 | 9.99 |
| Lithuania | 9.83 | 3.16 | 8.54 | 2.69 | 16.00 | 4.88 |

**Source:** Author's calculation according to results protocols of election.

The lowest overall level of disproportionality was recorded in the 2012 Georgian parliamentary elections (2.99). This election is a special case among the study objects. The disproportionality index of the SMD component in this case was 3.27, which is only 0.35 higher than the LSq index in the PR component. Both votes and seats were distributed between the two electoral subjects with a relatively high degree of proportionality. The difference between the share of majoritarian seats occupied by the first-place PEC Georgian Dream and the percentage of votes received by its candidates was less than 3 %. All other seats were won by the second-place party, the United National Movement. Thus, in this election, as Bedock and Sauger [2014] previously showed, a high level of bipolarization became a determinant of a low level of disproportionality.

In other cases, the study of election results has shown that the levels of disproportionality differ significantly in the proportional and majoritarian components of a mixed system. The full disproportionality index primarily serves as an intermediate indicator between the two. The average index of disproportionality of the full election results in the countries studied was 11.10. While the average level of the LSq index in the PR component was 8.59, in the SMD component it reached 21.97.

The dominant role of the majoritarian component in determining the level of complete disproportionality of the mixed-member system is indicated by the Pearson correlation coefficient. In case of the majoritarian component, it is equal to 0.71, which indicates a strong linear positive relationship between them. In the PR component, the Pearson correlation level (0.46) does not express a linear relationship. In addition, a strong linear positive relationship with the level of disproportionality of the election results in Lithuania is manifested not only in the SMD component (0.90), but also in the PR tier (0.71).

The level of disproportionality of the SMD component reached a particularly high level in Georgia and Hungary. The highest level of disproportionality in this component was observed in the 2016 and 2020 elections in Georgia. In both cases, the LSq index exceeded 40 (besides, the significantly reduced share of seats in the SMD component by 2020, together with the low threshold in the PR tier, significantly limited the component's impact on the overall level of disproportionality of the elections. While the LSq index of disproportionality in the 2016 elections reached 21.46, by 2020 it had decreased to 8.72). It is also worth noting the Hungarian elections of 1990, 1994, 2010, 2014 and 2018, when the $LSq_{SMD}$ index fluctuated between 30.54 (1990) and 39.96 (1994). The main influence on the high level of disproportionality in all these elections came from the high level of difference between the share of votes received by the winning party/PEC in SMDs and the share of majoritarian seats they got. The maximum deviation index in these cases ranged from 33.09 % to 53.36 %, while the share of seats occupied by the parties/PECs who took the first place in terms of obtained mandates in the majoritarian component varied between 64.77 % and 100 %.

In the 2016 parliamentary elections in Georgia, the Georgian Dream party won 71 (97.26 %) of the 73 SMDs. At the same time, the number of votes received by the party's candidates in single-member districts in the first round of the elections amounted to only 46.56 %. A high level of disproportionality (26.34) was also revealed in the majoritarian component of the 2008 parliamentary elections in Georgia. In the 2008 elections, the United National Movement won 71 (94.67 %) of the 75 seats to be distributed in SMDs, although its candidates received 61.58 % of the total votes. It is noteworthy that in both elections, the winning parties gained a constitutional majority in parliament, which they achieved precisely at the expense of the SMD component.

Similar to the 2008 and 2016 elections in Georgia, the winning electoral subject independently obtained a constitutional majority (2/3) in the 2010, 2014 and 2018 Hungarian elections, which was made possible by occupying an extremely high share of the seats allocated for SMDs. The PEC of the Hungarian Civic Alliance (Fidesz) and the Christian Democratic People's Party (KDNP) occupied 97.72 % of the total seats in the SMD component of the elections in 2010, 90.57 % in 2014 and 85.85 % in 2018. In all three cases, the share of majoritarian seats obtained significantly differed from the level of voter support. In 2010, the winning PEC candidates received 53.4 % of the vote, while in the next two elections the share of votes received in the first round by Fidesz and KDNP candidates was below 50 %.

It is worth noting that in some cases, the parties/PECs that came first in the majoritarian component did not win the most extra seats. For example, in the 2016 and 2024 Lithuanian Seimas elections, the parties that came second in the SMD vote won the most single-member districts. A similar result was observed in the 1998, 2002, and 2006 Hungarian National Assembly elections and the 2014 Ukrainian Rada elections. In the 2004 Lithuanian elections, the party that came third in the majoritarian component received the largest bonus, both in terms of votes and seats. In the 1998 Ukrainian elections, all major parties received smaller proportion of seats than the votes they received in the SMDs. The largest bonus, however, was received by independent candidates. They received 47.73 % of the SMD seats and 23.6 % of the mandates distributed based on both components.

Compared to Georgia and Hungary, the average level of disproportionality of the majoritarian component is lower in Lithuania and Ukraine. The $LSq_{SMD}$ index for nine elections in Lithuania varied between 7.72 (2004) and 23.29 (2016). Among the five elections in Ukraine held under a mixed-member system, the maximum level of disproportionality of the majoritarian component reached 25.10 (2019), and the lowest level was 12.21 (2002). It is noteworthy that the most recent elections in both countries show a significant increase in the level of disproportionality in favor of the winning parties. In the 2019 Ukrainian Rada elections, the Servant of the People party received 43.16 % of the PR votes and 32.87 % of the majoritarian component votes, although it represented 65 % of the winning candidates in SMDs. In Lithuania, despite the fact that the Social Democratic Party received less than 20 % of the votes in the 2024 elections, its candidates won 48 % of the single-member districts.

A special case is the 1995 parliamentary elections of Georgia, which are distinguished by a record high level of disproportionality of the proportional component (29.35). The PR tier played a major role in determining the disproportionality of the results of these elections. While 53 parties and PECs participated in the elections, only three electoral subjects managed to overcome the legal threshold. In total, they received only 38.5 % of the votes. The votes of the majority of voters who turned out were wasted. These votes went to those parties and PECs that received less than 5 % of the votes, independently. Conversely, some electoral subjects that could not overcome the threshold in the PR component managed to win mandates in the majoritarian one.

### 3.2. The impact of the legal threshold on the proportional component and overall disproportionality

In all four countries studied, the first elections held under a mixed-member system set a legal threshold of 4 % for electoral subjects to receive seats. After the first elections, differentiated thresholds were introduced in Hungary and Lithuania, which have not changed to this day. In particular, in Hungary, since 1994, the legal threshold has been 5 % for political parties, 10 % for two-party PECs, and 15 % for PECs consisting of three or more parties. Like in Hungary, a 5 % threshold has been set for parties in Lithuania since 1996, although for PECs it is 7 %, regardless of the number of parties included. After the return of the mixed electoral system in 2012, the legal threshold in Ukraine was increased to 5 %, and at the same time, the creation of PECs was prohibited. The dynamics of the electoral threshold in Georgia are significantly different from other countries, having changed 5 times between 1990 and 2020. It is noteworthy that among the 32 elections studied, both the highest (7 %) and the lowest (1 %) threshold were used in the elections held in Georgia[3].

Examining the results of 32 elections by legal threshold enables us to analyze its role in contributing to disproportionality. The direct effect of the legal threshold concerns the PR component, although it also affects the overall disproportionality of the elections.

Under the lowest legal thresholds of 1 and 2 percent, the Gallagher index for the 2020 and 1992 parliamentary elections in Georgia was 2.62 and 3.62, respectively. The relatively low level of disproportionality of the results of the PR component was also reflected in the overall indicator of the system.

With the 4 % legal threshold in place, the level of disproportionality reached a higher level. According to the results of the PR component of the five elections in all four countries, it varies between 6.64 and 14.38. The average level is 8.62. The lowest level of disproportionality under the 4 % threshold was observed in the 1992 elections to the Lithuanian Seimas. It is worth noting that the reduction in the level of disproportionality in these elections was also influenced by the fact that the 4 % legal threshold did not apply to the lists of ethnic minorities. For minority parties,

[3] In the 1992 elections, parties and PECs had to pass a 2 % threshold in each multi-member district. In 1995, a 5 % threshold was set for a single nationwide multi-member district. By 1999, the threshold increased to 7 %, and remained so until 2004. These two elections were held with the highest threshold among the 32 elections studied. Since 2008, parties and PECs had to pass a 5 % threshold to enter the Parliament of Georgia. For 2020, as a one time thing, the threshold was set at 1 % for political parties and in the case of PECs, this level was equal to the product of the number of parties in them.

collecting 2 % of the vote was enough for entering the legislative body. As a result, the Association of Poles in Lithuania, which received 2.14 % of the votes, was able to enter the Seimas, unlike national parties with less than 4 % support. The maximum level of the $LSq_{PR}$ index (14.38) under this threshold was recorded in the 1990 Hungarian elections, which was a result of post-communist party fragmentation. The level of support of the parties remaining below the threshold was higher in this election than in any other Hungarian election.

A higher average level of disproportionality is observed under the 5 % legal threshold than under the lower threshold (see Table 3). In addition, the average standard deviation of disproportionality under the 5 % threshold significantly exceeds the corresponding indicator under the thresholds of other levels. The levels of disproportionality show the highest volatility in Georgia. The average standard deviation of the $LSq_{PR}$ index in Georgia is 8.05, while in the other studied countries, it does not exceed 2.73.

*Table 3*

**Average LSq index of disproportionality by legal threshold levels**

| Legal threshold | Elections | $LSq_{PR}$ average | $LSq_{OV}$ average | Wasted votes (average) |
|---|---|---|---|---|
| 1 % for parties; for PECs – 1 % multiplied by the number of participating parties | Georgia 2020 | 2.62 | 8.72 | 6.13 % |
| 2 % | Georgia 1992 | 3.62 | 4.52 | 3.00 % |
| 4 % | Georgia 1990; Hungary 1990; Lithuania 1992; Ukraine 1998, 2002 | 8.62 | 9.00 | 16.78 % |
| 5 % | Georgia 1995, 2008, 2012, 2016; Ukraine 2012, 2014, 2019 | 9.98 | 14.46 | 19.61 % |
| 5 % for parties; 7 % for PECs | Lithuania 1996, 2000, 2004, 2008, 2012, 2016, 2020, 2024 | 8.73 | 10.28 | 19.94 % |
| 5 % for parties; 10 % for two-party PECs; 15 % for three and more party PECs | Hungary 1994, 1998, 2002, 2006, 2010, 2014, 2018, 2022 | 7.27 | 11.32 | 7.46 % |
| 7 %[a] | Georgia 1999, 2004 | 13.93 | 11.99 | 22.20 % |

**A note:** a) The results of the 2004 repeated elections to the Parliament of Georgia do not reflect the full results of the distribution of seats in Parliament.

**Source:** Author's calculations based on the results protocols of the elections.

In the 1995 Georgian parliamentary elections, held under a 5 % legal threshold, the $LSq_{PR}$ index of disproportionality reached a record high of 29.35. This level of disproportionality is twice as high as the average disproportionality index (13.93) of the proportional component of elections held under the highest threshold (7 %). In these elections, the parties and PECs registered in the single nationwide multi-member district that failed to pass the 5 % threshold received a total of 55.62 % of the votes cast. Among them, five electoral subjects managed to receive more than 3 % of the votes. The extremely high level of party fragmentation, which contributed to the increase in disproportionality, was influenced by the low legal threshold in the previous, 1992, elections. The 2.5-fold increase in the threshold was also reflected in a sharp increase in disproportionality.

After the 1992 Lithuanian Seimas elections, when the threshold for parties was raised to 5 % and for PECs to 7 %, the disproportionality index of the proportional component of the results in the first elections held under the new legal threshold (1996) doubled. The overall level of disproportionality increased even more. Compared to the previous elections, the total share of votes received by parties below the threshold increased fourfold in 1996. The initial effect of the increase in the threshold was a tendency to decrease disproportionality and support for parties below the threshold in subsequent elections.

The introduction of a differentiated threshold did not have a direct mechanical effect on the above-described trend observed in Lithuania after the 1992 elections. Among the eight elections held in 1996–2024, there was only one case when a PEC that received more than 5 % of the vote fell below the 7 % threshold (in the 2016 elections, the Anti-Corruption Coalition, consisting of the Lithuanian Centre Party and the Latvian Pensioners' Party, received only 6.32 % of the vote and failed to win any seats in the PR component). However, it must be assumed that the differentiated threshold had a psychological effect on the strategy of political parties too, stopping them from forming PECs.

Unlike Lithuania, raising the legal threshold did not lead to an increase in the level of disproportionality of the PR component and the number of votes received by parties/PECs remaining below the threshold in Hungary. Moreover, both indicators decreased compared to the level of 1990. The trend of decrease or stabilization continued in all subsequent elections. The number of wasted votes was the smallest in 2006–2014 and did not exceed 3–4 percent.

Under the 7 % threshold, the average level of disproportionality reached its highest level in the 1999 (PR component) and 2004 elections in Georgia. The $LSq_{PR}$ index

recorded in these two elections, among the 32 election results from the four countries, is only behind the corresponding indicator for the 1995 parliamentary elections in Georgia. The share of votes received by parties remaining below the threshold was also high (see Table 3).

The results indicate that as the legal threshold rises from 2 % to 5 %, the disproportionality index increases significantly. When the legal threshold reaches 7 percent, the LSq index of the proportional component reaches its maximum. In addition, the results reveal a lower average disproportionality of the differentiated threshold in the PR component than in the case of a uniform threshold of 5 percent, which may be determined by the local context of the countries and the level of institutionalization of the party system.

### 3.3. The influence of the connection between the components of a mixed-member system on the level of disproportionality

The mixed electoral systems in the countries studied are divided into two subtypes - unlinked and linked systems. In Lithuania, Ukraine and, until 2016, Georgia, seats obtained from the proportional and majoritarian components of the elections were distributed independently of each other. This system is also referred to as a mixed-member majoritarian (MMM) (Shugart & Wattenberg, 2003, pp. 13–17), a non-compensatory system. In 1990-2010, a linked mixed system was used to elect the National Assembly of Hungary. The third component of the three-tier system used a national compensatory list, where the distribution of mandates depended on the distribution of seats in the SMD component. Deviations from the share of seats distributed in the PR component were subject to partial compensation. The Hungarian electoral system model of the given period is also classified as Supermixed (SM) (Massicotte & Blais, 1999, p. 357) or MMM system with party compensation (Shugart & Wattenberg, 2003, p. 15). Since 2014, elections of the legislative body in Hungary have also been held under an unlinked system.

In the first 6 elections in Hungary, which were held using a linked (compensatory) system, the Gallagher disproportionality index was 10.40. In the case of the unlinked system (2014, 2018, 2022), the average disproportionality index reached 14.01 (see Table 1). If we add the results of 22 elections held in other countries to the 2014, 2018 and 2022 Hungarian National Assembly elections, which were held using an unlinked (non-compensatory) system, the difference narrows, although the average level of disproportionality in the unlinked systems still remains higher (11.27) than in the case of the 6 linked elections in Hungary (10.40).

For the 2020 parliamentary elections in Georgia, a special rule was introduced that set limitations on the disproportionality of votes and seats for political unions participating in the elections. However, unlike the Hungarian model, it did not significantly change the distribution of mandates. According to this rule, the share of seats received by an electoral subject in total, compared to the share of votes received by it through the party list, should not increase by more than one quarter of these votes. In this case, the electoral subjects should be deprived of their seats and the respective mandates should be assigned to other entities that had overcome the legal threshold. In accordance with this rule, the Georgian Dream party, which took all 30 seats in the SMD component, was deprived of one seat in the PR component and given to the electoral subject that came in second place (United National Movement – United Opposition "Strength in Unity").

**CONCLUSION**

The results of the study show that in post-communist countries with mixed electoral systems, the disproportionality of election results is affected by both the majoritarian and proportional components. However, as expected, the level of disproportionality in the SMD component is generally significantly higher than in the PR component, while the overall level typically falls between these two indicators.

The analysis of the SMD component revealed that the greater the difference increases between the majority seats obtained and votes received by the party or PEC that took the first place in elections, the greater the disproportionality level of the majoritarian component grows. The latter, in turn, is the main determinant of the disproportionality of the overall results.

The study confirmed the determining role of the legal threshold in disproportionality in the PR component. In addition, a sharp increase in the legal threshold between two elections also led to a significant increase in disproportionality. It is also worth noting that when we have differentiated legal thresholds, the difference in disproportionality levels is less noticeable in cases when the difference between the threshold levels is only one unit. In addition, the results show that setting a higher threshold for PECs did not lead to an increase in disproportionality. However, it could have had a psychological impact on the process of determining the strategy of political parties.

Among the countries studied, Georgia and Hungary showed more common characteristics in terms of the level of disproportionality of election results. The high

level of disproportionality of the SMD component is particularly noteworthy. The impact of the majoritarian tier on the overall disproportionality of election results in Hungary in 1990–2010 was being reduced by the compensation system. After its abolition and the increase in the share of seats of the majoritarian component, the overall disproportionality reached even higher level.

The electoral system in the countries studied was particularly beneficial for the winning political unions. Especially if the difference in voter support for the parties/PECs that came in first and second place reached a significant difference. Georgia and Hungary again stand out in this regard, where the winning electoral subjects even independently gathered a constitutional majority. A completely different result is observed in Lithuania, where the parties that came in first place independently, in many cases, are unable to even gain a majority in the legislative body. In Ukraine, the share of seats occupied by independent candidates is still quite high, which is similar to the trend in Georgia in the last decade of the 20th century.

Despite the fact that the countries studied had almost the same electoral system, a common communist past and more or less common characteristics of post-communist transformations, the problem of disproportionality manifested itself in different ways. Moreover, sometimes in some cases of one country, significantly different disproportionality rates were observed in different elections, which indicates the versatility of the conditions for the influence of the mixed electoral system. In post-communist countries, this system led to different results under different conditions, but one thing is clear in all cases: in these countries, the mixed electoral system was mainly inclined towards majoritarianism and showed a much higher level of disproportionality than it could be in a proportional representation system.

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