Soc Choice Welfare (2004) 23: 1–20
DOI: 10.1007/s00355-004-0317-3

Social Choice and Welfare
© Springer-Verlag 2004

Analysis of QM rules in the draft constitution for Europe proposed by the European Convention, 2003

Dan S. Felsenthal[1,3], **Moshé Machover**[2,3]

[1] University of Haifa, Mount Carmel, 31 905 Haifa, Israel
(e-mail: msdanfl@mscc.huji.ac.il)
[2]King's College, London, Strand, London WC2R 2LS, England
(e-mail: moshe.machover@kcl.ac.uk)
[3]Voting Power and Procedures Project, Centre for the Philosophy of the Natural and Social Sciences, London School of Economics and Political Science, Houghton Street, London WC2A 2AE, England

Received: 20 November 2003/Accepted: 30 December 2003

Abstract. We analyse and evaluate the qualified majority (QM) decision rules for the Council of Ministers of the EU that are included in the Draft Constitution for Europe proposed by the European Convention [5]. We use a method similar to the one we used in [9] for the QM prescriptions made in the Treaty of Nice.

1 Introduction

The provisions for the qualified majority (QM) decision rules for the Council of Ministers (CM) of the European Union included in Part I of the Draft Constitution for Europe proposed by the European Convention in July 2003 are as follows.

Article 24: Qualified majority

1. When the European Council or the Council of Ministers takes decisions by qualified majority, such a majority shall consist of the majority of Member States, representing at least three fifths of the population of the Union.
2. When the Constitution does not require the European Council or the Council of Ministers to act on the basis of a proposal of the Commission, or when the European Council or the Council of Ministers is not acting on the initiative of the Union Minister for Foreign Affairs, the required qualified majority shall consist of two thirds of the Member States, representing at least three fifths of the population of the Union.

3. The provisions of paragraphs 1 and 2 shall take effect on 1 November 2009, after the European Parliament elections have taken place, according to the provisions of Article 19.[1]

Here we have two schemes for QM rules. However, the second one, specified in Article I-24(2), is supposed to apply in rare exceptional circumstances.[2]

In this paper we will only be concerned with QM rules according to the scheme of Article I-24(1), which is intended to apply in normal circumstances. We will refer to this scheme as 'the proposed scheme'. We use the term 'scheme' because, strictly speaking, what we have in Article I-24(1) is not a single definite decision rule, but a general scheme (or meta-rule). It yields a definite QM decision rule when the member-states and their population data are specified. We shall consider here two different scenarios: a 25-member and 27-member EU. We shall refer to the two QM decision rules that result from the proposed scheme as 'the proposed rules'.

The very presence of an *explicit* QM scheme is a departure from past EU practice. So far, the QM rule for the CM was negotiated and agreed *ad hoc* for the original six members (1958), and again for each of the four subsequent enlargements of the EU, in 1973, 1981, 1986 and 1995.[3] As we shall see in a moment, the content of the proposed scheme also represents a far-reaching departure from the prescriptions of the Treaty of Nice on QM, and indeed from the pattern of the QM rules used by the EU from its foundation.

Our aim in this paper is to analyse and assess the proposed rules, and compare them with the corresponding Nice QM rules. The latter were analysed and assessed by us in [9]. We apply here an assessment method similar to the one applied in that paper, to which we refer the reader for detailed explanation of the various criteria we use. One additional analytic tool we will employ here is Coleman's measure γ of blocking (negative) power (see Subsect.3.1 below).

We must point out that the work reported here may well be a purely theoretical exercise. It is far from certain that the Draft Constitution, and in particular Article I-24(1), will be adopted by the EU without major change. Nevertheless, we think it is of considerable interest to explore in detail the effect that adopting the proposed scheme would have on decision-making by the CM.

Each of the Nice QM rules – for the CM with its present 15 members, for an enlarged 27-member CM and (at least by implication) for interme-

[1][5, p. 19].

[2]An analogous exceptional QM case exists at present and is also prescribed in the Treaty of Nice. Of course, the Treaty makes no reference to the Union Minister for Foreign Affairs – a new post whose creation is proposed in Article I-27 of the Draft Constitution.

[3]The Treaty of Nice contains a kind of partial scheme, which applies only to the proposed 27-member EU and to intermediate stages leading to it; see Subsect. 3 below.

diate stages of enlargement – was a meet of three components, each component being a weighted decision rule, also known as a *weighted voting game* (WVG). Thus, the Nice QM rules could be represented schematically in the form

$$\mathscr{N} = \mathscr{W} \wedge \mathscr{P} \wedge \mathscr{M}. \tag{1}$$

Here, on the left-hand side, $\mathscr{N}$ can be any of the Nice QM rules.

On the right-hand side, the first component, $\mathscr{W}$, is a WVG of the traditional pattern that has been used in the EU since its foundation in 1958 and in its four successive enlargements. The weights in $\mathscr{W}$ were allocated 'degressively', in such a way that the weight allotted to each member-state is (very roughly) proportional to the square root of the size of its population.[4] And the quota – the threshold needed to pass an act – of $\mathscr{W}$ was between 71.3% and 74.8% of the total weight (depending on which of the Nice rules $\mathscr{N}$ represents in (1)).

The second component, $\mathscr{P}$, allocated weights strictly proportional to the population size of the respective member-states; and the quota was 62% of the total weight.

The third component, $\mathscr{M}$, is a simple majority rule: each member-state has unit weight and the quota is $(n+1)/2$, where n is the number of member-states.

For an act to be approved under $\mathscr{N}$, it had to pass under each of the three components, $\mathscr{W}, \mathscr{P}$ and $\mathscr{M}$.

In [9] we showed that in all the Nice QM rules the dominant component was $\mathscr{W}$, while the other two components had little or no effect.[5]

The major innovation in the proposed scheme is that the component $\mathscr{W}$ is absent, so the scheme can be represented as follows:

$$\mathscr{C} = \mathscr{P} \wedge \mathscr{M}. \tag{2}$$

In this schematic representation, $\mathscr{P}$ is as in the Nice scheme, except that the quota has been lowered from 62% to 60% of the total population. $\mathscr{M}$ is again a simple majority WVG.

Without any calculation, we can see that the removal of $\mathscr{W}$ must have the following effects compared to the Nice QM rules.

First, since $\mathscr{W}$ presented by far the greatest obstacle to approval of an act,[6] We must expect that the resistance of the proposed rules will be much lower than that of the corresponding Nice QM rules $\mathscr{N}$. In other words, the a priori probability that an act will be approved rather than blocked will be

[4]For a more precise statement of the relationship between population sizes and weights under $\mathscr{W}$, see [11].

[5]In the pre-Nice QM rules, $\mathscr{W}$ was the *only* component.

[6]In other words, almost every coalition of member-states that could get a proposed act passed under $\mathscr{W}$ could also get it passed under $\mathscr{P}$ and $\mathscr{M}$; but the converse does not hold.

considerably higher. The lowering of the quota of $\mathscr{P}$ from 62% to 60% will further reduce the resistance.

Compared to $\mathscr{W}$, the component $\mathscr{P}$ clearly tends, relatively speaking, to favour the larger member-states, while the component $\mathscr{M}$ tends to favour the smaller member-states.

The combined effect must be an increase in the absolute voting powers of all member-states compared to the Nice QM rules. As for the *relative* distribution of voting power: the positions of the larger and smaller member-states must improve, compared to their relative positions under the Nice rules, at the expense of the relative positions of the middle-sized member-states.

In the following sections we will demonstrate these effects in quantitative detail, and add further observations.

2 Description of data

Our analysis and assessment is based on extensive data presented in detailed Tables 1–8. Here we explain the structure of these tables.

2.1 Population tables

All our calculations are based on the population data shown in Tables 1 and 2. These two tables have the same structure but relate to different scenarios. Table 1 relates to the stage of enlargement scheduled to occur in May 2004, when ten new members are expected to join the EU, making a total of 25 member-states. Table 2 relates to a later stage of enlargement, envisaged in the Treaty of Nice, when two additional new members – Romania and Bulgaria – are expected to join.[7]

The first column of figures in Tables 1 and 2, headed 'Population', shows the population of each member-state.[8] These data provide inputs for calculating the effect of the proposed rules. The next column, headed 'Pop.%', gives the population of each member state as a percentage of the total population.

The next column, headed 'Pop. sqrt.' gives the square root of the size of the population for each member-state. The last column, headed 'Pop. sqrt.%', gives the square root of the population size of each member-state as a percentage of the total (which appears at the bottom of the penultimate

[7]Of the two scenarios, the one most relevant to the Draft Constitution is that of the 27-member EU. This is because, assuming that Article I-24 is adopted in its present form, it will only take effect in 2009 (as prescribed in paragraph (3) of the Article) – by which time the EU is quite likely to have at least 27 members and perhaps a few more, including Turkey. Nevertheless we think that examining the 25-member scenario under both the proposed scheme and the Nice scheme, and comparing the two, is a worth-while exercise.

[8]These figures are taken from [6] and constitute the most recent estimate of the Statistical Office of the European Commission (EUROSTAT) of the population of the EU present and prospective member-states on 1 January 2003.

Table 1. Population of 25 present and prospective EU members as of 2004

Country	Population	Pop.%	Pop.sqrt.	Pop.sqrt.%
Germany	82,542,000	18.210	9,085.26	10.36
France	59,625,900	13.154	7,721.78	8.81
UK	59,086,300	13.035	7,686.76	8.77
Italy	57,071,700	12.591	7,554.58	8.62
Spain	40,683,000	8.975	6,378.32	7.27
Poland	38,214,000	8.430	6,181.75	7.05
Netherlands	16,192,800	3.572	4,024.03	4.59
Greece	11,018,400	2.431	3,319.40	3.79
Portugal	10,413,700	2.297	3,227.03	3.68
Belgium	10,355,800	2.285	3,218.04	3.67
Czech Rep	10,203,300	2.251	3,194.26	3.64
Hungary	10,152,000	2.240	3,186.22	3.63
Sweden	8,940,800	1.972	2,990.12	3.41
Austria	8,058,200	1.778	2,838.70	3.24
Denmark	5,383,500	1.188	2,320.24	2.65
Slovakia	5,379,200	1.187	2,319.31	2.65
Finland	5,206,300	1.149	2,281.73	2.60
Ireland	3,961,300	0.874	1,990.30	2.27
Lithuania	3,462,600	0.764	1,860.81	2.12
Latvia	2,331,500	0.514	1,526.93	1.74
Slovenia	1,995,000	0.440	1,412.44	1.61
Estonia	1,356,000	0.299	1,164.47	1.33
Cyprus	804,700	0.178	897.05	1.02
Luxembourg	448,300	0.099	669.55	0.76
Malta	397,300	0.088	630.32	0.72
Total	453,283,600	100.001	87,679.40	100.00

Note: Source of population figures: [6]. The apparent discrepancy in the total of the second column is due to rounding errors.

column). These square-root data will be needed for assessing the equitability of the rules (see Subsect.3.2 below).

2.2 Tables for the proposed rules

We denote by $\mathscr{C}_{25}$ and $\mathscr{C}_{27}$ the proposed rules that apply to the 25-member and 27-member scenarios, respectively. We write

$$\mathscr{C}_{25} = \mathscr{P}_{25} \wedge \mathscr{M}_{25}, \mathscr{C}_{27} = \mathscr{P}_{27} \wedge \mathscr{M}_{27}.$$

\These equations are the special case of schema (2) for the two scenarios. Thus, $\mathscr{P}_{25}$ (respectively, $\mathscr{P}_{27}$) is the population component: a weighted decision rule with weights proportional to the population figures in Table 1 (Table 2) and quota equal to 60% of the total weight. And $\mathscr{M}_{25}$ ($\mathscr{M}_{27}$) is a simple majority decision rule with 25 (27) voters, requiring at least 13 (14) 'yes' votes to approve an act.

Extensive data for $\mathscr{C}_{25}$ and $\mathscr{C}_{27}$ are shown in Tables 3 and 4 respectively. These data were obtained using the Bräuninger–König algorithm [1].

Table 2. Population of 27 present and prospective EU members

Country	Population	Pop.%	Pop.sqrt.	Pop.sqrt.%
Germany	82,542,000	17.092	9,085.26	9.55
France	59,625,900	12.346	7,721.78	8.12
UK	59,086,300	12.235	7,686.76	8.08
Italy	57,071,700	11.818	7,554.58	7.94
Spain	40,683,000	8.424	6,378.32	6.70
Poland	38,214,000	7.913	6,181.75	6.50
Romania	21,811,600	4.516	4,670.29	4.91
Netherlands	16,192,800	3.353	4,024.03	4.23
Greece	11,018,400	2.282	3,319.40	3.49
Portugal	10,413,700	2.156	3,227.03	3.39
Belgium	10,355,800	2.144	3,218.04	3.38
Czech Rep	10,203,300	2.113	3,194.26	3.36
Hungary	10,152,000	2.102	3,186.22	3.35
Sweden	8,940,800	1.851	2,990.12	3.14
Austria	8,058,200	1.669	2,838.70	2.98
Bulgaria	7,845,500	1.625	2,800.98	2.94
Denmark	5,383,500	1.115	2,320.24	2.44
Slovakia	5,379,200	1.114	2,319.31	2.44
Finland	5,206,300	1.078	2,281.73	2.40
Ireland	3,961,300	0.820	1,990.30	2.09
Lithuania	3,462,600	0.717	1,860.81	1.96
Latvia	2,331,500	0.483	1,526.93	1.60
Slovenia	1,995,000	0.413	1,412.44	1.48
Estonia	1,356,000	0.281	1,164.47	1.22
Cyprus	804,700	0.167	897.05	0.94
Luxembourg	448,300	0.093	669.55	0.70
Malta	397,300	0.082	630.32	0.66
Total	482,940,700	100.002	95,150.67	99.99

Note: Source of population figures: [6]. The apparent discrepancies in the totals of the second and last columns are due to rounding errors.

In the 'w' column are shown the weights we used for the $\mathscr{P}$ component. For the purpose of computation, we set the weight of each member-state as the integer nearest to that state's population, in units of 100,000 (as listed in Tables 1 and 2). The quota was set as the least integer equal to or greater than 60% of the total weight.

The next column, headed 'ψ', shows the value of Penrose's measure of a priori voting power (aka 'the absolute Banzhaf index') for each member-state.[9]

[9]For any decision rule $\mathscr{V}$ with N as assembly (set of voters) and any voter $a \in N$, the value $\psi_a[\mathscr{V}]$ of Penrose's measure of a's voting power under $\mathscr{V}$ is defined as

$$\psi_a[\mathscr{V}] := \frac{\eta_a[\mathscr{V}]}{2^{n-1}}.$$

Here n is the number of all voters, so 2^{n-1} is the total number of ways in which the voters other than a can be divided into two camps – 'yes' voters and 'no' voters. And $\eta_a[\mathscr{V}]$ is the number of those divisions that are such that, according to the decision rule $\mathscr{V}$, the vote of a will determine whether the act in question is approved or blocked.

Table 3. QM rule $\mathscr{C}_{25}$

Country	w	ψ	γ	100β	Quotient
Germany	825	0.308930	0.68794	13.3774	1.291
France	596	0.220060	0.49004	9.5291	1.082
UK	591	0.218543	0.48666	9.4635	1.079
Italy	571	0.212200	0.47254	9.1887	1.066
Spain	407	0.160653	0.35775	6.9566	0.956
Poland	382	0.156075	0.34755	6.7584	0.959
Netherlands	162	0.083776	0.18656	3.6277	0.790
Greece	110	0.068705	0.15299	2.9751	0.786
Portugal	104	0.066955	0.14910	2.8993	0.788
Belgium	104	0.066955	0.14910	2.8993	0.790
Czech Rep	102	0.066373	0.14780	2.8741	0.789
Hungary	102	0.066373	0.14780	2.8741	0.791
Sweden	89	0.062583	0.13936	2.7100	0.795
Austria	81	0.060254	0.13418	2.6091	0.806
Denmark	54	0.052308	0.11648	2.2651	0.856
Slovakia	54	0.052308	0.11648	2.2651	0.856
Finland	52	0.051720	0.11517	2.2396	0.861
Ireland	40	0.048191	0.10731	2.0868	0.919
Lithuania	35	0.046713	0.10402	2.0228	0.953
Latvia	23	0.043156	0.09610	1.8688	1.073
Slovenia	20	0.042267	0.09412	1.8303	1.136
Estonia	14	0.040491	0.09017	1.7534	1.320
Cyprus	8	0.038720	0.08622	1.6766	1.639
Luxembourg	4	0.037519	0.08355	1.6247	2.118
Malta	4	0.037519	0.08355	1.6247	2.260
Total	4534	2.309347	5.14254	100.0002	

Population quota: 2721 = 60.01% of 4534; $\omega = 7\,534\,069$
Note: For explanations see Subsect. 2.2.

The next column, headed 'γ', shows the value of Coleman's measure of a priori blocking power (or, as he called it, 'the power to prevent action') for each member-state. The figures in this column are proportional to those in the previous column, and can be obtained from the latter by multiplying them by $2^{n-1}/\omega$. Here again n is the number of voters (that is, 25 and 27 in $\mathscr{C}_{25}$ and $\mathscr{C}_{27}$, respectively); and ω – whose value is shown under each of the tables – is the number of divisions of the n voters whose outcome under the given decision rule is positive (that is, approval of the act in question).[10]

[10]See [2]. The definition of γ is

$$\gamma_a[\mathscr{V}] := \frac{\eta_a[\mathscr{V}]}{\omega}.$$

Table 4. QM rule $\mathscr{C}_{27}$

Country	w	ψ	γ	100β	Quotient
Germany	825	0.302008	0.68976	12.7960	1.340
France	596	0.215086	0.49124	9.1132	1.123
UK	591	0.213467	0.48754	9.0446	1.120
Italy	571	0.207105	0.47301	8.7750	1.105
Spain	407	0.154511	0.35289	6.5466	0.977
Poland	382	0.148832	0.33992	6.3060	0.971
Romania	218	0.096144	0.21959	4.0736	0.830
Netherlands	162	0.080190	0.18315	3.3976	0.803
Greece	110	0.065249	0.14902	2.7646	0.792
Portugal	104	0.063497	0.14502	2.6904	0.793
Belgium	104	0.063497	0.14502	2.6904	0.795
Czech Rep	102	0.062903	0.14367	2.6652	0.794
Hungary	102	0.062903	0.14367	2.6652	0.796
Sweden	89	0.059109	0.13500	2.5044	0.797
Austria	81	0.056766	0.12965	2.4052	0.806
Bulgaria	78	0.055884	0.12763	2.3678	0.804
Denmark	54	0.048839	0.11154	2.0693	0.849
Slovakia	54	0.048839	0.11154	2.0693	0.849
Finland	52	0.048253	0.11021	2.0445	0.853
Ireland	40	0.044722	0.10214	1.8949	0.906
Lithuania	35	0.043249	0.09878	1.8325	0.937
Latvia	23	0.039713	0.09070	1.6826	1.049
Slovenia	20	0.038829	0.08868	1.6452	1.108
Estonia	14	0.037063	0.08465	1.5704	1.283
Cyprus	8	0.035289	0.08060	1.4952	1.586
Luxembourg	4	0.034109	0.07790	1.4452	2.054
Malta	4	0.034109	0.07790	1.4452	2.182
Total	4830	2.360165	5.39042	100.0001	

Population quota: 2898 (= 60% of 4830); ω = 29 383 163
Note: For explanations see Subsect. 2.2.

The next column, headed '100β', shows the value of the (relative) Banzhaf index for each member-state, in percentages.[11] The figures in this column are again proportional to those in the ψ column; they are obtained from the latter by normalization: dividing each ψ value by the sum of all ψ values, and multiplying by 100.

The last column, headed 'Quotient' gives, for each member-state, the quotient obtained by dividing the value 100β shown in the previous column by the figure shown for that member-state in the last ('Pop. sqrt.%') column of the corresponding population table. These figures will be used for assessing the equitability of the rules (see Subsect. 3.2 below).

[11] By definition,

$$\beta_a[\mathscr{V}] := \frac{\psi_a[\mathscr{V}]}{\sum_{x\in N}\psi_x[\mathscr{V}]}.$$

Table 5. QM rule $\mathscr{N}'_{25}$

Country	w	ψ	γ	100β	Quotient
Germany	29	0.055052	0.76729	8.5605	0.826
France	29	0.055049	0.76725	8.5600	0.972
UK	29	0.055048	0.76724	8.5599	0.976
Italy	29	0.055048	0.76724	8.5599	0.993
Spain	27	0.052232	0.72799	8.1220	1.116
Poland	27	0.052232	0.72799	8.1220	1.152
Netherlands	13	0.027192	0.37899	4.2284	0.921
Greece	12	0.025147	0.35048	3.9103	1.033
Portugal	12	0.025147	0.35048	3.9103	1.062
Belgium	12	0.025147	0.35048	3.9103	1.065
Czech Rep	12	0.025147	0.35048	3.9103	1.073
Hungary	12	0.025147	0.35048	3.9103	1.076
Sweden	10	0.021045	0.29332	3.2725	0.960
Austria	10	0.021045	0.29332	3.2725	1.011
Denmark	7	0.014857	0.20707	2.3102	0.873
Slovakia	7	0.014857	0.20707	2.3102	0.873
Finland	7	0.014857	0.20707	2.3102	0.888
Ireland	7	0.014857	0.20707	2.3102	1.018
Lithuania	7	0.014857	0.20707	2.3102	1.089
Latvia	4	0.008548	0.11914	1.3292	0.763
Slovenia	4	0.008548	0.11914	1.3292	0.825
Estonia	4	0.008548	0.11914	1.3292	1.001
Cyprus	4	0.008548	0.11914	1.3292	1.299
Luxembourg	4	0.008548	0.11914	1.3292	1.741
Malta	3	0.006388	0.08903	0.9933	1.382
Total	321	0.643091	8.96311	99.9995	

Quota = 232 (=72.27% of total weight); ω = 1 203 735
Note: For explanations see Subsect. 2.3

2.3 Tables for the Nice QM rules

We wish to compare $\mathscr{C}_{25}$ and $\mathscr{C}_{27}$ with the QM provisions of the Treaty of Nice, applied to the same two scenarios.

Here we are faced with a problem. As we pointed out in [9], the Treaty contains two inconsistent specifications of the QM rule for the 27-member scenario. The inconsistency concerns the quota of the component we have denoted by '$\mathscr{W}$' in the schema(1) on p.3. First, dealing explicitly with the 27-member scenario, the Treaty sets the quota of $\mathscr{W}$ at 258 out of a total weight of 345 (see [3, p. 164]). But a few pages later there is a 'Declaration on the qualified majority threshold and the number of votes for a blocking minority in an enlarged Union' (see [3, p. 167]), which deals rather vaguely with the intermediate stages of enlargement, but is quite clear in implying that when the 27-member stage is reached the quota of $\mathscr{W}$ will be 255.

Which of these two quotas is the right one? In [9] we analysed both variants of $\mathscr{N}$ – which we denoted by $\mathscr{N}_{27}$ and $\mathscr{N}'_{27}$ – with the quota of the

Table 6. QM rule $\mathscr{N}'_{27}$

Country	w	ψ	γ	100β	Quotient
Germany	29	0.032688	0.80687	7.7799	0.815
France	29	0.032688	0.80686	7.7799	0.959
UK	29	0.032688	0.80686	7.7799	0.963
Italy	29	0.032688	0.80686	7.7799	0.980
Spain	27	0.031164	0.76924	7.4171	1.106
Poland	27	0.031164	0.76923	7.4171	1.142
Romania	14	0.017888	0.44155	4.2575	0.867
Netherlands	13	0.016691	0.41199	3.9725	0.939
Greece	12	0.015474	0.38197	3.6830	1.056
Portugal	12	0.015474	0.38197	3.6830	1.086
Belgium	12	0.015474	0.38197	3.6830	1.089
Czech Rep	12	0.015474	0.38197	3.6830	1.097
Hungary	12	0.015474	0.38197	3.6830	1.110
Sweden	10	0.012989	0.32061	3.0913	0.984
Austria	10	0.012989	0.32061	3.0913	1.036
Bulgaria	10	0.012989	0.32061	3.0913	1.050
Denmark	7	0.009190	0.22683	2.1872	0.897
Slovakia	7	0.009190	0.22683	2.1872	0.897
Finland	7	0.009190	0.22683	2.1872	0.912
Ireland	7	0.009190	0.22683	2.1872	1.046
Lithuania	7	0.009190	0.22683	2.1872	1.118
Latvia	4	0.005251	0.12961	1.2497	0.779
Slovenia	4	0.005251	0.12961	1.2497	0.842
Estonia	4	0.005251	0.12961	1.2497	1.021
Cyprus	4	0.005251	0.12961	1.2497	1.326
Luxembourg	4	0.005251	0.12961	1.2497	1.776
Malta	3	0.003959	0.09772	0.9423	1.422
Total	345	0.420160	10.37106	99.9995	

Quota = 255 (=73.91% of total weight); ω = 2 718 745
Note: For explanations see Subsect. 2.3

component $\mathscr{W}$ set at 258 and 255, respectively. But here we opt for the latter variant, $\mathscr{N}'_{27}$, with 255 as the quota of $\mathscr{W}$.

There are two reasons for our choice. First, from an insider's report on what took place at the Nice Conference (Galloway [10]) it transpires that the Declaration was in fact 'the final piece of the political jigsaw agreed by heads of government' ([10, p.85]). But by the time they reached this final agreement they were too tired to notice that they had left a different specification of the quota a few pages earlier in the text.[12]

Second, the part of the Treaty of Nice that sets the quota for the 27-member scenario at 258 says nothing about any intermediate stage. On the

[12]'Given the general state of weariness at 4.20 am at the end of a four-day marathon when overall agreement was reached, a degree of ambiguity inevitably crept into the final outcome' ([10,p. 83]). Even so, it is strange that more than two months later, when the 'definitive form' of text of the Treaty was officially signed, the 'degree of ambiguity' had still not been removed.

Table 7. QM rule $\mathscr{C}_{25}$ compared to $\mathscr{N}'_{25}$

Country	$\psi[\mathscr{C}_{25}]/\psi[\mathscr{N}'_{25}]$	$\gamma[\mathscr{C}_{25}]/\gamma[\mathscr{N}'_{25}]$	$\beta[\mathscr{C}_{25}]/\beta[\mathscr{N}'_{25}]$
Germany	5.611617	0.89658	1.5627
France	3.997561	0.63870	1.1132
UK	3.970034	0.63430	1.1055
Italy	3.854803	0.61589	1.0735
Spain	3.075757	0.49142	0.8565
Poland	2.988111	0.47742	0.8321
Netherlands	3.080880	0.49224	0.8579
Greece	2.732171	0.43653	0.7608
Portugal	2.662584	0.42541	0.7415
Belgium	2.662584	0.42541	0.7415
Czech Rep	2.639445	0.42171	0.7350
Hungary	2.639445	0.42171	0.7350
Sweden	2.973740	0.47512	0.8281
Austria	2.863123	0.45745	0.7973
Denmark	3.520856	0.56254	0.9805
Slovakia	3.520856	0.56254	0.9805
Finland	3.481218	0.55620	0.9694
Ireland	3.243744	0.51826	0.9033
Lithuania	3.144271	0.50237	0.8756
Latvia	5.048770	0.80665	1.4059
Slovenia	4.944787	0.79004	1.3770
Estonia	4.736990	0.75684	1.3191
Cyprus	4.529751	0.72373	1.2614
Luxembourg	4.389341	0.70129	1.2223
Malta	5.873849	0.93848	1.6357

Note: For explanations see Subsect. 2.4.

other hand, the Declaration, according to which the 27-member quota will be 255, does deal with intermediate stages. This is echoed by the Draft Constitution, according to which the quota of the Nice QM rule for the 25-member scenario is 232 out of a total weight of of 321 ([5, p. 233]).

In order to preserve consistency of notation with [9], we denote by $\mathscr{N}'_{25}$ and $\mathscr{N}'_{27}$ the QM rule as specified in the Declaration included in the Treaty of Nice ([3, p. 167]) for the 25-member and 27-member scenarios, respectively.

Tables 5 and 6 contain extensive data for $\mathscr{N}'_{25}$ and $\mathscr{N}'_{27}$, respectively, also calculated using [1].[13] The structure of these tables is the same as that of Tables 3 and 4, except that now the weights shown in the column headed 'w' are not population weights of the component $\mathscr{P}$, but weights of the component $\mathscr{W}$, which are specified by the Treaty ([3,p. 164]).[14] For the rest, the explanations given in Subsect.2.2 apply here as well.

[13]Table 6 differs slightly from that given for $\mathscr{N}'_{27}$ in [9], because we have now used the more recent population figures of [6].

[14]Of course, $\mathscr{N}'_{25}$ and $\mathscr{N}'_{27}$ are not single WVGs: each is a meet of three WVGs, as shown in schema (1) on p.3. However, the effect of the components $\mathscr{P}$ and $\mathscr{M}$ is very small.

Table 8. QM rule $\mathscr{C}_{27}$ compared to $\mathscr{N}'_{27}$

Country	$\psi[\mathscr{C}_{27}]/\psi[\mathscr{N}'_{27}]$	$\gamma[\mathscr{C}_{27}]/\gamma[\mathscr{N}'_{27}]$	$\beta[\mathscr{C}_{27}]/\beta[\mathscr{N}'_{27}]$
Germany	9.239071	0.85487	1.6448
France	6.579970	0.60833	1.1714
UK	6.530462	0.60425	1.1626
Italy	6.335859	0.58624	1.1279
Spain	4.958043	0.45875	0.8826
Poland	4.775850	0.44190	0.8502
Romania	5.374643	0.49730	0.9568
Netherlands	4.804385	0.44454	0.8553
Greece	4.126556	0.39015	0.7506
Portugal	4.103392	0.37968	0.7305
Belgium	4.103392	0.37968	0.7305
Czech Rep	4.064989	0.37612	0.7237
Hungary	4.064989	0.37612	0.7237
Sweden	4.550830	0.42108	0.8101
Austria	4.370458	0.40439	0.7780
Bulgaria	4.302564	0.39810	0.7659
Denmark	5.314565	0.49174	0.9461
Slovakia	5.314565	0.49174	0.9461
Finland	5.250768	0.48584	0.9347
Ireland	4.866562	0.45029	0.8664
Lithuania	4.706271	0.43546	0.8378
Latvia	7.563033	0.69979	1.3464
Slovenia	7.394794	0.68422	1.3164
Estonia	7.058465	0.65310	1.2566
Cyprus	6.720534	0.62183	1.1964
Luxembourg	6.496000	0.60106	1.1564
Malta	8.615555	0.79717	1.5338

Note: For explanations see Subsect. 2.4.

2.4 Comparison tables

Tables 7 and 8 provide – for the 25-member and 27-member scenarios, respectively – a direct comparison of the position of each member-state under the proposed rule with its position under the corresponding Nice QM rule. For each member-state, these tables give the ratio between the values of ψ, γ and β under the proposed rule and the respective values of these measures under the corresponding Nice rule.

3 Criteria for evaluating QM rules

In this section we explain the criteria used in our evaluation. Our method of evaluation here is largely the same as in [8] and [9], where the reader can find some further explanatory details.

3.1 Voting power: Absolute, relative and negative

An additional tool we use here, which was absent from our analysis in [8] and [9], is Coleman's measure γ. At first glance it may seem excessive to provide for each decision rule three series of figures that are proportional to one another: ψ, 100β and γ.

Note however that the factor of proportionality between any two of these series is not invariant but depends on the decision rule. And in fact each of these series conveys information on a different aspect of voting power.

Penrose's measure ψ is an objective measure of *absolute* a priori voting power; its value for a given voter quantifies the amount of influence over the outcomes of divisions that the voter derives from the decision rule itself.

Thus, if the value of ψ for a member-state is higher under decision rule $\mathscr{U}$ than under $\mathscr{V}$, it follows that the position of that member-state is objectively better – in the sense of being given more influence – under $\mathscr{U}$ than under $\mathscr{V}$. [15]

Unfortunately, the EU practitioners – politicians representing member-states and their advisers – seem to have little understanding of the concept of absolute voting power. It is not merely that they are uninterested in the numerical values of ψ, but that they do not seem to act as though they have even a rough intuitive feel for the kind of power that ψ measures.[16] On the other hand, they do display keen interest in *relative* and *negative* voting power, and some rough quantitative sense of the former.

Politicians are obviously interested in comparing the relative position of their country with those of other member-states, especially ones whose populations are close in size to their own. As far as we know, they do not employ the precise scientific measure of relative voting power, the Banzhaf index β, which is obtained from ψ by normalization (see Footnote 11). Instead, they look at the voting weights, which can give a rough idea about relative voting power.[17] Thus, by comparing the weights under $\mathscr{C}_{27}$ with those under $\mathscr{N}'_{27}$ (see the 'w' columns of Tables 4 and 6), it can be guessed that, in comparison with the Nice rule $\mathscr{N}'_{27}$, the proposed rule $\mathscr{C}_{27}$ increases the gap between the relative power of Italy and that of Spain (and Poland) and narrows the gap between Poland and Romania. Similarly, it can be guessed that $\mathscr{C}_{27}$ increases the gap between the relative voting powers of the Netherlands and Belgium. These guesses are in fact correct, as demonstrated by the precise β figures in Tables 4, 6 and 8.

Another aspect of voting power in which politicians are keenly interested is negative or blocking power – the ability to help block an act that they

[15]For a detailed explanation and examination of ψ, see [7,Ch. 4] (where it is denoted by β'); for a less technical exposition, see [8].

[16]This is evident from insiders' reports such as [10, Ch. 4] and [13].

[17]Note that the weights by themselves provide no information about absolute voting power: for this one needs to perform mathematical computations using the quota as well as the weights.

oppose. Of course, this does not mean that they have more than a vague notion as to how to quantify this power.

Absolute voting power, as measured by ψ, is the voter's ability to help secure a favourable outcome in a division. This can be resolved into two component parts: the power to help secure a positive outcome, approval of an act that the voter supports; and the power to help secure a negative outcome, blocking of an act that the voter opposes. These two components are quantified by the Coleman measures γ^* and γ, respectively. From a purely objective, disinterested viewpoint, both are equally important; and indeed ψ is a symmetric combination of γ^* and γ.[18] However, EU practitioners are much more concerned about negative voting power than about its positive counterpart. This is no doubt because failing to block at the CM an act that s/he opposes is for a politician far more damaging – in domestic electoral terms – than failing to push through an act that s/he supports. Insiders' reports (cited in Footnote 16) make it abundantly clear that politicians representing their countries at the EU are very determined in preserving and increasing their respective blocking powers. The fact that they have no clear idea as to how to measure this negative power does not make them any less determined. On the contrary: it seems to exacerbate their aversion to the risk of having insufficient blocking power, driving them to greater extremes in pursuing it.

So in this paper we present all three sets of data about the QM rules under consideration: ψ as an objective measure of absolute voting power; as well as β and γ, which quantify aspects of voting power that are of particular concern to practitioners.

3.2 Democratic legitimacy

The CM can be regarded as the upper tier of a two-tier decision-making structure: if we assume that each minister votes in the CM according to the majority opinion in his or her country,[19] then the citizens of the EU are seen as indirect voters, voting via their respective representatives at the CM. The criteria considered under the present heading are *equitability* and *adherence to majority rule*. These address different aspects of the functioning of the CM as the upper tier of the two-tier structure.

As explained in [8] and [9], a perfectly equitable decision rule for the CM – in the sense of equalizing the indirect voting powers of all EU citizens across all member-states – would give each member-state voting power proportional to the square root of its population size. So under such a decision rule the ratio between the value of 100β for a member-state would equal the value given for that member-state in the last column ('Pop. sqrt.%') of the corre-

[18]In fact, ψ is their harmonic mean: $\psi_a[\mathscr{V}] = 2(\gamma^*{}_a[\mathscr{V}]^{-1} + \gamma_a[\mathscr{V}]^{-1})^{-1}$. For further details, see [7, pp. 49–51].

[19]This assumption is referred to in [8] as a 'democratic idealization'.

sponding population table, and the quotient of these two values would therefore be 1 for all member-states.

In Tables 3–6, the figures in the 'Quotient' column are not all 1. The amount by which the figure for a given member-state exceeds 1 or falls short of 1 indicates the amount by which the voting power of this member-state exceeds or falls short of what it should have got under an equitable distribution of the same amount of total voting power. Thus, for example, from Table 3 we see that $\mathscr{C}_{25}$ gives Germany 29.1% 'too much' voting power, whereas Table 6 tells us that under $\mathscr{N}'_{27}$ Germany gets 18.5% 'too little'.

In order to assess the degree to which a given rule is equitable, we therefore gauge how close its '100β' column is to the ideal presented by the last column of the relevant population table. For this purpose we use the following three synoptic parameters.

D This is the widely used *index of distortion*, commonly attributed to Loosemore and Hanby [12], but which according to Taagepera and Grofman [14] harks back to Duncan and Duncan [4]. We use it to measure the discrepancy between the '100β' column in the table of the given rule and the last column of the relevant population table. It is given in percentage terms, obtained as half of the sum of the absolute differences between the 100β values and the corresponding figures in the last column of the population table. The *smaller* the value of D, the closer the fit between the two columns.

max $|d|$ Maximal relative deviation. This is obtained from the 'Quotient' column in the table of the rule. It is the largest absolute difference between a figure in this column and 1.

ran(d) Range of relative deviations. This is also derived from the 'Quotient' column. It is obtained by subtracting the smallest entry in this column from the largest.

The parameters max $|d|$ and ran(d) were also used by us in [8, 9]. But we now use D instead of Pearson's product-moment coefficient of correlation and χ^2, because we regard D as much more appropriate.

While D measures the *overall* equitability of a rule, max $|d|$ and ran(d) focus on the most extreme *individual* deviations from equitability, which presumably are the most invidious.

We now turn to our criterion of adherence to majority rule. In any non-trivial two-tier decision-making structure it can happen that the decision at the upper tier (in our case: the CM) goes against the majority view of the lower-tier indirect voters (in our case: the citizens of the EU at large). In a case where this happens – that is, the CM approves an act that is opposed by a majority of EU citizens, or blocks an act that is supported by a majority of the citizens – the margin by which the majority that opposes the decision exceeds the minority that supports it is the *majority deficit* of this decision. In a case where the majority of citizens support the CM decision the majority deficit is 0. The majority deficit can be regarded as a random variable (taking only non-negative integer values), whose distribution depends on the decision rule of the CM. The

mean value (mathematical expectation) of this random variable is the *mean majority deficit* (MMD). The larger the MMD, the further the CM decision rule is from the majoritarian ideal. Note however that the MMD can only be used to compare decision rules that apply to the same number of indirect voters.

3.3 Effectiveness

The two criteria we consider under this heading address the functioning of the CM as a decision-making body in its own right rather than as part of a two-tier structure.

The [absolute] sensitivity of a decision rule is the sum of the voting powers (as measured by ψ) of all members of the CM. It measures the degree to which the CM collectively is empowered as a decision-making body, the ease with which an average member can make a difference to the outcome of a division. It is thus a good indicator of effectiveness.

The *relative sensitivity index*, denoted by S, measures the sensitivity of the given rule on a logarithmic scale, on which $\mathrm{S} = 0$ holds for the least sensitive rule (unanimity) with the same number of voters, and $\mathrm{S} = 1$ holds for the most sensitive rule (the ordinary majority rule) with that number of voters.[20] Note that S cannot be used for comparing the sensitivities of decision rules with different numbers of voters.

The second criterion under the present heading is that of *compliance*. A direct measure of this is Coleman's 'power of the collectivity to act', which is simply the a priori probability A of an act being approved rather than blocked:

$$A := \frac{\omega}{2^n},$$

where n and ω are as defined in Subsect. 2.2.

The least possible value of A for a decision rule for n voters is $1/2^n$, which is attained for the unanimity rule. The maximal value of A for proper decision rules is $1/2$.[21]

A measures the compliance of a decision rule, the ease with which a positive outcome is approved. But it is often instructive to look at its reverse, so to speak: the resistance of a decision rule to approving an act. A convenient measure of this is the *resistance coefficient* R, defined as follows:

$$\mathrm{R} := \frac{2^{n-1} - \omega}{2^{n-1} - 1}.$$

For proper decision rules, the least value of R is 0 (attained for a simple majority rule with an odd number of voters) and its maximal value is 1 (attained by the unanimity rule).

[20] For further details see [7, p. 61] and [8, pp. 7–9].

[21] A decision rule is proper if there are no two disjoint coalitions both of which are winning under it.

Table 9. Synoptic comparison

Rule	D	$\max\|d\|$	$ran(d)$	MMD	S	A	R
Present	5.1903	124.1	144.2	5 519	0.861	0.078	0.844
$\mathscr{N}_{15}$	3.6198	91.4	104.5	5 447	0.861	0.082	0.836
$\mathscr{C}_{25}$	8.1991	126.0	147.0	3 565	0.962	0.225	0.551
$\mathscr{N}'_{25}$	4.4672	74.1	97.8	7 189	0.876	0.036	0.928
$\mathscr{C}_{27}$	8.7090	118.2	139.0	3 761	0.965	0.219	0.562
$\mathscr{N}'_{27}$	4.8227	77.6	99.7	7 937	0.858	0.020	0.959
Rule B	0.2490	1.2	2.1	3 882	0.966	0.198	0.605

D, $\max|d|$ and $\mathrm{ran}(d)$ are given in percentages.
Note: For general explanations of the seven synoptic parameters shown here, see Subsects. 3.2, 3.3. For discussion see Sect. 4.

4 Assessment and comparison

We can now proceed to analyse and assess the proposed rules. Also, for each scenario, we compare the proposed rule with the corresponding Nice rule.

For ease of comparison, the values of the eight synoptic parameters introduced in Subsects.3.2 and 3.3 are shown in Table 9. In addition to the values of these parameters for the proposed rules and the corresponding Nice rules, this table also shows their values for three other rules analysed in [9]:

Present The present QM rule: this rule has been in force since the EU's enlargement to 15 members in 1995 and is in force at the time of writing (November 2003). According to the Treaty of Nice it should lapse when the EU is further enlarged, or at the end of 2004 – whichever is earlier.

$\mathscr{N}_{15}$ The QM that the Treaty of Nice [3,pp.97–98] prescribes for the present 15-member CM as of 1 January 2005, in case the EU will not have been enlarged by then.

Rule B A benchmark rule proposed by us in [9] for the 27-member scenario (but re-calculated here to take account of the updated population data). This is a weighted decision rule in which the weights of member-states are proportional to the square root of their respective population numbers; and the quota is 60% of the total weight. We consider this rule to be near ideal in terms of the criteria explained in Sect. 3.

4.1 Absolute and negative voting power

The ψ and γ columns of Tables 7 and 8 show very clearly three salient facts about $\mathscr{C}_{25}$ and $\mathscr{C}_{27}$.

First, these rules endow all member-states with considerably more absolute voting power than the corresponding Nice rules.

Second, the proposed rules grant all member-states significantly less negative (blocking) power than the corresponding Nice rules.

Third, the comparative increase in absolute power and decrease in blocking power, far from being uniform, are very skewed: the gains in absolute voting power are much more pronounced for the very large and very small member-states than for the middle-sized ones; on the other hand, the losses of blocking powers are, on the contrary, much less pronounced for the very large and very small member-states than for the middle-sized ones.

These facts have important consequences, affecting all other aspects of the $\mathscr{C}_{25}$ and $\mathscr{C}_{27}$, which we address in what follows.

4.2 Equitability: Deterioration

From Tables 3 and 4 it is evident that the relative distributions of voting power under $\mathscr{C}_{25}$ and $\mathscr{C}_{27}$ are rather inequitable. These rules give the very large member-states (from Germany down to Italy) and the very small ones (from Latvia down to Malta) more than their fair relative shares of power; whereas the remaining member-states, those in the middle range (from Spain down to Lithuania), have less power than equitability would demand. The deviations from equitability are particularly large at the two extremes (Germany at one end and Luxembourg and Malta at the other) and around the middle of the intermediate range.

Moreover, the last columns of Tables 7 and 8 show that exactly the same picture emerges when the proposed rules are compared to the corresponding Nice rules, rather than to the theoretical ideal of equitability: under the proposed rules the relative positions of the very large and very small member-states are better, and those of the middle-sized ones worse, than under the corresponding rules in the Treaty of Nice.

However, it must be pointed out that Spain and Poland – who complained loudest against the proposed rules and whose opposition to them prevented agreement about the Draft Constitution at the Brussels summit meeting in mid-December 2003 – are much less adversely affected than countries nearer the middle of the size range.

Table 9 shows that $\mathscr{C}_{25}$ and $\mathscr{C}_{27}$ score very badly according to all three indicators of equitability ($D, \max|d|$ and ran(d)) in comparison with the corresponding Nice rules, not to mention the highly equitable Rule B.

4.3 Majoritarianism and sensitivity: Improvement

Table 9 shows that $\mathscr{C}_{25}$ and $\mathscr{C}_{27}$ have very low MMD; in fact, the MMD of $\mathscr{C}_{27}$ is even lower than that of our near-ideal Rule B, which addresses the same 27-member scenario. In this respect, the proposed rules are a considerable improvement compared to the corresponding Nice rules.

The sensitivity of $\mathscr{C}_{25}$ and $\mathscr{C}_{27}$ also shows improvement: it is significantly higher than that of the corresponding Nice rules. This is also a definite improvement.

4.4 Compliance and resistance: A mixed blessing?

The compliance of $\mathscr{C}_{25}$ and $\mathscr{C}_{27}$ is very high indeed, and their resistance is accordingly very low compared with the corresponding Nice rules.

Now, the Nice rules have dangerously low compliance (and high resistance). In [9] we warned that if $\mathscr{N}'_{27}$ is implemented as it stands, the CM is likely to become immobilized by the extreme difficulty of getting acts approved.

The proposed rules go in the right direction regarding compliance; but perhaps they go too far. Getting a resolution approved by the CM should not be made *too* easy: the status quo should be privileged to some extent as against attempts to change it. Note that the great increase in compliance – especially the more than tenfold increase of that of $\mathscr{C}_{27}$ compared to its Nice counterpart! – is achieved at the cost of a great loss of blocking power, especially by the middle-sized members.

As we noted in Subsect. 3.1, ministers representing their countries at the EU are – for understandable domestic political reasons – keen on having as much blocking power as possible. If $\mathscr{C}_{25}$ or $\mathscr{C}_{27}$ is implemented, ministers – especially those representing middle-sized member-states – will find themselves with too little negative power: too often unable to block in the CM acts that they oppose. This may lead to a great deal of resentment and disaffection.

In our opinion it would be prudent to aim at a somewhat lower compliance (and higher resistance) – something like that of our benchmark Rule B.

5 Conclusions

The QM rules proposed in the Draft Constitution submitted by the European Convention are considerably less equitable than the corresponding QM rules specified by the Treaty of Nice. The relative distribution of voting power in the proposed rules is skewed in favour of the four largest member-states and six smallest ones, at the expense of the middle-sized ones (from Spain down to Lithuania).

In other respects the proposed rules are an improvement: they conform better to the principle of majority rule and are more efficient than their Nice counterparts.

However, this improvement is achieved at the cost of somewhat excessive loss of blocking power, disproportionately so for the middle-sized member-states.

We would recommend a much more equitable QM rule, with resistance somewhat greater than that of the proposed rules though much smaller than

that of the Nice rules. Our benchmark Rule B recommends itself in all these respects.

References

[1] Bräuninger T, König T (2001) Indices of power IOP 2.0. Computer program, University of Konstanz, Konstanz http://www.uni-konstanz.de/FuF/Verwiss/Koenig/IOP.html
[2] Coleman JS (1971) Control of collectivities and the power of a collectivity to act.In: Lieberman B (ed) Social choice. Gordon and Breach, New York, pp 269–300
[3] Conference of the Representatives of the Governments of the Member States, Brussels, 28 February 2001. Treaty of Nice amending the Treaty on European Union, the Treaties establishing the European Communities and certain related Acts. EU document CONFER 4820/00
[4] Duncan OD, Duncan B (1955) A methodical analysis of segregation indexes. American Soc Rev 20: 210–217
[5] The European Convention (2003) Draft treaty establishing a constitution for Europe. Adopted by consensus by the European Convention on 13 June and 10 July 2003, submitted to the President of the European Council in Rome, 18 July 2003; EU document CONV 850/03
[6] EUROSTAT (the statistical office of the European Commission): News Release No. 92/2003, published on the Web on 8 August 2003 at URL http://europa.eu.int/comm/eurostat/
[7] Felsenthal DS, Machover M (1998) The measurement of voting power: Theory and practice, problems and paradoxes. Edward Elgar, Cheltenham
[8] Felsenthal DS, Machover M (2000) Enlargement of the EU and weighted voting in its Council of Ministers. London School of Economics and Political Science, Centre for Philosophy of Natural and Social Science, London VPP 01/00. Downloadable from http://www.lse.ac.uk/Depts/cpnss/projects/vp.html
[9] Felsenthal DS, Machover M (2001) The treaty of nice and qualified majority voting. Soc Choice Welfare 18:431–464. Downloadable from http://www.lse.a-c.uk/Depts/cpnss/projects/vp.html
[10] Galloway D (2001) The treaty of nice and beyond: Realities and illusions of power in the EU. Sheffield Academic Press, Sheffield
[11] Hosli MO, Wolffenbuttel RF (2001) Estimating the vote distribution in the Council of the European Union. J Int Rel Devel 4: 38–54
[12] Loosemore J, Hanby V (1971) The theoretical limits of maximum distortion: some analytical expressions for electoral systems: Brit J Polit Sci 1: 467–477
[13] Moberg A (2002) The Nice Treaty and voting rules in the Council. J Comm Market Stud 40: 259–282
[14] Taagepera R, Grofman B (2003) Mapping the indices of seats-votes disproportionality and inter-election volatility. Party Polit 9: 659–677

Addendum. While this paper was in print, the Brussels IGC has adopted on 18.6.04 a new QM rule for the CM, effective 1.11.09 if it is ratified by all 25 EU member states. Readers interested in an analysis of this rule should look up our new paper, Analysis of QM rules adopted by the EU Inter-Governmental Conference, Brussels, 18 June 2004 at the VPP website http://www.lse.ac.uk/Depts/cpnss/projects/vp.html