

POWER RELATIONSHIPS IN THE
INTERNATIONAL MONETARY FUND:
THE CONSEQUENCES OF QUOTA CHANGES

by

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There is a widespread agreement that the International Monetary Fund has played a central role in fostering a dynamic and open international economy in the post-war period. The consensus has also emerged, however, that substantial changes are required in the Fund's rules so as to make them better reflect the changing power relationships among its members. In an attempt to make these changes, the "Proposed Second Amendment to the Articles of Agreement of the International Monetary Fund"^{1/} was offered to the I.M.F.'s members for ratification along with a change in the distribution of the members' quotas. The new rules became effective as of April 1, 1978, when the Amendment was ratified by the required 60 percent of members with 80 percent of the total vote.

It is the purpose of this paper to demonstrate, using some simple game theoretical tools, that in many cases the framers of these amendments and quota changes have achieved a result that is exactly the opposite of their intentions. More specifically, we will show that:

1) Under the proposed changes 38 countries in the IMF have their percentage of the total vote decreased and yet their voting power within the organization increased when power is measured by the Banzhaf power index.

2) With the new vote distribution and voting rules, four major countries -- Belgium, Holland, West Germany and Japan have their percentage of the total vote increased and yet have their percentage of the total power decreased.

Paradoxical results of this variety were discussed theoretically by Fischer and Schotter (1978) and labeled the "Paradox of Redistribution."^{2/}

3) Under the previous distribution of votes and voting rules, smaller countries had a voting power that was out of proportion to their voting weights, and the newly introduced changes would generally aggravate this disproportion.

4) The power of the United States within the Fund increases substantially on issues where most countries vote through their Executive Directors (as groups), as opposed to issues where they vote through their Governors (individually).

5) Under both the previous and current voting system, significant diminishing returns to voting weights exist and the tendency is more pronounced under the new system. In most voting situations power is a concave function of voting weight with large linear segments.

6) Although these results are in many instances not quantitatively substantial, qualitatively they indicate a noticeable discrepancy between what one would think the consequences of the voting changes would be and what they actually are.

In this paper we will proceed as follows:

Section I will present some background material about the voting procedures at the IMF.

Section II will discuss the index that we are using to measure power.

Section III will present the results of our calculations and discuss their significance.

Finally, Section IV will offer some conclusions and consider the relevance of our findings.

Section I: Voting in the IMF

The organization of the I.M.F. is very simple. All powers of the Fund are vested in its Board of Governors which is composed of the Fund's 131 member countries. Each country has 250 votes plus one additional vote for each part of its quota which is equivalent to one hundred thousand S.D.R.s. The Board of Governors may, however, delegate certain decisions to be made to the Fund's body of Executive Directors which is composed of one representative from each of the five members of the Fund having the largest quotas plus 15 other representatives each of whom represents a certain subset or coalition of countries. There are then twenty Executive Directors each one having the number of votes equal to the sum of the votes contained in the subset of countries it represents. Thus, voting by the Directors is, in fact, a two stage process. First each coalition meets and agrees (using a simple majority rule) on how its representative (Executive Director) will cast his vote in the body of Executive Directors. Then the Executive Directors themselves meet and, using a decision rule that is not a simple majority rule, cast their votes.

Essentially, decisions binding on all IMF members can be taken either by the required majority of votes cast by the voting body of

Governors or the required majority of votes cast by the voting body of Executive Directors. The majorities required by these two bodies depend upon the type of issue to be decided. One type (which for want of a better description we shall denote as issues of procedure) requires a 70 percent majority in both voting bodies. This rule was left unchanged by the new amendments. Another class of issues (which we shall denote as issues of substance) however, required in any of the two voting bodies an 80 percent majority under the old rules and requires an 85 percent majority under the new ones. The required majority for deciding issues of substance was raised from 80 to 85 percent at the insistence of the United States to retain its veto power: The U.S. made this change a precondition for its agreement to having its voting share lowered from above to below 20 percent of the total vote. [See appendix A for a description of exactly which issues require a 70%, 80% or 85% majority].

One apparent curiosity that needs to be mentioned is that, in fact, no decisions within the Fund are made by means of formal balloting. It is an institution operating on the basis of consensus reached through informal consultations among members. In this context, possession by a member, or a group of members, of a given share of the total vote has to be viewed as an indication of its strength during the process of informal negotiations when a compromise among differing views on a certain issue is being forged. It is the threat by a country (or a group of countries) of bringing an issue to a formal vote in which its view would prevail that renders the actual vote unnecessary and decision making by consensus

roughly approximate to decision making by actually counting ballots.

Section II: Power and Power Indices

Power is an elusive concept whose full meaning is not quite clear to us. In voting bodies and other institutions, power usually means the ability of members or coalitions of members to make decisions unilaterally that are binding on the entire organization. In other words, power is the ability to influence outcomes. In order to measure this ability, game theorists and other social scientists have constructed various power indices all of which measure the ability of players to influence the outcomes of the voting bodies they belong to.

To make this more precise, let us discuss two commonly used power indices, the Banzhaf and the Shapley-Shubik indexes. First, let N be the set of voters in a voting body indexed $i = 1, \dots, n$ and let $w = (w_1, \dots, w_n)$ be a vote distribution normalized such that $w_i \geq 0$ and $\sum_{i=1}^n w_i = 1$. The voting body is then fully described by an $(n+1)$ -tuple $v = (d; w_1, \dots, w_n)$. where d is the decision rule of the body indicating the minimum fraction of the total vote that must be exceeded for the voting body to take collective action binding on all members, and (w_1, \dots, w_n) is the vote distribution. Let S be any subset of voters $S \subseteq N$. Then we can define the value of a coalition S as

$$V(S) = 0 \quad \text{if} \quad \sum_{i \in S} w_i < d$$

$$V(S) = 1 \quad \text{if} \quad \sum_{i \in S} w_i \geq d.$$

A voter is "critical" in a coalition S if his defection from that coalition changes the coalition from a winning to a losing coalition [i.e., $V(S) = 1$ and $V(S - \{i\}) = 0$].

The Banzhaf power index for member i is then defined as

$$P_B^i = \frac{\sum_S [V(S) - V(S - \{i\})]}{\sum_j \sum_S [V(S) - V(S - \{j\})]}$$

This index, then, describes the number of critical defections of member i relative to the number of critical defections of all members. It follows that $\sum_{i=1}^n P_B^i = 1$.

The Shapley-Shubik index for a member i is slightly more complex. It concerns itself with the proportion of permutations of the n members in which i's defection from a winning coalition is critical. It can be written as

$$P_{SS}^i = \sum_S \left[\frac{(s-1)! (n-s)!}{n!} \right] [V(S) - V(S - \{i\})],$$

where s is the number of members in the subset S and n is the total number of members.

In this paper we will use the Banzhaf power index exclusively since it can be argued that it presents a better intuitive measure of power than the Shapley-Shubik index, is far more easy to calculate, and usually (although not always) yields the same qualitative results as the Shapley-Shubik index.^{3/} We are fairly certain, however, that what we say is true for all power indices currently in use.^{4/}

Section III: The Consequences of Quota Changes

A. Previous Power Distribution

Before we investigate the consequences of the recent changes in the voting rules, distribution of voting weights, or the shares of the members of the IMF, let us first investigate the power relationship existing prior to April 1, 1978.

Appendix B, presents a table describing the existing voting percentage and Banzhaf power index for each country of the IMF and each voting rule under the rules and vote distribution prior to recent changes. Appendix C, presents a table giving the same information for the 20 Executive Directors. This data is illustrated in diagrams 1 through 4. From these diagrams, several interesting features appear. First, from diagram 1, we see that when individual countries voted on issues employing the 70 percent decision rule, the relationship between power and voting weights was practically log-linear except for the two largest countries, the United States and the United Kingdom, for which the relationship flattened out considerably. Put differently, while all members had a voting power proportional to their voting weights, the United States and the United Kingdom had voting powers considerably below their shares of the total vote. For issues involving the 80 percent rule (see Diagram 2) the linear relationship failed to hold for the ten countries with largest voting shares: the United States, the United Kingdom, Germany (Federal Republic), France, Japan, Canada, Italy, India, Netherlands, Australia. This result is interesting since, in the Fund, votes are allocated on the basis of a country's contribution to the Fund.

Consequently, say in the 70 percent case, while all countries may have claimed to be getting their "money's worth" in terms of power, this could not be said for the United States and the United Kingdom. For instance, while the United States contributed almost 16 percent more to the Fund than West Germany, it only received approximately 4 percent more of the power, as measured by the Banzhaff index, for that contribution.^{5/}

Similar results hold for issues which were voted upon by Executive Directors (see Diagrams 3 and 4), again with the concavity more pronounced for issues involving the 80 percent decision rule than for issues involving the 70 percent rule. In this voting body, however, the United States had relatively more power than it did in the voting body consisting of Governors. E.g., on issues involving the 70 percent decision rule, the U.S. had 13.54 percent of voting power as opposed to 9.07 percent when the same rule was used by the Executive Board. In other words, the United States' power within the Fund increased when the other countries voted in blocks rather than separately. This seems somewhat counter-intuitive, of course, since one would expect that a "large" member would be hurt by the formation of syndicates, each of which would act in unison on particular votes. However, as several recent studies in game theory have shown [see Aumann (1973), Postlewaite and Rosenthal (1974), and Schotter (1978)], syndication need not always be advantageous for the members who syndicate and here is an example of that phenomenon.

To present a picture of past power relationships in the IMF from a different angle, consider the "power Lorenz curves" (Diagrams

5 to 8) constructed to represent the degree of inequality of the distribution of power in the IMF among Executive Directors and individual Governors for issues involving the 70 percent and 80 percent voting rules.

In all of these diagrams, the cumulative percentage of the voting weights is plotted against the cumulative percentage of the voting power. As we might expect from our previous discussion, since large countries had voting powers that were less than proportional to their voting weights, the resulting Lorenz curves should demonstrate a certain over-representation for smaller countries and this is indeed what we see. The diagrams clearly show that the inequality of power in the favor of smaller countries was more pronounced on issues requiring 80 percent of the total vote than on issues calling for a 70 percent majority. As we would expect, the inequality diminished when countries voted through their Executive Directors instead of individually which is easily explained by the increase in power of large countries on issues requiring Executive Directors' votes.

B. Consequences of Quota Changes

1. Some Surprises. When we analyze the consequences of the recent quota changes, we find some surprises and some expected results. Among the surprises are the paradoxical results described before. Specifically, some of the power relations resulting from the changes contradict the intentions of their initiators. These paradoxical results are summarized in Tables 1 and 2 where we see (in Table 1) that, as a result, of the quota changes, 38 countries have their percentage of power increased within the Fund even though

TABLE 1
OCCURENCE OF THE PARADOX OF REDISTRIBTUION IN
THE INTERNATIONAL MONETARY FUND

The Voting Body of Governors

Country	Previous Voting System d = .80		Current Voting System d = .85	
	% of Vote	% of Power	% of Vote	% of Power
Luxembourg	.14	.20	.13	.22
Papua New Guinea	.14	.20	.13	.25
Jordan	.15	.21	.13	.22
Honduras	.15	.22	.14	.23
Cyprus	.16	.22	.14	.23
Malagasy Republic	.16	.22	.14	.23
Ethiopia	.16	.23	.14	.23
Liberia	.17	.24	.14	.24
Yemen (P.D.R.)	.17	.24	.16	.25
Costa Rica	.18	.25	.16	.25
Cameroon	.19	.27	.17	.27
Guatemala	.19	.27	.18	.30
Panama	.19	.27	.17	.27
Bahamas	.14	.20	.13	.22
Dominican Republic	.21	.30	.19	.31
Kenya	.23	.33	.22	.37
Tunisia	.23	.33	.21	.34
Syria	.23	.33	.21	.34
Jamaica	.24	.35	.23	.39
Burma	.26	.38	.23	.39
Trinidad and Tobago	.27	.39	.25	.41
Uruguay	.29	.42	.26	.43
Sudan	.30	.43	.27	.44
Ghana	.35	.50	.31	.51
Sri Lanka	.38	.55	.34	.56
Iraq	.41	.60	.39	.64
Morocco	.43	.61	.41	.68
Zaire	.43	.61	.42	.69
Ireland	.45	.64	.43	.69
Peru	.46	.66	.45	.73
Bangladesh	.46	.67	.42	.66
Turkey	.54	.78	.53	.86
Egypt	.66	.94	.60	.97
Romania	.66	.95	.64	1.03
Pakistan	.80	1.14	.73	1.17
Norway	.82	1.17	.76	1.20
Denmark	.88	1.25	.79	1.26
Austria	.91	1.29	.84	1.32

TABLE 2
 OCCURENCE OF THE PARADOX OF REDISTRIBUTION IN
 THE INTERNATIONAL MONETARY FUND
 The Voting Body of Governors

Country	Previous Voting System d = .80		Current Voting System d = .85	
	% of Vote	% of Power	% of Vote	% of Power
Belgium	2.08	2.76	2.17	2.62
Netherlands	2.24	2.92	2.30	2.68
Japan	3.78	4.06	3.99	2.99
Germany (Fed. Rep.)	5.01	5.39	5.16	3.01

their voting share decreases, while four countries (Table 2) have their percentage of power decreased even though the new vote distribution awards them a larger share of the total vote.^{6/}

This result is not surprising to students of voting power since the power of a member depends not only on the number of votes or percentage of the total vote that he has, but also on the way the remaining votes are distributed amongst the other $n-1$ voters. For instance, consider the following example offered by Fischer and Schotter (1978):

Let $V = (70/100; 55/100, 35/100, 10/100)$ be a voting body where $70/100$ is the decision rule and $(55/100, 35/100, 10/100)$ is the vote distribution. The Banzhaf index associated with this distribution is $(1/2, 1/2, 0)$. Now, redistribute the votes to obtain the following distribution:

$$V' = (70/100; 50/100, 25/100, 25/100).$$

Here, the Banzhaf index is $(3/5, 1/5, 1/5)$. We see that voter 1 has had his power increased though his percentage of the vote has decreased by 5 percent. This is not a peculiarity of the index, however, because voter 1 is actually more powerful after the change than before since he can now form a coalition with players 2, 3 and 2 and 3, and secure the desired outcome whereas before he could only win by joining forces with players 2 and (2 and 3). In other words, he is now "critical" in more coalitions than he was before. For a further theoretical discussion of these results, see Fischer and Schotter (1978).

2. Power Effects. If we were to give a general assessment of the recent changes, we could state that under the new distribution

of voting weights larger countries have unequivocally less power than they had under the old distribution. This fact is demonstrated in Daigrams 9 - 12 below, where we superimpose the voting power/voting weights relationship under the new scheme over the relation we found under the previous scheme.

The overall impression from these diagrams is that the voting changes did not drastically alter the basic relationship between voting weight and voting power. There is a universal tendency for the power of the large countries to be less than proportional to their voting shares and this tendency is more pronounced for issues of substance than it is for issues of procedure.

When we superimpose our power Lorenz curves constructed for the new rules and distribution of voting shares over the Lorenz curves previously presented (see Diagrams 13-16), we see that there is paractically no change in the degree of power inequality in the Fund except for issues of substance voted upon by Governors. In fact, for the body of Executive Directors, the Lorenz curves for the 70 percent voting rule under the new system coincides with the Lorenz curve generated under this rule for the old system. (See Diagram 15). For issues of substance, however, power is further redistributed in favor of the smaller countries.

To summarize our results, the recent changes in the voting rules and distribution of voting shares in the International Monetary Fund have somewhat increased the power of its smaller members. In addition, in many instances, these changes have produced outcomes opposite to the intentions of the drafters of the Amendments.

There is one more question that deserves investigation. It is whether or not the power relationships in the Fund fairly

reflect the relative economic importance of its members. This question will be discussed in the following section.

C. World Trade Shares and Power Within the IMF

One purpose of periodic adjustments in the IMF members' quotas is to bring in line a member's importance in the Fund with its importance in world trade. To see if this purpose was achieved, we investigated the relationship between the share of any particular country in total exports of all IMF members with its power within the organization. These relationships are presented as a set of two power Lorenz curves (Diagrams 17 and 18) for 80% decision rules.

For the purpose of comparison, we have superimposed these Lorenz curves over the power Lorenz curves presented before. These diagrams demonstrate that for small countries, trade shares are even worse proxies for power within the Fund than are their voting weights, that is, the distribution of power is even more biased in favor of the smaller countries when the members' trade shares, instead of voting weights, are used as a yardstick. In addition, if we compare power Lorenz curves under previous rules and quotas with the ones that result from the recent change, we see that this inequality is magnified (Diagrams 19 and 20).

Section IV: Implications and Conclusions

It is clear that the quantitative analysis of a voting system provides us with a singular perspective from which to view the power relationships in an institution. We are well aware that there are many more facets to power relationships than can be represented by power indices. In any voting assembly, and certainly in the IMF, where decisions are reached through informal consensus rather than by

formal vote, behind-the-scene activity and understandings resulting from it play a crucial role in adopting collective decisions. Yet, even though the decisions are reached through consultations rather than formal voting, it is safe to assume that the power of persuasion of a particular IMF member is closely related to its ability to make his views prevail in formal voting, should behind-the-scene negotiations result in a deadlock. Thus, power indices represent a proxy for the ability of a member, or a group of members, to influence outcomes reached by the IMF.

Analysis of power relationships as reflected in power indices, although admittedly limited in scope, appears to be demonstrably superior to contemplation of voting shares. While it is true that equity or fairness cannot be reflected adequately by numbers, power indices still remain the best quantitative tool available in assessing the soundness of many political structures.

With these caveats in mind one may be tempted to draw some implications of recent changes in rules and quotas for power relations at the IMF. It is clear that voting shares do not reflect properly members' voting powers. Generally, increases in members' voting shares result in less than proportional increases in their voting powers. Not infrequently, an increase in a member's voting share is translated into a decrease in his voting power. While this "paradox of redistribution" is unavoidable, its consequences ought to be taken into account when contemplating future redistribution of quotas (voting shares) at the IMF. It should be also borne in mind that voting powers of individual members may be substantially different depending on whether the decision is to be made by the

Executive Board or the Governors.

More important, our results raise a fundamental question about the desirability of using quotas as an appropriate basis for determining member countries' influence or power in the Fund. Under the previous as well as amended Articles of Agreement the members' quotas serve several purposes. But while the quotas may be considered to constitute the best criterion for determining the members' access to credit tranches and special financing facilities or their entitlements to periodic allocations of Special Drawing Rights, the system of quotas need not be appropriate for distributing voting shares among the Fund members. At the very least an argument can be made that in determining members' voting shares the relationship between the shares and the underlying quotas be specified in such a manner as to weaken the effect of nonlinearities reflected in Diagram 1 through 4. More generally, in deciding on future redistribution of quotas, the relationship between voting power indices, not just between voting shares, ought to be the focus of concern and attention of the negotiating parties.

FOOTNOTES

1/ A Report by the Executive Directors to the Board of Governors, International Monetary Fund, Washington, D.C., March, 1976.

2/ In that paper, the authors proved that such a paradox is inevitable for any voting body larger than some minimal size in the sense that for any given voting distribution, w , there always exists another distribution, w' , for which, a move from distribution w to w' would result in a paradox of redistribution. The authors have shown that the paradox is by no means a rare event (it has a probability of occurrence as high as 30 percent).

3/ Fischer and Schotter (1978) demonstrate that it is possible for the "paradox of redistribution" to occur when the Shapley-Shubik index is used and not to occur when the Banzhaf index is used in analyzing specific changes in voting distributions.

4/ It is certainly true of one index, the Coleman index, since the Coleman index is merely a linear transformation of the Banzhaf index.

5/ Mancur Olson and Richard Zeckhauser (1966) demonstrate, through a model that describes the services of international organizations, such as N.A.T.O. or the U.N., as public goods, that in most such organizations larger countries (notably the U.S.) wind up making a disproportionately large contributions to the financing of the organization.

6/ Since we are dealing with a very large voting body, it is not surprising that many of our results hold true only at a third decimal place; many countries have virtually no power to start with. However, the qualitative result still holds: increases or decreases in voting percentages do not necessarily imply increases or decreases in corresponding voting powers.

Our computations are based on the IMF membership as of December 31, 1976, consisting of 128 members. Since then the IMF membership rose to 133 countries.

LIST OF ABBREVIATIONS

- GEXPV -- previous distribution of voting shares among governors
- GCRPV -- current distribution of voting shares among governors
- GEXB70 -- previous distribution of voting power among governors under the 70 percent majority rule
- GCRB70 -- current distribution of voting power among governors under the 70 percent majority rule
- GEXB80 -- previous distribution of voting power among governors under the 80 percent majority rule
- GCRB85 -- current distribution of voting power among governors under the 85 percent majority rule
- DEXPV -- previous distribution of voting shares among executive directors
- DCRPV -- current distribution of voting shares among executive directors
- DEXB70 -- previous distribution of voting power among executive directors under the 70 percent majority rule
- DCRB70 -- current distribution of voting power among executive directors under the 70 percent majority rule
- DEXB80 -- previous distribution of voting power among executive directors under the 80 percent majority rule
- DCRB85 -- current distribution of voting power among executive directors under the 85 percent majority rule
- SHARES -- distribution of world export shares among the IMF members
- C -- (preceding one of the above abbreviations) stands for "cumulative". E.g., CDCR85 -- current cumulative distribution of voting power among executive directors under the 85 percent majority rule.

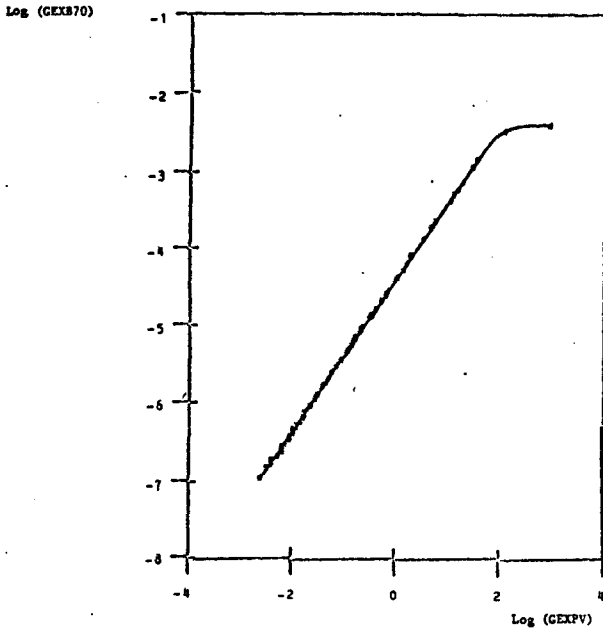


Diagram 1: The relationship between voting weight and voting power.
 Logs of weights vs. logs of Banzhaf power indices under previous quotas.
 The body of Governors voting on issues requiring a majority of 70 percent.

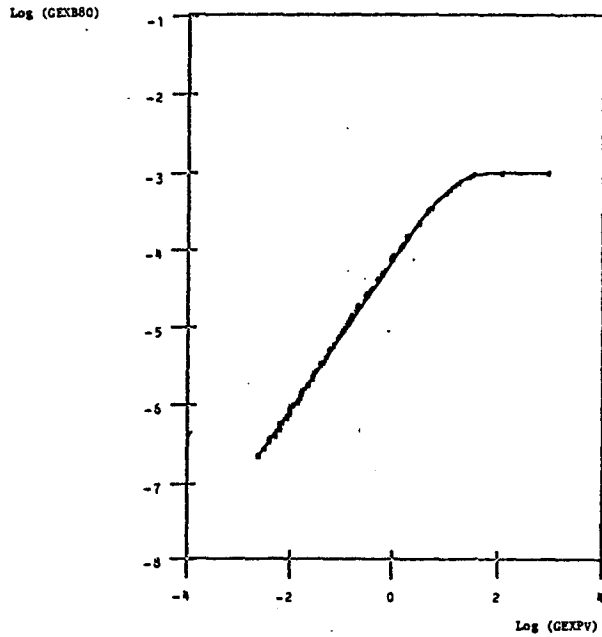


Diagram 2: The relationship between voting weight and voting power.
 Logs of weights vs. logs of Banzhaf power indices under previous quotas.
 The body of Governors voting on issues requiring a majority of 80 percent.

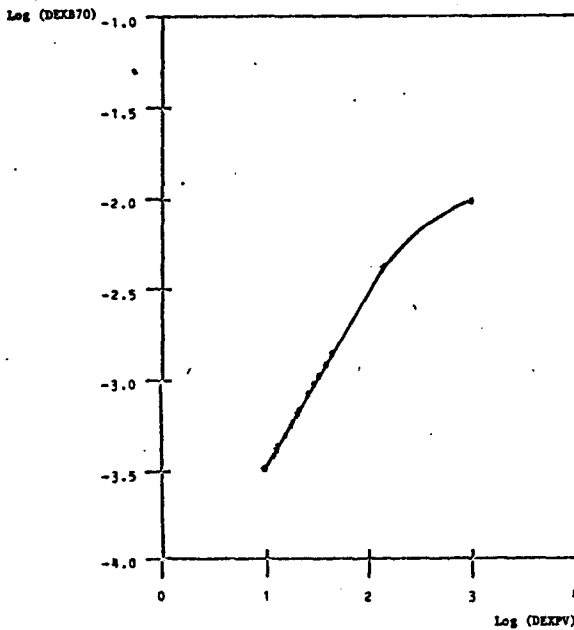


Diagram 3: The relationship between voting weights and voting power.
 Logs of weights vs. logs of Banzhaf power indices under previous quotas.
 The body of Executive Directors voting on issues requiring a majority of 70 percent.

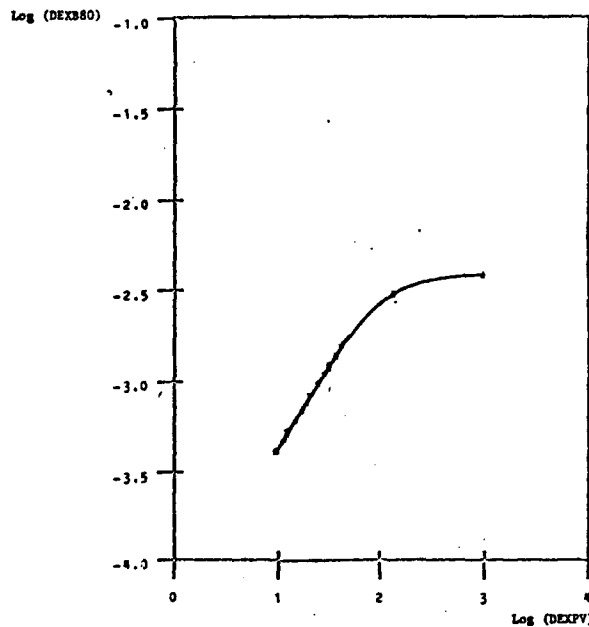


Diagram 4: The relationship between voting weight and voting power.
 Logs of weights vs. logs of Banzhaf power indices under previous quotas.
 The body of Executive Directors voting on issues requiring a majority of 80 percent.

CGEXB70

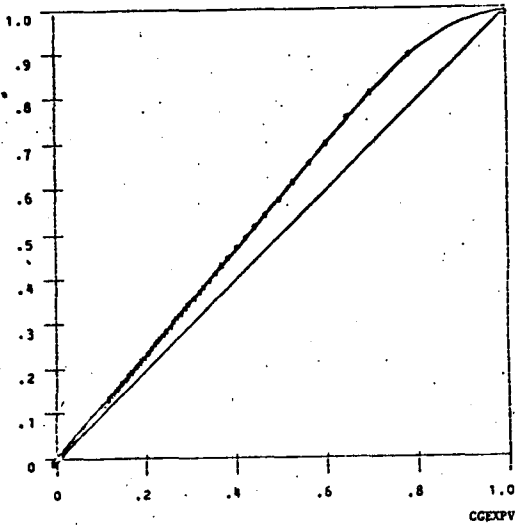


Diagram 5: A power Lorenz curve. Cumulative voting weights vs. cumulative Banzhaf power indices under previous quotas. The body of Governors voting on issues requiring a majority of 70 percent.

CGEXB80

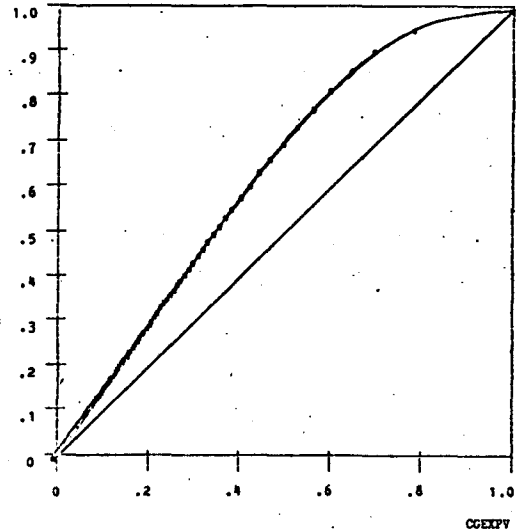


Diagram 6: A power Lorenz curve. Cumulative voting weights vs. cumulative Banzhaf power indices under previous quotas. The body of Governors voting on issues requiring a majority of 80 percent.

CDEXB70

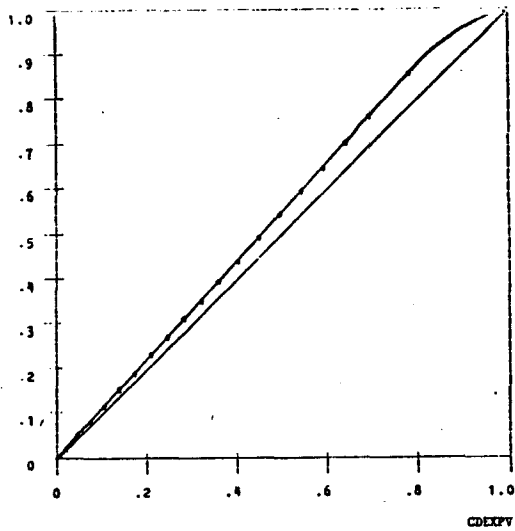


Diagram 7: A power Lorenz curve. Cumulative voting weights vs. cumulative Banzhaf power indices under previous quotas. The body of Executive Directors voting on issues requiring a majority of 70 percent.

CDEXB80

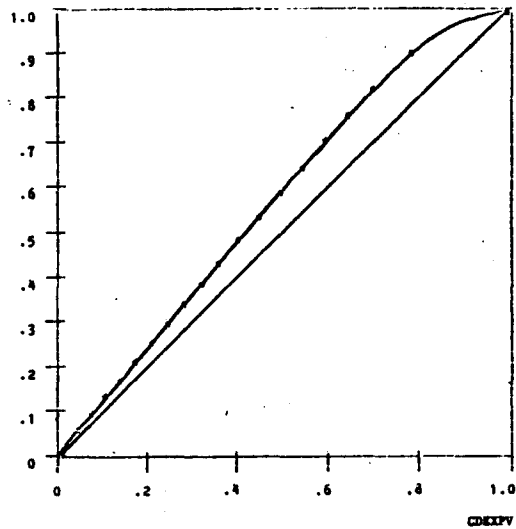


Diagram 8: A power Lorenz curve. Cumulative voting weights vs. cumulative Banzhaf power indices under previous quotas. The body of Executive Directors voting on issues requiring a majority of 80 percent.

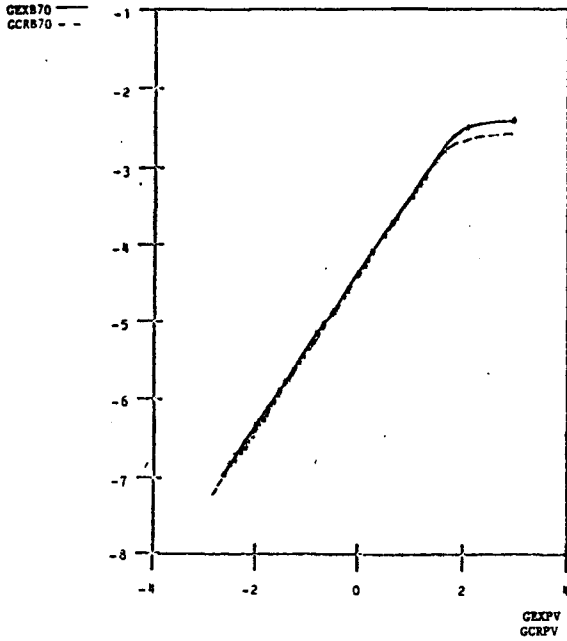


Diagram 9: The relationship between voting weight and voting power under previous (—) and current (---) quotas. Logs of weights vs. logs of Banzhaf power indices. The body of Governors voting on issues requiring a majority of 70 percent.

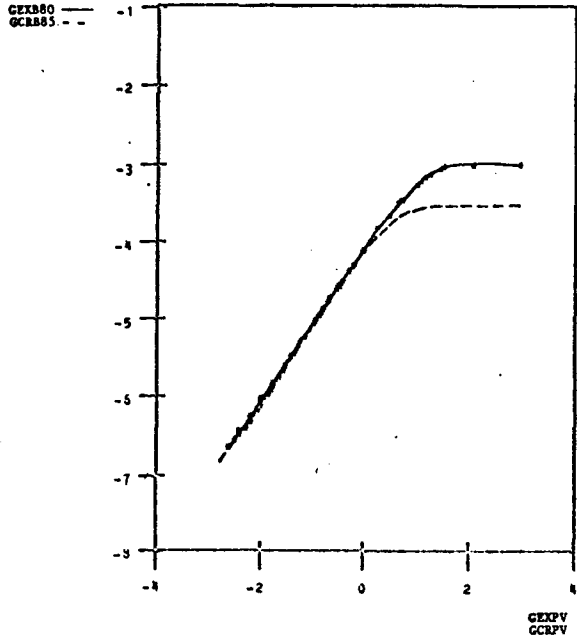


Diagram 10: The relationship between voting weight and voting power under previous (—) and current (---) quotas. Logs of weights vs. logs of Banzhaf power indices. The body of Governors voting on issues requiring a majority of 80 and 85 percent under previous and current rules, respectively.

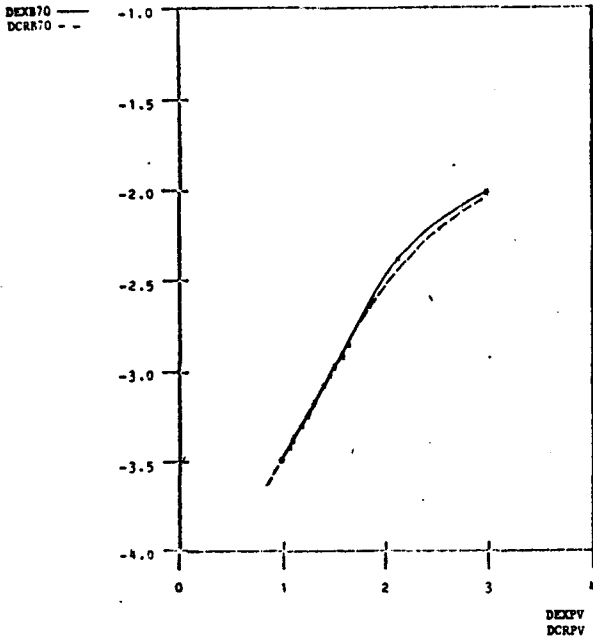


Diagram 11: The relationship between voting weight and voting power under previous (—) and current (---) quotas. Logs of weights vs. logs of Banzhaf power indices. The body of Executive Directors voting on issues requiring a majority of 70 percent.

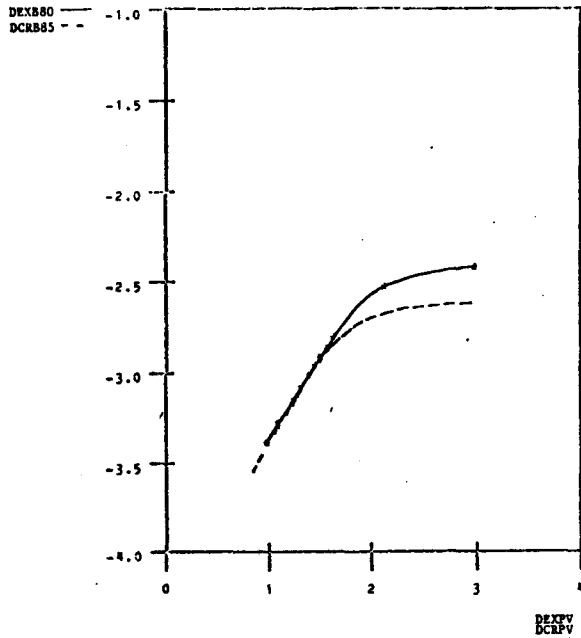


Diagram 12: The relationship between voting weight and voting power under previous (—) and current (---) quotas. Logs of weights vs. logs of Banzhaf power indices. The body of Executive Directors voting on issues requiring a majority of 80 to 85 percent under previous and current rules, respectively.

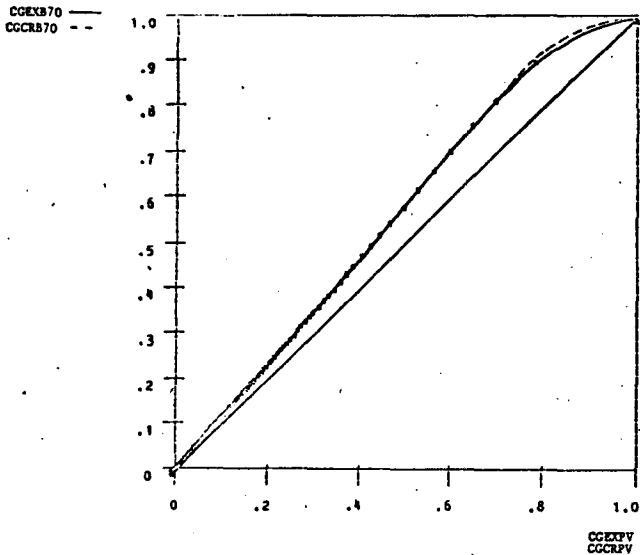


Diagram 13: Power Lorenz curves. Cumulative voting weights vs. cumulative Banzhaf power indices under previous (—) and current (---) quotas. The body of Governors voting on issues requiring a majority of 70 percent.

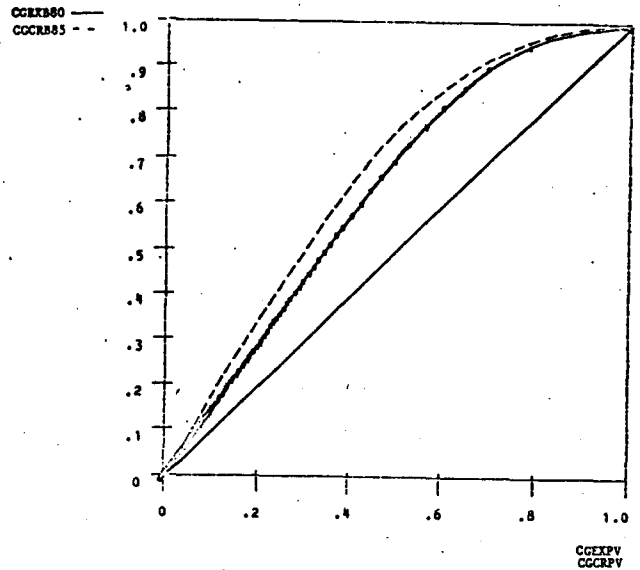


Diagram 14: Power Lorenz curves. Cumulative voting weights vs. cumulative Banzhaf power indices under previous (—) and current (---) quotas. The body of Governors voting on issues requiring a majority of 80 and 85 percent under previous and current rules, respectively.

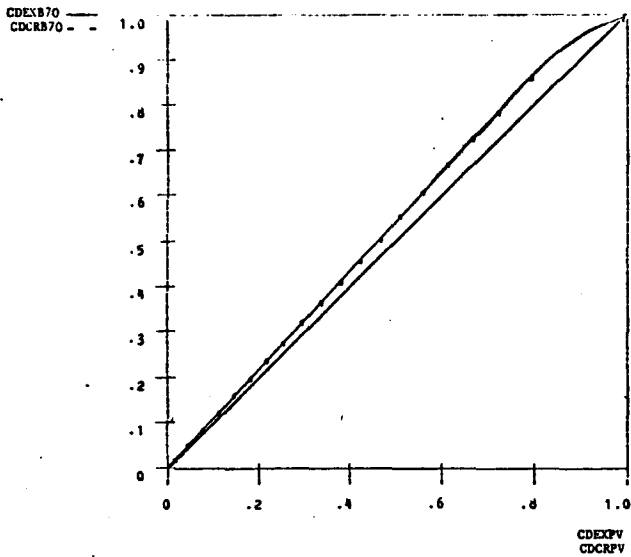


Diagram 15: Power Lorenz curves. Cumulative voting weights vs. cumulative Banzhaf power indices under previous (—) and current (---) quotas. The body of Executive Directors voting on issues requiring a majority of 70 percent (The power Lorenz curves under previous and current quotas coincide).

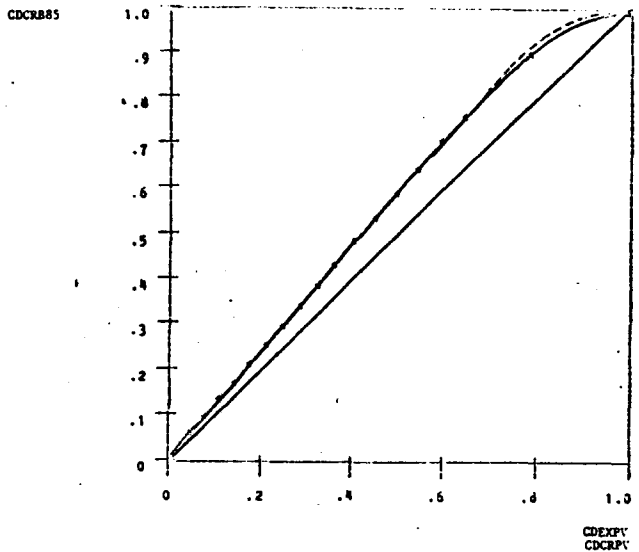


Diagram 16: Power Lorenz curves. Cumulative voting weights vs. cumulative Banzhaf power indices under previous (—) and current (---) quotas. The body of Executive Directors voting on issues requiring a majority of 80 and 85 percent under previous and current rules, respectively.

CGEX80

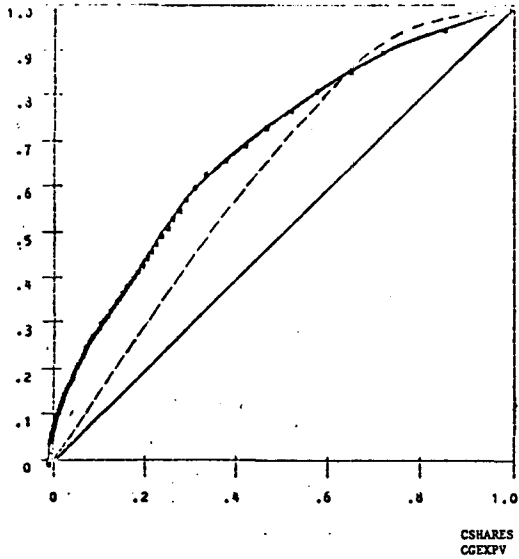


Diagram 17: Power Lorenz curves. Cumulative export shares (—) and cumulative voting weights (---) vs. cumulative Banzhaf power indices under previous quotas. The body of Governors voting on issues requiring a majority of 80 percent.

CDEX80

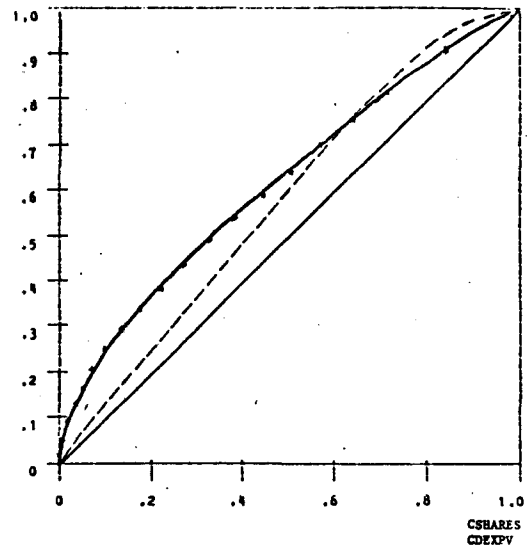


Diagram 18: Power Lorenz curves. Cumulative export shares (—) and cumulative voting weights (---) vs. cumulative Banzhaf power indices under previous quotas. The body of Executive Directors voting on issues requiring a majority of 80 percent.

CGEX80

CGCR85

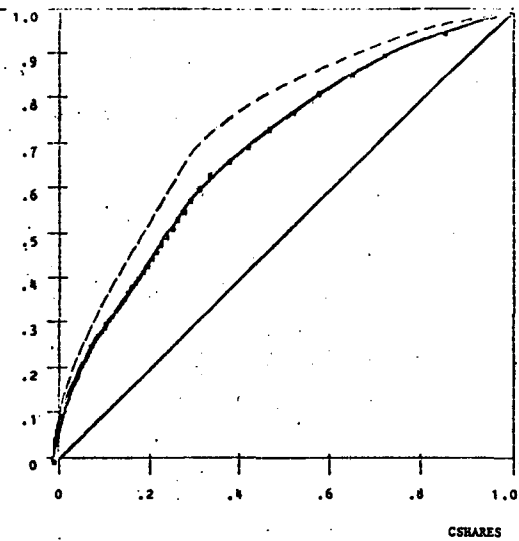


Diagram 19: Power Lorenz curves. Cumulative export shares vs. cumulative Banzhaf power indices under previous (—) and current (---) quotas. The body of Governors voting on issues requiring a majority of 80 and 85 percent under previous and current rules, respectively.

CDEX80

CDEX85

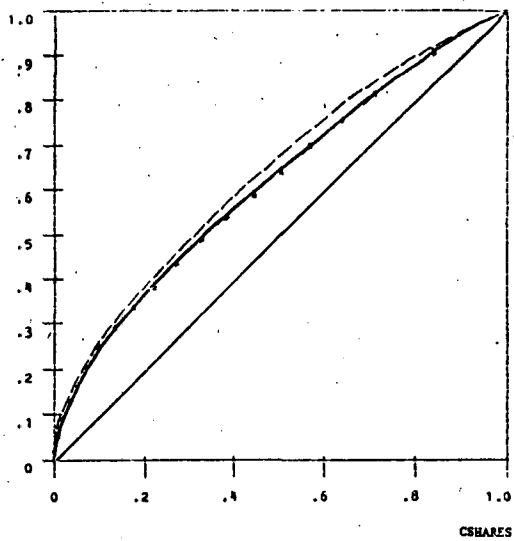


Diagram 20: Power Lorenz curves. Cumulative export shares vs. cumulative Banzhaf power indices under previous (—) and current (---) quotas. The body of Executive Directors voting on issues requiring a majority of 80 and 85 percent under previous and current rules, respectively.

APPENDIX A

Special Majorities

The special majorities and participation required for the adoption of decisions by the Board of Governors and the Executive Board under the amended Articles of Agreement of the IMF are summarized below. Wherever the required majority is 85 percent under the amended Articles, it was 80 percent prior to April 1, 1978. All other decisions are taken by a simple majority of the votes cast.

(1)	(2)	(3)	(4)	(5)
<u>Article</u>	<u>Section</u>	<u>Subject</u>	<u>Special Majorities (Proportion of Total Vote)</u>	<u>Directly Conferred on</u>
III	2(c)	Adjustment of quotas	85 percent	Board of Governors (except Article III, Section 2(b))
III	3(a), (d)	Prescription of medium of payment for additional subscription	70 percent	Board of Governors
IV	2(c)	Provision for general exchange arrangements	85 percent	
IV	4	Introduction of system of exchange arrangements based on par values	85 percent	
V	7(c)	Changes in period for repurchase	85 percent	
V	7(d)	Adoption of periods for repurchase of holdings acquired under special policy on use of Fund's general resources	85 percent	
V	7(e)	Adoption of policies on repurchase of holdings not acquired as a result of purchases	70 percent	
V	7(g)	Postponement of repurchase beyond maximum period	70 percent	

(1)	(2)	(3)	(4)	(5)
V	8(a), (d)	Determination of service charge for purchases	70 percent	
V	8(b), (d)	Determination of rates of charge on holdings of currencies	70 percent	
V	8(c), (d)	Imposition of charges deemed appropriate on failure to repurchase	70 percent	
V	9(a)	Determination of rate of remuneration	70 percent	
V	9(c)	Increase in percentage of quota as level for remuneration	70 percent	
V	12(b), (c)	Sale of gold	85 percent	
V	12(b), (d)	Acceptance of gold instead of special drawing rights or currency in payments to Fund	85 percent	
V	12(b), (e)	Sale of gold at present official price	85 percent	
V	12(f)(i)	Transfer of assets of Special Disbursement Account to General Resources Account	70 percent	
V	12(f)(ii), (iii)	Use of assets of Special Disbursement Account for operations and transactions not authorized by other provisions and for distribution to developing members	85 percent	
V	12(g)	Transfer of proceeds of sale of gold to Investment Account	85 percent	

(1)	(2)	(3)	(4)	(5)
V	12(j)	Termination of Special Disbursement Account prior to liquidation of Fund	70 percent	
		Adoption of rules and regulations for administration of Special Disbursement Account	70 percent	
XII	1	Application of Schedule D	85 percent	Board of Governors
XII	3(b)	Increase or decrease in number of elective Executive Directors	85 percent	Board of Governors
XII	3(b)	Maintenance of number of elective Executive Directors	85 percent	Board of Governors
XII	6(d)	Distribution from general reserve	70 percent	
XII	6(f)(ii)	Transfer to Investment Account of currencies held in General Resources Account for immediate investment	70 percent	
XII	6(f)(vi)	Termination of Investment Account or reduction of amount of investment prior to liquidation of Fund	70 percent	
		Adoption of rules and regulations regarding administration of Investment Account	70 percent	
XII	8	Publication of report on member's monetary or economic conditions and developments	70 percent	

(1)	(2)	(3)	(4)	(5)
XV	2	Determination of method of valuation of special drawing right other than a change in principle or a fundamental change in application of principle in effect	70 percent	
		Change in principle of valuation or fundamental change in application of principle in effect	85 percent	
XVII	3(i)	Prescription of other holders of special drawing rights	85 percent	
XVIII	2(a), 4(a), (d)	Allocation or cancellation of special drawing rights	85 percent	Board of Governors
XVIII	2(b), 4(a), (d)	Determination of rates at which allocation and cancellation are to be made	85 percent	Board of Governors
XVIII	2(c), 4(a), (d)	Determination of duration of basic period, intervals for allocations or cancellations, and dates as of which quotas and net cumulative allocations are to be basis for allocations or cancellations	85 percent	Board of Governors
XVIII	3, 4(a), (d)	Change in rates or intervals of allocation or cancellation or in length of basic period, or starting new basic period	85 percent (except decrease in rates of allocation)	Board of Governors
XIX	2(c)	Prescription of operations in which participant may engage in agreement with another participant	70 percent	
XIX	6(b)	Adoption, modification, or abrogation of rules for reconstitution	70 percent	

(1)	(2)	(3)	(4)	(5)
XIX	7(b)	Adoption of policies to authorize participants to agree on exchange rates other than those applicable under Article XIX, Section 7(a)	85 percent	
		Authorization of individual participants, under these policies, to agree on exchange rates other than those applicable under Article XIX, Section 7(a)	70 percent	
XX	3	Determination of rate of interest on special drawing rights	70 percent	
XXIII	1	Temporary suspension of operation of certain provisions relating to special drawing rights for not more than one year	85 percent	Executive Board (Council)
XXVI	2(b)	Compulsory withdrawal of member	Majority of Governors having 85 percent	Board of Governors
XXVII	1(a)	Temporary suspension of operation of certain provisions for not more than one year	85 percent	Executive Board (Council)
XXVII	1(b)	Extension of temporary suspension of operation of provisions	85 percent	Board of Governors
XXVII	1(c)	Termination of suspension under Article XXIII, Section 1 or Article XXVII, Section 1(a)	Absolute majority	Executive Board

(1)	(2)	(3)	(4)	(5)
XXIX	(b)	Overrule of decision of Committee on Interpretation	85 percent	Board of Governors
XXX	(c)(iii)	Exclusion of purchases and holdings under policies on use of Fund's general resources for purpose of calculating a member's reserve tranche	85 percent	

Schedule Paragraph

C	5	Adoption of margin or margins for spot exchange transactions	85 percent	
C	8	Objection to termination of par value by member	85 percent	
C	11	Uniform proportionate changes in par values	70 percent	
D	1(a)	Change in number of Associates in Council	85 percent	Board of Governors

Previous and Current voting power of the 128 Governors of the IMF

Governor	GEXPV	GEXB70	GEXB80	GCRPV	GCRB70	GCRB85	Trade share
Grenada	0.0008	0.0010	0.0012	0.0007	0.0008	0.0011	0.000015
Western Samoa	0.0008	0.0010	0.0012	0.0007	0.0008	0.0011	0.000013
Botswana	0.0009	0.0011	0.0013	0.0008	0.0009	0.0013	0.000174
Lesotho	0.0009	0.0011	0.0013	0.0008	0.0009	0.0013	0.000025
The Gambia	0.0010	0.0012	0.0014	0.0008	0.0009	0.0013	0.000044
Oman	0.0010	0.0012	0.0014	0.0011	0.0012	0.0018	0.000652
Equatorial Guinea	0.0010	0.0012	0.0015	0.0008	0.0010	0.0014	0.000063
Swaziland	0.0010	0.0012	0.0015	0.0009	0.0010	0.0015	0.000213
Lebanon	0.0010	0.0012	0.0015	0.0009	0.0011	0.0015	0.001211
Bahrain	0.0011	0.0013	0.0016	0.0011	0.0012	0.0018	0.000888
Yemen (Arab Republic)	0.0011	0.0013	0.0016	0.0009	0.0011	0.0015	0.000016
Barbados	0.0012	0.0014	0.0017	0.0010	0.0011	0.0016	0.000107
Benin	0.0012	0.0014	0.0017	0.0010	0.0011	0.0016	0.000086
Central African Republic	0.0012	0.0014	0.0017	0.0010	0.0011	0.0016	0.000074
Chad	0.0012	0.0014	0.0017	0.0010	0.0011	0.0016	0.000075
Congo (People's Republic)	0.0012	0.0014	0.0017	0.0010	0.0012	0.0016	0.000243
Fiji	0.0012	0.0014	0.0017	0.0010	0.0012	0.0016	0.000186
Laos	0.0012	0.0014	0.0017	0.0010	0.0012	0.0016	0.000011
Mauritania	0.0012	0.0014	0.0017	0.0010	0.0012	0.0017	0.000304
Niger	0.0012	0.0014	0.0017	0.0010	0.0012	0.0017	0.000122
Upper Volta	0.0012	0.0014	0.0017	0.0010	0.0012	0.0017	0.000050
Nepal	0.0012	0.0014	0.0017	0.0010	0.0012	0.0017	0.000124
Gabon	0.0012	0.0014	0.0018	0.0013	0.0015	0.0022	0.000755
Malawi	0.0012	0.0014	0.0018	0.0010	0.0012	0.0017	0.000193
Togo	0.0012	0.0014	0.0018	0.0010	0.0012	0.0017	0.000121
United Arab Emirates	0.0012	0.0014	0.0018	0.0034	0.0040	0.0056	0.003821
Malta	0.0013	0.0015	0.0018	0.0011	0.0013	0.0019	0.000193
Burundi	0.0014	0.0016	0.0020	0.0011	0.0013	0.0019	0.000061
Haiti	0.0014	0.0016	0.0020	0.0011	0.0013	0.0019	0.000102
Paraguay	0.0014	0.0016	0.0020	0.0011	0.0013	0.0019	0.000246
Rwanda	0.0014	0.0016	0.0020	0.0011	0.0014	0.0020	0.000066
Somalia	0.0014	0.0016	0.0020	0.0011	0.0014	0.0020	0.000092
Bahamas	0.0014	0.0016	0.0020	0.0013	0.0015	0.0022	0.001046
Guyana	0.0014	0.0016	0.0020	0.0011	0.0015	0.0020	0.000266
Luxembourg	0.0014	0.0016	0.0020	0.0013	0.0015	0.0022	0.003056
Papua New Guinea	0.0014	0.0016	0.0020	0.0013	0.0015	0.0022	0.001016
Qatar	0.0014	0.0016	0.0020	0.0016	0.0018	0.0025	0.001235
Mali	0.0015	0.0017	0.0021	0.0012	0.0014	0.0020	0.000104
Mauritius	0.0015	0.0017	0.0021	0.0012	0.0014	0.0020	0.000258
Iceland	0.0015	0.0017	0.0021	0.0012	0.0014	0.0020	0.000573

Jordan	0.0015	0.0017	0.0021	0.0013	0.0016	0.0022	0.000114
Guinea	0.0015	0.0018	0.0022	0.0013	0.0016	0.0023	0.000016
Libya	0.0015	0.0018	0.0022	0.0050	0.0058	0.0081	0.006819
Cambodia	0.0015	0.0018	0.0022	0.0013	0.0016	0.0022	0.000014
Honduras	0.0015	0.0018	0.0022	0.0014	0.0016	0.0023	0.000517
Sierra Leone	0.0015	0.0018	0.0022	0.0013	0.0016	0.0022	0.000256
Cyprus	0.0016	0.0018	0.0023	0.0014	0.0017	0.0024	0.000342
Malagasy Republic	0.0016	0.0018	0.0023	0.0014	0.0017	0.0024	0.000400
Ethiopia	0.0016	0.0019	0.0023	0.0014	0.0017	0.0024	0.000470
Nicaragua	0.0016	0.0019	0.0023	0.0014	0.0017	0.0023	0.000549
Liberia	0.0017	0.0020	0.0024	0.0014	0.0017	0.0024	0.000640
Yemen (People's Demo Rep.)	0.0017	0.0020	0.0024	0.0015	0.0019	0.0026	0.000222
Costa Rica	0.0018	0.0021	0.0025	0.0016	0.0019	0.0026	0.000680
Ecuador	0.0018	0.0021	0.0026	0.0022	0.0026	0.0037	0.001082
Senegal	0.0018	0.0021	0.0026	0.0016	0.0019	0.0026	0.000386
Cameroon	0.0019	0.0022	0.0027	0.0017	0.0019	0.0027	0.000729
El Salvador	0.0019	0.0022	0.0027	0.0016	0.0019	0.0027	0.000707
Guatemala	0.0019	0.0022	0.0027	0.0018	0.0021	0.0030	0.000878
Panama	0.0019	0.0022	0.0027	0.0017	0.0019	0.0027	0.000283
Afganistan	0.0019	0.0022	0.0028	0.0017	0.0019	0.0027	0.000283
Bolivia	0.0019	0.0022	0.0028	0.0017	0.0019	0.0027	0.000514
Singapore	0.0019	0.0022	0.0028	0.0032	0.0037	0.0053	0.007239
Uganda	0.0020	0.0024	0.0029	0.0018	0.0021	0.0029	0.000574
Tanzania	0.0021	0.0024	0.0030	0.0019	0.0022	0.0031	0.000725
Dominican Republic	0.0021	0.0025	0.0030	0.0019	0.0022	0.0031	0.000873
Kenya	0.0023	0.0026	0.0033	0.0022	0.0026	0.0037	0.000941
Tunisia	0.0023	0.0026	0.0033	0.0021	0.0024	0.0034	0.000784
Syria	0.0023	0.0027	0.0033	0.0021	0.0024	0.0034	0.000693
Ivory Coast	0.0024	0.0028	0.0034	0.0024	0.0028	0.0039	0.001693
Jamaica	0.0024	0.0028	0.0035	0.0023	0.0027	0.0039	0.000770
Burma	0.0026	0.0031	0.0038	0.0023	0.0027	0.0039	0.000277
Vietnam	0.0027	0.0031	0.0039	0.0027	0.0032	0.0045	0.000115
Trinidad and Tobago	0.0027	0.0032	0.0039	0.0025	0.0030	0.0042	0.001377
Kuwait	0.0028	0.0033	0.0040	0.0062	0.0072	0.0099	0.006805
Uruguay	0.0029	0.0034	0.0042	0.0026	0.0030	0.0043	0.000635
Sudan	0.0030	0.0035	0.0043	0.0027	0.0033	0.0044	0.000863
Zambia	0.0031	0.0036	0.0045	0.0039	0.0046	0.0064	0.002265
Korea	0.0032	0.0038	0.0047	0.0044	0.0051	0.0072	0.006366
Ghana	0.0035	0.0041	0.0050	0.0031	0.0036	0.0051	0.001244
Sri Lanka	0.0038	0.0044	0.0055	0.0034	0.0040	0.0056	0.000809
Iraq	0.0041	0.0048	0.0060	0.0039	0.0046	0.0064	0.004329
Morocco	0.0043	0.0050	0.0061	0.0041	0.0047	0.0068	0.001797
Zaire	0.0043	0.0050	0.0061	0.0042	0.0049	0.0069	0.001982
Portugal	0.0044	0.0051	0.0063	0.0047	0.0055	0.0076	0.003675
Ireland	0.0045	0.0053	0.0065	0.0043	0.0050	0.0070	0.004208
Peru	0.0046	0.0053	0.0066	0.0045	0.0052	0.0073	0.002071

Bangladesh	0.0046	0.0054	0.0067	0.0042	0.0049	0.0066	0.000706
Algeria	0.0048	0.0056	0.0069	0.0073	0.0086	0.0117	0.003744
Israel	0.0048	0.0056	0.0069	0.0054	0.0064	0.0088	0.002880
Saudi Arabia	0.0049	0.0058	0.0071	0.0148	0.0173	0.0210	0.015192
Thailand	0.0049	0.0058	0.0071	0.0049	0.0057	0.0079	0.003087
Nigeria	0.0049	0.0058	0.0071	0.0091	0.0107	0.0142	0.006842
Greece	0.0050	0.0059	0.0072	0.0050	0.0058	0.0081	0.002875
Turkey	0.0054	0.0064	0.0073	0.0053	0.0062	0.0086	0.002600
Philippines	0.0056	0.0065	0.0080	0.0056	0.0065	0.0090	0.003600
Colombia	0.0056	0.0066	0.0081	0.0052	0.0060	0.0084	0.002352
Chile	0.0056	0.0066	0.0081	0.0057	0.0067	0.0093	0.002429
Malaysia	0.0065	0.0076	0.0093	0.0066	0.0077	0.0106	0.006013
Egypt	0.0066	0.0077	0.0094	0.0060	0.0070	0.0097	0.002221
Finland	0.0066	0.0078	0.0095	0.0068	0.0080	0.0109	0.007574
Romania	0.0066	0.0078	0.0095	0.0064	0.0075	0.0103	0.007282
Iran	0.0067	0.0078	0.0096	0.0162	0.0189	0.0223	0.012364
New Zealand	0.0070	0.0082	0.0100	0.0061	0.0071	0.0098	0.005130
Yugoslavia	0.0072	0.0084	0.0102	0.0072	0.0084	0.0114	0.005631
Pakistan	0.0080	0.0094	0.0114	0.0073	0.0086	0.0117	0.001892
Norway	0.0082	0.0096	0.0117	0.0076	0.0089	0.0120	0.009329
Denmark	0.0088	0.0103	0.0125	0.0079	0.0093	0.0126	0.012335
Indonesia	0.0088	0.0103	0.0125	0.0120	0.0140	0.0179	0.006043
Austria	0.0091	0.0107	0.0129	0.0084	0.0098	0.0132	0.010429
South Africa	0.0106	0.0125	0.0150	0.0106	0.0124	0.0162	0.012091
Sweden	0.0108	0.0127	0.0153	0.0112	0.0132	0.0162	0.024085
Venezuela	0.0110	0.0128	0.0155	0.0162	0.0190	0.0223	0.009657
Mexico	0.0122	0.0143	0.0171	0.0133	0.0155	0.0194	0.004464
Spain	0.0130	0.0152	0.0181	0.0138	0.0161	0.0199	0.010263
Argentina	0.0143	0.0168	0.0199	0.0133	0.0155	0.0194	0.006447
Brazil	0.0143	0.0168	0.0199	0.0163	0.0191	0.0224	0.012237
China (Republic of)	0.0177	0.0208	0.0241	0.0136	0.0159	0.0198	0.008637
Belgium	0.0200	0.0244	0.0276	0.0217	0.0252	0.0262	0.044385
Australia	0.0213	0.0249	0.0281	0.0193	0.0225	0.0247	0.018870
Netherlands	0.0224	0.0262	0.0292	0.0230	0.0268	0.0268	0.047486
India	0.0298	0.0348	0.0359	0.0277	0.0321	0.0284	0.005759
Italy	0.0316	0.0369	0.0372	0.0300	0.0346	0.0289	0.043872
Canada	0.0347	0.0405	0.0391	0.0327	0.0377	0.0293	0.052185
Japan	0.0378	0.0440	0.0406	0.0399	0.0455	0.0299	0.073006
France	0.0470	0.0545	0.0434	0.0460	0.0519	0.0301	0.072368
Germany (Fed. Republic)	0.0501	0.0579	0.0439	0.0516	0.0574	0.0301	0.133381
United Kingdom	0.0672	0.0647	0.0453	0.0699	0.0706	0.0301	0.060523
United States	0.2075	0.0907	0.0453	0.1996	0.0613	0.0301	0.140829

Appendix C

Previous and current voting power of the 20 Executive Directors of the IMF

Executive Director	DEXPV	DEXB70	DEXB80	DCRPV	DCRB70	DCRB85	Trade share
Zaire et al.	0.0276	0.0307	0.0340	0.0246	0.0274	0.0293	.00751
Argentina et al.	0.0260	0.0306	0.0341	0.0266	0.0293	0.0320	.01136
Nigeria et al.	0.0301	0.0331	0.0365	0.0326	0.0356	0.0400	.01560
Iran et al.	0.0310	0.0341	0.0374	0.0344	0.0375	0.0420	.02395
Mexico et al.	0.0312	0.0349	0.0383	0.0346	0.0380	0.0424	.01747
Brazil et al.	0.0340	0.0373	0.0405	0.0353	0.0385	0.0431	.01818
Sweden et al.	0.0359	0.0393	0.0427	0.0367	0.0400	0.0444	.05390
Belgium et al.	0.0367	0.0402	0.0436	0.0373	0.0405	0.0453	.06048
Japan	0.0376	0.0414	0.0447	0.0399	0.0435	0.0486	.07301
India et al.	0.0382	0.0418	0.0453	0.0422	0.0458	0.0499	.00728
Pakistan et al.	0.0389	0.0426	0.0461	0.0424	0.0461	0.0500	.04533
Netherlands et al.	0.0425	0.0464	0.0496	0.0434	0.0472	0.0514	.06362
Canada	0.0450	0.0491	0.0522	0.0435	0.0473	0.0515	.05836
Australia et al.	0.0467	0.0509	0.0539	0.0460	0.0499	0.0538	.04072
France	0.0471	0.0512	0.0543	0.0495	0.0537	0.0571	.07237
FRG	0.0501	0.0545	0.0574	0.0516	0.0559	0.0582	.13338
Italy et al.	0.0502	0.0546	0.0575	0.0540	0.0583	0.0596	.05800
Taiwan et al.	0.0535	0.0579	0.0610	0.0555	0.0598	0.0607	.03812
U.K.	0.0672	0.0938	0.0812	0.0699	0.0754	0.0665	.06052
U.S.	0.2075	0.1354	0.0898	0.1996	0.1303	0.0742	.14083

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