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Reforming IMF and World Bank governance : in search of simplicity,  
transparency and democratic legitimacy in the voting rules

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# Reforming IMF and World Bank governance: in search of simplicity, transparency and democratic legitimacy in the voting rules\*

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**Abstract.** We discuss the reform of the voting rules at the heart of the governance of the IMF and World Bank (the BWIs) in terms of three principles that we suggest ought to be fundamental: simplicity, transparency and democratic legitimacy. By simplicity we mean that the rules should make sense in terms of the purposes of the BWI and be easy to understand. By transparency we mean that the rules mean what they appear to mean in the sense of leading to the same distribution of voting power as the institution's designers intended. We show using voting power analysis that the inequality in the distribution of voting power among countries is greater than that of their voting weight. By democratic legitimacy, we consider whether we can reconcile weighted voting with democracy. Our conclusion is that the voting rules as they currently exist are far from satisfying any of these criteria and that recent reform proposals do not lead us to change this conclusion.

## 1 Voting rules in the Bretton Woods Institutions

The governing bodies of the Bretton Woods Institutions, the IMF and World Bank, (the BWIs), make decisions using weighted voting rules in which each of the 185 member coun-

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tries has a different number of votes which they cast as a single bloc. In the IMF, for example, the smallest member, Tonga has 319 votes, while the largest, the USA, has 371,743, the second largest, Japan, 133,378, and the others are distributed in between. The idea behind this system is that each member's vote share reflects its importance within the IMF system according to its quota.

The number of votes allocated to each member does not depend only on its quota: there is also a fixed component common to all countries. According to the Articles (the rules governing the IMF) a member has 250 basic votes plus one vote for each 100,000 of Special Drawing Rights of quota. In the World Bank members have shares rather than a quota, and are referred to as shareholders; this distinction is quite minor because shareholdings are based closely on IMF quotas. The formula here is that each shareholder country has 250 votes plus one vote for each share it subscribes.<sup>1</sup>

The two BWIs therefore have very similar voting systems. In addition to weighted voting, each employs a range of decision rules with different thresholds for different types of decisions, from ordinary decisions requiring a simple majority, to special decisions requiring a supermajority of 85 percent, of the votes. Any important decision, such as admission of new members, changes to the quotas, or any proposal for fundamental change to the rules is subject to the latter very high threshold. The 85 percent rule, of course, means that the United States, having more than 15 percent of the votes, must be a member of any winning majority, ensuring it a unilateral veto. Because the voting rules are so similar in the two BWIs, and membership of the World Bank is in any case contingent on membership of the IMF, little is to be gained by considering the two separately and in the remainder of the paper we will concentrate solely on the voting arrangements of the IMF. (Beisbart *et al.* , 2005)

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<sup>1</sup>The unit of measurement is 100,000 1944 US dollars, fixed when the Bretton Woods institutions were founded

The shares of quotas and votes in 2008 for the 20 countries with the largest quotas are illustrated in Figure 1. For each of these countries its voting weight is completely dominated by its quota and the basic votes make almost no difference. The USA has 17.09 percent of the total quota and 16.77 percent of the voting weight. Japan has 6.02 percent of the votes, Germany 5.88, UK and France 4.86. China is next with 3.66 percent of the voting weight, placing it above Italy, with 3.19 percent.

Figure 2 shows the corresponding figures for the countries with the smallest quotas and votes. The basic votes are much more important to these countries since they have such small quotas. For example a country like Eritrea has 0.02 percent of the votes with 0.01 percent of the quota. The smallest member, Palau, has 0.01 percent of the voting weight represented almost entirely by its basic 250 votes. The picture as regards middle-quota countries resembles that in Figure 1 more closely than Figure 2, as the quota component of voting weight rapidly becomes dominant. Therefore basic votes are practically irrelevant as far as decision making is concerned, but are important to the poor countries in ensuring they have a degree of meaningful participation.

### **1.1 Quota allocations: lacking simplicity and transparency**

Quotas are reviewed periodically, usually every five years, when each member's quota is determined by the board of governors. Its quota is intended to represent the country's importance in the world economy as well as the likelihood of it getting into payments difficulties and needing to be bailed out. It is therefore at the same time a measure of how much the country can afford to contribute to the Fund and how much it is likely to need in a crisis. Quotas are adjusted by resolution of the governing body. However they are also in theory if not in practice determined by a mathematical formula.<sup>2</sup> There is therefore a

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<sup>2</sup>Though there is nothing laid down in the Articles about how quotas should be fixed. See Buira (2005).

Quota shares and vote shares:  
2008, largest 20 quotas

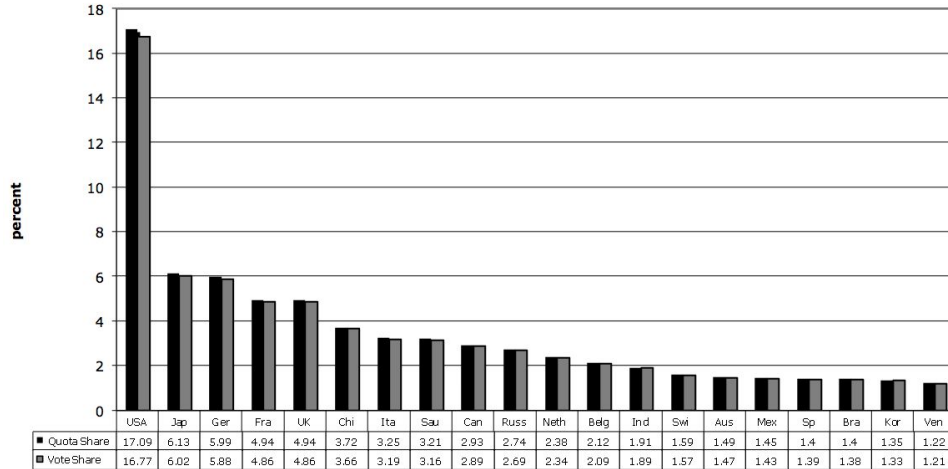


Figure 1: Quotas and votes: largest quota countries

Quota shares and vote shares:  
2008, smallest quotas

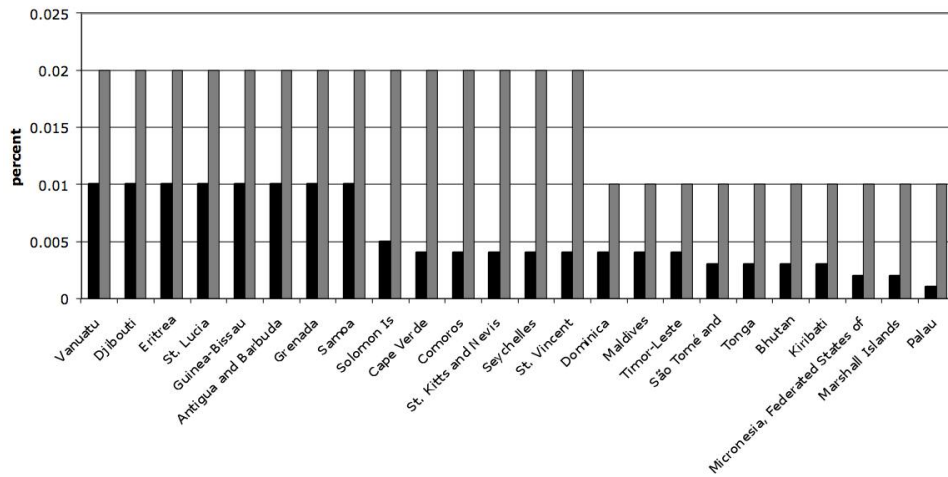


Figure 2: Quotas and votes: smallest quota countries

question, first, of simplicity in the quota formula.

The formula that guides the weighted voting rule is designed intentionally to ensure that different members have different voting powers in decision making, and that these voting powers are defined precisely by the formula. Our second question about the formula, therefore, in addition to simplicity, is whether it is successful in doing that if voting power is understood, instrumentally, as the ability to influence decisions that are taken by voting. This is a question of transparency that can only be answered properly by voting power analysis. We use voting power analysis to show that the current system of weighted voting, and also the recent modifications of it that have recently been proposed by the board, is far from being transparent in this sense and that a different approach is needed.

The original quotas for the inaugural IMF in 1946 were determined by the United States according to a political formula designed to ensure that the big four wartime allies would retain control under its leadership. The economist who had the task of turning this political formula into a mathematical one, Raymond Mikesell, later described the process. He was asked to come up with a formula that would “give the largest quota to the USA, approximately 2.9 billion dollars, then the UK including its colonies were to receive about half the US quota, the Soviet Union just under that and China somewhat less.” (Mikesell, 1994)

“This exercise required many calculations with a 1940s-style calculator, using a number of variables and weights for each country. If I had had access to a modern computer, I could probably have come up with a better formula. [...] My formula was [...] used as a basis for determining the IMF and World Bank quotas at Bretton Woods for most member countries represented at the conference. Thereafter, it was used in a somewhat revised form for new members joining the Fund. In fact, the formula is still used, but with special adjustments for individual countries. I take no pride in having authored the formula and

sometimes apologize for it as my claim to infamy! It has continued to be used in large part because the Fund wanted to apply the same conditions in determining quotas for new members as were applied to the original members.”(Mikesell, 1994)

When he was asked to explain how the quotas had been calculated: “I gave a rambling 20 minute seminar on the factors taken into account in calculating the quotas, but I did not reveal the formula. I tried to make the process appear as scientific as possible, but the delegates were intelligent enough to know that the process was more political than scientific. The formula was published, and minor modifications made to the weights and definitions of the variables (such as using GDP instead of National Income and such like) but it has been in use ever since although its use has been supplemented by other formulae also being used side by side.”(Mikesell, 1994)

That the actual formula used up to now in the determination of quotas is far from simple is evident from Table 1.<sup>3</sup> It is actually an amalgam that uses the original Bretton Woods formula of Mikesell plus four alternatives. The quotas given by the five formulas are computed and then a choice is made using the rule: “The calculated quota of a member is the higher of the Bretton Woods calculation and the average of the lowest two of the remaining four calculations (after adjustment).” (IMF, 2008)

This formula not only fails the criterion of simplicity by a wide margin. To the extent that its use has served to conceal underlying power relations, it could also be said to be far from transparent. The use of what appears to be a scientific formula, of a complexity so great that it is not well understood except by a small number of experts, creates a mystique that is an important source of lack of transparency. This, as the testimony of Mikesell suggests, helps to perpetuate the dominance of international economic governance by the rich industrial nations. Moreover in practice actual quotas are not determined by

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<sup>3</sup>The new formula that has now replaced it is discussed in Section 3 below.



#### The Existing Five Quota Formulas

Bretton Woods:  $Q1 = (0.01Y + 0.025R + 0.05P + 0.2276VC) (1 + C/Y)$ ;

Scheme III:  $Q2 = (0.0065Y + 0.0205125R + 0.078P + 0.4052VC) (1 + C/Y)$ ;

Scheme IV:  $Q3 = (0.0045Y + 0.03896768R + 0.07P + 0.76976VC) (1 + C/Y)$ ;

Scheme M4:  $Q4 = 0.005Y + 0.042280464R + 0.044 (P + C) + 0.8352VC$ ;

Scheme M7:  $Q5 = 0.0045Y + 0.05281008R + 0.039 (P + C) + 1.0432VC$ ;

where:

Q1, Q2, Q3, Q4, and Q5 = Calculated quotas for each formula;

Y = GDP at current market prices for a recent year;

R = twelve-month average of gold, foreign exchange reserves, SDR holdings and reserve positions in the IMF, for a recent year;

P = annual average of current payments (goods, services, income, and private transfers) for a recent five-year period;

C = annual average of current receipts (goods, services, income, and private transfers) for a recent five-year period; and

VC = variability of current receipts, defined as one standard deviation from the centered five-year moving average, for a recent 13-year period.

For each of the four non-Bretton Woods formulas, quota calculations are multiplied by an adjustment factor so that the sum of the calculations across members equals that derived from the Bretton Woods formula. The calculated quota of a member is the higher of the Bretton Woods calculation and the average of the lowest two of the remaining four calculations (after adjustment).

Table 1: The existing quota formula

formula but by resolution of the members, under the 85 percent rule, and there is a wide gap between formula quotas and actual quotas, made worse by the fact that quota revisions do not keep up with the rapid growth of emerging markets.

However, as we shall show below by using voting power analysis, the weighted voting system based on quotas fails to be transparent in an important additional sense, the disproportionality between voting power and voting weight to which all weighted voting systems are susceptible. While the dominance of the IMF by industrial countries might be regarded as reasonable on some grounds, for instance the commonly used argument that creditors nations should have the right to outvote debtors, and therefore a very unequal distribution of vote shares is fair, this very inequality, combined with weighted voting, leads to an even more unequal distribution of voting power. In our view this is a serious limitation on the voting system that is presently used. We develop this argument in the next section.

## 2 Weighted voting is not transparent

The use of weighted voting rules is a fundamental principle of the governance of the BWIs, one that is shared by many international bodies. Under the Articles each country must cast all of its votes as a single bloc when it votes in the board of governors.<sup>4</sup> This means that it uses a voting rule which is singularly lacking in transparency because of a confusion between voting power and voting weight.

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<sup>4</sup>And in the executive board, any director who represents a multimember constituency commands a bloc vote equal to the aggregate voting weight of the countries in his constituency which cannot be split even if the members are divided on the issue. This has a number of consequences for the fairness and transparency of the representation of members when viewed from the point of view of their influence in decision making. First, it matters when the constituency contains a mixture of industrial and developing countries whose interests may diverge substantially. (Buire, 2003)

Second, many constituencies include countries with a wide range of quotas and are effectively dominated by one or two of their members (for example, those of Canada, India, Italy, Australia/Korea, Netherlands, Belgium, Brazil, Argentina, Switzerland). see (Leech & Leech, 2006)

## 2.1 Voting power analysis

Weighted voting rules are not transparent because they conflate the ideas of voting power and voting weight. If countries have different weighted votes, then it is a mathematical consequence that there is no direct, simple or predictable relation between the voting power that each has in decisions taken by voting (that is its influence within the voting rules) and its weight. Although this issue is well known in social choice theory<sup>5</sup>, nevertheless it has frequently been assumed away in much of the discussion of weighted voting in intergovernmental bodies like the IMF.<sup>6</sup> However it is beginning to be better understood, particularly in the context of the voting rules used in the EU and continuing discussions surrounding the Lisbon treaty; of particular concern is the need to ensure that qualified majority voting in the council of ministers is transparent and ensures appropriateness of representation. See for example Felsenthal & Machover (2001, 2003); Leech (2002a).

Appraisal of weighted voting systems must be done using voting power analysis, which examines the working of the voting system in terms not only of the voting rules and the different numbers of votes cast by each member - the inputs to decision taking - but through an examination of the decisions that the members could make through voting - the outcomes.

The classic example, which illustrates the pitfalls that can occur when voting power is ignored in the design of weighted voting systems, is that of the council of ministers of the EEC between 1958 and 1972 (the original Six) where the weights were assigned as follows: France, West Germany, Italy 4 votes each; Belgium, Netherlands 2 votes each; and Luxembourg 1 vote. It was said that these weights meant the qualified majority voting rules were strongly biased away from democratic principles, and towards the Westphalian principle of equality of sovereign states, because they were not even approximately proportional to

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<sup>5</sup>See for example Felsenthal & Machover (1998); Leech (2002b).

<sup>6</sup>A recent exception however is (Bini Smaghi, 2004).

populations: Luxembourg, with only about 0.5 percent of its population, had 25 percent as many votes as West Germany. However this latter comparison is false because a simple voting power analysis shows that, with 12 votes required for a qualified majority, there could be no circumstances in which Luxembourg could use its vote to affect the outcome. For Luxembourg to be the pivotal voter would require the votes of the other countries to be precisely 11 which was clearly impossible given the weights. Therefore Luxembourg had no voting power. It had agreed to become a full member of an organisation governed by a council in which it had effectively no vote.<sup>7</sup>

Voting power analysis is a means to avoid this kind of problem. Although it was easy to show that Luxembourg was without voting power, in general we are interested in a richer analysis of power, based on measuring voters' power; not merely whether a country has no power but comparing the amount of power each has. By counting the number of times each country can be pivotal in all theoretically possible ballots or divisions we measure each country's constitutional voting power. This is mathematically complex and requires the use of sophisticated computer software. Without doing such an analysis, however, it is impossible to comment intelligently on the suitability of the voting weights or the decision rule. Technically we compute the the Penrose power measure (Penrose, 1946) of each member's absolute voting power, and the Banzhaf power index (Banzhaf, 1964) to compare relative voting power shares.<sup>8</sup>

## 2.2 Voting power in the 2008 IMF

We begin by using this approach in an appraisal of the reforms to IMF quotas agreed at Singapore and further reforms to the weighted voting system and quota formula that

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<sup>7</sup>This is not to say the Luxembourg did not have any actual power arising from another source, such as the expertise or persuasiveness of its ministers, only that it had none arising from the formal voting rules.

<sup>8</sup>The Banzhaf indices are normalised such that members' powers are percentages and we can talk of a power distribution that can be compared directly with the weight distribution.

have been proposed. We investigate the distribution of voting power in each case from the fairness point of view in terms of different metrics, such as whether voting powers are proportional to voting weights, or shares of world GDP, or population shares. Our general finding is that the IMF weighted voting system, based on existing and proposed quotas, and conventional metrics, is far from transparent. Under the present arrangements in which EU countries have separate seats, and therefore the USA is dominant, the system fails the fairness criterion because voting power is much more unequally distributed than voting weight, that of the USA being much greater than its vote share at the expense of all other members. There is thus a sort of hidden "transfer" of voting power to the USA and away from all other members that occurs as a result of bloc voting with the particular weights.

We next examine the question from the point of view of a democratic ideal whereby each member country is thought of as a democracy where decisions are taken by majority vote to mandate the government in the IMF. We show that fairness on this criterion does not imply that voting power should correspond to population shares. In fact, in an idealised model equality of voting power at the citizen level in each country is obtained by using weights proportional to the square roots of populations. This would achieve both transparency and democratic legitimacy but breaks the link between quotas and votes, considered as essential by many countries.

We then discuss the idea of democratic legitimacy from the point of view of the IMF as purely a monetary institution. If each unit of quota is taken as if it had a vote, then requiring voting power to be proportional to quota shares is unfair since the countries with the largest quotas will be massively over represented. On the other hand fairness, in the sense that one unit of quota be equally powerful in each country, is guaranteed by votes being proportional to square roots of quotas. This would also be a transparent rule based

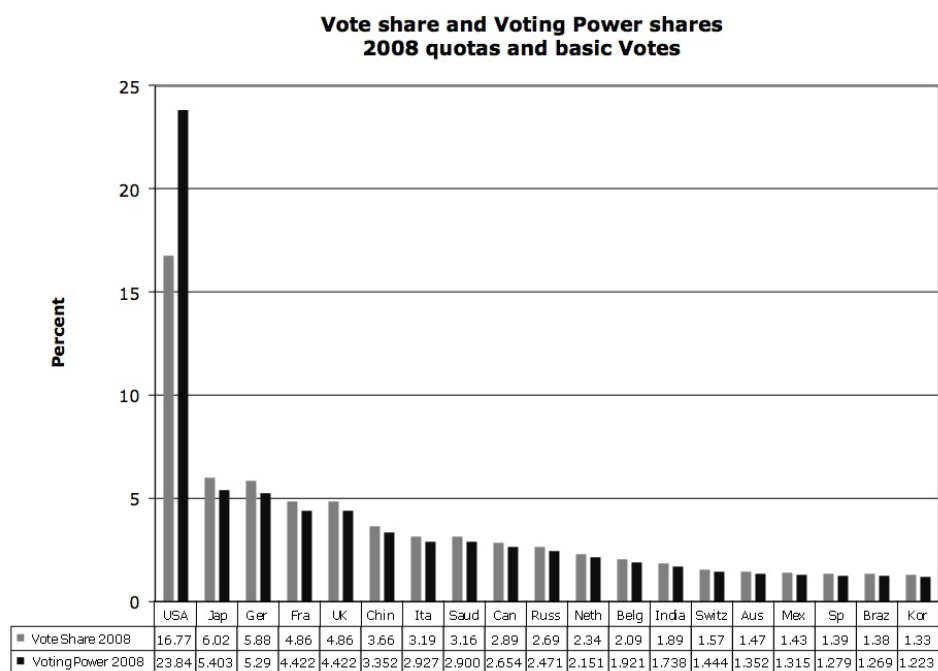


Figure 3: 2008 quotas: voting power indices for the largest quota countries

on "one-dollar-one-vote" but it is difficult to justify it in terms of an idea of democratic legitimacy.

### 3 Recent board decisions to redistribute votes

At its Singapore meeting in September 2006, the IMF board of governors adopted a resolution on Quota and Voice Reform with the aim to better align the current governance regime with members' relative positions in the world economy and to make it more responsive to changes in global economic realities while, and equally important, enhancing the participation and voice of low-income countries in the IMF. This is to be achieved by a new quota formula which will guide the assessment of the adequacy of members' quotas in the

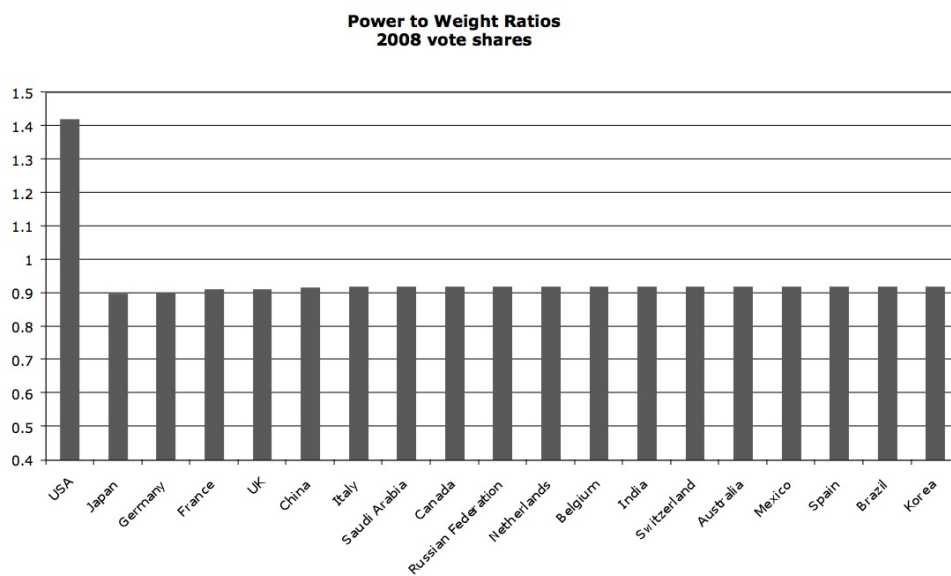


Figure 4: 2008 quotas: power ratios for the largest quota countries

IMF. Such a formula should provide a simpler and more transparent means of capturing members' relative positions in the world economy.

It also agreed immediate ad hoc quota increases for four of the most obviously under-represented countries: China, Korea, Mexico and Turkey. It also agreed to amend the Articles in order to achieve at least a doubling of the basic votes that each member possesses independently of its quota, as a means to protect the voice of the poorest countries under whatever quota formula is finally decided on. Commenting on the decision, managing Director Rodrigo de Rato said: "To meet global challenges, we need to make sure the voice and representation of members is appropriate and the system that determines governance of the Fund is as transparent as possible." (IMF press release, September 1 2006)

In this paper we argue that the stated aims of simplicity and transparency in the voting system based on quotas are incompatible from the point of view of appropriateness of voice

#### The New Quota Formula

The proposed new quota formula includes four quota variables (GDP, openness, variability and reserves), expressed in shares of global totals, with the variables assigned weights totaling to 1.0. The formula also includes a compression factor that reduces dispersion in calculated quota shares.

The proposed new formula is:

$$CQS = (0.5*Y + 0.3*O + 0.15*V + 0.05*R)^k$$

Where CQS = calculated quota share;

Y = a blend of GDP converted at market rates and PPP exchange rates averaged over a three year period. The weights of market-based and PPP GDP are 0.60 and 0.40, respectively;

O = the annual average of the sum of current payments and current receipts (goods, services, income, and transfers) for a five year period;

V = variability of current receipts and net capital flows (measured as a standard deviation from the centered three-year trend over a thirteen year period);

R = twelve month average over a year of official reserves (foreign exchange, SDR holdings, reserve position in the Fund, and monetary gold); and  
k = a compression factor of 0.95. The compression factor is applied to the uncompressed calculated quota shares which are then rescaled to sum to 100.

Table 2: The replacement formula



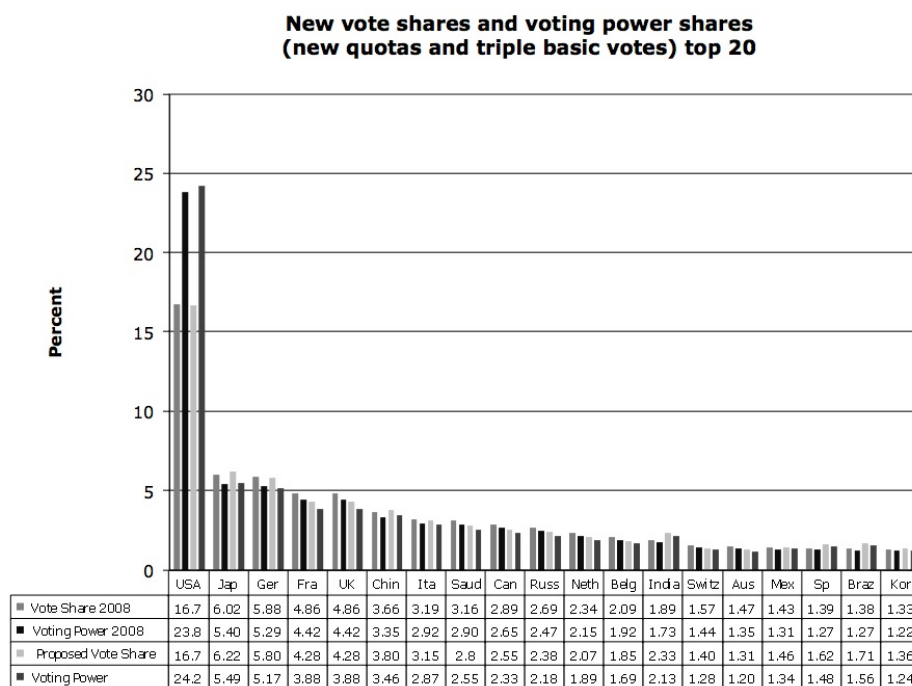


Figure 5: New vote shares: voting power indices

and representation. We use the voting power approach to investigate a range of reforms that have been proposed and find there is a lack of transparency. This arises because if members' quota shares are aligned with their relative positions in the world economy, and these are also shares of voting weight, then their voting power is not in general the same, and in some instances they can differ substantially. In the conditions whereby there is one country with a very large voting weight much greater than that of any other, that country is often found to have much more than proportionate voting power, and all the others correspondingly less. This is a serious failure of transparency even if the quota allocation formula is very simple.

## 4 The 85 percent rule

The voting power analyses reported in the last section apply to ordinary decisions that are made by a simple majority of 50 percent of the weighted votes. Decisions concerning the reform of the institution, or involving more fundamental changes that affect the power relations between members, however, are taken using special majorities of 70 or 85 percent. At the most fundamental level, amendments to the Articles or changes in quotas must be taken by the 85 percent rule. This requirement, of course, as is well known, ensures that the USA has a unilateral veto.

Figures 6 and 7 show the voting powers under this rule for the largest-quota countries . Rather surprisingly, perhaps, the power distribution turns out to be remarkably egalitarian. The USA share has the same power share to two decimal places of percentages as Japan and Germany, 3.21 percent, the UK and France only slightly less at 3.20, China on 3.13 and so on. Voting power is less than weight only for eight countries; the eight is Saudi Arabia with 3.16 percent of the weight and 3.05 percent of the voting power. For all the other countries their voting power is greater than their weight. The pattern for all countries is shown in the power ratios in Figure 7. There is a general "redistribution" from the large-quota countries to the small-quota countries. The smallest-quota countries all have a ratio of voting power to weight of 1.6 and therefore can be said to have a sixty percent greater share of voting power than voting weight.

The reason for this finding is that., although the 85 percent rule gives the USA complete power to prevent action since it must participate in any winning vote, so too do small or relatively small groups of other countries. For example three countries (say UK, Germany and France) could equally block a majority which included the USA. This means that the power of the USA to initiate action is severely limited<sup>9</sup> and therefore its voting power is

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<sup>9</sup>An example of this was when the USA proposed using IMF funds for the reconstruction of Iraq after

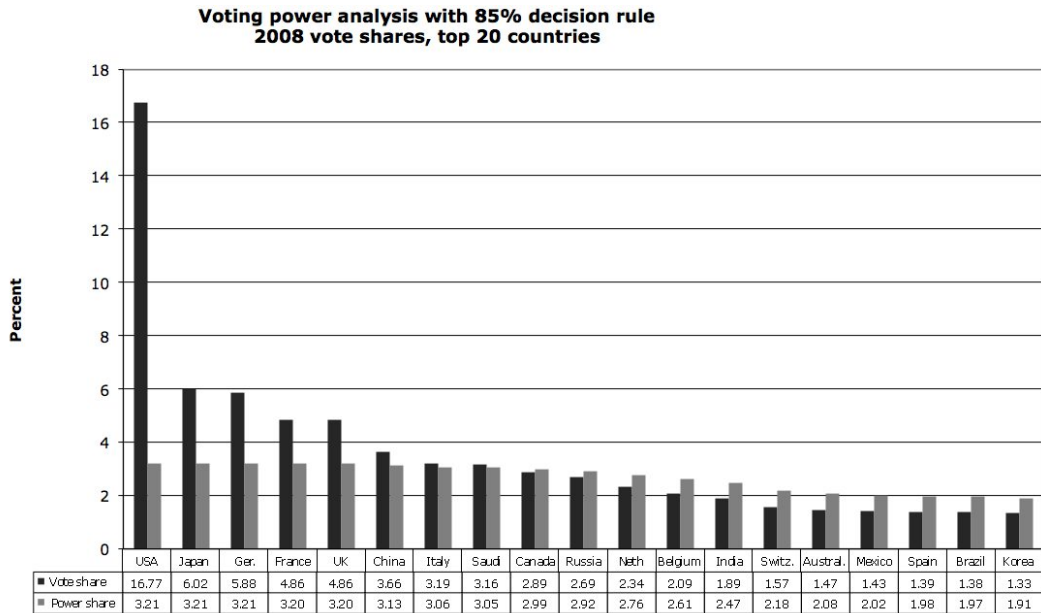


Figure 6: 85 percent rule: voting power indices

much less than under the simple majority rule.

The extreme supermajority rule is unanimity, whereby no decision can be taken without the support of all members. This would mean a completely egalitarian power distribution since each country would have a veto and the same very limited power to initiate action. The IMF's 85 percent rule can be seen to be fairly close to that situation.

We therefore take the view that the 85 percent rule is of little interest as far as the distribution of voting power is concerned. The effect of the rule is effectively to frustrate the intentions of the designers of the weighted voting system by making the distribution of power relatively equal and depriving the large-quota countries of their advantage. The effect is therefore even more lacking in transparency than the 50 percent rule.

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the invasion, an idea that found little support among its allies and was dropped.

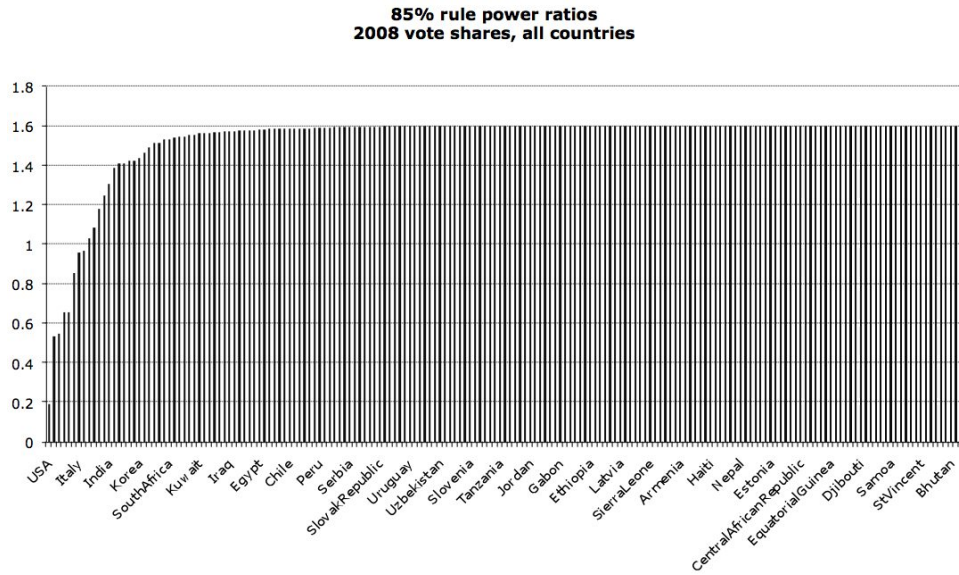


Figure 7: 85 percent rule: power ratios

## 5 Changes to basic votes

Increasing the basic votes makes the distribution of vote shares and hence voting power more equal. This is a reform that has been argued for by the developing countries and agreed at the Singapore meeting. It is of interest to know how important this reform is

Figure 8 shows the results for increasing the share of the basic votes. We consider four possibilities: the status quo where the basic votes are about 2 percent, restoring the original share of 11 percent when the IMF was formed, increases to 25 percent and 50 percent.

The effect of increasing the basic votes seems rather weak. The power of the USA is greater than its weight in all the cases considered except going to 50 percent basic votes.

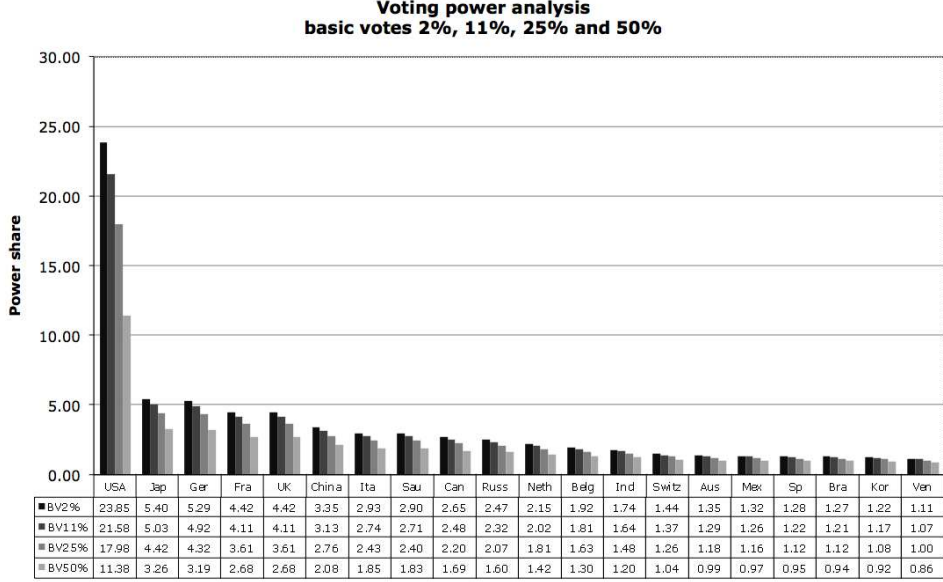


Figure 8: Voting power: increasing basic votes

## 6 Democratic legitimacy and the Penrose Rule

We now discuss the voting rules from the point of view of democratic legitimacy. We consider the international financial institutions not simply as intergovernmental bodies but as institutions of world economic governance. We envisage a kind of idealised democracy where country governments are elected by, and held accountable to, their domestic populations. Our model is therefore of a process with two-stages of voting: first, popular democratic governments are elected in each country by one-person-one-vote and then delegates appointed by the elected governments cast each country’s voting weight at the BWI.<sup>10</sup> We argue that democratic legitimacy can only be achieved by basing voting weights to at least some extent on populations.

<sup>10</sup>We accept that this is an unreal assumption in that it ignores the obvious lack of democracy in many member countries. But the design of constitutional rules requires the assumption of ideal situations, and it is of intrinsic interest to do so.

Penrose (1946) suggested that a simple way of implementing the principle of democratic legitimacy in such a two-stage voting system was to allocate weights according to the square roots of populations. This could achieve a high degree of transparency, in the sense of proportionality between weights and voting powers, at a small cost in simplicity. In his paper Penrose showed that this principle would lead to an equitable weighted voting scheme for the (proposed) United Nations but, in the event, that body did not adopt weighted voting, although the BWIs, which are agencies of it, did. Penrose's rule therefore has an obvious application, as a design principle for intergovernmental weighted voting systems, in the context we are discussing.

The Penrose rule proposes that the weights and decision threshold be set such that the voting power of each country be proportional to the square root of the electorate. The reason for this is that the voting power of a single voter in the national election, stage 1 can be shown to be inversely proportional to the square root of the electorate; that is, the probability of an individual voter being able to swing the election assuming all voters are equally likely to vote for or against a particular party or policy. Therefore in order that voters in all countries have equal ability to influence the decision taken at stage 2, indirect voting power, the probability of their country being the swing voter must be directly proportional to the square root of the electorate, since the indirect voting power of a voter is the product of these two probabilities. See Felsenthal & Machover (1998) for the mathematical details.

Penrose's rule is not always straightforward to implement because it stipulates what the voting *powers* must be, and these are determined by the weights and decision rule in non-obvious ways. It therefore has to be applied indirectly which can be done fairly easily using a computer to determine the weights by means of an algorithm that prescribes the weights by trial-and-error in such a way that the voting powers can be chosen. This

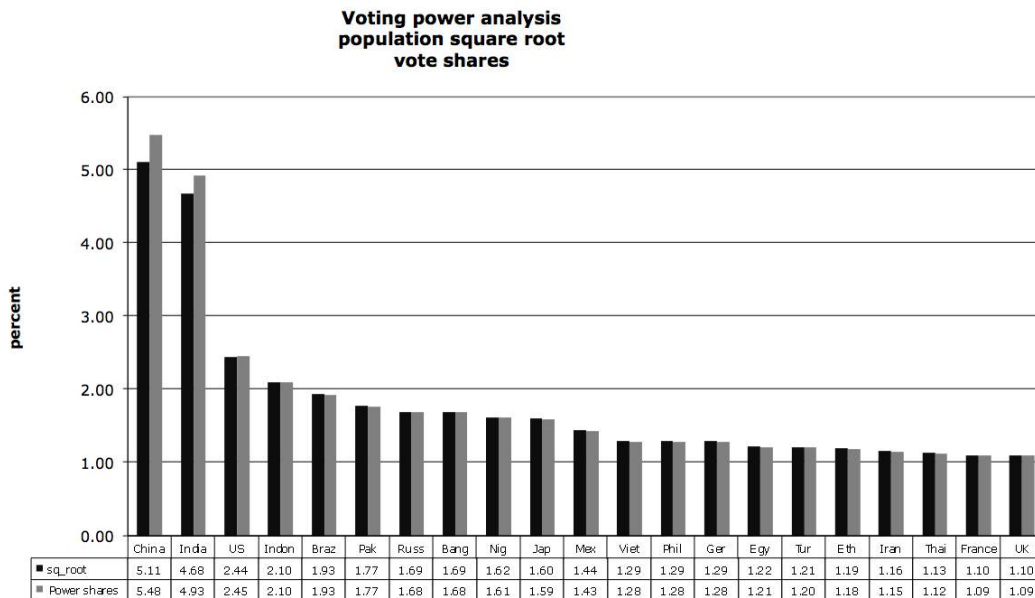


Figure 9: Population square roots: voting power indices

method has been applied to the IMF case in Leech (2002b) where it is described in detail.

An alternative approach is to use an approximation by choosing the *weights* themselves (rather than the powers) to be proportional to square roots. This works well in some voting bodies where powers are roughly proportional to weights. This is simple to apply and can work reasonably well with little error if the weights are not too concentrated.<sup>11</sup> This approximate version of the Penrose rule is the approach we adopt here.

Figure 9 shows the voting power analysis (for the top 20 countries) for a voting system with weights proportional to population square roots.<sup>12</sup> Not surprisingly, this is close to being transparent, with weight shares and power shares almost equal for most countries. The power ratios are shown in Figure 10. Only China and India would depart somewhat

<sup>11</sup>For example it has been found to work quite well as a solution to the problem of designing a voting system for the EU Council of Ministers. See Leech & Aziz (2009).

<sup>12</sup>Populations are taken to stand for electorates. The voting rule assumed is simple majority.

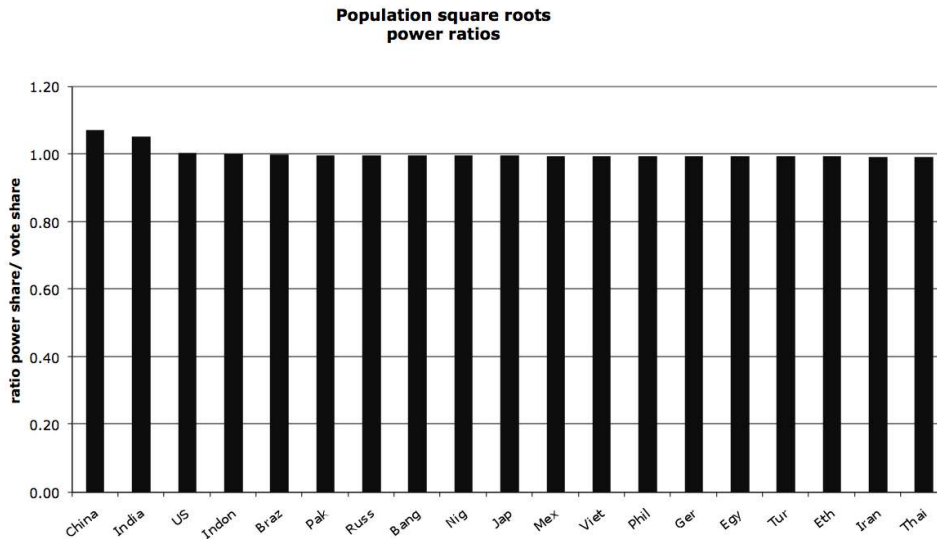


Figure 10: Population square roots: power ratios

from that with greater power than weight. (China would have 5.48 percent of the power and 5.11 percent of the weight, the corresponding figures for India being 4.68 and 4.93.) The rule is also relatively simple, though it does involve a mathematical formula. It has democratic legitimacy through the Penrose rule: it gives equal indirect voting power to all citizens of all countries given basic democracy in every country.

This analysis presupposes voting to be based on populations, which would, of course, be radically different from the actual voting system based on quotas. It is interesting to see if the Penrose rule leads to the same transparency if it is applied to quotas rather than populations. In Figure 11 we show the voting power analysis for weights based on square roots of quotas. It appears to work reasonably well, there being a difference in the first place of decimals only for the USA.

Allocating votes in the IMF according the square roots of quotas would therefore achieve a much greater degree of transparency than the present arrangements, at some cost in



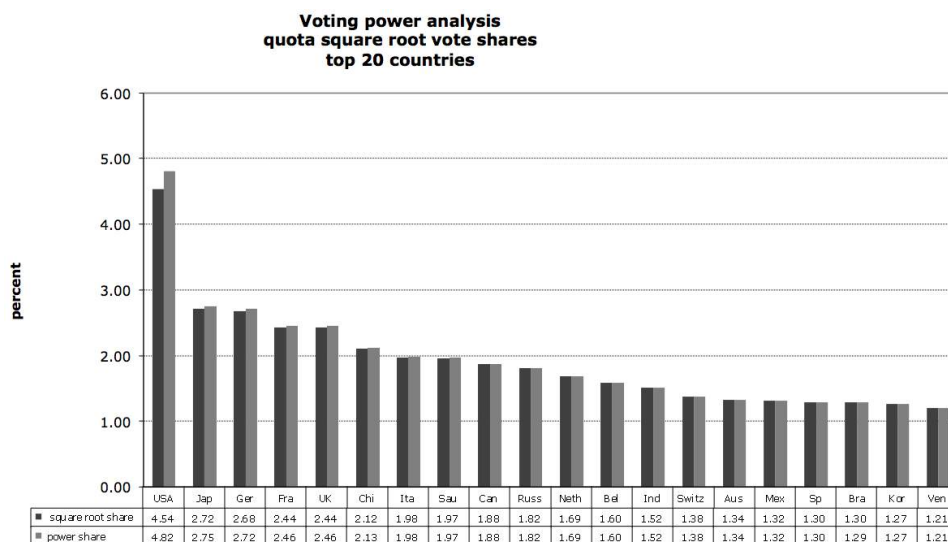


Figure 11: Square roots of quotas: voting power indices

simplicity. This prompts the question as to whether such a voting system can be justified in terms of democratic legitimacy as an application of the Penrose rule. It is not unusual for commentators on the BWIs voting system to refer to it as "one dollar one vote". The analogy is between shares in a joint stock company, each of which counts one vote regardless of whether it is held singly or in a bloc with millions of others, and IMF quotas. We might think in terms of a two-stage voting model whereby each dollar of a country's quota has a vote in some notional first stage, before being amalgamated into the country's bloc vote at the second stage. Some such model would have to be envisaged before we could assign any real dem We are therefore left with an open question of how to justify the current voting rules based on quotas in terms of democratic legitimacy. The IMF therefore remains undemocratic in a fundamental sense.

## 7 Conclusion

We have investigated the justification of the voting rules that govern the constitution of the Bretton Woods Institutions in terms of three criteria - simplicity, transparency and democratic legitimacy - and have found that the present arrangements fail to satisfy any of them. They are far from being simple since they depend on complex formulae whose workings are hard to understand. This contributes to an absence of transparency.

However another important source of lack of transparency, that is the main focus of this paper, is the weighted voting effect that is little commented on in the mainstream literature. This is the fact that the relative voting powers of the member countries are not proportional to the voting weights (that are referred to as voting powers by the IMF and many commentators). One implication of this is that the voting power of the biggest member, the USA, is much greater than its weight. That is, according to the voting rules, the USA is supposed to have 16 percent of the voting power in decision- making in line with its quota but, because of the weighted voting effect it actually has much more than that. This result emerges solely from the voting rules and the allocation of quotas. In reality the USA has a lot more actual influence than that, as is well known.

There is a need for radical reform of the voting rules to reduce the effects of this weighted voting effect in creating greater inequality than the design of the voting system intended. The simplistic link between votes and quotas is hard to justify and a new basis of international economic democracy, that is capable of achieving democratic legitimacy, needs to be found.

## References

- Banzhaf, J.F. 1964. Weighted voting doesn't work: A mathematical analysis. *Rutgers Law Review*, **19**, 317.
- Beisbart, C., Bovens, L., & Hartmann, S. 2005. A utilitarian assessment of alternative decision rules in the Council of Ministers. *European Union Politics*, **6**(4), 395.
- Bini Smaghi, L. 2004. A single EU seat in the IMF. *Journal of Common Market Studies*, **42**(2), 229–248.
- Buira, Ariel. 2003. *Challenges to the IMF and World Bank: Developing Country Perspectives*. London: Anthem Press.
- Buira, Ariel. 2005. *Reforming the governance of the IMF and World Bank*. London: Anthem Press.
- Felsenthal, Dan, & Machover, Moshé. 1998. *The Measurement of Voting Power*. Cheltenham: Edward Elgar.
- Felsenthal, D.S., & Machover, M. 2001. The Treaty of Nice and qualified majority voting. *Social Choice and Welfare*, **18**(3), 431–464.
- Felsenthal, D.S., & Machover, M. 2003. Analysis of QM rules in the Draft Constitution for Europe proposed by the European Convention. *Social Choice and Welfare*, **23**(1), 1–20.
- IMF. 2008 (March). *Reform of Quota and Voice in the International Monetary Fund—Report of the Executive Board to the Board of Governors*. Tech. rept. International Monetary Fund.
- Leech, Dennis. 2002a. Designing the Voting System for the Council of the European Union. *Public Choice*, **113**(3), 437–464.

- Leech, Dennis. 2002b. Voting Power in the Governance of the International Monetary Fund. *Annals of Operations Research*, **109**, 373–95.
- Leech, Dennis, & Aziz, Haris. 2009. The Double Majority Voting Rule of the EU Reform Treaty as a Democratic Ideal for an Enlarging Union: An Appraisal using Voting Power Analysis. In: Słomczynski, Wojciech, & Zyczkowski, Karol (eds), *The Distribution of Voting Power in the EU*. Ashgate.
- Leech, Dennis, & Leech, Robert. 2006. Voting Power in the Bretton Woods Institutions. In: Paloni, Alberto, & Zanardi, Maurizio (eds), *The IMF, World Bank and Policy Reform*. Routledge.
- Mikesell, Raymond F. 1994. The Bretton Woods Debates: A Memoir. *Essays in International Finance*.
- Penrose, Lionel S. 1946. The elementary statistics of majority voting. *Journal of the Royal Statistical Society*, **109**, 53–7.