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Rebalancing IMF Quotas

Agnès Bénassy-Quéré[1] *and Sophie Béreau*[2]

[1]*CEPII, University Paris-Ouest and Ecole Polytechnique and* [2]*University Paris-Ouest*

1. INTRODUCTION

THE 2007–09 financial crisis has triggered a change in global governance. The most nociteable evolution has been the reliance on the G20 – a forum created in the wake of the Asian financial crisis of 1997–98 – rather than on G7 as the key forum to reshape global architecture and governance. The G20 has provided large emerging countries a powerful platform to voice their claims. One of them is to obtain a better say in international institutions, especially within the International Monetary Fund.

Accordingly, at the G20 meeting of London in March 2009 it was decided that the governance of the IMF should be reformed to ‘reflect changes in the world economy’ and that ‘emerging and developing countries, including the poorest, must have greater voice and representation’. The G20 leaders commited to ‘implementing the package of IMF quota and voice reforms agreed in April 2008 and call on the IMF to complete the next review of quotas by January 2011’.[1] The Manuel report issued on 24 March 2009 suggested April 2010 as the completion date of this new quota review.[2]

IMF quotas are considered a strategic issue by member countries because they determine financial contributions, but also access rights to IMF financing, SDR allocation and voting rights.[3] The latter function has become especially 1
topical because the IMF legitimacy crisis of the 2000s and the subsequent

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[1] G20 communiqué, 2 April 2009, available at http://www.londonsummit.gov.uk/en/summit-aims/summit-communique/.

[2] This will be the fourteenth quota review since 1944. According to IMF statutes, Members’ quotas should be reviewed periodically at intervals of not more than five years. The 13th quota review was completed in April 2008.

[3] Voting rights are not exactly proportional to quota shares due to basic votes. See below.

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demand of low and medium-income countries to acquire a bigger say in the decision process.

IMF statutes do not specify how quotas should be determined. Originally, a so-called 'Bretton Woods' formula was used where the quota of each Member state would depend on national income, official reserves, imports, export variability and the export-to-GDP ratio. This original formula was complemented in the 1960s by four other formulas, and marginal changes were subsequently introduced. This complicated system of five formulas was kept unchanged from 1983 to 2008, although observed quotas generally differed from calculated ones. On 28 April 2008, the IMF Board of Governors adopted a reform that included (i) an immediate adjustment in quota shares, (ii) a tripling of basic votes (those votes that are given to any member country whatever its quota share) and (iii) a new quota formula that would be used in future quota reviews.

This reform seemed to end a 10-year debate launched in 1997 by the Executive board of the IMF. Already in 1999, a group of experts chaired by Richard Cooper had been asked to make a proposal to simplify quota calculation and provide less-developed countries with higher quota shares. The so-called Cooper formula, which only relied on GDP and on the variability of current receipts and net long-term capital flows, launched a lively discussion and intense work by Fund's staff until the 2008 reform.[4] Yet, the latter reform was considered insufficient by a wide array of countries that especially mentioned the very large share still retained by the European union as a whole.

In this paper, we argue that quota formulas should be assessed in a forward-looking manner rather than relying on past data because they are to base periodical readjustments in quotas shares. For sure, the calculation of quota shares should rely on hard data rather than on projections that can be manipulated. However, the selection of the formula itself should account for its dynamic properties, the global economy being a fast-moving object. Indeed, it is important to understand how the different proposed formulas would allow a rebalancing of quota shares not only in the short run, but also in the next decades, in parallel to the reshaping of the global economy.

We first discuss the relevance of various specifications of quota formulas regarding the choice of variables, the way to measure them and the potential functional forms, in relation with the different purposes of these formulas. Then, we simulate the evolution of quota shares for 49 countries or zones from 2001 to 2030 based on long-run GDP projections provided by Poncet (2006) and on CEPII's computable general equilibrium MIRAGE.

[4] National and regional institutions also spent considerable energy on this topic. See, e.g. Skala et al. (2007).

The paper is organised as follows. In Section 2, the content of quota formulas is discussed with reference to the objectives of the quotas. Section 3 presents the methodology followed for simulating quota formulas up to 2030. Section 4 reports and discusses the main results of the simulations. Section 5 concludes.

2. QUOTA FORMULAS

Quotas are generally believed to serve four purposes by determining:[5]

1. the financial contribution of each Member country;
2. the access of each Member country to IMF financing;[6]
3. the share of each Member country in SDR allocations;
4. together with basic votes, the voting rights of each Member state in the decision process.

These various roles of quotas clearly overlap. For instance, it is natural to grant large voting rights to large shareholders. In the event of a crisis, big shareholders will likely neeed more financing than small ones.

However, financing needs are highly volatile and unlikely to be a fixed proportion of the quotas. Actually, IMF programmes have tended to to be less strongly tied to quotas in recent years. At the same time, emerging and developing countries have kept asking for more say in Fund's decisions, irrespective their potential needs in terms of financings. In fact, the rising emphasis on the surveillance role of the IMF is consistent with greater weight given to the last purpose of quotas – defining voting rights – relative to the others. These moves may have complicated the discussions on IMF quotas, as the overlap between the different functions of quotas has loosened over time, suggesting different formulas for each function.

Here we successively discuss the variables to be included in the formulas and the functional forms of the formulas themselves.

a. The Variables

Past and present quota formulas (detailed in Box 1) rely on four economic variables: GDP, openness, variability of current receipts, official reserves. Here we discuss the rationale for each variable and the implications of various measurements of it.

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[5] See, e.g. IMF (2007).

[6] Although increasingly, the Fund provides financial assistance to some members irrespective of their quotas.

BOX 1 – QUOTA FORMULAS

From 1983 to 2008, the quota Q of each member country at the IMF was calculated on the basis of five formulas, where Y stands for GDP at current market prices for a recent year, R is the 12-month average of official reserves for a recent year, C_{pay} is the annual average of current payments for a recent five-year period, C_{rec} is the average annual current receipts for a recent five-year period and V is the variability of current receipts, defined as one standard deviation from the centred five-year moving average, for a recent 13-year period:

$$Q_0 = (0.01Y + 0.025R + 0.05C_{pay} + 0.2276_{VC})(1 + C_{rec}/Y)$$
$$\text{(Bretton – Woods formula)}$$

$$Q_1 = (0.0065Y + 0.0205125R + 0.078C_{pay} + 0.4053V)(1 + C_{rec}/Y)$$

$$Q_2 = (0.0045Y + 0.03896768R + 0.07C_{pay} + 0.76976V)(1 + C_{rec}/Y)$$

$$Q_3 = 0.005Y + 0.042280464R + 0.044(C_{pay} + C_{rec}) + 0.8352V$$

$$Q_4 = 0.0045Y + 0.05281008R + 0.039(C_{pay} + C_{rec}) + 1.0432V$$

Formulas Q_1 to Q_4 were rescaled by an adjustment factor in order for the sum of all quotas across member states to be equal to the one with Q_0. Then, the calculated quota for each member state, Q, was:

$$Q = \max\big(Q_0, \operatorname{avg}\big(Q_i, Q_j\big)\big),$$

where Q_i, Q_j are the two lowest figures obtained from Q_1 to Q_4 after adjustment.

Finally, ad hoc adjustments were made so that the final quotas rarely corresponded to this calculation. The voting right of each member was equal to a 250 basic vote plus one vote for each SDR 100,000 of quotas. Following the increasing needs of the IMF, quotas were regularly raised without any increase in basic votes. Mechanically, the voting shares of small or less-developed countries declined steadily over time (see Mirakhor and Zaidi, 2006).

On 28 April 2008, the Board of Governors of the IMF decided to replace this complicated system by the following, single formula (see IMF, 2008):

BOX 1 *Continued*

$$Q = \left(0.5\left(0.6\ Y + 0.4\ Y_{ppp}\right) + 0.3\left(C_{pay} + C_{rec}\right) + 0.15VC + 0.05R\right)^{k},$$

where Y_{ppp} is GDP converted at purchasing power parity (*PPP*) rates, *VC* is the variability of current receipts plus net capital inflows (standard deviation from the centred three-year trend over a 13-year period) and k is a compression factor (k = 0.95). Contrasting to the previous methodology, all variables are introduced in shares of global totals (not in levels). Due to the compression factor, quota shares need ultimately to be rescaled to sum to unity.

The quota reform also included a tripling of basic votes, thus raising the difference between quota shares and voting rights, which had been blurred since 1983.

(i) GDP

As shown in Box 1, all past and present quota formulas include GDP as one major component. Indeed, GDP is the most comprehensive measure of economic size. Hence it is consistent with the four roles of quotas: a country with large GDP will have higher ability to contribute to the Fund, higher needs in case of a crisis, higher liquidity needs (at least within the initial, Bretton Woods monetary system), and higher legitimacy to weigh on Fund's decisions.

In the old quota formulas, GDP was taken at current market prices and market exchange rates. This choice was consistent with the first two roles of quotas: the ability to contribute to the fund as well as the amounts needed in case of a crisis are more or less indexed on GDP at market prices. Additionally, empirical research on balance of payment crises generally shows that an overvalued exchange rate has a positive impact on the probability of crisis (see, for instance, Berg and Patillo, 1999), hence on the probability of asking for Fund's assistance. This is another argument for indexing quotas on GDPs at current exchange rates.

Still, using GDPs at current prices and exchange rates appears in contradiction with the objective of giving more say to emerging and developing countries, whose currencies tend to be undervalued relative to *PPP*. Consistently, it has been suggested to measure GDPs at *PPP* exchange rates (see Mirakhor and Zaidi, 2006). Additionally, PPP GDPs better reflect the future ability of member countries to contribute to the Fund (Truman, 2006). The formula adopted in 2008 includes GDPs both at current and *PPP* exchange rates (see Box 1). However, this choice is not perfectly satisfactory, for two reasons:

- Purchasing power parity exchange rates rely on the international price comparison (IPC) programme of the OECD, Eurostat, Community of Independent States (CIS) and the World Bank, covering 115 countries. The data for the remaining 69 countries are estimated by the World Bank or by the IMF and they do not rely on country surveys. Even for those countries covered by the International Comparison Programme (ICP), there are problems of comparability (see Box 2).[7]
- In order to increase the share of developing countries in the quotas and, more generally, the democratic legitimacy of the IMF, it would be more appropriate to rely on population rather than PPP GDP. This possibility, already discussed in the early days of Bretton Woods and recently advocated by Camdessus (2005) and Bryant (2008), would better fit the idea of each individual having a say in global decision making ('one person-one vote' principle), given that the consequences of ill-governance are suffered by each individual regardless his or her income. The tripling of basic votes decided in April 2008 only partially addressed the legitimacy issue because only small countries benefited significantly from this increase.

(ii) Openness

Openness is another building block of quota formulas.[8] It is viewed as an indicator of Member's involvement and stake in the global economy. It is based on current receipts and payments (goods, services, income and private transfers) averaged over a five-year recent period. Given the dramatic increase in capital flows compared with trade flows, it has been suggested to extend the notion of openness to capital flows. For instance, the needs for financial assistance may not be proportional to current payments, but rather to the whole liability side of the balance of payments. Indeed, the financial crises of the late 1990s and early 2000s have shown that capital repatriation is a major component of financial crises, raising the needs for financial assistance. Symmetrically, the willingness to contribute to global financial stability could be proportional to the amount of foreign assets held by a given member country.

Measuring financial openness, however, raises tricky questions such as whether to retain gross or net amounts, flows or stocks, all capital (foreign direct investment, portfolio and 'other') or only some of them. Data availability restricts the range of possible choices. On the whole, it was decided not to include capital flows in the openness measure included in the 2008 quota formula.

[7] The current IPC programme, due by end 2007, will provide upgraded data for 147 countries (not all IMF members). However, 41 IMF member countries will still not be covered by the survey.
[8] The 'Cooper' formula was a major exception. See Cooper and Truman (2007).

BOX 2 – MEASURING *PPP*

Purchasing power parity exchange rates are theoretical, nominal exchange rates that would equalise the price of a given consumption basket across countries. They are widely used to compare living standards across countries: because the same consumption basket is cheaper in developing countries, the same dollar of income entitles households to buy more goods in low-price countries, and this should be accounted for in international comparisons.

In order to calculate *PPP* exchange rates, a set of comparable consumption price *levels* is needed. The ICP of the World Bank provides comparable price levels for a basket of 155 items based on surveys in 115 countries. The surveys are carried out every three years by the OECD, Eurostat and the CIS in a total of 52 countries, and every five years by the World Bank in coordination with various agencies in 63 developing and emerging countries. The consumption basket is assumed to be similar across all countries, which is a very strong assumption. It can be argued that only price differences, not purchasing power differences, can be measured this way. Another strong assumption is that the goods are exactly the same across countries, neglecting quality differences.

For 60 countries, *PPP* exchange rates do not rely on a country survey. They are rather estimated by the World Bank staff based on regional averages and econometric relationships.

Finally, the data is not available for the remaining 10 member countries.

One illustration of the difficulty in measuring *PPP* is given in the OECD Economic Survey on China (2005). The OECD staff reports the *PPP* exchange rate of the yuan against the US dollar varying from 0.88 to 4.25 for year 1990.

(iii) Variability

Variability is included in quota formulas in order to capture the vulnerability of member countries to balance-of-payment crises, hence their potential borrowing needs. In the old system of formulas, variability was defined as the standard deviation of current receipts from the centred five-year moving average, for a recent 13-year period. This variable was viewed as a complement to openness because some relatively closed economies (say, Brazil) may nevertheless be vulnerable to crises due to the instability of current receipts.

The recent experience in balance-of-payment crises, however, revealed the importance of the financial account as a major source of instability. Consistently, the formula adopted in 2008 measures variability based on the sum of current receipts and net capital inflows (see Box 1).

More fundamentally, it has been argued that weighting variability in the quota formula amounts to 'rewarding' member countries whose policies are inappropriate, leading to high instability. This problem points to some inconsistency in using quota shares both for sizing financial assistance and for calculating voting rights, with possible moral hazard for large countries. The same kind of problem arises in the case of foreign exchange reserves.

(iv) Reserves

Official reserves are also included in quota formulas because they represent the ability of a member country to contribute to the Fund. However, large reserves can also be viewed as a protection against currency crises, reducing the needs to ask for financial assistance from the Fund. Furthermore, excess reserve accumulation is often viewed as one cause of currency disorders and should not be encouraged, in the same way as instability should not be encouraged (whereas supporting world GDP and trade growth are at the core of the IMF's *raison d'être*).

In fact, the literature on optimal reserves suggests that the level of reserves should be endogenous to the other variables included in quota formulas. Econometric studies (see Aizenman and Lee, 2005) show that openness explains the bulk of cross-country variance of reserve holdings. This is an additional reason for limiting the role of reserves in quota formulas. The formula adopted in 2008 includes official reserves, but with a small weight (see Box 1).

b. Functional Forms

The literature on IMF quotas does not limit itself to discussing the variables to be included in the formulas. The functional form of the formulas also appears a tricky issue. IMF (2006) lists a number of desirable properties for the functional form: simplicity, transparency, homogeneity, monotonicity, non-convexity. The old system of formulas lacked simplicity because five different formulas were used to calculate quotas. They lacked transparency because the quota share of one country could not be calculated unless all quotas were known. However, each formula was homogenous of degree one because doubling all variables included in the formulas in one country resulted in doubling the corresponding quota. Hence, doubling all variables in all countries did not change the distribution of quotas. Conversely, these formulas were not all monotonous in each variable. In the Bretton Woods formula, for instance, a rise in GDP, other things equal, reduced the quota up to a certain threshold, because the openness ratio declined.

The new formula introduced in 2008 uses compression as a way to limit quota shares of the largest countries, given the positive correlation between GDP and the other variables included in the formula. Such compression reduces transparency, as illustrated in Box 3 in the case of a simple formula based on GDP (50 per cent) and openness (50 per cent). Any functional form is satisfactory as far as monoticity and non-convexity are concerned: a rise in, say, GDP (or in the GDP share in world GDP), always raises the quota (or the quota share), and the rise is never higher than the increase in GDP (or GDP share). However, a trade-off needs to be made between transparency and the willingness to reduce quota inequalities across countries.[9]

BOX 3 – THE MATHEMATICAL PROPERTIES OF VARIOUS FUNCTIONAL FORMS

Here we compare the properties of various functional forms based on a simple formula which includes GDP (50 per cent) and openness (50 per cent). Let us denote Y_i the GDP of country i, and y_i its share in world GDP Y. Similarly, C_i denotes the sum of current receipts and current payments of country i, and c_i the share of current receipts and payments in world receipts and payments C. We have $y_i = Y_i/Y$ and $c_i = C_i/C$.

The following table summarises the various ways of writing the formula, where λ is the compression factor ($0 < \lambda < 1$) and $k > 0$ is a re-scaling factor:

	In levels	*In shares*
Multiplicative	$Q_i = Y_i^{0.5} C_i^{0.5}$	$q_i = y_i^{0.5} c_i^{0.5}$
Linear	$Q_i = 0.5\ Y_i + 0.5\ C_i$	$q_i = 0.5\ y_i + 0.5\ c_i$
Compressed linear	$Q_i = (0.5\ Y_i + 0.5\ C_i)^{\lambda}$	$q_i = k(0.5\ y_i + 0.5\ c_i)^{\lambda}$

All six formulas are monotonous in the sense that a rise in one variable included in the formula always increases the quota or the quota share. Indeed, all partial derivatives are positive. None of these formulas is convex, i.e. the impact of a rise in, say, GDP, never has a higher impact on the quota for higher initial GDP.

[9] A second way of accounting for the high correlation between GDP and openness would be to introduce openness as a ratio (current receipts and payments over GDP). A third solution, proposed by Cooper and Truman (2007), would be to cap quota shares to 60% of GDP shares.

BOX 3 *Continued*

The two multiplicative and two linear formulas are homogenous of degree 1: doubling the level or share of all variables results in doubling the quota level or share. In turn, the compressed linear formula is homogenous of degree λ. This means that a simultaneous, one per cent increase in Y and C results in an increase in Q by λ per cent. This is an interesting property for increasing the quota share of smaller countries.

The multiplicative and linear formulas in shares are the most transparent ones because it is immediately possible to derive the quota share of a country from its GDP and current transactions shares. In the multiplicative formula in shares, a 1% increase in the share of country i in world GDP results in a 0.5 per cent increase in its quota share, other things equal:

$$\frac{dq_i}{q_i} = 0.5\frac{dy_i}{y_i} + 0.5\frac{dc_i}{c_i}$$

In the linear formula, a 1 percentage point increase in country *i's* share in world GDP results in a 0.5 percentage point increase in its quota share, other things equal: $dq_i = 0.5dy_i + 0.5dc_i$. Conversely, the impact of a 1 percentage point increase in the GDP share depends on the initial quota share in the compressed linear formula: $dq_i = k\lambda q_i^{(\lambda-1)/\lambda}(0.5dy_i + 0.5dc_i)$. Since $0 < \lambda < 1$, the impact of a 1 percentage point increase in the GDP share is larger the lower the initial quota share.

Finally, a compressed multiplicative formula in shares seems to combine the transparency of a multiplicative formula in shares with the advantages of compression. Indeed, with $q_i = k\left(y_i^{0.5}c_i^{0.5}\right)^{\lambda}$, a 1 per cent increase in the GDP share leads to a rise in the quota share by 0.5λ%:

$$\frac{dq_i}{q_i} = 0.5\lambda\frac{dy_i}{y_i} + 0.5\lambda\frac{dc_i}{c_i}.$$

Hence this is a much transparent formula; to the extent that $\lambda < 1$, it allows smaller countries to benefit from relatively higher quota shares, compared to their shares in world GDP.

3. SIMULATION METHODOLOGY

In this section, we present our methodology for simulating quota shares at the 2030 horizon according to the 'old' system of formulas as well as the 'new', single formula. We rely on the long-run GDP projections of Poncet (2006) and on long-run trade and Foreign Direct Investment (FDI) projections provided by CEPII's CGE model Mirage (see Bchir et al., 2002; Decreux and Valin, 2007). Then, a number of assumptions are made to simulate openness, variability and official reserves. The methodology is detailed in Bénassy-Quéré et al. (2007). The world is disaggregated into 45 countries and four country groups, and we discuss the impact of merging Eurozone countries into a single seat, in terms of quota shares.

a. GDP, Trade and FDI at Year 2030

(i) GDP

We rely on long-term scenarios for world economic growth developed in Poncet (2006). These scenarios are based on an augmented Solow growth model. In this framework, growth stems from three driving sources: the labour force, capital accumulation and total factor productivity (TFP). Labour force growth is based on the latest demographic projections from the United Nations and on the assumption of stable unemployment rates and constant hours worked per employee. Capital accumulation relies on the closed-economy assumption of investment rates equal to savings rates, the latter being projected based on an econometric estimation over 1965–2005.[10] As for TFP growth, we rely on the recent generalisation of the Nelson–Phelps catch-up model of technology diffusion by Benhabib and Spiegel (1994). In this model, human capital 2 raises TFP growth through its influence on the rate of catch-up and on own innovation. Poncet (2006) estimates the TFP growth model on panel data over 1965–2005.

These projections of GDP in volume are complemented with projections of real exchange rates based on a simple, Balassa–Samuelson effect: a 1 per cent reduction in the TFP gap to the United States is supposed to involve a 1 per cent appreciation of the real exchange rate, which is consistent with non-tradable sectors to account for half of the economic activity. The inclusion of real exchange rate variations in our simulations is crucial. For instance, China and India are found to experience similar growth paths at constant prices, but only China experiences a strong real appreciation due to the rise in GDP per capita. Alternatively, using GDPs in PPP amounts to basing quota calculations on simulated GDPs at constant relative prices.

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[10] Empirical estimates point to the importance of GDP level and growth as determinants of savings rates. This closed-economy assumption may be less restrictive than it seems due to the Feldstein–Horioka puzzle pointing to a high correlation between savings and investment rates. It is clearly a conservative view of world growth. Indeed, world growth may be higher with capital flowing from low return to high return countries.

(ii) Trade and FDI

The evolution of trade and FDI consistent with GDP and population growth rates is computed with the MIRAGE model. MIRAGE is a multi-region, multi-sector computable general equilibrium model devoted to trade policy analysis and developed by the CEPII. It incorporates FDI. The detailed structure of MIRAGE is presented in Bchir et al. (2002) and updated in Decreux and Valin (2007).

Foreign-owned firms are treated as domestic firms in all respects. The only difference is that the capital revenue goes back to the source country. Non-FDI capital flows are assumed to be exogenous as a percentage of world GDP.

Computable General Equilibrium models are not particularly well designed towards long-term prospective exercises such as growth rate predictions. Here, GDP simulations are taken from Poncet (2006), and TFP growth is adjusted accordingly in MIRAGE to make the model match Poncet's projections.

For the present study, only two sectors are identified – goods and services – whereas 49 countries or regions are detailed. In the absence of further information, FDI bilateral stocks and flows have been distributed between the two production sectors, proportionally to initial capital stocks. They are ultimately aggregated again in one bilateral figure for the value of inward and outward FDI stocks and flows.

Here we retain a scenario where no further trade liberalisation occurs from 2001 to 2030. This may be considered a 'conservative' scenario, although the global crisis of 2007–09 has considerably raised the risk of a halt to tariff cuts.

The construction of the variables included in the formulas, as well as the country coverage, are detailed in Appendix A.

4. RESULTS

a. 'New' Versus 'Old' Formulas

Table 1 presents the calculated quota shares based on the 'old' system of formulas as well as with the 'new', single formula (adopted in 2008), for a selection of countries and zones (full results are reported in Table B1). The first column reports actual quota shares as for year 2007 (i.e. after the 2006 ad-hoc adjustment but before the 2008 one). The next columns provide calculated quotas based on model projections. It should be noted that, because MIRAGE projections are based on the GTAP database for 2001, the calculation of quotas may differ from other sources in 2010. Hence, the results should not be taken at face value: only evolutions over time as well as comparisons across the different methodologies for a given year are meaningful.

TABLE 1
Projected Quota Shares

Per cent	*Actual Quota Share in 2007*[a]	*'Old' Formulas*				*'New' Formula*			
		2001[b]	*2010*	*2030*	*2030–10*	*2001*[b]	*2010*	*2030*	*2030–10*
USA	17.08	16.4	16.2	16.5	+0.3	19.4	19.1	18.8	−0.3
Japan	6.12	7.8	7.3	6.4	−0.9	9.8	8.9	8.1	−0.8
Eurozone	22.78	23.8	21.6	18.5	−3.1	22.1	19.7	16.4	−3.3
France	4.94	4.0	3.6	3.0	−0.6	4.1	3.7	3.0	−0.7
Germany	5.98	6.2	5.6	4.6	−1.0	6.0	5.2	4.2	−1.0
UK	4.94	4.5	4.3	3.9	−0.4	4.8	4.5	4.0	−0.5
Korea	1.35	1.9	2.2	2.9	+0.7	2.0	2.3	3.3	+1.0
Mexico	1.45	1.6	1.6	1.6	+0.0	1.9	1.7	1.6	−0.1
China	3.72	4.6	6.4	7.9	+1.5	6.7	9.5	12.9	+3.4
Brazil	1.40	1.3	1.2	1.0	−0.2	1.8	1.6	1.1	−0.5
India	1.91	0.9	1.1	1.4	+0.3	2.1	2.6	3.5	+0.5
Russia	2.73	1.1	1.3	1.3	+0.0	1.2	1.5	1.5	+0.0
Sub-Saharan Africa	4.56	0.8	0.8	0.7	−0.1	1.1	1.0	0.9	−0.1

[a] After the Singapore ad hoc adjustment.
[b] Base year.
Source: Authors' calculations based on model projections from year 2001.

'Old' formulas induce a fall in the Eurozone and Japan calculated shares from 2010 to 2030 (−3.1 and −0.9 p.p., respectively), to the benefit of China (+1.5 p.p.) and other fast-growing countries. The Indian share rises by 0.3 p.p. but it remains at a relatively low level of 1.4 per cent in 2030. This is due to Indian growth not being accompanied by strong real exchange rate appreciation over the three decades. Indeed, GDP per capita does not increase rapidly compared with China whose growth relies less on labour, more on productivity, in our scenario. Finally, the share of Sub-Saharan Africa remains very low throughout the two decades, due to our conservative scenario in terms of GDP and trade growth for this region. That of the United States is remarkably stable.

The 'new' formula produces an immediate jump of the Chinese and Indian shares (+3.1 and +1.5 p.p. respectively in 2010). This is to the detriment of the Euro area (−1.9 p.p. in 2010) and of some advanced economies not included in the table. Ironically, the shares of the United States, Japan and the United Kingdom increase. Note, however, that the United States has advertised that it would not claim for a higher share. From 2010 to 2030, China and India enjoy higher increase in their quota shares with the new formula than with the old ones. However, this is not the case for Sub-Saharan Africa whose benefit from the formula change is limited both in the short and in the long run according to our simulations.

On the whole, the new formula has the desired, immediate effect on emerging and developing countries, and it tends to magnify the subsequent increase in these quota shares. However, this immediate effect remains limited, and is of little help to increase the aggregate share of Sub-Saharan Africa.

b. A Single Chair for the Eurozone

The large quota share retained by the Euro area (22.8 per cent in 2007) and by the EU27 (31 per cent) has been the focus of much criticism: lowering this share would free quota shares for emerging and less developed countries. This would make sense especially in the case of the Euro area, given that intra-Eurozone trade flows are irrelevant to assess the likelihood of a balance-of-payment crisis: the Euro area is much less open than what appears when including intra-area flows in the measure of openness. Additionally, a single chair for the Eurozone would be consistent with the recommendation of the Manuel report (2009) to reduce the number of chairs.

Here we measure the impact of removing intra-Eurozone current receipts and payments in the calculation of quota shares based on the 'new' formula. The results are reported in Table 2 for a selection of countries or zones (full results are reported in Table B2). Removing intra-Eurozone flows from the calculation of openness produces a 2.8 p.p. fall in the Eurozone's share in 2010.

TABLE 2
A Single Chair for the Eurozone ('New' Formula)

Per cent	*Actual Quota Share in 2007*[a]	*Including Intra-Eurozone Current Transactions*			*Excluding Intra-Eurozone Current Transactions*		
		2001[b]	*2010*	*2030*	*2001*[b]	*2010*	*2030*
USA	17.08	19.4	19.1	18.8	20.1	19.7	19.3
Japan	6.12	9.8	8.9	8.1	10.1	9.2	7.6
Eurozone	22.78	22.1	19.7	16.4	18.9	16.9	14.1
France	4.94	4.1	3.7	3.0	3.6	3.2	2.6
Germany	5.98	6.0	5.2	4.2	5.3	4.5	3.7
UK	4.94	4.8	4.5	4.0	5.1	4.7	4.2
Korea	1.35	2.0	2.3	3.3	2.1	2.4	3.4
Mexico	1.45	1.9	1.7	1.6	2.0	1.8	1.6
China	3.72	6.7	9.5	12.9	6.9	9.7	13.2
Brazil	1.40	1.8	1.6	1.1	1.8	1.6	1.2
India	1.91	2.1	2.6	3.5	2.2	2.6	3.5
Russia	2.73	1.2	1.5	1.5	1.2	1.5	1.5
Sub-Saharan Afr.	4.56	1.1	1.0	0.9	1.1	1.1	0.9

[a] After the Singapore ad hoc adjustment.
[b] Base year.

Source: Authors' calculations based on model projections from year 2001.

In this simulation, however, freed quotas are distributed across all partners, which limits the benefit for emerging and developing countries. For instance, the Chinese share rises by only 0.2 p.p. in 2010. More importantly, the benefit of Eurozone consolidation fades over time because Eurozone trade is expected to increase less within the area than with third partners. Freed shares are of only 2.3 p.p. in 2030. On the whole, although it would certainly help, the single Eurozone chair can hardly be the single component of a rebalancing of quota shares in favour of emerging and developing countries.

c. How to Raise the Quota Share of Developing Countries

One major motivation for changing quota formulas has been to raise the quota share of developing countries. Table 1, however, shows that the new formula performs relatively poorly in this respect: with the new formula, for instance, Sub-Saharan Africa does not reap much more than one per cent of quota shares, and India stays at 3.5 per cent – little more than France – at the 2030 horizon. As illustrated in Table 2, merging all Eurozone quotas into a single chair could contribute to raising LDCs' voice by freeing 2–3 p.p. of quotas shares, but this is likely to be insufficient.

Table 3 illustrates how the inclusion of population in the formula could be more powerful in raising the quota share of less developed countries. The table uses a much simpler formula based on GDP (50 per cent) and openness (50 per cent). We compare the results of this formula when GDP is taken at market value, when it is valued with *PPP* exchange rates, and when it is replaced by

TABLE 3
How to Raise Quota Shares of LDCs (50–50 Formula, Including Intra-Eurozone Flows)

Per cent	*Actual Quota Share in 2007*[a]	*GDP at Current Prices*		*PPP GDP*		*Population*	
		2001[b]	*2030*	*2001*[b]	*2030*	*2001*[b]	*2030*
USA	17.08	23.4	23.4	19.9	19.0	10.8	10.9
Japan	6.12	10.5	8.0	7.0	5.3	4.1	3.6
Eurozone	22.78	24.7	18.5	24.2	17.9	17.7	14.0
France	4.94	4.7	3.4	4.4	3.2	3.1	2.4
Germany	5.98	7.2	5.2	6.8	4.9	4.9	3.8
UK	4.94	5.5	4.7	5.6	4.2	3.7	3.2
China	3.72	5.0	11.4	8.8	15.5	13.1	13.3
India	1.91	1.2	2.3	3.5	5.5	8.9	9.4
Sub-Saharan Africa	4.56	0.8	0.7	1.3	1.1	5.5	7.4

[a] After the Singapore ad hoc adjustment.
[b] Base year.
Source: Authors' calculations based on model projections from year 2001.

population. Strikingly, the share of Sub-Saharan Africa exceeds seven per cent in 2030 and that of India exceeds nine per cent with population instead of GDP. This is at the expense of advanced economies whose shares are much lowered. Except for China, the use of PPP GDPs instead of GDPs at current prices has much smaller impact on quota shares.

This is not to say that GDP should be replaced by population in the quota formula. But rather than mixing GDP at market prices with a fragile measure of GDP in *PPP*, a more straightforward and efficient solution could be to mix it with population, the relative weights of which remaining to be defined.

5. CONCLUSION

In this paper, we first discuss the underpinnings and properties of quota formulas in relation with the different, sometimes contradictory, objectives of these quotas. We suggest introducing population in the formula as a simpler, more efficient, and more transparent way to raise the quota share of emerging and developing countries, than the choice made in 2008 to use GDPs in *PPP*. We then argue that the debate on IMF quota shares should adopt a forward-looking approach: because quota formulas will normaly be used for several quota reviews, it is important to understand their dynamic properties given different population growth rates, catch-up speeds and trade integration. Accordingly, the 'new' quota formula adopted in April 2008 is compared with the 'old' system of formulas not only in the short run, but also at the 2030 horizon, based on a standard, growth scenario as well as CEPII's CGE model of trade and foreign direct investment. Although these scenarios should be considered with great caution given the heroic assumptions they derive from, they provide useful benchmarks.

The results suggest the following conclusions:

- The formula adopted in April 2008 immediatly raises emerging countries' quota shares, and it magnifies their subsequent increase at the 2030 horizon, compared with the 'old' system of formulas. However, this new formula fails to raise the aggregate share of Sub-Saharan Africa.
- A single chair for the Eurozone would be consistent with a 2.8 p.p. reduction in the areas's quota share in 2010. However, as intra-zone trade is bound to increase at a lower pace than trade with the rest of the world, freed quotas tend to diminish over time. On the whole, this cannot be the single component of a rebalancing of quotas in favour of emerging and developing countries.
- A much more powerful way of raising LDCs' voice would be to substitute population for PPP GDP in the formula (although possibly with a different

weight). This would bring the additional advantage of basing quota calculations on more reliable variables than PPP GDPs whose evaluation raises technical difficulties.

The lively discussions around IMF quotas reflect existing inconsistencies between the different purposes of the quotas – contribution to the Fund, access to resources, SDR allocation, voting rights – not to mention the design of good policy incentives for member countries. The tripling of basic votes has contributed to reconcile these various objectives. Going further in the direction of giving more say to LDCs would however require more fundamental changes in the way quota shares are calculated.

APPENDIX A: METHODOLOGY

a. Formula Variables

(i) GDP

GDP projections are based on Poncet (2006). It is assumed that a 1 per cent increase in TFP relative to the United States translates into a 1 per cent real appreciation against the US dollar. The resulting GDPs at constant and current relative prices are reported in Table A.1.

(ii) Openness

Openness is defined based on current receipts and payments. Exports and imports of goods and services are derived from MIRAGE simulations. In order to compute the other components of current receipts and payments, we assume a constant relationship between, on the one hand, income and private transfers, and on the other hand, trade in goods and services. We therefore rely on region or country-specific multiplier coefficients, noted m_I *and* m_T, computed as the average ratio between income and private transfers, respectively, and trade in goods and services, for the 2000–04 period. The multiplier coefficients are displayed in Table A.2. Current account receipts C_{rec} are obtained by augmenting exports of goods and services (provided by Mirage) by a factor (1 + m_I+m_T); similarly, current payments C_{pay} are based on imports:

$$C_{rec} = (1 + m_T + m_I)X \tag{1}$$

and

$$C_{pay} = (1 + m_T + m_I)M, \tag{2}$$

where X and M denote exports and imports of goods and services, respectively.

(iii) Variability

In the 'old' formulas, variability is defined as the standard deviation of current receipts from the centred three-year moving average, for a 13-year period before the year of computation of the quotas. We rely on region and country-specific multiplier coefficients m_V computed as the ratio of variability (as observed over the period 1991–2004) over the average sum of current receipts. Region-specific multipliers are displayed in Table A.2. Variability V is then obtained by multiplying m_V with current receipts that are projected along the lines described above:

$$V = m_V C_{rec}. \tag{3}$$

In the 'new' formula, net capital inflows are included in the measure of variability:

$$V = m_V(C_{receipts} + F_{in} - F_{out}), \tag{4}$$

where F_{in} and F_{in} represent projected capital inflows and outflows. These gross flows are assumed to be multiples of gross foreign direct investment flows that are projected by MIRAGE:

$$F_{in} = (1 + m_p)FDI_{in} \tag{5}$$

and

$$F_{out} = (1 + m_p)FDI_{out} \tag{6}$$

We therefore rely on region and country-specific multiplier coefficients m_p computed as the ratio of inward and outward portfolio investments on total inward and outward FDI over the period 200–2004. Country specific multipliers are displayed in Table A.2.

(iv) Reserves

Official reserves are defined as the sum of foreign exchange, SDR holdings, reserve position in the Fund, and monetary gold valued at SDR 35 per ounce. Reserves are projected by assuming a constant relationship between reserves and imports of goods and services. We therefore rely on region and country-specific multiplier coefficients m_R computed as the average ratio between reserves and imports of goods and services over the period 1995–2003. Region-specific multiplier coefficients are displayed in Table A.2. Reserves are then obtained by multiplying m_R with the imports of goods and services provided by Mirage:

$$R = m_R M. \tag{7}$$

b. Country Coverage

The world is divided in 49 countries or zones: Argentina, Australia, Austria, Belgium and Luxembourg, Brazil, Bulgaria, Canada, China, Cyprus, Czech Republic, Denmark, Estonia, EU27, Eurozone, Finland, France, Germany, Greece, Hungary, India, Indonesia, Ireland, Italy, Japan, Korea, Latvia, Lithuania, Malta, Mexico, Netherlands, New Zealand, Norway, Poland, Portugal, Romania, Russian Federation, Saudi Arabia, Singapore, Slovak Rep., Slovenia, South Africa, Spain, Sub-Saharan Africa (39 countries), Sweden, Switzerland, Thailand, United Kingdom, United States, Rest of the world (86 countries).

Four country groups are included in our simulations: the Eurozone, the EU27, Sub-Saharan Africa and the Rest of the world. The Eurozone and EU27 are simple aggregations of their corresponding countries that are identified separately in the simulations. However, some simulations are performed while removing intra-Eurozone flows from the definition of openness. In the Sub-Saharan Africa and Rest of the world cases, the detail of the countries is not identified in the simulations, which raises a problem when using compressed formulas. Specifically, compression should be performed at the country level, not the country-group one. To reduce the case for errors despite the lack of data, we proceed as follows: (i) we calculate the variables to be included in the formula for the aggregate, (ii) we divide each variable by the number of countries in the aggregate, (iii) we calculate (compressed) quota shares for each country and (iv) we sum up the quota shares across the countries of the aggregate.

TABLE A1
Projected Evolution of GDP at Constant and Variable Real Exchange Rates

	Constant Real Exchange Rates			*Variable Real Exchange Rates*		
	2000	*2015 (2000 = 100)*	*2030 (2000 = 100)*	*2000*	*2015 (2000 = 100)*	*2030 (2000 = 100)*
Total Eurozone	5 820 900	131	164	5 820 900	123	151
Sub-Sahar. Africa	195 000	155	216	195 000	139	165
Argentina	284 000	132	174	284 000	107	122
Austria	194 000	131	156	194 000	123	141
Belgium-Lux.	248 000	136	173	248 000	128	153
Brazil	601 000	129	150	601 000	103	97
Bulgaria	12 600	149	181	12 600	166	209
Canada	725 000	156	221	725 000	147	202
China	1 370 000	265	495	1 370 000	357	802
Cyprus	8 820	168	267	8 820	172	286
Czech Republic	55 700	151	202	55 700	146	195
Denmark	158 000	131	164	158 000	125	151
Estonia	5 150	177	239	5 150	211	315
Finland	120 000	143	192	120 000	140	183
France	1 310 000	129	162	1 310 000	123	147

TABLE A1 *Continued*

	Constant Real Exchange Rates			*Variable Real Exchange Rates*		
	2000	*2015 (2000 = 100)*	*2030 (2000 = 100)*	*2000*	*2015 (2000 = 100)*	*2030 (2000 = 100)*
Germany	1 870 000	128	159	1 870 000	121	149
Greece	112 000	152	197	112 000	161	217
Hungary	46 700	148	190	46 700	160	204
India	465 000	218	420	465 000	245	521
Indonesia	150 000	203	401	150 000	223	483
Ireland	94 900	204	316	94 900	195	282
Italy	1 080 000	124	141	1 080 000	114	125
Japan	4 750 000	129	164	4 750 000	128	162
Korea	512 000	205	386	512 000	242	554
Latvia	7 180	177	206	7 180	195	226
Lithuania	11 400	156	190	11 400	164	200
Malta	3 560	123	152	3 560	104	123
Mexico	581 000	141	189	581 000	115	131
Netherlands	371 000	134	185	371 000	118	164
Other countries	2 790 000	169	268	2 790 000	191	294
Poland	167 000	151	201	167 000	164	221
Portugal	106 000	125	163	106 000	114	149
Romania	37 000	157	205	37 000	191	261
Russian Federation	260 000	214	307	260 000	259	388
Saudi Arabia	491 000	158	224	491 000	135	168
Singapore	91 600	191	304	91 600	198	344
Slovakia	20 300	152	185	20 300	160	196
Slovenia	19 000	148	170	19 000	131	138
South Africa	128 000	137	171	128 000	128	142
Spain	563 000	145	183	563 000	136	170
Sweden	240 000	142	189	240 000	141	180
Thailand	123 000	213	421	123 000	261	621
United Kingdom	1 440 000	143	196	1 440 000	138	183
USA	9 820 000	151	226	9 820 000	149	223
EU27	8 053 310	135	172	8 053 310	128	161

Source: Poncet (2006).

TABLE A2
Multiplier Coefficients

Country	*Reserves/ Imports m_R*	*Volatility/ openness m_V*	*Transfers/ trade m_T*	*Income/ trade m_I*	*Portfolio/ FDI m_P*
Argentina	0.68	0.07	0.02	0.30	2.34
Australia	0.23	0.02	0.03	0.17	1.48
Austria	0.20	0.02	0.04	0.13	4.42
Belgium-Lux.	0.09	0.02	0.05	0.35	0.91
Brazil	0.64	0.06	0.02	0.17	0.26
Bulgaria	0.39	0.03	0.04	0.09	0.25
Canada	0.12	0.01	0.01	0.11	0.84
China	0.85	0.02	0.01	0.11	0.59
Cyprus	0.39	0.03	0.04	0.13	1.19
Czech Republic	0.39	0.02	0.02	0.08	0.88
Denmark	0.32	0.03	0.07	0.16	3.69

TABLE A2 *Continued*

Country	*Reserves/ Imports* m_R	*Volatility/ openness* m_V	*Transfers/ trade* m_T	*Income/ trade* m_I	*Portfolio/ FDI* m_P
Estonia	0.18	0.02	0.02	0.07	0.77
Finland	0.24	0.02	0.04	0.19	2.89
France	0.13	0.03	0.07	0.18	2.30
Germany	0.14	0.02	0.04	0.16	6.02
Greece	0.40	0.03	0.09	0.09	12.25
Hungary	0.35	0.03	0.02	0.07	0.64
India	0.60	0.02	0.12	0.07	0.63
Indonesia	0.47	0.02	0.02	0.08	2.71
Ireland	0.11	0.02	0.06	0.39	9.32
Italy	0.16	0.02	0.07	0.15	3.14
Japan	0.80	0.03	0.02	0.13	5.30
Korea	0.44	0.02	0.04	0.04	2.38
Latvia	0.24	0.02	0.10	0.07	0.98
Lithuania	0.23	0.01	0.02	0.05	0.84
Malta	0.54	0.02	0.06	0.24	2.12
Mexico	0.23	0.02	0.03	0.06	0.21
Netherlands	0.10	0.02	0.03	0.18	3.11
New Zealand	0.27	0.03	0.03	0.14	1.52
Norway	0.53	0.02	0.04	0.14	6.31
Poland	0.46	0.03	0.04	0.06	0.69
Portugal	0.32	0.01	0.10	0.16	3.17
Romania	0.25	0.02	0.06	0.04	0.27
Russian Federation	0.32	0.04	0.02	0.10	0.62
Saudi Arabia	0.39	0.03	0.11	0.05	54.28
Singapore	0.52	0.03	0.00	0.09	0.85
Slovakia	0.29	0.03	0.02	0.03	0.76
Slovenia	0.34	0.01	0.03	0.04	0.59
South Africa	0.16	0.02	0.02	0.11	2.22
Spain	0.27	0.04	0.06	0.14	1.58
Sub-Saharan Africa	0.40	0.01	0.10	0.08	0.08
Sweden	0.20	0.03	0.04	0.19	0.99
Switzerland	0.42	0.03	0.10	0.36	1.44
Thailand	0.49	0.02	0.01	0.05	0.81
United Kingdom	0.11	0.03	0.06	0.43	1.71
USA	0.10	0.02	0.04	0,24	2.08
Rest of the World	0.70	0.18	0.14	0.09	1.72

APPENDIX B: DETAILED RESULTS

TABLE B1
Projected Quota Shares

Per cent	*Actual Quota Share in 2007*[a]	*'Old' Formulas*			*'New' Formula*		
		2001[b]	*2010*	*2030*	*2001*[b]	*2010*	*2030*
Argentina	0.97	0.6	0.5	0.5	1.0	0.9	0.8
Australia	1.49	0.9	0.9	0.9	1.1	1.1	1.1
Austria	0.86	1.0	0.9	0.7	0.9	0.8	0.6
Belgium-Lux.	2.12	2.3	2.1	1.8	1.7	1.6	1.3
Brazil	1.40	1.3	1.2	1.0	1.8	1.6	1.1
Bulgaria	0.29	0.1	0.1	0.1	0.1	0.1	0.1
Canada	2.93	2.5	2.4	2.4	2.4	2.3	2.2
China	3.72	4.6	6.4	7.9	6.7	9.5	12.9
Cyprus	0.06	0.1	0.1	0.1	0.1	0.1	0.1
Czech Rep.	0.38	0.5	0.5	0.5	0.4	0.4	0.3
Denmark	0.75	0.8	0.7	0.6	0.7	0.7	0.6
Estonia	0.03	0.1	0.1	0.1	0.1	0.1	0.0
Eurozone	22.78	23.8	21.6	18.5	22.1	19.7	16.4
Finland	0.58	0.5	0.5	0.4	0.5	0.5	0.4
France	4.94	4.0	3.6	3.0	4.1	3.7	3.0
Germany	5.98	6.2	5.6	4.6	6.0	5.2	4.2
Greece	0.38	0.5	0.5	0.4	0.5	0.5	0.4
Hungary	0.48	0.4	0.4	0.4	0.3	0.3	0.3
India	1.91	0.9	1.1	1.4	2.1	2.6	3.5
Indonesia	0.96	0.6	0.7	0.9	0.8	0.8	1.2
Ireland	0.38	1.0	1.0	1.0	0.8	0.8	0.8
Italy	3.24	3.1	2.8	2.2	3.3	2.8	2.2
Japan	6.12	7.8	7.3	6.4	9.8	8.9	8.1
Korea	1.35	1.9	2.2	2.9	2.0	2.3	3.3
Latvia	0.06	0.0	0.0	0.0	0.1	0.1	0.0
Lithuania	0.07	0.1	0.1	0.1	0.1	0.1	0.1
Malta	0.05	0.0	0.0	0.0	0.0	0.0	0.0
Mexico	1.45	1.6	1.6	1.6	1.9	1.7	1.6
Netherlands	2.37	2.0	1.8	1.8	1.7	1.5	1.4
New Zealand	0.41	0.2	0.2	0.2	0.2	0.2	0.3
Norway	0.77	0.7	0.6	0.6	0.7	0.6	0.6
Poland	0.63	0.6	0.6	0.6	0.7	0.7	0.6
Portugal	0.40	0.4	0.4	0.3	0.5	0.4	0.3
RoW	13.36	20.9	21.6	23.4	12.7	13.3	14.5
Romania	0.47	0.2	0.2	0.2	0.2	0.2	0.2
Russia	2.73	1.1	1.3	1.3	1.2	1.5	1.5
Saudi Arabia	3.21	0.8	0.8	0.8	0.8	0.8	0.8
Singapore	0.40	2.0	2.1	2.2	1.0	1.0	1.2
Slovakia	0.16	0.2	0.2	0.2	0.2	0.2	0.1
Slovenia	0.11	0.1	0.1	0.1	0.1	0.1	0.1
South Africa	0.86	0.4	0.4	0.4	0.5	0.5	0.5
Spain	1.40	2.2	2.1	1.7	2.1	2.0	1.6
Sub-Saharan Afr.	4.56	0.8	0.8	0.7	1.1	1.0	0.9
Sweden	1.10	1.0	0.9	0.9	1.0	0.9	0.8

TABLE B1 *Continued*

Per cent	*Actual Quota Share in 2007*[a]	*'Old' Formulas*			*'New' Formula*		
		2001[b]	*2010*	*2030*	*2001*[b]	*2010*	*2030*
Switzerland	1.59	1.3	1.2	1.4	1.3	1.1	0.9
Thailand	0.50	0.8	1.0	1.4	0.8	1.0	1.4
UK	4.94	4.5	4.3	3.9	4.8	4.5	4.0
USA	17.08	16.4	16.2	16.5	19.4	19.1	18.8

[a] After the Singapore ad hoc adjustment.
[b] Base year.

Source: Authors' calculations based on model projections from year 2001.

TABLE B2
A Single Chair for the Eurozone ('New' Formula)

Per cent	*Actual Quota Share in 2007*[a]	*Including Intra-Eurozone Trade*			*Excluding Intra-Eurozone Trade*		
		2001[b]	*2010*	*2030*	*2001*[b]	*2010*	*2030*
Argentina	0.97	1.0	0.9	0.8	1.1	1.0	0.8
Australia	1.49	1.1	1.1	1.1	1.1	1.1	1.1
Austria	0.86	0.9	0.8	0.6	0.7	0.6	0.5
Belgium-Lux.	2.12	1.7	1.6	1.3	1.3	1.2	1.0
Brazil	1.40	1.8	1.6	1.1	1.8	1.6	1.2
Bulgaria	0.29	0.1	0.1	0.1	0.1	0.1	0.1
Canada	2.93	2.4	2.3	2.2	2.5	2.4	2.3
China	3.72	6.7	9.5	12.9	6.9	9.7	13.2
Cyprus	0.06	0.1	0.1	0.1	0.1	0.1	0.1
Czech Rep.	0.38	0.4	0.4	0.3	0.4	0.4	0.4
Denmark	0.75	0.7	0.7	0.6	0.8	0.7	0.6
Estonia	0.03	0.1	0.1	0.0	0.1	0.1	0.0
Eurozone	22.78	22.1	19.7	16.4	18.9	16.9	14.1
Finland	0.58	0.5	0.5	0.4	0.4	0.4	0.4
France	4.94	4.1	3.7	3.0	3.6	3.2	2.6
Germany	5.98	6.0	5.2	4.2	5.3	4.5	3.7
Greece	0.38	0.5	0.5	0.4	0.4	0.4	0.4
Hungary	0.48	0.3	0.3	0.3	0.4	0.4	0.3
India	1.91	2.1	2.6	3.5	2.2	2.6	3.5
Indonesia	0.96	0.8	0.8	1.2	0.8	0.9	1.2
Ireland	0.38	0.8	0.8	0.8	0.7	0.7	0.7
Italy	3.24	3.3	2.8	2.2	2.9	2.5	1.9
Japan	6.12	9.8	8.9	8.1	10.1	9.2	7.6
Korea	1.35	2.0	2.3	3.3	2.1	2.4	3.4
Latvia	0.06	0.1	0.1	0.0	0.1	0.1	0.0
Lithuania	0.07	0.1	0.1	0.1	0.1	0.1	0.1
Malta	0.05	0.0	0.0	0.0	0.0	0.0	0.0
Mexico	1.45	1.9	1.7	1.6	2.0	1.8	1.6
Netherlands	2.37	1.7	1.5	1.4	1.4	1.3	1.2

TABLE B2 *Continued*

Per cent	*Actual Quota Share in 2007*[a]	*Including Intra-Eurozone Trade*			*Excluding Intra-Eurozone Trade*		
		2001[b]	*2010*	*2030*	*2001*[b]	*2010*	*2030*
New Zealand	0.41	0.2	0.2	0.3	0.2	0.2	0.3
Norway	0.77	0.7	0.6	0.6	0.7	0.7	0.6
Poland	0.63	0.7	0.7	0.6	0.7	0.7	0.6
Portugal	0.40	0.5	0.4	0.3	0.4	0.3	0.3
RoW	13.36	12.7	13.3	14.5	13.7	13.7	14.8
Romania	0.47	0.2	0.2	0.2	0.2	0.2	0.2
Russia	2.73	1.2	1.5	1.5	1.2	1.5	1.5
Saudi Arabia	3.21	0.8	0.8	0.8	0.9	0.9	0.9
Singapore	0.40	1.0	1.0	1.2	1.0	1.1	1.2
Slovakia	0.16	0.2	0.2	0.1	0.2	0.2	0.1
Slovenia	0.11	0.1	0.1	0.1	0.1	0.1	0.1
South Africa	0.86	0.5	0.5	0.5	0.6	0.5	0.5
Spain	1.40	2.1	2.0	1.6	1.8	1.7	1.4
Sub-Saharan Afr.	4.56	1.1	1.0	0.9	1.1	1.1	0.9
Sweden	1.10	1.0	0.9	0.8	1.0	1.0	0.8
Switzerland	1.59	1.3	1.1	0.9	1.3	1.2	0.9
Thailand	0.50	0.8	1.0	1.4	0.8	1.0	1.5
UK	4.94	4.8	4.5	4.0	5.1	4.7	4.2
USA	17.08	19.4	19.1	18.8	20.1	19.7	19.3

[a] After the Singapore ad hoc adjustment.
[b] Base year.

Source: Authors' calculations based on model projections from year 2001.

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