Appendix for Marchesi, Sabani, Dreher, 2010, "Read my lips: the role of information transmission in multilateral reform design."

In order to prove Proposition 2, we should first provide a sketch of the proof of Proposition 1. The proof follows directly from Theorem 1 in Crawford and Sobel (1982). We focus here on the delegation scheme but the proof also applies to the centralization scheme.

Proof. Proposition 1. CS show that in equilibium the following conditions must be satisfied:

(i) $\int_0^A \left[a + (\frac{p_i+p_{i+1}}{2}) - (a+p_i) - B\right]^2 f(a)da = \int_0^A \left[(a+p_i) - \left[a + (\frac{p_{i-1}+p_i}{2})\right] + B\right]^2 f_A(a)da$

(ii) $p_0 = 0$; $p_N = P$

Condition (i) is an "arbitrage" condition which says that for states of nature that fall on the boundaries of two intervals, the IMF must be indifferent between the actions $(s(a,t))$ on these two intervals. Condition (i) defines a second order linear differential equation on p_i, while condition (ii) specifies its initial and terminal conditions. Since the IMF is not informed on the true value of a, when choosing t, it will take the expected value of a, that is $\frac{A}{2}$. The arbitrage condition (i) then specializes to:

$$\begin{aligned} A/2 + (\frac{p_{i+1}+p_i}{2}) - (A/2+p_i) - B &= A/2 + p_i - \left[A/2 + (\frac{p_{i-1}+p_i}{2})\right] + B \\ (i &= 1, ..., N-1), \end{aligned}$$

from which it is easily obtained

$$p_{i+1} = 2p_i - p_{i-1} + 4B \tag{A.1}$$

This second order linear difference equation has a class of solutions parameterized by p_1 (given p_0= 0):

$$p_i = ip_1 + 2i(i-1)B, \qquad (i = 1, ..., N-1).$$

Given that $p_N = P$ we have:

$$p_1 = \frac{P - 2N(N-1)B}{N}$$

from which, using (A.1) and substituting for the value of p_1, we get:

$$p_i = \frac{iP}{N} - 2i(N-i)B, \qquad (i = 1, ..., N), \tag{A.2}$$

From (A.2) it is easily obtained:

$$p_i - p_{i-1} = \frac{P}{N} + 2(2i - N - 1)B.$$

By imposing the condition $p_1 \geq 0$, $N(B,P)$ is the largest positive integer N such that :

$$P - 2N(N-1)B = 0 \tag{A.3}$$

which is given by:

$$N(B,P) = \left\langle -\frac{1}{2} + \frac{1}{2}\left[1 + \frac{2P}{B}\right]^{\frac{1}{2}} \right\rangle$$

where $\langle v \rangle$ denotes the smallest integer greater than or equal to v.

Proof. Proposition 2. ■

Firstly, we prove that $L_D^{IMF}(N,B,P)$, computed in the focal equilibrium, e.g., $N = N(B,P)$, is continuous in P although $N(B,P)$ is not. The proof follows directly from Lemma 1 in Harris and Raviv (2005).

Define P_n to be the value of P such that $N(B,P_n)$ jumps from $n-1$ to n. Note that $N(B,P_n) = n-1$. From (A.3) we obtain:

$$0 = P_n - 2Bn(n-1),$$

solving for P_n we obtain:

$$P_n = 2Bn(n-1), \tag{A.4}$$

and noting that:

$$\sigma_p^2 = \frac{P^2}{12N^2} + \frac{B^2(N^2-1)}{3}$$

we obtain:

$$L_D^{IMF}(n-1,B,2Bn(n-1)) = \sigma_p^2 + B^2 = \frac{(2Bn(n-1))^2}{12(n-1)^2} + \frac{B^2((n-1)^2-1)}{3} + B^2 = \frac{2B^2n(n-1)}{3} + B^2, \tag{A.5}$$

and:

$$\begin{aligned} L_D^{IMF}(n,B,2Bn(n-1)) &= \frac{4B^2n^2(n-1)^2}{12n^2} + \frac{B^2(n^2-1)}{3} + B^2 = \\ &= \frac{B^2(n-1)^2}{3} + \frac{B^2(n^2-1)}{3} = \frac{2B^2n(n-1)}{3} + B^2. \end{aligned}$$

Therefore:

$$\lim_{P \to P_{n^-}} L_D^{IMF}(n-1,B,P_n) = \lim_{P \to P_{n^+}} L_D^{IMF}(n,B,P_n).$$

This implies that $L_D^{IMF}(N(B,P),B,P)$ is continuous in P although $N(B,P)$ is not and that $L_D^{IMF}(N(B,P),B,P) = L^D(n,B,P)$ for $P \in [P_n, P_{n+1}]$.

Now we prove Proposition 2. The proof follows directly from Theorem 1 in Harris and Raviv (2005). They show that centralization is prefererred iff $P \geq P(A,B)$, where $P(A,B)$

is given by:

$$P(A,B)=\begin{cases}\sqrt{(8B^2n^3-16B^2n^2+A^2)\frac{n-1}{n}}, \text{ if } A\in\left[P_n,\widehat{A}_n\right] \\ \left[A^2-12n^2B^2\right]^{\frac{1}{2}}, \text{ if } A\in\left[\widehat{A}_n,P_{n+1}\right]\end{cases},$$

where $n=N(B,A)$, P_n is defined by (A.4), $\widehat{A}_n$ will be defined by (A.6) below. Furthermore, $P(A,B)$ is increasing and continuous in A, and for any B, $P(A,B)\leq\left[\max\left\{-12B^2+A^2,0\right\}\right]^{\frac{1}{2}}$, then $P(A,B)<A$, for all B.

Define $A=\widehat{A}_n$ such that the IMF is indifferent between delegation (with $P=P_n$) and centralization (with $A=\widehat{A}_n$). Then:

$$L_D^{IMF}(n-1,B,P_n)=L_C^{IMF}(n,B,\widehat{A}_n).$$

From (A.5), noting that:

$$\sigma_a^2=\frac{A^2}{12N^2}+\frac{B^2(N^2-1)}{3},$$

we obtain:

$$B^2+\frac{2B^2n(n-1)}{3}=\frac{\widehat{A}_n{}^2}{12n^2}+\frac{B^2(n^2-1)}{3}.$$

Solving for $\widehat{A}_n$, we obtain the following:

$$\widehat{A}_n=2Bn(n^2-2n+4)^{\frac{1}{2}}. \tag{A.6}$$

It can be verified that:

$$P_n\leq\widehat{A}_n\leq P_{n+1}.$$

Suppose that $A\in\left[P_n,\widehat{A}_n\right]$ and P is such that the IMF is indifferent between centralization and delegation. Then P must satisfy:

$$L_D^{IMF}(n-1,B,P)=L_C^{IMF}(n,B,A),$$

and:

$$\frac{P^2}{12(n-1)^2}+\frac{B^2((n-1)^2-1)}{3}+B^2=\frac{A^2}{12(n)^2}+\frac{B^2(n^2-1)}{3}.$$

Therefore, it follows that:

$$P=\sqrt{(8B^2n^3-16B^2n^2+A^2)\frac{n-1}{n}}. \tag{A.7}$$

Now suppose that $A\in\left[\widehat{A}_n,P_{n+1}\right]$ and P is such that the IMF is indifferent between centralization and delegation. In this case:

$$L_D^{IMF}(n, B, P_n) = L_C^{IMF}(n, B, A)$$

and:

$$\frac{P^2}{12(n)^2} + \frac{B^2((n)^2 - 1)}{3} + B^2 = \frac{A^2}{12(n)^2} + \frac{B^2(n^2 - 1)}{3}.$$

Thus, it follows:

$$P = \sqrt{(-12B^2n^2 + A^2)}. \tag{A.8}$$

Combining (A.7) and (A.8) yields the threshold level $P(A, B)$. It is easy to check that this function is continuous in A.

The IMF prefers centralization iff:

$$L_D^{IMF}(N(B, P), B, P) \geq L_C^{IMF}(N(B, A), B, A).$$

By definition of $P(A, B)$:

$$L_D^{IMF}(N(B, P(A, B)), B, P(A, B)) = L_C^{IMF}(N(B, A), B, A),$$

which implies that the IMF prefers centralization iff:

$$L_D^{IMF}(N(B, P), B, P) \geq L_D^{IMF}(N(B, P(A, B)), B, P(A, B)).$$

Therefore, exploiting the continuity of the function "expected loss" the IMF prefers centralization iff $P \geq P(A, B)$.

Now suppose $A \in \left[0, \widehat{A}_1\right]$, from (A.7) $P(A, B) = 0$; for all $A \geq \widehat{A}_1$ and from (A.8) $P(A, B) \leq \max\left\{\sqrt{(-12B^2 + A^2)}, 0\right\} < A$. For $A \in \left[P_n, \widehat{A}_n\right]$ for some $n \geq 2$ we want to show that:

$$P(A, B) = \sqrt{(8B^2n^3 - 16B^2n^2 + A^2)}\frac{n-1}{n} \leq A.$$

It will suffice to show that this is true for $A = P_n$. Using (A.6) and substituting we obtain:

$$2Bn\sqrt{n^2 - 3} < 2Bn^2,$$

which is always true for $n \geq 2$. ■

Appendix: Descriptive Statistics (Estimation sample of column 3, Table 3)

Variable	Min	Max	Mean
Number of Conditions	14	349	73.63
Government stability	3.67	12	7.87
Law and order	2	12	6.63
Bureaucracy quality	3	10.63	5.53
Ethnic tension	2	12	8.19
Democracy	-7	10	4.52
Press freedom	0	3	2
Trade (percent of GDP)	14.73	222.88	72.99
Lack of Transparency	0.01	0.46	0.13
IMF loans (share of GDP)	0	0.37	0.04
Number of Quarters	3	18	9.95
(log) GDP p.c.	4.82	9.01	6.97
GDP growth	-11.03	16.73	3.3
Current account balance (percent of GDP)	-44.84	19.75	-3.19
International reserves (percent of imports)	0.04	11.08	3.63
Inflation	-0.08	0.9	0.14
Voting in line with the U.S. in the UNGA	0.16	0.63	0.37

Appendix: Correlations of the variables (Estimation sample of column 3, Table 3)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)
(1) Number of Conditions	1.00																
(2) Government stability	0.39	1.00															
(3) Law and order	0.06	0.04	1.00														
(4) Bureaucracy quality	-0.18	-0.07	0.25	1.00													
(5) Ethnic tension	0.14	0.07	0.39	0.07	1.00												
(6) Democracy	0.02	0.04	0.05	0.00	0.24	1.00											
(7) Press freedom	-0.05	-0.08	0.19	0.15	0.24	0.55	1.00										
(8) Trade (percent of GDP)	-0.04	0.06	0.15	0.11	0.02	0.14	0.24	1.00									
(9) Lack of transparency	-0.07	-0.13	-0.11	-0.25	-0.11	-0.05	0.03	0.17	1.00								
(10) (log) GDP p.c.	-0.12	0.05	0.21	0.38	0.46	0.36	0.40	0.10	-0.33	1.00							
(11) GDP growth	0.01	0.00	0.02	-0.26	-0.01	-0.07	-0.09	-0.06	0.01	-0.11	1.00						
(12) Current account balance (percent of GDP)	0.06	0.16	0.00	0.22	0.03	-0.08	-0.02	-0.02	0.00	0.21	-0.05	1.00					
(13) International reserves (percent of imports)	-0.02	0.16	0.13	0.04	0.16	0.13	0.10	-0.24	-0.36	0.26	0.11	0.15	1.00				
(14) Inflation	-0.08	-0.37	0.13	-0.05	0.08	0.10	0.00	0.06	0.21	-0.10	-0.27	0.01	-0.14	1.00			
(15) Voting in line with the U.S. in the UNGA	-0.14	-0.25	0.51	0.13	0.29	0.23	0.22	0.12	0.10	0.25	-0.13	-0.14	-0.07	0.47	1.00		
(16) IMF loans (share of GDP)	0.20	0.00	0.09	-0.10	-0.01	-0.05	-0.06	0.32	0.05	-0.26	-0.02	-0.21	-0.12	0.15	-0.05	1.00	
(17) Number of Quarters	0.44	0.29	-0.08	-0.24	-0.12	-0.19	-0.16	0.01	0.12	-0.46	0.22	-0.10	0.00	-0.16	-0.26	0.34	1.00