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Exchange Rate Volatility and Investment: A Panel Data Cointegration Approach

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This paper examines the link between real exchange rate volatility and domestic investment by using panel data cointegration techniques. We study the empirical connection between real effective exchange rate volatility and investment for 51 developing countries (23 low-income and 28 middle-income countries). The theoretical relationship between investment and real exchange rate volatility predicts that the effects of exchange rate uncertainty on profits are ambiguous. The empirical results illustrate that real effective exchange rate volatility has a strong negative impact on investment. This outcome is robust in low income and middle income countries, and by using an alternative measurement of exchange rate volatility.

Keywords: *exchange rate volatility, investment, appreciation, depreciation, panel data cointegration, capacity principle*

JEL Classification: *O11, O16, O19, O57*

1. Introduction

Multiples efforts have been deployed by governments and international organizations to maintain a stable macroeconomic environment in developing countries but, unfortunately, instability still remains one of their greatest economic problems.

The theoretical link investment-exchange rate volatility has been the subject of many studies. (Campa and Goldberg, 1995) model predicts that the effects of exchange rate uncertainty on profits are ambiguous. Increases in exchange rate augment expected profit if the firm exports more than it imports and lower expected profit in the opposite case. (Goldberg, 1993), using a duality theory, and (Darby et al., 1999) an adapted model of (Dixit and Pindyck, 1994), found the same threshold effects of exchange rate uncertainty on investment.

Empirical investigations of the relation between exchange rate volatility and investment in developing countries use, in general, OLS, Two-Stage Least Squares, Fixed effects, GMM and system GMM. A significant

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negative impact of exchange rate volatility on investment is reported by the major part of the studies (Serven, 1998, Bleaney and Greenaway, 2001, and Serven, 2002). The impact of exchange rate instability on investment is nonlinear. (Serven, 2002) illustrates that the effect is large when, firstly, volatility is high and secondly, when there is large trade openness combined with low financial development. Contrary, in an environment with low openness and high financial development, exchange rate volatility tends to act positively on investment. Furthermore, (Guillaumont et al., 1999) find that "primary" instabilities (climatic, terms of trade and political instabilities) act on Africa growth through the negative effect that "intermediate" instabilities (instability of real exchange rate and instability of the rate of investment) exert on growth.

This paper fits in these researches of the link between investment and real exchange rate volatility. But it distinguishes itself in the following way. We apply panel data cointegration techniques to study the empirical relation between investment and exchange rate volatility for 51 developing countries (23 low-income and 28 middle-income countries presented in Appendix 1, note that countries and time period selection depend on the availability of data). There are some previous studies which employ microeconomic panel data methods (Fixed Effects, GMM, etc.) on annual data with a relatively long period. But given the existence of potential unit roots in variables, these estimations could be seriously affected by spurious regressions effects (See Kao, 1999 for further details on spurious regressions in panel data). This is why we think using panel data cointegration methods is more appropriate. For this study we use the original Program of Pedroni (1999) converted in RATS Procedure by Estima Corporation. Kao and Chiang (2000) have put together a set of GAUSS subroutines called NPT, for studying nonstationary panel data (Available online at: http://www.maxwell.syr.edu/maxpages/faculty/cdkao/working/npt.html). The latest version of Eviews (Eviews 8) also provides many tests on panel data cointegration. I have also introduced a new User-Written Stata command named **"xtdolshm"** which performs Dynamic Ordinary Least Squares for Cointegrated Panel Data with homogeneous covariance structure (Kao and Chiang, 2000).

The application of panel data cointegration techniques has several advantages. Initially, annual data enable us not to lose information contrary to the method of averages over sub-periods. Then, the addition of the cross sectional dimension makes that statistical tests are normally distributed, more powerful and do not depend on the number of regressors in the estimation as in individual time series. Among the panel data cointegration techniques, we utilize (Pedroni, 1999) *Fully Modified Ordinary Least Squares* (FMOLS) estimator which deals with possible autocorrelation and heteroskedasticity of the residuals, takes into account the presence of nuisance parameters, is asymptotically unbiased and, more importantly, deals with potential endogeneity of regressors. The results demonstrates firstly, that exchange rate volatility has a strong negative impact on investment, secondly, the effect of REER volatility is higher in countries which rely heavily on imports. Furthermore, robustness checks shows that this negative impact of REER volatility on investment is stable to the use of an alternative measurement of REER volatility and on subsamples of countries (low-income and middle-income developing countries).

The remaining of the paper is organized as follow: section 2 gives the estimation methods, section 3 presents the data and variables, section 4 provides the results of the study and the last part concludes.

2. Estimation Methods

Since our data base is composed of annually data going from 1975 to 2004, we run panel data unit root tests on all variables. Table 1 shows that among the five unit root tests, there exist at least one which tells us that each variable is non-stationary and I(1).

This outcome led us to apply recent panel data cointegration techniques to estimate a model of the form

$$\frac{I_{it}}{K_{it-1}} = \gamma EV_{it} + \beta' X_{it} + \alpha_i + \varepsilon_{it} \tag{1}$$

Where $\frac{I_{it}}{K_{it-1}}$ is investment I_{it} over lagged capital stock K_{it-1}, EV_{it} the exchange rate volatility, X_{it} all other explanatory variables, α_i country individual specific effects, and ε_{it} the idiosyncratic error. i specifies countries and t the time. To estimate equation (1), we use the FMOLS *(Fully Modified Ordinary Least Squares)* estimator developed in panel data context by (Pedroni, 1996) and (Phillips and Moon, 1999).

This estimator was initially introduced in time series context by (Phillips and Hansen, 1990). The advantage of the FMOLS estimator over the OLS estimator (which is super-consistent but is asymptotically biased and is function of nuisance parameters; Kao and Chen, 1995, 2000; Pedroni, 1996). is that it deals with possible autocorrelation and heteroskedasticity of the residuals, potential endogeneity of the regressors, takes into account the presence of nuisance parameters and is asymptotically unbiased (A good survey on recent panel data cointegration is provided by Baltagi and Kao, 2000 and Hurlin and Mignon, 2006*)*. Other estimators used for estimations and inferences in panel data cointegration are the DOLS *(Dynamic Ordinary Least Squares)*, (Kao and Chiang, 2000), (Mark and Sul, 1999), (Pedroni, 2001), PMGE *(Pooled Mean Group Estimator)*, (Pesaran et al. 1999), and the vector error-correction representation, (Breitung, 2005), (Mark and Sul, 2003). (Pedroni, 1996) and (Phillips and Moon, 1999) showed that the FMOLS estimator is normally distributed. Analogous results were also obtained by (Kao and Chiang, 2000) for the methods FMOLS and DOLS.

The use of panel data cointegration techniques in estimating equation (1) has several advantages. Initially, annual data enable us not to lose information contrary to the method of averages over sub-periods employed in some previous studies. Then, the additions of the cross sectional dimension makes that statistical tests are normally distributed, more powerful and do not depend on the number of regressors as in individual time series.

To test the presence of cointegration in equation (1), we utilize (Pedroni, 1999) tests. To explain the tests procedure, we rewrite equation (1) in the following manner

$$y_{it} = \alpha_i + \delta_i t + \beta_{1i} x_{1,it} + \beta_{2i} x_{2,it} + \ldots + \beta_{Mi} x_{M,it} + \varepsilon_{it} \qquad (2)$$

Where δ_i are time specific effects, *i=1,…,N*, *t=1,…,T* and *m=1,…,*M. (Pedroni, 1999) compute four within tests and three between tests. If we write the residuals in equation (2) as an *AR(1)* process $\hat{\varepsilon}_{it} = \rho_i \hat{\varepsilon}_{it-1} + u_{it}$ the alternatives hypothesis for the tests are formulated in the following manner

- For within tests, the alternative hypothesis is $H_A : \rho_i = \rho < 1 \quad \forall i$
- For between tests, the alternative hypothesis is $H_A : \rho_i < 1 \quad \forall i$

We have seven (4 within and 3 between) tests in (Pedroni, 1999). See that paper for more details.

Table 1. *Panel unit root tests*

Variables	Levin, Lin and Chu t	Breitung t-stat	Im, Pesaran and Shin W-stat	Maddala Wu		Hadri Z-stat
				ADF - Fisher Chi-square	PP - Fisher Chi-square	
Investment, t / Capital stock, t-1	1.2975	0.3458	-1.9590	116.8340	139.6890	9.7625
	(0.9028)	(0.6352)	(0.0251)	(0.1496)	(0.0079	(0.0000)
GDP, t / Capital stock, t-1	3.3161	0.8132	0.4463	93.9174	104.5540	12.0348
	(0.9995)	(0.7919)	(0.6723)	(0.7035)	(0.4114)	(0.0000)
REER volatility 1, t	3.4882	-1.2381	-1.1465	122.8660	3021.0700	6.6479
	(0.9998)	(0.1078)	(0.1258)	(0.0781)	(0.0000)	(0.0000)
Real interest rate, t	-1.5507	-3.5656	-2.9037	94.2369	658.1490	13.4941
	(0.0605)	(0.0002)	(0.0018)	(0.3592)	(0.0000)	(0.0000)
Investment deflator, t / GDP deflator, t	-0.2080	-0.6727	-1.5745	108.5020	188.7280	6.5644
	(0.4176)	(0.2506)	(0.0577)	(0.3112)	(0.0000)	(0.0000)
Long term debt, t / GDP, t	1.6168	-3.0040	2.2875	69.1210	59.2335	9.8184
	(0.9470)	(0.0013)	(0.9889)	(0.9948)	(0.9998)	(0.0000)
ln(1+Inflation), t	1.8531	-2.9731	-2.4724	134.8430	782.8750	8.6758
	(0.9681)	(0.0015)	(0.0067)	(0.0163)	(0.0000)	(0.0000)
REER volatility 1, t × Imports of GS, t	-0.6414	-0.5348	-0.9650	103.9010	1136.6900	6.9685
	(0.2606)	(0.2964)	(0.1673)	(0.4290)	(0.0000)	(0.0000)
Terms of trade, t	2.02646	1.2532	-3.5582	188.3260	211.3420	7.5547
	(0.9786)	(0.8949)	(0.0002)	(0.0000)	(0.0000)	(0.0000)
REER Volatility 2, t	2.5109	-0.5354	-2.7373	133.3530	2501.2300	7.6559
	(0.9940)	(0.2962)	(0.0031)	(0.0202)	(0.0000)	(0.0000)
REER volatility 1, t × Exports of GS, t	0.3174	-1.0508	-0.1375	98.9928	931.1110	8.2079
	(0.6245)	(0.1467)	(0.4453)	(0.5659)	(0.0000)	(0.0000)

Note: The p-values are in parenthesis. All tests include intercepts (fixed effects) and individual trends. For the autocorrelation correction methods, the specified lags are 3 or 4 and Newey-West bandwidth selection using either Barlett, Parzen or Quadratic Spectral kernel depending on the variable and the test type

Source: Author's Calculations

3. Data and Variables

To study the effect of volatility on investment, we utilize annually data from 1975 to 2004 of 51 developing countries (23 low-income and 28 middle-income countries). The choice of the sample is based on the availability of data. The data are from World Development Indicators (WDI) 2006, International Financial Statistics (IFS), April, 2006 and CERDI 2006. The REER is calculated in foreign-currency terms meaning that an increase of the REER indicates an appreciation and, hence a potential loss of competitiveness. A decrease is considered as a depreciation.

After calculating the exchange rate, we compute as in (Serven, 1998; Serven, 2002) and (Bleaney and Greenaway, 2001) real exchange rate volatility using ARCH family methods. We proceed as such because many ARCH family methods can take account asymmetric chocks effects. We employ two ARCH-Family methods: GARCH (Generalized Autoregressive Conditional Heteroskedasticity), (Bollersev, 1986), and GARCH-M (GARCH-in-Mean), (Engle et al., 1987). The former specification implies symmetric effect of innovations while the second assumes asymmetric impact of good and bad news. The two estimated models, for each country of the sample, are

GARCH(1,1)

$$\begin{aligned} \ln(REER_t) - \ln(REER_{t-1}) &= \beta_0 + \varepsilon_t \\ \sigma_t^2 &= \gamma_0 + \gamma_1 \varepsilon_{t-1}^2 + \delta_1 \sigma_{t-1}^2 \end{aligned} \quad (3)$$

GARCH-M(1,1)

$$\begin{aligned} \ln(REER_t) - \ln(REER_{t-1}) &= \beta_0 + \psi \sigma_t^2 + \varepsilon_t \\ \sigma_t^2 &= \gamma_0 + \gamma_1 \varepsilon_{t-1}^2 + \delta_1 \sigma_{t-1}^2 \end{aligned} \quad (4)$$

Where $\varepsilon_t \sim N\left(0, \sigma_t^2\right)$, ε_t^2 is the squared residuals, σ_t^2 the variance of the regression model's disturbances, γ_0 and γ_1 the ARCH parameters, δ_1 the GARCH parameter and ψ the GARCH-M parameter. We compute the exchange rate volatility as the square root of the conditional variance of the regression. In the paper, the GARCH(1,1) measure of exchange rate volatility is referred to as *REER volatility 1, t* and the GARCH-M(1,1) measure as *REER volatility 2, t (*The weights used to generate the REER, from which these two measurements come, are respectively: general trade including oil countries, general trade without oil countries).

As dependent variable, we use the ratio of actual investment over lagged capital stock (computed by the perpetual-inventory method). Formulating investment this way is known as capacity principle, (Chenery, 1952). Other formulations close to this are the capital stock adjustment principle, (Goodwin, 1951) and the flexible accelerator, (Koyck, 1954). Traditional determinants of investment are considered as control variables: GDP over lagged capital stock, real interest rate, user cost of capital (investment deflator over GDP deflator), inflation, long term debt and the terms of trade. Table 2 gives summary statistics on all variables.

Table 2. *Summary statistics on variables*

Variables	Observations	Mean	Std. Dev.	Min	Max
Investment, t / Capital stock, t-1	1472	0.0725	0.0296	-0.0050	0.1994
GDP, t / Capital stock, t-1	1475	0.3599	0.1928	0.0584	1.6920
Real interest rate, t	1087	0.0767	0.2799	-0.9781	7.8980
Investment deflator, t / GDP deflator, t	1523	1.0586	0.3474	0.1198	3.4958
REER volatility 1, t	1499	0.1323	0.2534	0.0000	6.8452
REER volatility 1, t × Imports of GS, t	1498	0.0437	0.1409	0.0000	4.4626
ln(1+Inflation), t	1530	0.1733	0.3717	-0.2763	4.7749
Long term debt, t / GDP, t	1517	0.6140	0.6023	0.0233	8.2349
Terms of trade, t	1518	1.0853	0.3759	0.3213	6.0800
REER volatility 2, t	1499	0.1213	0.1364	0.0000	2.2887

REER volatility 1, t × Exports of GS, t	1498	0.0338	0.0698	0.0000	2.2272

Source: Author's Calculations

4. Estimation Results

In this section, we describe first the panel data cointegration tests and second present the estimation results.

Table 3 illustrates that among the seven tests of (Pedroni, 1999), there is at least one that shows that we reject the null hypothesis of no cointegration in all 5 equations (See Table 4 for a list of these equations). This allows us to estimate the panel data cointegration relationships.

As mentioned earlier, panel data cointegration estimators, in particular the FMOLS, deal with possible autocorrelation and heteroskedasticity of the residuals, takes into account the presence of nuisance parameters, are asymptotically unbiased and, more importantly, deal with potential endogeneity of the regressors. Table 4 present the results of (Pedroni, 1999) panel data cointegration estimation results.

All five equations illustrates that the real exchange rate volatility is statistically significant and has the expected sign. Regression 1 represents the *capacity principle* model in which we add the real exchange rate volatility. In this model, the REER volatility is negative and marginally significant. The coefficient increases in magnitude and statistical significance when we control for traditional investment determinants, beginning from regression 2. These regressions show that the impact of REER volatility is high. Referring to regression 2, an increase in REER volatility by one standard deviation reduces the ratio of investment to lagged capital stock by an amount approximately equivalent to eight standard deviations. If we take regression 5, the impact become higher because an increase of REER volatility equal to the its interquartile range make the ratio of investment to lagged capital pass from the ninetieth percentile to approximately the tenth percentile, a drop higher than the interquartile range. The absolute value of REER volatility coefficient diminish by more than a half when we introduce long term debt in regression 4, suggesting that the effect of volatility on investment may pass through long term debt. The coefficient of actual GDP over lagged capital stock is positive and highly significant in all regressions. This is in line with (Chenery, 1952) capacity principle which state that an augmentation in capacity usage rise investment. The real interest rate and the user cost of capital have the expected signs and are, generally, statistically significant. Meaning that large costs of capital reduce investment. The other remaining variables have the expected signs and are, generally, statistically significant.

Table 5 presents the results of the interaction of the real exchange rate volatility with the variable imports, in the first place, and with the variable exports, in the second place.

In all four regressions, the REER volatility coefficient is negative and significant at 1 percent level. The interaction of REER volatility with imports of goods and services is negative, statistically significant with a high coefficient in absolute value in all first three equations. This suggests that the effect of REER volatility is higher in countries which rely heavily on imports. This outcome corroborates the theoretical predictions cited in the introduction. In regression 4, the interaction of REER volatility with exports of goods and services has the expected sign. This result implies that, the more an economy exports, the less exchange rate volatility has negative impact on investment. The export threshold for which the marginal impact of REER volatility on investment is nil is 2.54. This value is out of range of exports of goods and services in the sample (The minimum of export of goods and services over GDP is 0.0290 and the maximum 1.2441). Then in our sample, we could consider that the effect of REER volatility on investment is negative in regression 4.

Table 6 gives an estimation using an alternative measurement of REER volatility. It also provides regressions on subsamples of low-income and middle-income countries.

As mentioned, the alternative measurement of REER volatility, the GARCH-M(1,1), takes into account asymmetric effects of innovations. Regression 1 in Table 6 shows that the impact of the GARCH-M(1,1) measurement is significant and very high. This demonstrates that if we take account asymmetric effects, volatility can have a strong negative impact on investment. The coefficients of the REER volatility for regressions on the subsamples of countries are significant and have the expected signs. The absolute value of the coefficient of the REER volatility for low-income countries is larger than that of middle-income countries. Thus the effect of exchange rate volatility on investment is higher in low-income countries than in middle-income countries. This is the case because low income countries are more vulnerable to shocks.

Table 3. *Panel data cointegration tests*

Pedroni Panel Cointegration Tests		(1)	(2)	(3)	(4)	(5)
Panel Cointegration tests	panel v-stat	-0.2949	-2.6656	-2.9809	-3.1164	-3.6536
	panel rho-stat	0.4283	4.1791	4.9366	4.8765	6.5996
	panel pp-stat	-3.1529	-2.1764	-3.9206	-3.0677	-2.9631
	panel adf-stat	-2.4911	2.0490	5.6660	-0.4804	0.3043
Group mean cointegration tests	group rho-stat	2.5166	7.3718	8.1990	8.2804	9.6908
	group pp-stat	-1.9672	-1.6667	-4.2611	-2.9673	-4.6715
	group adf-stat	-1.4405	0.3701	1.9417	0.5910	2.8247

Note: All reported values are distributed N(0,1) under null of no cointegration

Source: Author's Calculations

Table 4. *Panel data cointegration estimation results. Dependent Variable: Investment, t / Capital stock, t-1*

Regressors	(1)	(2)	(3)	(4)	(5)
GDP, t / Capital stock, t-1	0.2361***	0.1391***	0.2217***	0.2194***	0.3585***
	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)
Real interest rate, t		-0.0121*	-0.1675	-0.0170***	-0.5345***
		(0.0778)	(0.1575)	(0.0006)	(0.0000)
Investment deflator, t / GDP deflator, t		-0.0506***	-0.0663***	-0.0257***	-0.0611***
		(0.0000)	(0.0000)	(0.0000)	(0.0000)
REER volatility 1, t	-0.0213*	-0.9431***	-0.7822***	-0.3318***	-1.0195***
	(0.0595)	(0.0000)	(0.0000)	(0.0000)	(0.0000)
ln(1+Inflation), t			-0.1615		-0.6314***
			(0.1989)		(0.0000)
Long term debt, t / GDP, t				-0.0987***	
				(0.0000)	
Terms of trade, t					0.0695***
					(0.0000)

Source: Author's Calculations

Note: ***, ** and * significant at 1%, 5% and 10% respectively. P-values in brackets

Table 5. *Exchange rate volatility pass-through. Dependent Variable: Investment, t / Capital stock, t-1*

Regressors	(1)	(2)	(3)	(4)
GDP, t / Capital stock, t-1	0.2459***	0.2929***	0.2933***	0.3043***
	(0.0000)	(0.0000)	(0.0000)	(0.0000)
REER volatility 1, t	-1.4319***	-0.9161***	-1.3506***	-0.5971***
	(0.0016)	(0.0042)	(0.0045)	(0.0049)
Imports of GS, t	0.3553	0.3565***	0.3242***	
	(0.1328)	(0.0013)	(0.0005)	
REER volatility 1, t × Imports of GS, t	-0.1067***	-0.4744***	-0.1905***	
	(0.0033)	(0.0044)	(0.0023)	
Terms of trade, t	0.0254***		0.0128***	
	(0.0000)		(0.0000)	
Investment deflator, t / GDP deflator, t		-0.0525***	-0.0498***	-0.0421***
		(0.0000)	(0.0000)	(0.0000)
ln(1+Inflation), t		0.0073	0.0066	0.0118
		(0.4298)	(0.3045)	(0.1891)
Exports of GS, t				0.0115**
				(0.0220)
REER volatility 1, t × Exports of GS, t				0.2349**
				(0.0117)

Source: Author's Calculations

Note: ***, ** and * significant at 1%, 5% and 10% respectively. P-values in brackets

Table 6. *Estimation results using an alternative measurement of real effective exchange rate volatility and on sub-samples of countries. Dependent Variable: Investment, t / Capital stock, t-1*

	Full sample	**Middle-Income Countries**	**Low-Income Countries**
Regressors	(2)	(2)	(5)
GDP, t / Capital stock, t-1	0.4308***	0.3096***	0.4067***
	(0.0000)	(0.0000)	(0.0000)
Real interest rate, t	-0.0119***	-0.0411***	-1.2375***
	(0.0000)	(0.0000)	(0.0000)
Investment deflator, t / GDP deflator, t	-0.0827***	-0.0463***	-0.1172***
	(0.0000)	(0.0000)	(0.0000)
REER volatility 1, t		-0.0489***	-1.8454***
		(0.0040)	(0.0000)
REER volatility 2, t	-7.7435***		
	(0.0000)		
ln(1+Inflation), t			-1.3942***
			(0.0000)
Terms of trade, t			0.0578***
			(0.0000)

Source: Author's Calculations

Note: ***, ** and * significant at 1%, 5% and 10% respectively. P-values in brackets

5. Conclusion

This paper examines the relationship between REER volatility and investment empirically. The theory indicates that exchange rate volatility have nonlinear effects on investment. Using new developments on panel data cointegration techniques, we find that real exchange rate volatility has a strong negative impact of investment. An increase in REER volatility by one standard deviation reduces the ratio of investment to lagged capital stock by an amount approximately equivalent to eight standard deviations. The robustness checks illustrates that this negative impact of REER volatility on investment is stable to the use of an alternative measurement of REER volatility and on subsamples of countries (low-income and high-income countries).

Though the results found were informative, some caveats remain. If data on both public and private investment are available, some regressions on these two variables would allow us to compare the effects of REER between these two variables and domestic investment. Some studies on structural change in the context of panel cointegration could also provide helpful information on the impact of REER volatility on investment.

From economic policy perspectives, the results illustrate that macroeconomic instability, in particular exchange rate volatility could have negative impacts on investment and that efforts made to reduce them might revive investment and productivity.

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Appendix

Appendix 1. *List of 51 countries*

Low Income countries				Middle Income countries		
N°	**Word Bank Code**	**Countries**		**N°**	**Word Bank Code**	**Countries**
1	BDI	Burundi		**1**	ARG	Argentina
2	BEN	Benin		**2**	BOL	Bolivia
3	BFA	Burkina Faso		**3**	CHL	Chile
4	BGD	Bangladesh		**4**	CHN	China
5	CIV	Cote d'Ivoire		**5**	COL	Colombia
6	CMR	Cameroon		**6**	CRI	Costa Rica
7	COG	Congo, Rep.		**7**	DOM	Dominican Republic
8	GHA	Ghana		**8**	DZA	Algeria
9	GMB	Gambia, The		**9**	ECU	Ecuador
10	GNB	Guinea-Bissau		**10**	EGY	Egypt, Arab Rep.
11	IND	India		**11**	GAB	Gabon

12	KEN	Kenya	**12**	GTM	Guatemala
13	LSO	Lesotho	**13**	HND	Honduras
14	MDG	Madagascar	**14**	HUN	Hungary
15	MLI	Mali	**15**	IDN	Indonesia
16	MRT	Mauritania	**16**	LKA	Sri Lanka
17	MWI	Malawi	**17**	MAR	Morocco
18	NIC	Nicaragua	**18**	MEX	Mexico
19	RWA	Rwanda	**19**	MYS	Malaysia
20	SEN	Senegal	**20**	PER	Peru
21	TGO	Togo	**21**	PHL	Philippines
22	ZMB	Zambia	**22**	PRY	Paraguay
23	ZWE	Zimbabwe	**23**	SWZ	Swaziland
			24	THA	Thailand
			25	TTO	Trinidad and Tobago
			26	TUN	Tunisia
			27	URY	Uruguay
			28	VEN	Venezuela, RB

Note: This subdivision is from the Word Development Indicators 2006 classification based on countries 2004 GNI per capita: Low Income Countries (GNI/per capita ≤ US $825); Middle Income Countries (US $826 ≤ GNI per capita ≤ US $10065).

Source: Author's Calculations