THE EFFECT OF ECONOMIC FREEDOM ON BUSINESS CYCLE VOLATILITY: CASE OF DEVELOPING COUNTRIES

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Abstract *- Few studies have analyzed the effect of economic freedom on business cycle volatility. The objective of this paper is to examine the relationship between economic freedom and volatility cycles of 109 developing countries over the period 1995-2012. Using Generalized Method of Moments (GMM) estimators we prove that greater economic freedom leads to less business cycle volatility. Yet, this link is not statistically significant for all different income level groups.*

Key-words - ECONOMIC FREEDOM, DEVELOPING COUNTRIES, BUSINESS CYCLE FLUCTUATIONS

JEL Classification - E32, O5, O17

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1. INTRODUCTION

In spite of an abundant literature on the determinants of economic growth and the relationship between economic growth and volatility, few studies have focused on the question of business cycle volatility and their causes. The scarcity of studies on this topic is mainly due to the fact that until the 1980s business cycles and economic growth theories were considered two independent streams of economic theory. Three main papers published in the early 1980s put the long believed evidence into question. The first is Nelson and Plosser (1982) showed that the movements of gross domestic product (GDP) tend to be permanent. Second, joining Schumpeter (1911), who argued that the main cause of business cycle volatility is the adoption of new technology, Kydland and Prescott (1982), and Long and Plosser (1983) provided new models for which they incorporated the growth and business cycles theories for analyzing economic fluctuations[1]. According to these authors the main cause of output fluctuations is the stochastic variations in technology. In the third study, by incorporating endogenous growth theory in business cycle model, King et al. (1988) showed that temporary disruptions in production can affect the trend of the output.

These papers have shaken the basic beliefs of Real Business Cycles (RBC) literature and re-established the relationship between business cycle and economic growth. Therefore, it would then be unsafe to hold the view that economic fluctuation and economic growth theories are disconnected. The live debate about the relationship between business cycle volatility and growth dates back to the early 1990s. That it is positive or negative depends on the operating mechanisms (Imbs, 2002). Yet it seems that most papers on this topic tend to find a strong connection between business cycle fluctuation and long-run growth (Caballero and Hammour, 1994; Ramey and Ramey, 1995; Aghion and Saint-Paul 1998; Martin and Rogers, 2000; Kroft and Lloyd-Ellis, 2002; Fatás, 2002; Serven, 2003; etc.).

The importance of the above mentioned debate is certainly undeniable, yet what is more important for us is to trace the possible causes of the volatility of economic growth as determining them is in the very heart of controlling the level of growth volatility. This question is of paramount importance for developing economies since some research on business cycle volatility proves that, in the major developed market economies, the business cycle has become less volatile (Altman, 1992; Balke and Gordon, 1989; Boltho, 1989) while developing countries encountered larger volatility (Loayza et al., 2007).

It is commonly admitted that there are three main resources of macroeconomic volatility in developing countries. The most immediate one is that developing countries receive bigger exogenous shocks because of their higher trade and financial openness degree. Head (1995) demonstrated that the higher output variance of smaller countries is due to their greater openness and susceptibility

[1] We should point out here that the RBC considers technical progress as a purely random shock. It produces no break, contrary to what one can say of Schumpeter.

to exogenous shocks. Loayza and al. (2007)[2] and Carmignani and al. (2007) stressed the importance of trade openness as an essential source of volatility. In countries with less-diversified economic structures trade openness may enhance output volatility[3] (Easterly, Islam, and Stiglitz, 2000, Giovanni and Levchenko, 2008). In addition, sudden stops or speculative attacks can be a source of exogenous shocks. Second, developing economies are more likely to experience more domestic shocks, generated by; intrinsic instability of the development process, volatile fiscal policy (Fatás and Mihov, 2006), social conflict, economic mismanagement and political instability (Raddatz, 2007). Third, financial markets and the macroeconomic stabilization policies identified by literature as shock absorber are weak and inefficient in developing countries, so they often amplify volatility. Kharroubi (2006) proved that the negative relationship between volatility and economic growth observed in developing countries is based on the weaknesses of their financial systems.

In economic growth literature many studies evaluated the impact of economic freedom[4] on growth and development and most of them have supported a positive link between economic freedom and growth[5]. For example, Gwartney and al. (1996) note that the countries with the highest economic freedom scores have an average annual growth rate of per capita real GDP of 2.4% while those with the lowest economic freedom scores have an average of negative 1.3% for 1980-1994. Nevertheless, economic freedom as determining factor of economic fluctuations has received little attention in the literature. It was not until recent years that economists have just begun to assess the effects of economic freedom on economic performance (Lipford, 2007). This analysis can be viewed as an attempt to fill this gap and a contribution to the literature attempting to understand how economic freedom matters for economic volatility.

The effect of economic freedom on the volatility cycles, which until now has never been studied, is ambiguous and the economic theory does not give an adequate answer. On one hand, economic freedom can increase volatility through business, financial and trade freedoms that can contribute to the failure of many businesses. On the other hand, economic freedom can serve as catalyst for stability. Freedom of wages, contracts and prices can absorb economic shocks (Campell and Snyder, 2012). Freedom of property and the accessibility to sound money can also guarantee a safe and stable economic environment.

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[2] Loayza and al. (2007) demonstrated that over each of four decades in 1960-2000, developing countries (except East Asia developing countries) encountered terms of trade volatility at least three times larger than the industrial economies.

[3] If trade openness leads to industrial specialization, a specific sector shock transform into whole economic shock. In this case trade openness may enhance volatility. For a detail overview of the effect of trade on specialization see Alimi (2015).

[4] Berggren (2003) defined economic freedom as "the degree to which an economy is a market economy – that is, the degree to which it entails the possibility of entering into voluntary contracts within the framework of a stable and predictable rule of law that upholds contracts and protects private property, with a limited degree of interventionism in the form of government ownership, regulations, and taxes".

[5] For empirical studies review, see De Haan et al. (2006).

Hence, the main objective of this paper is to demonstrate empirically whether economic freedom is a stabilizing factor of business cycle in 109 developing countries[6] or rather a destabilizing one and if the effect of economic freedom changes according to the income level, after controlling this effect by other important characteristics of these countries.

To set the stage for this analysis, we shall focus our attention on the relationship between business cycle volatility and economic growth (section 2) which will itself pave the way to developing an econometric model that allows us to study the relationship between business cycle fluctuation and economic freedom (section 3). Our research will be accentuated with the empirical results (Section 4). Last but not least we will highlight our findings in a fifth section offering concluding results.

2. BUSINESS CYCLE VOLATILITY AND ECONOMIC GROWTH: A BRIEF OVERVIEW

As far as we know, most of the published studies on this topic recognize a relationship between economic growth and business cycle volatility. While some theoretical and empirical approaches predict a positive relationship, others predict a negative one. To highlight this debate and without immersing ourselves into details and without the intention of being exhaustive, we would mention a few studies below.

Schumpeter (1911) argued that technological innovation which contributes to long-run growth can cause cyclical fluctuations. In turn, Kuznets (1967) and the partisans of real business cycle theory (Kydland and Prescott, 1982, Long and Plosser, 1983...) demonstrated a positive relationship between fluctuations and economic growth. This result was confirmed by Komendi and Meguire (1985) and Grier and Tullock (1989) who find a positive relationship between mean growth and its standard deviation. So, if business cycle volatility is reduced, we would expect lower rate of economic growth and vice versa. This means that there is a tradeoff between economic growth and cyclical volatility.

After losing the momentum for several years, debate about volatility-growth relationship has prompted a resurgence of interest particularly since Ramey and Ramey (1995) uncovered a strong negative link between volatility and growth in 92 less-developed[7]. However, positive impact did manifest in the OECD countries.

In the same spirit of Ramey and Ramey (1995) and along their lines, some other empirical papers further lend credence to the strong correlation between

[6] See appendix 1 for the list of developing countries and the different income level groups.

[7] Ramey and Ramey (1995) showed that the standard dichotomy in macroeconomics between growth and the volatility of economics fluctuations is not supported by the data. Ramey and Ramey explained the real business cycle theory and Lucas's (1987) questionable conclusions by the assumption of the absence of any interaction. They added: "by assuming no interaction between volatility and growth, the theoretical business cycle and growth literatures omit important elements" (p. 1148).

real business cycle and economic growth and supporting Ramey and Ramey findings (Kharroubi, 2006; Aghion and al., 2005; Fatás, 2002; Aghion and St Paul, 1998; Kroft and Huw, 2002 and Faruk, 2006).

Using Spearman correlation coefficient for the shorter and longer time-frames Altman (1995) found that over time per-capita economic growth is inversely related to business cycle volatility, quite contrary to what one would expect from the Schumpeter-Kuznets and real business cycle analyses. However, this negative relationship is not a strong one, so it is difficult to discern any clear relationship between increases in growth and a dampening of the business cycle. According to Altman there is no support for the view that there is a tradeoff between economic growth and cyclical volatility. He adds that high levels of cyclical volatility are not a necessary condition for high rates of economic growth. For this reason, one cannot argue that dampening the business cycle will result in less economic growth and business cycle volatility should result in a fall in the rate of economic growth.

Mills (2000) reworked the Altman analysis by using different statistical techniques (graphical, linear regression, rank correlation, and exploratory data analysis) over 1870-1994, to assess the robustness of the Altman's results. He concluded that a tight relationship between volatility and growth has not existed over the complete period and there is little evidence of a positive relationship between growth and volatility[8]. Mills added that the nature of the relationship changes through periods and methods. Using the linear trend estimate of volatility for the sample period 1870-1908, the author showed that the relationship is essentially flat for low levels of volatility, but positive for the countries with the highest cyclical volatility. However by using the linear trend measure Mills demonstrated a positive relationship for low levels of volatility but negative relationship for high levels. These relationships would disappear if the sample period was extended to 1928. All estimates suggest no relationship for low levels of volatility, but the two linear (BK and HP) filters estimates indicate a positive relationship for high levels of volatility. For the period 1954-1972 all measures used by Mills (2000) showed a positive relationship between low levels of volatility and growth.

3. DATA, METHODOLOGY AND EMPIRICAL MODEL

The empirical methodology used in this study is cross-country regression analysis. We examine the relationship between business cycle fluctuation and economic freedom using a large data set that includes 109 developing countries from different regions in the first step. In the second step we subdivide the total sample into sub-samples according the income level.

Several methods have been proposed to measure the volatility of the variables. Cariolle (2012) classified them into three approaches: economic volatility as the standard deviation of the growth rate of a variable (Ramey and Ramey, 1995; Servén, 1997; Acemoglu et al., 2003; Di Giovanni and Levchenko, 2010;

[8] Only for Japan, Korea and Taiwan, structural volatility estimate show a nonlinear but positive relationship between volatility and growth over the period 1870-1994.

Van der Ploeg and Poelhekke, 2009 and Raddatz, 2007…etc.), economic volatility as the standard deviation of the residual of an econometric regression (Servén, 1998; Pritchett, 2000; Combes and Guillaumont, 2002; …etc) and economic volatility as the standard deviation of the cycle isolated by a statistical filter (Altman, 1995; Dawe, 1996 ; Becker and Mauro, 2006; Chauvet and Guillaumont, 2009; Afonso and Furceri, 2010). While the first and the second approaches put forward restrictive hypotheses, the third approach does not formulate the behavior of a series in advance. Thus, we choose the latter approach as a measure of volatility and business cycle volatility, the dependent variable in the analysis, is the standard deviation of the cyclical component of real GDP isolated using Hodrick-Prescott (1997) filter[9].

All explanatory variables considered in the empirical analysis are briefly discussed below.

EFI is the economic freedom index and it is our variable of interest. We use the economic freedom index published by The Wall Street Journal and The Heritage Foundation. The index is scaled from 0 to 100, where 0 represents the least free and 100 represents the most free.

The control variables considered for the volatility regressions represent the foremost causes of macroeconomic fluctuations as described in the literature. These include the average of opening rate ([exports + imports] / GDP) (OPEN) calculated at the beginning and ending of the period – as a proxy for economic diversification (Lipford, 2007), the standard deviation of the annual growth rate of terms of trade (SDTTG) – as a measure of terms of trade shocks[10], the frequency of financial crises (FFC) – measured as the fraction of years in the sample period during which a country experienced a financial crises, the standard deviation of inflation rate (SDINF), and an indicator of financial openness (KAOPEN). Capital movement's liberalization is a double-edged sword. On the one hand, the easing of restrictions on capital movements can promote the development of financial system. This can reduce economic volatility due to improved efficiency in the allocation of productive resources and adjustment to shocks. On the other hand, financial liberalization imposes constraints on the conduct of economic policy and may make economies more sensitive to disturbances affecting them (Dornbusch and Giovannini, 1990). Moreover, capital flows are also a propagation mechanism of financial and currency crises (Calvo and Mendoza, 2000; Calvo, 2000) that make the most unstable growth (Combes and al., 2000).

[9] To extract cyclical component from macroeconomic aggregate different measures have been proposed (Altman, 1995; Harvey, 1985; Baxter and King (BK), 1995; Hodrick and Prescott (HP), 1997, etc.). Among these filters, HP filters was been extensively used in business cycle research.

[10] Terms of trade shocks have the potential to affect economic volatility and it is likely to have a greater effect in countries more open to international trade (Andrews and Rees, 2009; Mendoza, 1995; Kose, 2002).

In addition, using the Exchange Rate Regime Reinhart and Rogoff[11] we define a dummy variable for the change in exchange rate regime (CHERR) that take one if over the period 1995-2012 country adopt more than one exchange rate regime and zero otherwise.

Underlying data on real GDP, inflation rates, openness degree, population and terms of trade are from the World Bank's World Development Indicators database. Data on financial crises are from Laeven and Valencia (2008). As noted above, the EF index is from Wall Street Journal and The Heritage Foundation (2013). The measure of financial openness is the Chinn & Ito index for financial openness (KAOPEN)[12].

To perform analysis on the effect of economic freedom on economic cycle volatility we investigate the model adopted by Lipford (2007) and Dawson (2010). However, we should mention that there is a difference between the methods that were used. While Lipford (2007) and Dawson (2010) used the ordinary least squares (OLS)[13], we will use the GMM estimators. We chose this method to take in consideration the possibility of endogeneity of economic freedom. Thus, the following model will be estimated considering 109 developing countries and four different income level groups during the period 1995-2012:

$$\sigma_i = \alpha_0 + \alpha_1 EFI_i + \alpha_2 Z_i + \varepsilon_i$$

σ_i is a measure of business cycle volatility. Z_i is a vector of control variables as defined previously.

The linear regression Eq. (1) raises the challenge of endogeneity: the possibility that economic freedom is endogenous. That is, economic freedom itself may be determined to some extent by the underlying macroeconomic environment, in particular the volatility of the business cycle. Similarly, fluctuations of the business cycle may prompt various other policy changes that affect the degree of economic freedom (Dawson, 2010). To control this problem, we use the Generalized Method of Moments (GMM) estimators suggested by Arellano and Bond (1991). To isolate the exogenous variation in economic freedom instrumental variables were used such as the initial level of real GDP, standard deviation of terms of trade, openness, frequency of financial crises and the standard deviation of inflation rates (Hall and Jones, 1999; Dollar and Kraay, 2003; Dawson, 2010). Table 3.1 provides summary statistics for all variables for the total sample and tables 3.2, 3.3, 3.4 and 3.5 for different income level groups[14] (appendix 3).

In addition due to the risk of multicollinearity it is necessary before estimation to look closely at the correlation coefficients between independent varia-

[11] http://www.carmenreinhart.com/data/browse-by-topic/topics/11/
[12] Web.pdx.edu./~ito/Chinn-Ito_website.htm
[13] Dawson (2010) used the two-stage least squares for the instrumental variables analysis.
[14] The variables, Economic freedom index (EFI), open and the GDP are expressed in their natural logarithmic form.

bles. Tables 4.1[15] (appendix 4) details results of correlation test. As we can see some independent variables suffer from multicollinearity. For example, the simple coefficient correlation between economic freedom index (EFI) on one hand and the measure of financial liberalization (KAOPEN), the standard deviation of inflation (SDINF) and the standard deviation of terms of trade growth rate (SDTTG), on the other hand, are approximately 0.5, 0.30 and 0.28, respectively[16]. This result is not surprising since business freedom, monetary freedom and trade freedom are some components of economic freedom. To avoid correlation between these explanatory variables, the EFI is adjusted to exclude business freedom, monetary freedom and trade freedom from the measure of overall economic freedom. These adjusted measures of the EFI are used in the analysis that follows. To take these collinear relationships into consideration, the reported regressions contain combinations of the independent variables that minimize the inclusion of collinear variables.

4. EMPIRICAL RESULTS

Table 1 presents empirical findings. Columns 2 and 3 present the results for the total sample and columns 4 to 10 report the results of estimates for different income level groups. For all regressions, the model is globally significant.

Even though, standard deviation of inflation (SDINF), the change in exchange rate regime (CHERR) and the measure of financial openness (KAOPEN) were consistently found to be statistically insignificant in explaining volatility across countries in regressions for total sample they are theoretically valid and likely to be correlated with other explanatory variables. Since excluding these variables would violate one of the classical assumptions of the linear regression model and cause bias in the coefficient estimates, they are not excluded from the analysis (Dawson, 2010).

In addition we point out that economic freedom loses its statistical significance when we introduce the change in exchange rate regime, but the volatility of terms of trade keep their significance and expected signs in all regressions.

As to the key interest variable (EFI), regressions 1(a) and 1(b) support the hypothesis that economic freedom contribute to more stable economic cycles in developing economies. Economic freedom evidently improves an economy's capacity to adjust to any shock, whether from policy or external causes. The estimated impact of an increase of one standard deviation in economic freedom in reducing volatility over 18-year period is 0.1%.

As for the control variables the coefficient of openness (OPEN) is positive and statistically significant (1(a), 1(b)). This means that trade increase the volatility of business cycle via the transfer of external shocks. The coefficient of standard deviation of terms of trade growth rate (SDTTG) is statistically significant and positive (1(a), 1(b)), as expected.

[15] Table 4.1 report the result of coefficient correlation between variables of the total sample. See tables 4.2, 4.3, 4.4 and 4.5 for the coefficient correlation between variables of different income level groups (appendix 4).

[16] These correlation coefficients are significant at 5% risk level.

Table 1. Business cycle volatility and economic freedom, 1995-2012 general moment method (GMM) estimation

Variable	Total sample (1)		Low Income (2)	Lower middle income (3)		Upper lower income (4)		High income (5)	
	Regression (a)	Regression (b)	Regression (a)	Regression (a)	Regression (b)	Regression (a)	Regression (b)	Regression (a)	Regression (b)
EFI	-0.013** (-2.306)	-0.010** (-1.944)	-0.007 (-0.885)	-0.004 (-0.760)	-0.006 (-1.330)	-0.016 (-1.586)	0.002 (0.297)	-0.006 (-0.607)	-0.020** (-2.685)
FFC	0.098* (1.675)		0.213*** (3.482)	-0.028 (-1.588)		0.284** (2.136)			0.137* (2.210)
CHERR		0.001 (0.150)	-0.004 (-0.685)		0.011** (2.318)		-0.014 (-0.869)	0.035*** (4.601)	
KAOPEN	0.0002 (0.022)	0.004 (0.632)	-0.030** (-2.086)				0.010 (1.391)	-0.024 (-1.443)	0.0003 (0.029)
OPEN	0.017*** (2.860)	0.014*** (2.714)	0.013 (1.566)	0.005 (0.883)	0.011** (2.302)	0.023* (1.902)		0.010 (1.252)	0.021*** (3.315)
SDINF	0.0002 (1.072)		0.0004 (0.960)	0.0007*** (7.047)				-0.0006** (-2.713)	
SDTTG	0.049** (2.276)	0.061*** (3.504)	0.029* (1.777)	0.094*** (4.247)		-0.040 (-0.440)	-0.001 (-0.013)	0.220*** (5.875)	0.204*** (4.294)
J-statistic	0.005	0.010	0.004	0.017	0.020	0.032	0.001	0.070	0.0004
Ajusted - R2	0.102	0.032	0.572	0.566	0.193	0.02	0.069	0.688	0.48
Obs	109	109	23	35	35	36	36	15	15

Estimation is by GMM. T-student is shown in parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

This result is in accordance with the ones of Dawson (2010) and Andrews and Rees (2009) who demonstrated that terms of trade volatility has a significant and positive impact on the volatility of output growth. It is also in accordance with the result of Kose (2002) and Mendoza (1995). Indeed Kose confirmed that the terms of trade shocks can explain almost all of the variance in output in small open developing economies and Mendoza estimated that roughly one-half of the variation in aggregate output in a sample of G7 and 23 developing countries can be attributed to the terms of trade shocks. The coefficient of financial crises frequency is significant and positive (1(a), 2(a), 4(a), 5(b)), as expected.

Looked closely to these coefficients we estimate that an increase of one standard deviation in the volatility of terms of trade and openness leads to an increase by 0.7% and 0.76% in business cycle volatility, respectively.

As it was mentioned earlier, to answer the question if the effect of economic freedom on business cycle differs according to the income group, we estimate equation 1 for four different income level groups.

For the whole sample considered (109 developing countries) economic freedom has a negative and statistically significant effect on business cycle volatility as it was pointed out earlier. However, the estimation findings by income level groups suggest the absence of a significant relationship between these two variables, except in the case of developing high income countries (regression 5b). This finding leaves us to think about the presence of a development threshold from which economic freedom starts to affect volatility. We particularly see that high income group have the highest average degree of economic freedom while the low income countries have the lowest degree of economic freedom (table 2, appendix 2).

Openness (3(b), 4(a) and 5(b)) and terms of trade shocks (2(a), 3(a), 5(a) and 5(b)) preserve their significances in most of the cases and they are more significant in high income group where a fall of one standard deviation in openness and the volatility of terms of trade lead to a decrease in business cycle volatility by 8.75% and 2.22%, respectively.

The coefficient of frequency of financial crises (FFC) is statistically significant and positive in the case of low income group, upper middle income group and high income group, and it is higher in the case of low income group where the frequency of financial crises is the highest. The measure of financial openness (KAOPEN) is statistically significant and negative only in low income group where an increase in KAOPEN score of one standard deviation contributes to a decrease in business cycle volatility by 1%. This conclusion confirms the benefit of financial openness on growth and volatility widely discussed in economic literature.

Volatility of inflation rate increase business cycle volatility in lower middle income group and decrease it in high income group.

5. CONCLUSION

Studies that have examined the relationship between economic freedom and volatility have been relatively thin. Three exceptions are the studies by Lipford (2007), Dawson (2010) and Campbell and Snyder (2012). The purpose of this paper was a careful analysis to examine whether there is in fact a close and robust relationship between economic freedom and business cycle volatility for 109 developing countries in a first step and for different income level groups, in a second step, over the period 1995-2012.

Three main results emerge from this study. First, our findings suggest that economic freedom foster economic stability in developing countries, even after controlling for other determinants of volatility and accounting for possible endogeneity of economic freedom. Yet this effect differs from one income level group to another. In other words, our findings imply that economic freedom is a stabilizing factor in high income countries nevertheless its effect in the other groups is not significant. Second, changes in exchange rate regime stimulate volatility in lower middle income level group and high income level group. Third, financial openness weakens business cycle volatility in low income countries. This result can be considered as an argument to prod these countries to restructuring their financial systems into benefit from international capital.

This result can be considered as an argument to encourage these countries to restructure their financial systems before liberalization to benefit from international capital.

As expected and in concordance with many other studies, an increase in openness, volatility of terms of trade and the frequency of financial crises is associated with an increase in business cycle volatility in developing countries.

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APPENDIX 1

List of developing countries: different income level groups

LOW INCOME	LOWER MIDDLE INCOME	UPPER MIDDLE INCOME	HIGH INCOME
Bangladesh	Armenia	Albania	Bahamas
Benin	Bolivia	Algeria	Bahrain
Burkina-Faso	Cameroon	Angola	Chile
Cambodia	Côte-d'Ivoire	Azerbaijan	Emirates U.A
Chad	Egypt	Belarus	Croatia
Ethiopia	El Salvador	Belize	Equatorial-Guinee
Guinea	Georgia	Bosnia & Herzegovina	Kuwait
Guinea-Bissau	Ghana	Botswana	Latvia
Haiti	Guatemala	Brazil	Lithuania
Kenya	Guyana	Bulgaria	Oman
Madagascar	Honduras	China	Poland
Malawi	India	Colombia	Russia
Mali	Indonesia	Costa-Rica	Saudi A.
Mozambique	Kyrgyz	Dominican R.	Trinidad & Tobago
Nepal	Lao	Ecuador	Uruguay
Niger	Lesotho	Fiji	
Rwanda	Mauritania	Gabon	
Sierra Leone	Moldova	Hungary	
Tajikistan	Mongolia	Jordan	
Tanzania	Morocco	Kazakhstan	
Togo	Nicaragua	Lebanon	
Uganda	Nigeria	Macedonia	
Zimbabwe	Pakistan	Malaysia	
	Paraguay	Malta	
	Philippines	Mauritius	
	Senegal	Mexico	
	Sri Lanka	Namibia	
	Swaziland	Panama	
	Syrian A. R.	Peru	
	Ukraine	Romania	
	Uzbekistan	South Africa	
	Vietnam	Suriname	
	Yemen	Thailand	
	Zambia	Tunisia	
		Turkey	
		Turkmenistan	
		Venezuela	

APPENDIX 2

Table 2. Average of economic freedom index and business cycle volatility

Countries	Economic freedom index*	Business cycle volatility (%)
Low income (N=23)	3.95	3.51
Lower middle income (N=34)	4.00	4.78
Upper middle income (N=37)	4.05	4.69
High income (N=15)	4.16	2.76

***** The average of neperian logarithm of economic freedom index.
N = number of countries.

APPENDIX 3

Table 3.1. Summary statistics (total sample)

	Mean	Median	Maximum	Minimum	Std. Dev.
BCV	0.039	0.028	0.379	0.006	0.042
EFI	4.034	4.054	4.317	3.580	0.136
FFC	0.056	0.056	0.278	0.000	0.071
KAOPEN	0.432	0.293	1.557	0.000	0.327
OPEN	4.294	4.304	5.357	3.058	0.451
SDINF	11.922	4.672	169.075	0.738	21.982
SDTTG	0.196	0.165	1.138	0.068	0.141

Table 3.2. Summary statistics (low income)

	Mean	Median	Maximum	Minimum	Std. Dev.
BCV	0.035	0.024	0.101	0.006	0.027
EFI	3.951	3.954	4.140	3.580	0.120
FFC	0.043	0.000	0.278	0.000	0.078
KAOPEN	0.295	0.177	1.557	0.081	0.332
OPEN	4.098	4.037	5.357	3.235	0.470
SDINF	7.199	5.538	19.103	0.738	4.977
SDTTG	0.286	0.223	1.137	0.073	0.246

Table 3.3. Summary statistics (lower middle income group)

	Mean	Median	Maximum	Minimum	Std. Dev.
BCV	0.028	0.021	0.080	0.009	0.018
EFI	4.016	4.047	4.258	3.768	0.106
FFC	0.066	0.056	0.222	0.000	0.077
KAOPEN	0.434	0.252	0.947	0.000	0.317
OPEN	4.313	4.321	5.005	3.544	0.367
SDINF	11.701	5.417	86.735	1.415	16.933
SDTTG	0.179	0.171	0.382	0.083	0.070

Table 3.4. Summary statistics (upper middle income group)

	Mean	Median	Maximum	Minimum	Std. Dev.
BCV	0.047	0.029	0.378	0.015	0.063
EFI	4.060	4.073	4.254	3.614	0.139
FFC	0.067	0.055	0.222	0,000	0.065
KAOPEN	0.421	0.347	1,000	0.036	0.280
OPEN	4.350	4.446	5.292	3.058	0.498
SDINF	17.144	4.408	169.075	1.105	33.223
SDTTG	0.160	0.143	0.433	0.068	0.072

Table 3.5. Summary statistics (high income group)

	Mean	Median	Maximum	Minimum	Std. Dev.
BCV	0.051	0.052	0.134	0.020	0.031
EFI	4.164	4.195	4.335	3.889	0.132
FFC	0.038	0.000	0.167	0.000	0.057
KAOPEN	0.676	0.746	1.000	0.014	0.343
OPEN	4.456	4.547	5.072	3.640	0.417
SDINF	7.791	4.008	46.057	0.921	11.900
SDTTG	0.179	0.164	0.441	0.090	0.101

APPENDIX 4

Table 4.1. Correlation coefficients (total sample)

	BCV	CHERR	CRISES	EFI	KAOPEN	OPEN	SDINF	SDTTG
BCV	1,000							
CRC	-0,030	1,000						
CRISES	0,211**	0,358***	1,000					
EFI	-0,201**	-0,141	-0,278	1,000				
KAOPEN	-0,052	0,087	0,133	0,500***	1,000			
OPEN	0,189**	0,063	-0,089	0,116	0,057	1,000		
SDINF	0,222**	0,227**	0,176*	-0,302***	-0,140	0,048	1,000	
SDTTG	0,193**	0,012	0,122	-0,280***	-0,072	0,104	-0,039	1,000

***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

Table 4.2. Correlation coefficients (low income economies)

	BCV	CHERR	CRISES	EFI	KAOPEN	OPEN	SDINF	SDTTG
BCV	1.000							
CHERR	-0.052	1.000						
CRISES	0.564***	0.164	1.000					
EFI	-0.720***	-0.064	-0.705***	1.000				
KAOPEN	-0.188	0.282	0.434**	0.158	1.000			
OPEN	0.273*	0.305	-0.047	-0.028	-0.145	1.000		
SDINF	0.113	0.093	0.080	0.045	-0.005	-0.151	1.000	
SDTTG	0.595***	-0.088	0.369*	-0.352*	-0.052	0.222	0.078	1.000

***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

Table 4.3. Correlation coefficients (lower middle income economies)

	BCV	CHERR	CRISES	EFI	KAOPEN	OPEN	SDINF	SDTTG
BCV	1							
CHERR	0.386**	1						
CRISES	0.023	0.307*	1,000					
EFI	-0.062	0.105	0.058	1,000				
KAOPEN	0.013	0.148	0.120	0.573***	1,000			
OPEN	0.422**	0.354**	0.104	-0.011	-0.210	1,000		
SDINF	0,677***	0.362**	0.129	-0.259	-0.037	0.304*	1,000	
SDTTG	0.401**	0.416**	0.073	-0.183	-0.045	0.303*	-0.009	1

***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

Table 4.4. Correlation coefficients (lower middle income economies)

	BCV	CHERR	CRISES	EFI	KAOPEN	OPEN	SDINF	SDTTG
BCV	1.000							
CHERR	-0.156	1.000						
CRISES	0.271	0.494***	1.000					
EFI	-0.262	-0.332*	-0.397*	1.000				
KAOPEN	-0.124	-0.144	-0.094	0.483***	1.000			
OPEN	0.088	-0.147	-0.206	0.033	0.248	1.000		
SDINF	0.180	0.208	0.190	-0.503***	-0.292*	0.003	1.000	
SDTTG	0.007	-0.071	0.039	-0.023	0.268	0.161	0.022	1.000

***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

Table 4.5. Correlation coefficients (high income economies)

	BCV	CHERR	CRISES	EFI	KAOPEN	OPEN	SDINF	SDTTG
BCV	1.000							
CHERR	0.281	1.000						
CRISES	0.064	0.564**	1.000					
EFI	-0.514*	-0.024	-0.275	1.000				
KAOPEN	-0.101	0.286	0.133	0.529*	1.000			
OPEN	0.377	-0.229	-0.575**	0.065	-0.083	1.000		
SDINF	0.052	0.499*	0.483*	-0.466	-0.169	-0.444	1.000	
SDTTG	0.774***	-0.123	-0.094	-0.311	-0.101	0.374	-0.013	1.000

***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

L'EFFET DE LA LIBERTÉ ÉCONOMIQUE SUR LA VOLATILITÉ DES CYCLES DANS LES PAYS EN DÉVELOPPEMENT

Résumé - *Très peu d'études ont étudié l'effet de la liberté économique sur la volatilité des cycles économiques. L'objectif de cet article est de vérifier si ce lien existe en considérant 109 pays en développement sur la période 1995-2012. En utilisant la méthode des moments généralisés (GMM), nous montrons que de manière générale les pays qui disposent d'une plus grande liberté économique connaissent des cycles moins volatils. Toutefois, ce résultat n'est pas vérifié dans tous les cas si l'on envisage des groupes de pays particuliers selon leur niveau de revenu.*

Mots-clés - LIBERTÉ ÉCONOMIQUE, PAYS EN DÉVELOPPEMENT, VOLATILITÉ DES CYCLES ÉCONOMIQUES