A Sensitivity Analysis on the Economic Vulnerability-Growth Nexus: Theory and Practice

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A Sensitivity Analysis on the Economic Vulnerability-Growth Nexus: Theory and Practice*

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Abstract

This paper performs a sensitivity analysis of the effects of the Economic Vulnerability Index (EVI) on economic growth both theoretically and empirically. The first part uses Continuous Time Stochastic Optimal Control techniques to build a stochastic endogenous growthmodel which illustrates that an increase in Economic Vulnerability reduces the growth rate in the Economy. The second part employs the new Dynamic Common Correlated Effects Estimator for Heterogeneous Cross-Sectionally Dependent Dynamic Panels Data to empirically undertake the sensitivity analysis of the impacts of the Economic Vulnerability Index on growth. To this end, we build many Economic Vulnerability Indices by changing how its components enter its definition according to a wide range of possible scenarios.

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Keywords: Dynamic Common Correlated Effects Estimator; Heterogeneous Panels; Endogenous Growth Theory; Stochastic Optimal. Control; Economic Vulnerability Index.

JEL classification: C61, C63, O41, O47, O50.

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Abstract

[...]

Then we utilize the Dynamic Common Cor-related Effects Estimator for Heterogeneous Cross-Sectionally Dependent Dynamic Panels Data to estimate various econometric models. The advantages of this econometric technique, compared to the literature, is that it takes into account the heterogeneity of the countries while being at the same time a dynamic panel data method. The empirical results corroborate the theoretical predictions that Economic Vulnerability acts negatively on economic growth in all of the scenarios. The negative impact of Economic Vulnerability on growth is maintained when we utilize subsamples of Least Developed Countries (LDCs) and Non Least Developed Countries, and other robustness checks.

1 Introduction

The Economic Vulnerability Index (EVI) is one of the measurements utilized by the United Nations Committee for Development Policy (UN CDP) for the classification of the Least Developed Countries (LDCs). Recently, the United Nations General Assembly have also called its development associates to think through the EVI in their benchmarks for allocating official development assistance. The LDCs are low-income countries that have the smallest social and economic standards of development. Guillaumont (2009b, 2015) defines Economic Vulnerability as the likelihood that the economic development of a nation state could be hindered by unanticipated exogenous shocks.

Guillaumont (2009a) appeals to make the difference between Economic Vulnerability and three other concepts: weakness following a financial crisis, like the Asian financial crisis in some emerging countries in the 1990s, state fragility and ecological fragility. The first thing to notice is that structural vulnerability depends on exogenous factors unrelated to the present policy adopted by an economy. A Financial crisis, like the Asian financial crisis is, generally, the outcome of policy choices and is, in most cases, transitory. Second, state fragility is characterized following policy indicators, mainly from the country policy and institutional assessment (CPIA) of the World Bank. The nations with a small policy score from this indicator and others are classified as fragile states. Hence, fragile states are defined based on policy factors while economic vulnerability is defined based on structural factors. Third, we should make a distinction between economic vulnerability and ecological fragility. The dissimilarity between the two concepts is that, for example, biodiversity losses are ingredients of ecological fragility than components of economic vulnerability. The similarity between the two notions is that economic vulnerability caused by environmental factors can be well thought-out as either as ecological vulnerability or economic vulnerability.

Following Guillaumont (2006, 2009a,b), we will concisely assess the motives demonstrating why economic vulnerability is harmful to growth. We will analyze these issues according to the three constituents of economic vulnerability: shocks, exposure and resilience.

In the literature of economic vulnerability, there are two types of shocks: one sided shocks and two-sided shocks. One sided shocks are, generally, natural shocks such as floods, typhoons and earthquakes. The losses engendered by this this kind of shocks, in terms of capital and deaths, are gigantic. This in turn results in the drop of the growth rate and hinders the development of the affected country. Two-sided shocks are, generally, the results of instability (volatility). This

second kind of shocks have the most damaging impact on growth and development over the long-run because they are the outcome of continuous booms and slumps of many variables at the same time: rainfall, external demand, prices, exports, etc. To this end, in studying economic vulnerability in the long-term, it is more suitable to examine the effect of instability (volatility) than analyzing the effect of separate shocks. The impact of instability (successive up-and-down fluctuations) is not harmless in the long-run. The consequences of volatility could be either the uncertainty created by preceding fluctuations or the asymmetric reaction to negative and positive shocks ex-post. Not all volatilities are part of economic vulnerability. For instance, growth volatility as studied by Ramey and Ramey (1995) cannot be considered as an element of vulnerability because its depends on structural as well as policy factors. Only structural volatility factors are included in the EVI. The included volatilities (instabilities) are generally the structural volatility variables and are named primary instabilities: the instability of the terms of trade, the instability of the real value of exports and the instability of the agricultural value added. These instabilities (volatilities) are mainly exogenous. Guillaumont, Guillaumont Jeanneney, and Brun (1999) show that these primary instabilities have a negative and significant effect on the growth rates of African countries. Guillaumont, Guillaumont Jeanneney, and Brun (1999) demonstrate that the effects of primary instabilities have a bigger effect on the rate of variation of total factor productivity than on the level of investment. The transmission channels of the primary instabilities to growth are through the intermediate economic instabilities (instability of investment and instability of relative prices). The intermediate instabilities have a negative impact on growth and are linked to economic policy which is enfeebled by this mean by structural vulnerability. This chain of causal implications underlined by Guillaumont, Guillaumont Jeanneney, and Brun (1999) is something that we will employ in the building process of our theoretical model below.

The effect of the shocks is function of the exposure to these shocks. The most common measurement of exposure is the country size, like its smallness. The smaller a country is, the more it could be exposed to shocks. How can we define smallness? In some situations, like the case of natural shocks, the geographic size of a country, like its geographic smallness, could be considered as a measure of the exposure to shocks. But for defining a measurement of exposure of a country to shocks independent from its income per capita, the better measure of exposure is the number of its population. There are three major channels through which smallness affects exposure: trade inten-

sity, government size and social cohesion. Firstly, the export to GDP ratio is a good measure of trade intensity and exposure to external shocks. All other things being equal, the smaller the population of an economy is, the higher the export to GDP ratio and the more dependent the country is. The greater the ratio of exports to GDP, the larger is the effect of a drop of exports in the economy. Secondly, by its effect on government size, smallness is viewed as a factor of lower economic growth. In fact, Alesina and Spolaore (2004) empirically find that there is a negative association between population size and the relative size of the government. Thirdly, social cohesion could be a mean through which population size affects vulnerability and growth. Smallness might be a factor of higher social cohesion through lower religious and ethnolinguistic fragmentation. However, numerous empirical studies illustrate that when adequate control variables are employed, the logarithm of population size have a positive and significant impact on growth Guillaumont and Chauvet (2001); Bosworth and Collins (2003); Alesina and Spolaore (2004). The reason that smallness diminishes growth might be caused either by diseconomies of scale or higher vulnerability or their joint impact.

Resilience is the capacity of a country to respond to shocks. Resilience relies more on present policy, is less structural and is easily inverted. But it is important to underline that there might exist a structural part in the resilience constituent of vulnerability.

Similar to the works cited above, this paper examines the connection between Economic Vulnerability and economic growth. Specifically, it makes several contributions. On the theoretical side, this paper is the first to introduce a fully-micro-founded endogenous economic growth model that illustrates the explicit effect of Economic Vulnerability on long-run growth in a stochastic optimal control in continuous time framework. On the empirical side, the paper has many innovations. First, we use the new database on the Economic Vulnerability Index (EVI) created by Feindouno and Goujon (2016), and updated in 2020, to empirically capture the notion of *Economic Vulnerability*. Second, since we are dealing with annual long-run panels data for the Economic Vulnerability Index (EVI), we employ the new Dynamic Common Correlated Effects Estimator for Heterogeneous Cross-Sectionally Dependent Dynamic Panels Data to empirically undertake the sensitivity analysis of the impacts of the Economic Vulnerability Index on growth. To this end, we build many Economic Vulnerability Indices by changing how its components enter its definition according to a wide range of possible scenarios. Then we utilize the Dynamic Common Correlated Effects Estimator for Heterogeneous Cross-Sectionally Dependent Dynamic Panels Data to estimate various econometric models. This the-

oretical model, this updated data, this econometric technique and the numerous EVI measurements have not been used in previous studies. The theoretical endogenous growth model demonstrates that Economic Vulnerability decreases economic growth. The econometric results confirm the theoretical previsions that Economic Vulnerability affects growth negatively. This result remains unchanged when we perform various robustness checks including: subsamples of Least Developed Countries (LDCs) and Non Least Developed Countries, the use of small sample bias corrections and sensitivity to the choice of lag orders.

The remaining of the paper is organized in the following manner: the first section presents the theoretical model, the second section exposes the empirical investigations and the last part concludes.

2 Theoretical Model

In this section, we expose the theoretical model and illustrate how the main equations are obtained.

2.1 Model Specification

Our model is a fully-micro-founded continuous time stochastic endogenous growth model. The model presumes identical individuals, meaning that they have similar preference parameters. Therefore, we can employ the representative-agent hypothesis within which the analysis is done from the decisions of one agent. The agent picks out a consumption path that maximizes the expected value of the present value of his lifetime utility function[1] subject to a dynamic constraint and the initial value of income. His optimization program is given by:

$$\underset{c(t)}{\text{Max}}\ \mathbb{E}_0\left(\int_0^{\infty} \frac{e^{\rho(-t)}c(t)^{\gamma}}{\gamma}\,dt\right) \tag{1}$$

Subject to:

$$dy(t) = A\left(\frac{y(t)(A-\delta+\mu)}{A} - c(t)\right)dt + \sigma y(t)dw(t) \tag{2}$$

And

$$y(0) = y_0 \text{ is given}$$

In equation (1), $c(t)$ is consumption, $\frac{1}{1-\gamma}$ measures the constant intertemporal elasticity of substitution in consumption, ρ represents the subjective rate of time preference and $\mathbb{E}_0(\cdot)$ is the Expectations Operator. We have $\rho > 0$ and $0 < \gamma < 1$. The functional form of the felicity function has also been considered by Kamien and Schwartz (1991), and Boucekkine, Pintus, and Zou (2018). Equality (2) gives the law of motion of income or output or production. It is an Ito stochastic differential equation (SDE) process. In this equation, A is total factor productivity, $y(t)$ is income or output or production, δ is the depreciation rate, μ is a parameter that measures the intensity of Economic Vulnerability, σ is the volatility or instability of income, t designates time and $w(t)$ is a Wiener Process. The last expression says that initial income, y_0, is given. In equation (2), we assume the following conditions on the parameters: $A > 0$, $0 < \delta < 1$, $-\infty < \mu < 0$ and $0 \leq \sigma \leq 1$. In (2), the drift term, generally, says that the rate of variation of income increases through an augmentation of overall production minus consumption. The diffusion term, demonstrates that the rate of variation of income is reduced by

[1] The agent lives forever.

instability caused by Economic Vulnerability. Here Economic Vulnerability is modeled as an unfortunate random outcome that negatively affects income. This negative effect is modeled through two channels. The first one is through the drift term and the second one is through the diffusion term of the Ito stochastic differential equation (SDE) process. Remember that we said in the Introduction that Guillaumont, Guillaumont Jeanneney, and Brun (1999) demonstrate that the effects of primary instabilities have a bigger effect on the rate of variation of total factor productivity than on the level of investment. Firstly, this phenomenon is captured in our theoretical model by the value of the parameter μ in the drift term of the SDE process. Since this parameter is negative, Economic Vulnerability reduces the level of total factor productivity A. This in turn diminishes the overall level of production, which in turn decreases the rate of change of output. Secondly, given that Economic Vulnerability makes that we have an instability of many variables in the economy (the instability of the terms of trade, the instability of the real value of exports and the instability of the agricultural value added), the aggregated and combined impacts of these variables continuously exert fluctuations in the rate of change of output. This is captured by the diffusion term of the SDE process because it is modeled as a Wiener Process which is a continuous-time and continuous-state random process. Indeed, a Wiener Process $w(\mu, \sigma)$ with drift μ and diffusion σ has its state at time t following $\mathcal{N}\left(\mu t, \sigma\sqrt{t}\right)$.

The Stochastic Hamilton-Jacobi-Bellman (SHJB) equation for our model is:

$$\rho V(y(t)) = \underset{c(t)}{\text{Max}} \left(AV'(y(t)) \left(\frac{y(t)(A - \delta + \mu)}{A} - c(t) \right) + \frac{c(t)^{\gamma}}{\gamma} + \frac{1}{2}\sigma^2 y(t)^2 V''(y(t)) \right) \tag{3}$$

In this last equation, $V(y(t))$ is the Value Function of Bellman. The other variables and parameters are defined as above.

2.2 Economic Equilibrium

Taking the first order conditions of equation (3), we get:

$$c(t) = (AV'(y(t)))^{\frac{1}{\gamma-1}} \tag{4}$$

Replacing this expression in equality (3) and simplifying, we obtain:

$$\frac{2(\gamma - 1)A^{\frac{\gamma}{\gamma-1}} V'(y(t))^{\frac{\gamma}{\gamma-1}}}{\gamma} + 2\rho V(y(t)) = y(t)\left(2(A - \delta + \mu)V'(y(t)) + \sigma^2 y(t) V''(y(t))\right) \tag{5}$$

As in Boucekkine, Pintus, and Zou (2018), we will choose this functional form for our guess of the solution of the previous equation.

$$V(y(t)) = \frac{\Omega^{1-\gamma} y(t)^{\gamma}}{\gamma} \tag{6}$$

Substituting this function in equality (5) and doing lots of algebra and simplifications, we find:

$$\Omega = \frac{2(\gamma - 1)A^{\frac{\gamma}{\gamma-1}}}{2\gamma(A - \delta + \mu) + (\gamma - 1)\gamma\sigma^2 - 2\rho} \tag{7}$$

With this value of Ω, we can find consumption in terms of $y(t)$:

$$c(y(t)) = \frac{A^{\frac{1}{\gamma-1}} y(t)}{\Omega} \tag{8}$$

The quantities in the expressions (2), (6), (7) and (8) allows us to find the equations of interest in our study after many tedious algebra, stochastic calculus, substitutions and simplifications. Hence, the Ito process stochastic differential equation (SDE) for income or output or production is given by:

$$dy(t) = \frac{y(t)\left(\Omega(A - \delta + \mu) - A^{\frac{\gamma}{\gamma-1}}\right)}{\Omega} dt + \sigma y(t) dw(t) \tag{9}$$

where $y(0) = y_0$. Equation (9) gives us the expression for the growth rate in our economy. From this equality, we see that the growth rate is function of only the parameters of the model, time and the Wiener process. Hence the growth rate is endogenous in the sense that it is engendered from inside the system as a direct outcome of internal mechanisms. It changes as time varies and it is stochastic. Similarly, the Ito process for consumption is:

$$dc(t) = \frac{c(t)\left(\Omega(A - \delta + \mu) - A^{\frac{\gamma}{\gamma-1}}\right)}{\Omega} dt + \sigma c(t) dw(t) \tag{10}$$

where $c(0) = \frac{y_0 A^{\frac{1}{\gamma-1}}}{\Omega}$. By the same token, the equation for the Value Function is provided by:

$$dV(t) = \frac{\gamma V(t)\left(-2A^{\frac{\gamma}{\gamma-1}} + 2\Omega(A - \delta + \mu) + (\gamma - 1)\sigma^2\Omega\right)}{2\Omega} dt + \gamma\sigma V(t) dw(t) \tag{11}$$

where $V(0) = \frac{\Omega^{1-\gamma} y_0^{\gamma}}{\gamma}$. By the same calculations, we can find the expressions for the mean of the growth rate, the variance of the growth rate and the transversality condition respectively:

$$y_0 e^{t\left(-\frac{A^{\frac{\gamma}{\gamma-1}}}{\Omega} + A - \delta + \mu\right)} \tag{12}$$

$$y_0^2\left(e^{\sigma^2 t}-1\right)e^{2t\left(-\frac{A^{\frac{\gamma}{\gamma-1}}}{\Omega}+A-\delta+\mu\right)} \tag{13}$$

$$\mathbb{E}\left(e^{\rho(-t)}V(y(t))\right)=\frac{\Omega^{1-\gamma}y_0^{\gamma}\exp\left(\frac{1}{2}t\left(-\frac{2\gamma A^{\frac{\gamma}{\gamma-1}}}{\Omega}+2\gamma(A-\delta+\mu)+(\gamma-1)\gamma\sigma^2-2\rho\right)\right)}{\gamma} \tag{14}$$

We will study these last three expressions in more details in the subsequent section below by using numerical methods.

2.3 Numerical Simulations

In order to perform the numerical experiments, we first calibrate the parameters. We take these parameters mostly from the literature. $\rho = 0.02$ is from Barro and Sala-i Martin (2004). $\delta = 0.10$ is from Levy (1995). $A = 1$ and $y_0 = 2$ are normalizations. $\gamma = \frac{1}{3}$ is computed from the survey of Thimme (2017). We set the volatility or instability of income to $\sigma = 0.75$ because income is highly volatile in periods of intense Economic Vulnerability as typically is the case in most developing countries. The Economic Vulnerability parameter μ is set to -0.95 because, as indicated above, high Economic Vulnerability negatively and drastically affects total factor productivity, which in turn reduces economic growth.

From these calibrated values of the parameters and variables, we numerically checked that the transversality condition for our model is verified and satisfied. That is:

$$\begin{aligned}\lim_{t\to\infty}\mathbb{E}(V(y(t),t)) &= \lim_{t\to\infty}\mathbb{E}\left(e^{\rho(-t)}V(y(t))\right)\\ &= \lim_{t\to\infty}\frac{\Omega^{1-\gamma}y_0^{\gamma}\exp\left(\frac{1}{2}t\left(-\frac{2\gamma A^{\frac{\gamma}{\gamma-1}}}{\Omega}+2\gamma(A-\delta+\mu)+(\gamma-1)\gamma\sigma^2-2\rho\right)\right)}{\gamma}\\ &= 0\end{aligned} \tag{15}$$

Figure 1 provides the evolution of income or output or production (equation (9)) through time. We simulate 2 realizations of the trajectories for convenience. We observe that output is falling during periods of Economic Vulnerability. This happens because Economic Vulnerability reduces total factor productivity which in turn makes output to fall. Also, since Economic Vulnerability makes that we have a volatility of many variables, this makes that their combined effects cause income to fluctuate. All these factors cause output to plunge. This also happens because mean production is diminishing and its variance (uncertainty) is augmenting as illustrated in figure 2.

Figure 3 provides the evolution of consumption (equation (10)) through time. As previously, we simulate 2 realizations of the trajectories. We observe that consumption is falling during periods of Economic Vulnerability. This happen because consumption is a positive linear function of output as depicted by equation (8). Since when there is Economic Vulnerability output is falling, this implies that consumption is also decreasing in this period.

The Value Function is, to some extent, related to the Welfare of the agent in our model since it represents the choice of the agent of a consumption path that maximizes the expected value of the present value of his lifetime utility function. Figure 4 gives the evolution of the Value Function (equation (11)) through time. As before, we simulate 2 realizations of the trajectories. Here also we perceive that the Value Function is decreasing. This is an indication that when there is Economic Vulnerability, the Welfare of the citizens in the country is, to a certain degree, deteriorating.

3 Empirical Investigations

This section presents the estimation methods, the data and variables, and the econometric results.

3.1 Estimation Methods

To empirically analyze the effects of the Economic Vulnerability Indices (EVIs) on growth, we estimate the following econometric model:

$$\ln\left(gdpcap_{i,t}\right) - \ln\left(gdpcap_{i,t-1}\right) = c_i + \phi_i \ln\left(gdpcap_{i,t-1}\right) + \alpha_i EVIs_{i,t} + \boldsymbol{\beta}_i' \boldsymbol{x}_{i,t} + \sum_{l=0}^{p_T} \boldsymbol{\delta}_{i,l}' \bar{\boldsymbol{z}}_{t-l} + e_{i,t} \qquad (16)$$

Where $\ln\left(gdpcap_{i,t}\right)$ is the logarithm of real GDP per capita; $\ln\left(gdpcap_{i,t-1}\right)$ pinpoints the lagged value of the logarithm of real GDP per capita; $\ln\left(gdpcap_{i,t}\right) - \ln\left(gdpcap_{i,t-1}\right)$ expresses the growth rate of real GDP per capita; $EVIs_{i,t}$ are the various Economic Vulnerability Indices (EVIs) we are using for our sensitivity analysis; $\boldsymbol{x}_{i,t}$ illustrates a vector of control variables: the lagged value of the human capital index, logarithm of general government final consumption expenditures over GDP, logarithm of openness (exports + imports over GDP), logarithm of terms of trade (exports prices over imports prices), lagged logarithm of fertility rate, logarithm of domestic credit to private sector over GDP (financial development), lagged reciprocal of life expectancy, logarithm of 1 + the inflation rate, logarithm of investment over GDP; $\bar{\boldsymbol{z}}_{t-l}$ indicates the cross-sectional (CS) averages of the dependent

and all the independent variables; p_T designates the number of lags of the cross sectional averages; $e_{i,t}$ is the error term; i specifies the countries and t the time; all parameters are heterogeneous and the coefficients of interest are ϕ_i, α_i and $\boldsymbol{\beta}_i'$.

To estimate equation (16) we employ the Dynamic Common Correlated Effects Estimator developed by Chudik and Pesaran (2015a). They demonstrates that the model is consistently estimated if $\sqrt[3]{T}$ lags of the cross section averages are augmented. Following Chudik and Pesaran (2015a), Ditzen (2018), and setting $\boldsymbol{\pi}_i = (\phi_i, \alpha_i, \boldsymbol{\beta}_i')'$, the mean group coefficients are obtained according to the following formula:

$$\hat{\boldsymbol{\pi}}_{\mathrm{MG}} = \frac{\sum_{i=1}^{\mathrm{N}} \hat{\boldsymbol{\pi}}_i}{\mathrm{N}} \tag{17}$$

When N, T and p_T tend towards infinity and under full rank of the factor loadings, all the sets of parameters in (17) are reliably computed with a rate of convergence of $\sqrt{\mathrm{N}}$. The asymptotic distribution of the mean group coefficients and the nonparametric consistent asymptotic variance-covariance matrix are calculated according to:

$$\sqrt{\mathrm{N}}\left(\hat{\boldsymbol{\pi}}_{\mathrm{MG}} - \boldsymbol{\pi}\right) \xrightarrow{d} \mathcal{N}\left(\mathbf{0}, \boldsymbol{\Sigma}_{\mathrm{MG}}\right) \tag{18}$$

$$\hat{\boldsymbol{\Sigma}}_{\mathrm{MG}} = \frac{\sum_{i=1}^{\mathrm{N}} \left(\hat{\boldsymbol{\pi}}_i - \hat{\boldsymbol{\pi}}_{\mathrm{MG}}\right)\left(\hat{\boldsymbol{\pi}}_i - \hat{\boldsymbol{\pi}}_{\mathrm{MG}}\right)'}{\mathrm{N}-1} \tag{19}$$

To correct for small sample time series biases, Chudik and Pesaran (2015a) employ the Recursive Mean Adjustment method. The Recursive Mean Adjustment procedure is provided by:

$$\tilde{\boldsymbol{\omega}}_{\mathrm{it}} = \boldsymbol{\omega}_{\mathrm{it}} - \frac{\sum_{s=1}^{t-1} \boldsymbol{\omega}_{\mathrm{is}}}{t-1} \tag{20}$$

In this equality $\boldsymbol{\omega}_{\mathrm{it}} = \left(\ln\left(gdpcap_{i,t}\right) - \ln\left(gdpcap_{i,t-1}\right), \ln\left(gdpcap_{i,t-1}\right), EVIs_{i,t}, \boldsymbol{x}_{i,t}'\right)'$. In our regression tables we also include the test for cross sectional dependence devised by Chudik and Pesaran (2015b) and Pesaran (2015). The decision of the test is that the error terms are weakly cross sectional dependent in the null hypothesis.

The Dynamic Common Correlated Effects Estimator developed by Chudik and Pesaran (2015a) takes into account the panel time series nature of the data, parameter heterogeneity, cross-section dependence and dynamics. Since our data are annual data from 1990 to 2018, we are dealing with panel time series (large N, large T). Micro-panel techniques such as fixed effects and panel data

GMM designed for large N and small T are inappropriate for our current study. The impacts of the Economic Vulnerability Indices (EVIs) on growth might be different across countries according to their institutions and particularities. This, because countries might not have the same distribution of the components of the Economic Vulnerability Indices (EVIs). For instance, in some economies, the instability of exports could not be a major problem but population size might represent an issue, and, in some other countries, the exposure index could be a problem but not the economic structure index, etc. It is thus crucial to consider heterogeneities in countries. As pointed out by Chudik, Mohaddes, Pesaran, and Raissi (2013), conditioning only on country-specific-variables does not guaranty cross-sectional error independence because there could be omitted common factors, probably associated with the independent variables, which affect these countries. Not considering these linkages could result to biased estimated coefficients. In equation (16), we have the lagged value of the logarithm of real GDP per capita on the right-hand side. This makes of our equation dynamic. Hence, we must think about the dynamics of the regressed equations. The Dynamic Common Correlated Effects Estimator addresses all the issues raised previously and allows us to consistently estimate the effects of the Economic Vulnerability Indices on economic growth. These are the reasons why we use this estimator in this paper.

For the methods of doing the sensitivity analysis we could utilize the following techniques: Bayesian Model Averaging of Classical Estimates (BACE), Leamer's Extreme Bounds Analysis and Machine Learning. But all these previously cited methods are developed for cross-sectional data. Currently, none of these techniques is developed for panel data, even less so for Heterogeneous Cross-Sectionally Dependent Dynamic Panels Data. Consequently, to avoid introducing biases in our estimates, we opted for a more traditional approach. That is, we use the Dynamic Common Correlated Effects Estimator for Heterogeneous Cross-Sectionally Dependent Dynamic Panels Data to estimate various econometric models by varying the control variables we introduce for each of the 13 Economic Vulnerability Indices (EVIs) measurements.

3.2 Data and Variables

The Economic Vulnerability Indices (EVIs) data used in this study are created by Feindouno and Goujon (2016) at the FERDI (Fondation pour les Études et Recherches sur le Développement International). The Economic Vulnerability Index (EVI) is a blended quantitative measurement. In the EVI com-

puted by the United Nations Committee for Development Policy (UN CDP), each component of the EVI enters in the definition of the EVI with a specific weight defined by the UN CDP. All the elementary components are regularized according to a min-max technique to obtain measurements that vary between 0 and 100. This implies that the composite EVI also varies between 0 and 100. The components of the EVI are defined in clusters in a nested structure style. In the following, we are going to list this nesting procedure and indicate in parenthesis, the default weight used by the UN CDP to define the EVI. The EVI is comprised of two main clusters: the exposure index (0.5) and the shock index (0.5). The shock index contains the natural shock index (0.5) and the instability of exports index (0.5). The natural shock index is composed of the disasters index (0.5) and the instability of agriculture index (0.5). The exposure index contains the population size index (0.25), the remoteness index (0.25), the share of population living in low elevated coastal zone (LECZ) index (0.25) and the economic structure index (0.25). The economic structure index is comprised of the concentration index (0.5) and the share of agriculture index (0.5). The EVI with the previously defined weights is named in our estimations as EVI UNCDP. All the other remaining EVIs are derived from this one by adding 0.25 to the weight of each of the elementary subcomponents of the EVI defined above, one at a time. For example: if we increase the weight of the concentration index by 0.25, that is from 0.5 to 0.5 + 0.25 = 0.75, and re-compute all the other weights, to make 1 in total, we name the resulting EVI, *EVI Concentration Index* 75%. We repeat this procedure for each elementary subcomponent of the EVI definition. Hence, in the end, we get 13 EVIs in total that we use in our econometric sensitivity analysis. This dataset captures the notion of Economic Vulnerability that we theorized earlier because it encompasses all these elementary subcomponents. See Feindouno and Goujon (2016) for more additional details on how the EVI is calculated. Their paper gives additional technical details including the actual formulae employed to calculate the EVI.

The sample of study contains 57 developing countries with annual data from 1990 to 2018. The choice of the sample is based on the availability of data, the choice of the variables of the study and because the Economic Vulnerability Indices (EVIs) are available only for developing countries. The data essentially come from the World Bank (World Development Indicators, 2020); the Fondation pour les Études et Recherches sur le Développement International (FERDI, 2020). That is Feindouno and Goujon (2016), updated in 2020; and the Penn World Tables 9.1.

3.3 Econometric Results

In this part, we will present the main estimation results and the robustness analysis.

3.3.1 Main Estimation Results

Table 1 gives the estimation results of the relationship between the Economic Vulnerability Index (EVI) and growth using the Dynamic Common Correlated Effects (CCE) Estimator for all Countries. This table uses the EVI based on the UN CDP weights (EVI UN CDP). In this table, the coefficient of the lagged real GDP per capita is significant and negative in all regressions. The negative coefficient indicates conditional convergence with respect to real GDP per capita. This convergence is conditional in that it concludes that the growth rate of real GDP per capita is bigger the lagged real GDP per capita is small, only if the other regressors are kept constant. The coefficient indicates that conditional convergence is very high because it is carried out at a rate of 109.4% per year[2]. All five equations show that the EVI UN CDP is statistically significant at all conventional levels and have the expected sign. This implies that an augmentation of the EVI UNCDP decreases the growth rate. The above-mentioned results, empirically corroborate what we have found in the theoretical part. Specifically, this means that Economic Vulnerability reduces total factor productivity which in turn makes output to fall. Also, since Economic Vulnerability makes that we have a volatility of many variables, this makes that their combined effects cause income to fluctuate. All these factors cause output to plunge. Our findings illustrate that, the negative effect of the EVI UN CDP on growth is robust to the introduction of different control variables. In fact, through the five equations we have varied the introduction of the control variables but the coefficient of the EVI UNCDP retains its expected sign and is always statistically significant. Hence, this table demonstrate that the EVI UN CDP is robust. The magnitude of the effect of the EVI UN CDP on growth is very high. Referring to regression (5), a rise in the EVI UN CDP by 1 unit decreases the growth rate by 1.054 units. This is a very high value, suggesting that the EVI UNCDP has a huge diminishing impact on growth. This result validates what we have found in the theoretical portion in our Numerical Simulations (subsection 2.3). In fact, this outcome suggests that Economic Vulnerability must have a huge negative impact on growth. Something that is neglected in most developing countries and in International development organizations. Since the EVI is an exogenous variable, it is possible to say that the negative relationship

[2]From equation (4).

between the EVI UN CDP and economic growth seems to go from the EVI UN CDP towards growth and not the reverse. We observe that the standard errors of the coefficients of the EVI UNCDP are relatively small. This implies that the corresponding confidence intervals, though not reported, are tinier meaning that the coefficients of the EVI UNCDP are estimated with great precision. The CD Statistic and its p-value that test for cross sectional dependence, show that we do not reject the null hypothesis which states that the error terms are weakly cross sectional dependent in all estimations. Human capital and investment act positively on growth while government consumption has a negative impact on growth. These outcomes were found by many empirical growth studies.

Table 2 provides the estimation results of the relationship between the EVI Concentration Index 75% and growth using the Dynamic Common Correlated Effects (CCE) Estimator for all Countries. This table uses the EVI based on the EVI Concentration Index 75%. That is, we increase the weight of the concentration index in the computation of the EVI by 0.25 to obtain 0.5 + 0.25 = 0.75 = 75%. The results show that we have conditional convergence in all the regressions. We see that the EVI Concentration Index 75% has a negative and statistically significant impact on growth in all the 5 regressions. The magnitude of the coefficients of the EVI Concentration Index 75% is very high. Referring to equation 4, a rise in the EVI Concentration Index 75% by 1 unit, reduces the growth rate by 1.072 units. Since the EVI is an exogenous variable, it is possible to say that the negative relationship between the EVI Concentration Index 75% and economic growth seems to go from the EVI Concentration Index 75% towards growth and not the reverse. For our sensitivity analysis, our findings illustrate that, the negative effect of the EVI Concentration Index 75% on growth is robust to the introduction of different control variables. In fact, through the five equations we have varied the introduction of the control variables but the coefficient of the EVI Concentration Index 75% retains its expected sign and is always statistically significant. Hence, like the previous results, this table also demonstrate that the EVI Concentration Index 75% is robust. The CD Statistic and its p-value that test for cross sectional dependence, show that we do not reject the null hypothesis which states that the error terms are weakly cross sectional dependent in all estimations. Government consumption has a negative effect on growth while human capital acts positively on growth.

In the following, we repeat the same procedure we did in Table 2 for the EVI Concentration Index 75% by estimating 5 relevant equations by changing the included control variables for each of the remaining 11 EVI measurements. That is, we do the estimations for the following EVI measures: EVI

Share Agriculture Index 75% (Table 3); EVI Population Size 50% (Table 4); EVI Remoteness Index 50% (Table 5); EVI LECZ Index 50% (Table 6); EVI Economic Structure Index 50% (Table 7); EVI Disasters Index 75% (Table 8); EVI Instability of Agriculture 75% (Table 9); EVI Natural Shock Index 75% (Table 10); EVI Instability of Export 75% (Table 11); EVI Exposure Index 75% (Table 12) and EVI Shock Index 75% (Table 13). All the tables give the estimation results of the relationship between an EVI measure and growth using the Dynamic Common Correlated Effects (CCE) Estimator for all Countries. All the results show that we have conditional convergence in all the regressions. We see that each EVI measure has a negative and statistically significant impact on growth in all the 5 regressions for each table of results. The magnitude of the coefficients of the EVIs are very high. Since the EVIs are exogenous variables, it is possible to say that the negative relationship between the EVIs and economic growth seems to go from the EVIs towards growth and not the reverse. For our sensitivity analysis, our findings illustrate that, the negative effect of the EVIs on growth is robust to the introduction of different control variables. In fact, in each table of results, through the five equations we have varied the introduction of the control variables but the coefficients of the EVIs retain their expected sign and are always statistically significant. Hence, like the previous results, these tables also demonstrate that the EVIs are robust. The CD Statistic and its p-value that test for cross sectional dependence, show that we do not reject the null hypothesis which states that the error terms are weakly cross sectional dependent in most of the estimations. The control variables continue to have their expected signs when statistically significant as was found in many empirical economic growth works.

3.3.2 Robustness Analysis

Tables 14 and 15 present the results of the estimations for the Least Developed Countries (LDCs) using the Dynamic CCE Estimator. In these 2 tables of results, we have introduced each EVI indicator one at a time instead of making a regression table for each measurement separately in order to save space. Similar to the previous regressions, all the EVIs influence negatively economic growth and they are all statistically significant. As in the main estimations, the effects of EVIs are very high. Referring to regression (6) in table 15, a rise in the EVI Exposure Index 75% by 1 unit decreases the growth rate by 1.489 units. Consequently, Economic Vulnerability is very harmful to the Least Developed Countries (LDCs). The coefficients of the EVIs are roughly stable in all the 13 equations. The results

for the Least Developed Countries (LDCs) corroborates those found in our main regressions. Hence, all the EVIs are robust in the subsample of Least Developed Countries (LDCs). We see that we have conditional convergence in all the regressions. Investment has a positive impact on growth. The CD Statistic and its p-value that test for cross sectional dependence, show that we do not reject the null hypothesis which states that the error terms are weakly cross sectional dependent in most of the estimations.

Tables 16 and 17 present the results of the estimations for the Non Least Developed Countries (NLDCs) using the Dynamic CCE Estimator. In these 2 tables of results, we have introduced each EVI indicator one at a time instead of making a regression table for each measurement separately in order to save space. Similar to the previous regressions, all the EVIs influence negatively economic growth and they are all statistically significant. As in the main estimations, the effects of EVIs are very high. Referring to regression (6) in table 17, a rise in the EVI Exposure Index 75% by 1 unit decreases the growth rate by 0.822 units. Consequently, Economic Vulnerability is very harmful to the Non Least Developed Countries (NLDCs). But we also notice that this effect is not as high as for that of the Least Developed Countries (LDCs). The coefficients of the EVIs are roughly stable in all the 13 equations. The results for the Non Least Developed Countries (NLDCs) corroborates those found in our main regressions. Hence, all the EVIs are robust in the subsample of Non Least Developed Countries (NLDCs). We see that we have conditional convergence in all the regressions. Investment and Terms of Trade have a positive impact on growth while Government Consumption and Inflation act negatively on growth. The CD Statistic and its p-value that test for cross sectional dependence, show that we do not reject the null hypothesis which states that the error terms are weakly cross sectional dependent in most of the estimations.

In Tables 18 and 19 we take into account the Recursive mean adjustment method. This procedure allows for small sample time series bias corrections. It utilizes the formula displayed in equality (20). In these 2 tables of results, we have introduced each EVI indicator one at a time instead of making a regression table for each measurement separately in order to save space. As in the main regressions, there is conditional convergence in all estimations. All the 13 equations show that the coefficients of the EVIs are negative and statistically significant. Similarly, the absolute value of the impact of the EVIs on growth are very large. In most of the regressions, the CD Statistic demonstrates that we do not reject the null hypothesis which claims that the error terms are weakly cross sectional

dependent. Most control variables are statistically significant. Investment and terms of trade have a positive impact on growth while inflation and government consumption act negatively on economic growth. These results using the Recursive mean adjustment method support those found in our main estimations. Thus, all the EVIs are robust when using the Recursive mean adjustment method.

Chudik and Pesaran (2015a) underline that it is hard to identify in practice the finest lag order since this is function of several unidentified characteristics of the true data generating process including the sample size. They highlight the necessity to explore the reactiveness of the outcomes to the choice of the lag order when the data generating process is unrevealed. Hence, tables 20 and 21 give the regressions using the dynamic CCE estimator with sensitivity to the choice of lag orders. Until now, we have been using a lag order of 1. The equations in these 2 tables employ a lag order of 2. It is important to inform the reader that we could not test for lag orders higher than 2 because the algorithm used to estimate the equations crashes when the lags are superior or equal to 3. All coefficients that are statistically significant in these 2 tables have the correct expected signs. We observe that there is conditional convergence in all equations. The magnitude of the impact of the EVIs are also very large. In most of the equations, the CD Statistic reveals that we do not reject the null hypothesis which asserts that the error terms are weakly cross sectional dependent. The results found in these 2 tables demonstrate that the general conclusions we found in our main regressions, do not change even if we take into account more lags of the cross sectional averages. Consequently, all the EVIs are robust when we perform a sensitivity to the choice of lag orders.

4 Conclusion

In this paper, we examine the effect of Economic Vulnerability on growth both theoretically and empirically. In the theoretical part, we build a fully-micro-founded stochastic endogenous economic growth model that demonstrate that Economic Vulnerability have a negative influence on growth. The empirical part conducts a sensitivity analysis by creating many Economic Vulnerability Indices (EVIs) and studying their impact on growth using the Dynamic Common Correlated Effects Estimator for Heterogeneous Cross-Sectionally Dependent Dynamic Panels Data on a sample of 57 developing countries with annual data from 1990 to 2018. The empirical results corroborate the theoretical predictions that Economic Vulnerability acts negatively on economic growth in all of the scenarios. Since the EVIs are exogenous variables, it is possible to say that the negative relationship between the EVIs and economic growth seems to go from the EVIs towards growth and not the reverse. The magnitudes of the effects of the EVIs on growth are very high. Referring to regression (5) in Table 1 for the EVI UN CDP indicator, a rise in the EVI UN CDP by 1 unit decreases the growth rate by 1.054 units. This outcome suggests that Economic Vulnerability must have a huge negative impact on growth. The results found in this paper illustrate that no matter how the Economic Vulnerability Index (EVI) is measured, it always has a negative and huge damaging impact on growth. This outcome is also corroborated by many robustness analyses like regressions on subsamples of Least Developed Countries (LDCs) and Non Least Developed Countries (NLDCs), small sample bias corrections and sensitivity to the choice of lag orders.

Though the results found were informative, some extensions could be made. We did not empirically isolate the channels through which EVIs act on growth though we did this theoretically. Concerning the theoretical model, a jump-diffusion model could also give us more insights on how Economic Vulnerability affects growth. These avenues of research are left for our future studies.

From economic policy perspectives, the results illustrate that Economic Vulnerability could have negative impacts on growth. Hence, efforts made to reduce it, like augmenting and targeting resilience and official development assistance (ODA), might relaunch total factor productivity, diminish instability (volatility) and increase long-run growth and development.

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Figure 1: Evolution of Income or Output or Production

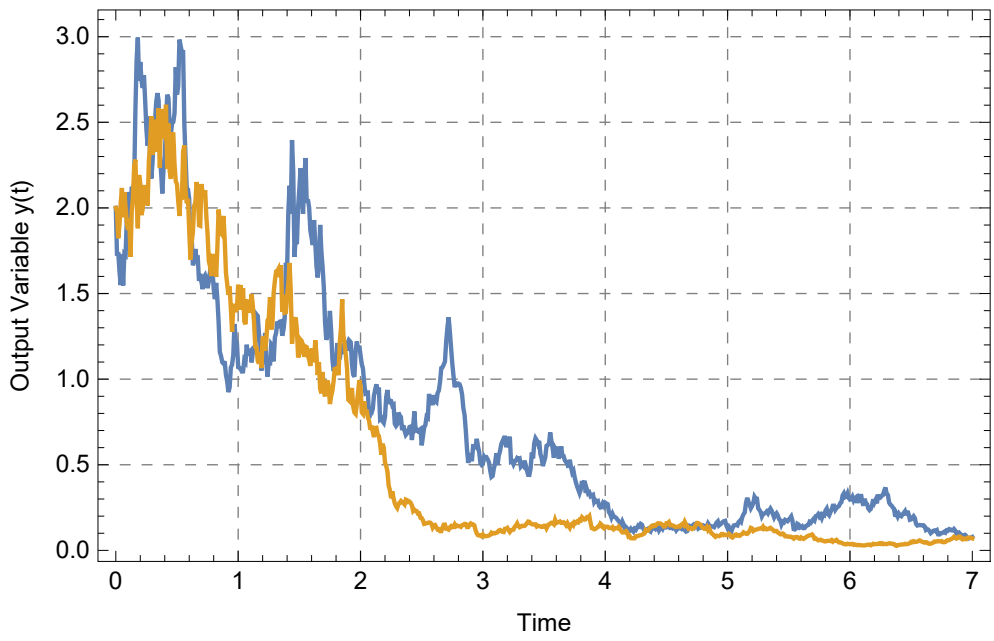

Figure 2: Evolution of the Moments of Income or Output or Production

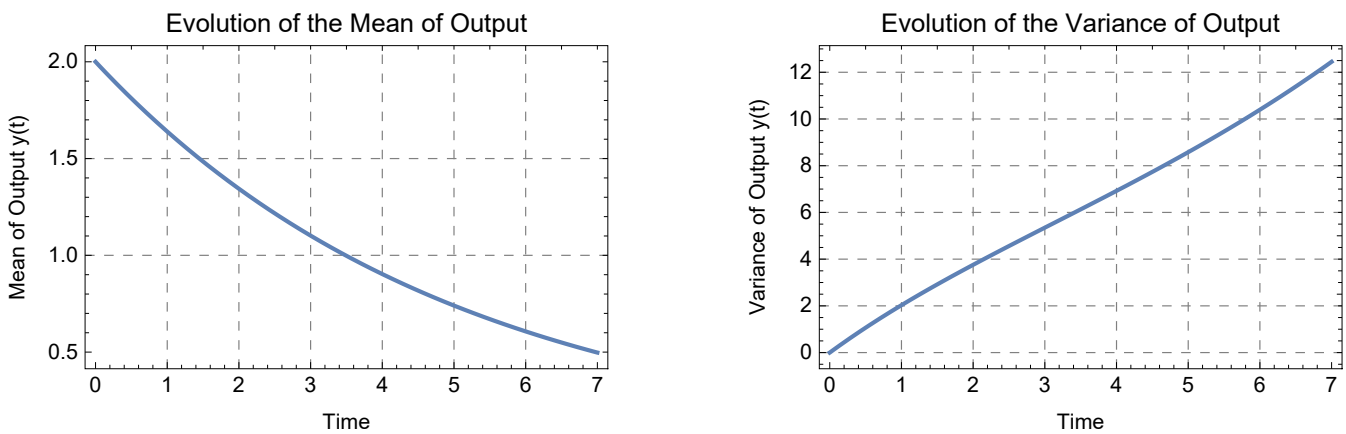

Figure 3: Evolution of Consumption

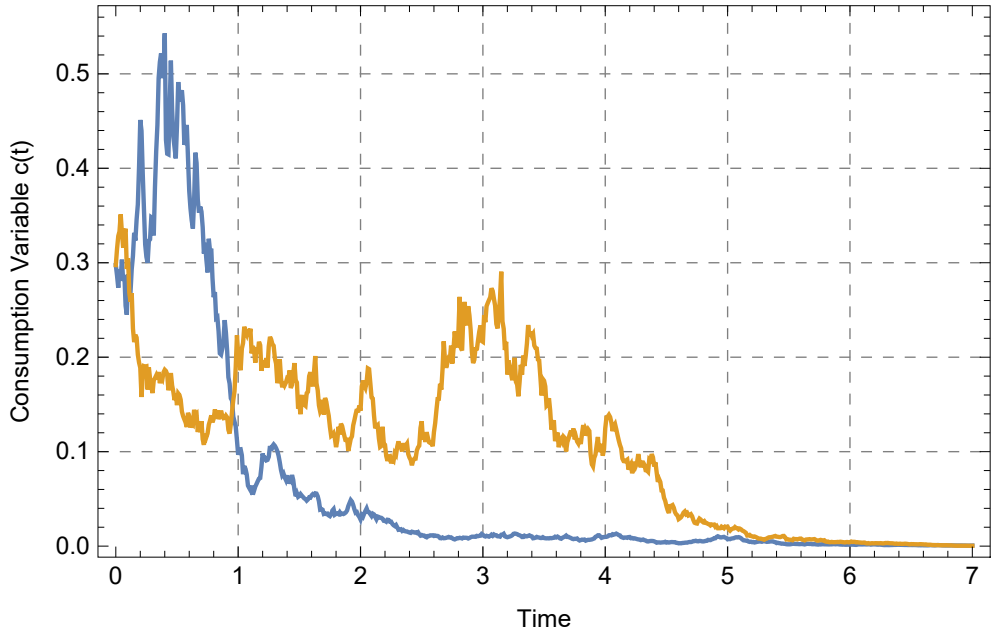

Figure 4: Evolution of the Value Function

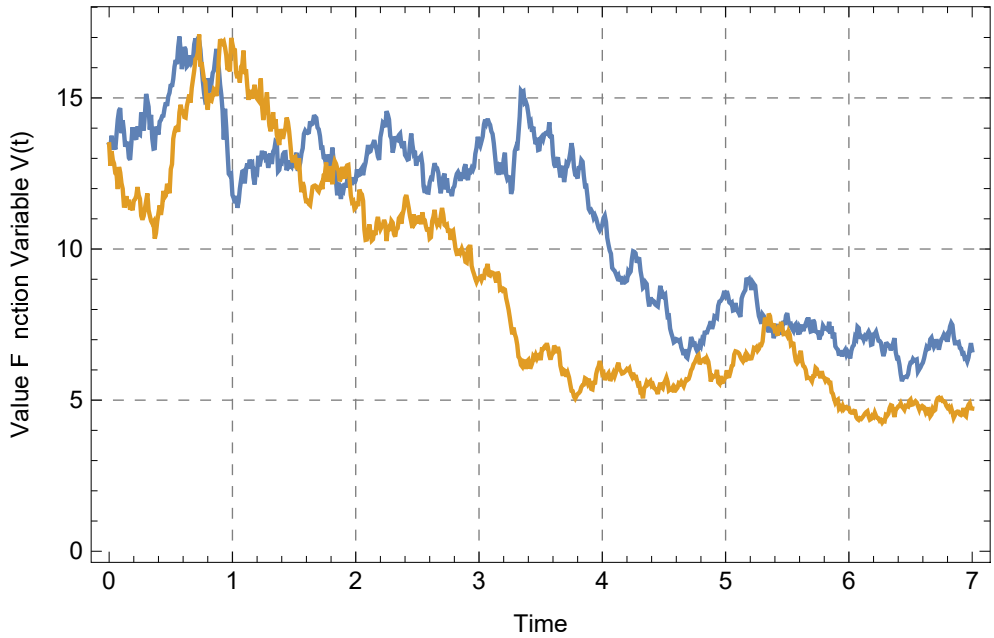

Table 1: Regressions using the Dynamic CCE Estimator for all Countries: EVI UN CDP

Dependent Variable: Growth Rate of Real GDP per Capita					
Regressors	(1)	(2)	(3)	(4)	(5)
Lagged Real GDP per Capita	-0.715***	-0.550***	-0.702***	-1.094***	-0.878***
	(0.0672)	(0.0930)	(0.0869)	(0.137)	(0.321)
EVI UN CDP	-0.453*	-0.594*	-0.508*	-0.610*	-1.054**
	(0.237)	(0.319)	(0.281)	(0.338)	(0.522)
Lagged Human Capital	1.191*	-0.0609	0.999		-2.106
	(0.662)	(0.375)	(0.828)		(1.493)
Government Consumption		-0.117***	-0.0896**		-0.0363
		(0.0417)	(0.0372)		(0.0522)
Openness		-0.0371		-0.0431	
		(0.0413)		(0.0444)	
Terms of Trade		0.0589			-0.299
		(0.0681)			(0.262)
Lagged Fertility Rate	1.164		1.370	-2.963	
	(0.802)		(0.992)	(2.035)	
Financial Development	-0.0116		-0.00569		-0.0623
	(0.0288)		(0.0368)		(0.0737)
Lagged Reciprocal of Life Expectancy				37.85	
				(232.0)	
Inflation				0.0882	0.0818
				(0.0866)	(0.194)
Investment				0.241*	
				(0.126)	
Constant	-7.244*	2.786	-1.709	7.232	22.55
	(4.365)	(2.072)	(6.171)	(6.318)	(18.66)
Observations	1,168	1,504	1,146	1,399	1,036
CD Statistic	1.544	1.104	0.595	0.298	-1.092
P-value CD Statistic	0.123	0.270	0.552	0.766	0.275

Standard errors in parentheses
*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Table 2: Regressions using the Dynamic CCE Estimator for all Countries: EVI Concentration Index 75%

Dependent Variable: Growth Rate of Real GDP per Capita					
Regressors	(1)	(2)	(3)	(4)	(5)
Lagged Real GDP per Capita	-0.728***	-0.545***	-0.554***	-0.729***	-0.812***
	(0.0678)	(0.0977)	(0.0974)	(0.143)	(0.247)
EVI Concentration Index 75%	-0.423*	-0.381*	-0.599*	-1.072***	-1.052*
	(0.223)	(0.205)	(0.335)	(0.411)	(0.585)
Lagged Reciprocal of Life Expectancy		-107.7			
		(78.41)			
Government Consumption		-0.0355	-0.121***		-0.0335
		(0.0322)	(0.0452)		(0.0551)
Openness		0.0444	-0.0444	-0.0278	
		(0.0431)	(0.0451)	(0.0341)	
Terms of Trade		0.00714	0.0644		-0.289
		(0.0547)	(0.0784)		(0.228)
Lagged Human Capital	1.234*		-0.0746	0.935	-1.775
	(0.662)		(0.386)	(0.617)	(1.217)
Lagged Fertility Rate	1.159			1.029	
	(0.795)			(0.712)	
Financial Development	-0.00829			-0.0205	-0.0619
	(0.0278)			(0.0290)	(0.0656)
Inflation					0.0846
					(0.205)
Constant	-6.771	3.937	2.610	-3.880	18.07
	(4.237)	(3.625)	(2.519)	(4.185)	(13.47)
Observations	1,168	1,504	1,504	1,146	1,036
CD Statistic	1.549	-1.053	0.955	0.876	-0.466
P-value CD Statistic	0.121	0.292	0.340	0.381	0.641

Standard errors in parentheses
*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Table 3: Regressions using the Dynamic CCE Estimator for all Countries: EVI Share Agriculture Index 75%

Dependent Variable: Growth Rate of Real GDP per Capita					
Regressors	(1)	(2)	(3)	(4)	(5)
Lagged Real GDP per Capita	-0.698***	-0.954***	-0.830***	-0.549***	-0.685***
	(0.0661)	(0.0560)	(0.231)	(0.0921)	(0.0847)
EVI Share Agriculture Index 75%	-0.486*	-0.428*	-0.726**	-0.586*	-0.537*
	(0.251)	(0.243)	(0.355)	(0.309)	(0.287)
Lagged Human Capital	1.126*	-0.261		-0.0848	0.934
	(0.657)	(1.110)		(0.373)	(0.808)
Lagged Fertility Rate	1.161	-3.327*			1.165
	(0.805)	(1.810)			(0.956)
Financial Development	-0.0149				-0.0104
	(0.0297)				(0.0330)
Lagged Reciprocal of Life Expectancy		-385.1	-18.73		
		(293.2)	(85.15)		
Government Consumption			-0.133*	-0.115***	-0.0905**
			(0.0718)	(0.0396)	(0.0376)
Openness			-0.0490	-0.0332	
			(0.0902)	(0.0390)	
Terms of Trade			0.124	0.0541	
			(0.132)	(0.0618)	
Constant	-7.710*	9.475	-11.77	2.951*	-1.806
	(4.494)	(11.77)	(11.54)	(1.788)	(5.995)
Observations	1,168	1,511	1,504	1,504	1,146
CD Statistic	1.497	0.832	-0.557	0.686	0.635
P-value CD Statistic	0.134	0.405	0.577	0.493	0.526

Standard errors in parentheses
*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Table 4: Regressions using the Dynamic CCE Estimator for all Countries: EVI Population Size 50%

Dependent Variable: Growth Rate of Real GDP per Capita					
Regressors	(1)	(2)	(3)	(4)	(5)
Lagged Real GDP per Capita	-0.702***	-0.705***	-0.562***	-0.696***	-0.990***
	(0.0666)	(0.114)	(0.0927)	(0.0831)	(0.100)
EVI Population Size 50%	-0.458*	-0.562**	-0.523*	-0.552*	-0.656*
	(0.246)	(0.254)	(0.290)	(0.284)	(0.336)
Lagged Reciprocal of Life Expectancy		-56.80			-2.810
		(80.29)			(147.0)
Government Consumption		-0.0678***	-0.116***	-0.0796**	
		(0.0243)	(0.0391)	(0.0393)	
Openness		0.0130	-0.0240		-0.0287
		(0.0415)	(0.0395)		(0.0315)
Terms of Trade		0.0550	0.0525		
		(0.0583)	(0.0641)		
Lagged Human Capital	1.213*		-0.0570	0.907	-0.869
	(0.668)		(0.374)	(0.875)	(1.190)
Lagged Fertility Rate	1.151			0.815	
	(0.800)			(0.858)	
Financial Development	-0.0133			-0.0246	
	(0.0295)			(0.0349)	
Inflation					0.0748
					(0.0768)
Investment					0.317***
					(0.120)
Constant	-7.753*	-2.833	2.187	-1.500	11.71
	(4.394)	(4.061)	(1.716)	(6.007)	(7.378)
Observations	1,168	1,504	1,504	1,146	1,399
CD Statistic	1.370	-1.315	0.575	0.392	0.599
P-value CD Statistic	0.171	0.189	0.565	0.695	0.549

Standard errors in parentheses
*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Table 5: Regressions using the Dynamic CCE Estimator for all Countries: EVI Remoteness Index 50%

Dependent Variable: Growth Rate of Real GDP per Capita					
Regressors	(1)	(2)	(3)	(4)	(5)
Lagged Real GDP per Capita	-0.545***	-0.987***	-0.400***	-0.795***	-0.674***
	(0.0507)	(0.0567)	(0.0898)	(0.0684)	(0.165)
EVI Remoteness Index 50%	-0.291*	-0.559**	-0.534*	-0.411*	-0.378*
	(0.160)	(0.243)	(0.310)	(0.234)	(0.217)
Lagged Human Capital		-0.252			0.0853
		(1.110)			(0.723)
Lagged Fertility Rate		-3.368**		0.0800	
		(1.709)		(1.106)	
Lagged Reciprocal of Life Expectancy	11.79	-287.3		47.81	-134.0
	(35.63)	(303.2)		(223.0)	(154.7)
Terms of Trade	0.0719***				
	(0.0268)				
Government Consumption			0.0342	-0.0587	
			(0.0663)	(0.0456)	
Inflation			0.0535	-0.103*	0.0618
			(0.0961)	(0.0622)	(0.153)
Financial Development			-0.00622		
			(0.0231)		
Investment			0.380***		0.932***
			(0.132)		(0.359)
Constant	1.053	6.376	0.317	-0.0345	5.287
	(1.928)	(11.85)	(1.509)	(3.422)	(4.739)
Observations	1,508	1,511	1,145	1,506	1,506
CD Statistic	1.016	0.879	-0.575	0.380	1.168
P-value CD Statistic	0.310	0.380	0.565	0.704	0.243

Standard errors in parentheses
*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Table 6: Regressions using the Dynamic CCE Estimator for all Countries: EVI LECZ Index 50%

Dependent Variable: Growth Rate of Real GDP per Capita					
Regressors	(1)	(2)	(3)	(4)	(5)
Lagged Real GDP per Capita	-0.696***	-0.713***	-0.901***	-0.562***	-0.994***
	(0.0645)	(0.113)	(0.266)	(0.0884)	(0.101)
EVI LECZ Index 50%	-0.431*	-0.500**	-0.590*	-0.485*	-0.651*
	(0.237)	(0.254)	(0.336)	(0.288)	(0.334)
Lagged Reciprocal of Life Expectancy		-76.89			-17.70
		(82.78)			(150.3)
Government Consumption		-0.0749***	-0.103	-0.123***	
		(0.0278)	(0.0658)	(0.0431)	
Openness		0.0113		-0.0254	-0.0271
		(0.0427)		(0.0381)	(0.0318)
Terms of Trade		0.0520	0.0219	0.0651	
		(0.0609)	(0.0834)	(0.0653)	
Lagged Human Capital	1.293*		-0.316	-0.129	-0.935
	(0.669)		(0.374)	(0.397)	(1.244)
Lagged Fertility Rate	1.303				
	(0.799)				
Financial Development	-0.0148				
	(0.0297)				
Investment			0.956*		0.311**
			(0.515)		(0.120)
Inflation					0.0750
					(0.0782)
Constant	-7.511*	-1.764	9.705*	2.450	11.99
	(4.223)	(3.924)	(5.258)	(1.645)	(7.568)
Observations	1,168	1,504	1,504	1,504	1,399
CD Statistic	1.464	-0.435	1.407	0.853	0.910
P-value CD Statistic	0.143	0.664	0.159	0.394	0.363

Standard errors in parentheses
*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Table 7: Regressions using the Dynamic CCE Estimator for all Countries: EVI Economic Structure Index 50%

Dependent Variable: Growth Rate of Real GDP per Capita					
Regressors	(1)	(2)	(3)	(4)	(5)
Lagged Real GDP per Capita	-0.738***	-0.944***	-0.558***	-1.129***	-0.700***
	(0.0661)	(0.351)	(0.0953)	(0.133)	(0.0793)
EVI Economic Structure Index 50%	-0.408**	-0.853*	-0.417*	-0.608*	-0.631**
	(0.191)	(0.460)	(0.242)	(0.355)	(0.316)
Lagged Reciprocal of Life Expectancy		-82.52		-67.31	
		(95.14)		(251.2)	
Government Consumption		-0.0803**	-0.135***		-0.0406
		(0.0369)	(0.0487)		(0.0288)
Openness		-0.0304	-0.0317	-0.0505	
		(0.0676)	(0.0405)	(0.0488)	
Terms of Trade		0.0593	0.0915		0.0143
		(0.0557)	(0.0757)		(0.0388)
Lagged Human Capital	1.179*		-0.164		0.0958
	(0.611)		(0.385)		(0.526)
Lagged Fertility Rate	1.118			-3.404*	-0.283
	(0.759)			(2.032)	(0.888)
Financial Development	-0.00738				
	(0.0259)				
Inflation				0.0820	
				(0.0843)	
Investment				0.245*	0.703***
				(0.136)	(0.187)
Constant	-5.633	-6.120	1.728	8.391	0.937
	(3.775)	(9.098)	(2.013)	(6.018)	(4.939)
Observations	1,168	1,504	1,504	1,399	1,397
CD Statistic	1.445	-1.227	1.229	-0.278	-1.129
P-value CD Statistic	0.149	0.220	0.219	0.781	0.259

Standard errors in parentheses
*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Table 8: Regressions using the Dynamic CCE Estimator for all Countries: EVI Disasters Index 75%

Dependent Variable: Growth Rate of Real GDP per Capita					
Regressors	(1)	(2)	(3)	(4)	(5)
Lagged Real GDP per Capita	-0.544***	-0.966***	-0.928***	-0.356**	-1.176***
	(0.0546)	(0.152)	(0.145)	(0.172)	(0.164)
EVI Disasters Index 75%	-0.495**	-0.900*	-1.294*	-0.686*	-1.090*
	(0.218)	(0.515)	(0.731)	(0.415)	(0.605)
Lagged Fertility Rate		-0.882	1.584		3.128
		(2.074)	(5.699)		(2.303)
Government Consumption	-0.0704**	-0.196*	-0.0482	-0.303	
	(0.0325)	(0.113)	(0.0485)	(0.247)	
Openness		-0.0368			
		(0.0750)			
Inflation	-0.0636	-0.103	0.0648	0.225	
	(0.0587)	(0.197)	(0.152)	(0.293)	
Terms of Trade	-0.0140	0.0348		-0.0969	0.0963
	(0.0384)	(0.113)		(0.121)	(0.122)
Investment		0.904***	0.182		0.865**
		(0.275)	(0.312)		(0.350)
Lagged Reciprocal of Life Expectancy	20.23		225.1		238.5
	(43.46)		(440.9)		(372.9)
Financial Development			-0.0146		-0.0567
			(0.0895)		(0.0389)
Lagged Human Capital				-0.629	
				(0.547)	
Constant	0.240	-2.568	-1.796	2.360*	5.744
	(2.063)	(9.385)	(19.29)	(1.279)	(10.77)
Observations	1,503	1,296	864	1,503	1,037
CD Statistic	-0.711	0.181	1.625	-1.117	1.350
P-value CD Statistic	0.477	0.856	0.104	0.264	0.177

Standard errors in parentheses
*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Table 9: Regressions using the Dynamic CCE Estimator for all Countries: EVI Instability of Agriculture 75%

Dependent Variable: Growth Rate of Real GDP per Capita					
Regressors	(1)	(2)	(3)	(4)	(5)
Lagged Real GDP per Capita	-0.981***	-0.543***	-0.519*	-0.790***	-1.002***
	(0.0551)	(0.0785)	(0.270)	(0.0653)	(0.0583)
EVI Instability of Agriculture 75%	-0.396*	-0.477*	-2.511*	-0.423*	-0.346*
	(0.210)	(0.276)	(1.410)	(0.250)	(0.192)
Lagged Human Capital	-0.348	0.125	1.864*	-1.654	-0.314
	(1.099)	(0.469)	(0.999)	(1.317)	(0.911)
Government Consumption		-0.0838***		-0.0992***	
		(0.0271)		(0.0266)	
Openness		-0.00286	0.0624		
		(0.0317)	(0.135)		
Terms of Trade		0.00837			
		(0.0547)			
Lagged Fertility Rate	-3.034*		1.994	-0.514	-0.292
	(1.660)		(1.353)	(1.041)	(1.076)
Lagged Reciprocal of Life Expectancy	-489.8				-21.85
	(315.1)				(214.4)
Financial Development			-0.220		
			(0.225)		
Inflation				-0.0355	
				(0.106)	
Investment					0.532***
					(0.131)
Constant	7.563	5.274***	-2.296	9.405	-1.864
	(10.92)	(1.609)	(3.409)	(7.505)	(7.256)
Observations	1,511	1,504	1,146	1,506	1,507
CD Statistic	0.813	0.574	0.851	-0.0755	0.291
P-value CD Statistic	0.416	0.566	0.395	0.940	0.771

Standard errors in parentheses
*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Table 10: Regressions using the Dynamic CCE Estimator for all Countries: EVI Natural Shock Index 75%

Dependent Variable: Growth Rate of Real GDP per Capita					
Regressors	(1)	(2)	(3)	(4)	(5)
Lagged Real GDP per Capita	-0.541***	-0.591***	-0.377***	-0.534***	-0.586***
	(0.0531)	(0.0427)	(0.0983)	(0.122)	(0.0573)
EVI Natural Shock Index 75%	-0.453**	-0.410**	-0.421*	-0.577**	-0.547**
	(0.193)	(0.189)	(0.247)	(0.287)	(0.262)
Lagged Human Capital		0.0428			
		(0.272)			
Government Consumption		-0.0582*	-0.0721**		-0.0778**
		(0.0314)	(0.0318)		(0.0367)
Terms of Trade	0.0704**	0.0693**	-0.0853	0.0745*	-0.00613
	(0.0298)	(0.0297)	(0.0667)	(0.0448)	(0.0472)
Lagged Reciprocal of Life Expectancy	24.82				
	(44.99)				
Openness			0.0199	0.00795	
			(0.0335)	(0.0407)	
Inflation			0.00358	0.168	-0.131**
			(0.0832)	(0.251)	(0.0644)
Lagged Fertility Rate				-1.752	0.129
				(1.160)	(0.442)
Constant	0.913	2.493*	-1.953	2.648	-1.322
	(1.992)	(1.332)	(1.738)	(2.813)	(2.161)
Observations	1,508	1,504	1,503	1,503	1,503
CD Statistic	1.497	1.496	-1.499	-0.753	0.192
P-value CD Statistic	0.134	0.135	0.134	0.452	0.847

Standard errors in parentheses
*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Table 11: Regressions using the Dynamic CCE Estimator for all Countries: EVI Instability of Export 75%

Dependent Variable: Growth Rate of Real GDP per Capita					
Regressors	(1)	(2)	(3)	(4)	(5)
Lagged Real GDP per Capita	-0.280***	-0.937***	-0.628**	-0.381***	-0.633***
	(0.0564)	(0.253)	(0.268)	(0.0925)	(0.134)
EVI Instability of Export 75%	-0.448*	-0.853*	-0.767*	-0.509*	-1.060**
	(0.254)	(0.469)	(0.421)	(0.292)	(0.479)
Lagged Human Capital		-0.545			
		(0.996)			
Lagged Fertility Rate		-1.361	4.498		-1.196*
		(1.237)	(4.434)		(0.704)
Financial Development	0.00227	-0.00289	-0.0167	-5.41e-05	-0.00878
	(0.0238)	(0.0522)	(0.0767)	(0.0241)	(0.0296)
Investment		0.499		0.190	0.0466
		(0.339)		(0.134)	(0.234)
Government Consumption	-0.0571*		-0.142*		
	(0.0292)		(0.0752)		
Openness	-0.00994			-0.0103	0.0277
	(0.0248)			(0.0374)	(0.0382)
Lagged Reciprocal of Life Expectancy			142.3		
			(191.0)		
Terms of Trade			-0.260		
			(0.288)		
Inflation				0.0289	
				(0.0783)	
Constant	-0.00450	-4.190	-0.381	-1.966	3.124
	(1.316)	(5.402)	(9.988)	(2.185)	(2.119)
Observations	1,165	1,165	1,037	1,145	1,146
CD Statistic	0.179	0.872	-0.685	-0.111	1.425
P-value CD Statistic	0.858	0.383	0.493	0.912	0.154

Standard errors in parentheses
*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Table 12: Regressions using the Dynamic CCE Estimator for all Countries: EVI Exposure Index 75%

Dependent Variable: Growth Rate of Real GDP per Capita					
Regressors	(1)	(2)	(3)	(4)	(5)
Lagged Real GDP per Capita	-0.734***	-1.018***	-0.771***	-1.017***	-1.408**
	(0.0660)	(0.0599)	(0.132)	(0.0613)	(0.698)
EVI Exposure Index 75%	-0.737**	-0.715*	-2.072*	-1.199*	-2.150*
	(0.359)	(0.392)	(1.240)	(0.663)	(1.270)
Lagged Human Capital	1.106*	0.151	0.0474	-0.424	
	(0.570)	(1.041)	(1.847)	(1.108)	
Lagged Fertility Rate	1.126	-2.724*	1.416	-2.501*	1.560
	(0.734)	(1.587)	(0.870)	(1.468)	(1.329)
Financial Development	-0.00419		0.0193		0.0259
	(0.0259)		(0.0480)		(0.0628)
Lagged Reciprocal of Life Expectancy		-410.5		-360.3	
		(334.9)		(292.1)	
Government Consumption			-0.0944**		
			(0.0458)		
Terms of Trade				0.0335	0.450*
				(0.0344)	(0.234)
Inflation					0.363
					(0.486)
Investment					0.618*
					(0.335)
Constant	-4.055	5.095	-4.674	6.586	-0.571
	(3.418)	(11.62)	(13.00)	(12.35)	(5.190)
Observations	1,168	1,511	1,146	1,508	1,036
CD Statistic	1.503	0.713	0.379	0.484	0.911
P-value CD Statistic	0.133	0.476	0.705	0.629	0.363

Standard errors in parentheses
*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Table 13: Regressions using the Dynamic CCE Estimator for all Countries: EVI Shock Index 75%

Dependent Variable: Growth Rate of Real GDP per Capita					
Regressors	(1)	(2)	(3)	(4)	(5)
Lagged Real GDP per Capita	-0.523***	-0.696***	-1.056***	-0.762***	-0.990***
	(0.0609)	(0.0654)	(0.148)	(0.0928)	(0.0972)
EVI Shock Index 75%	-0.257*	-0.308*	-0.389*	-0.686*	-0.455*
	(0.135)	(0.170)	(0.222)	(0.408)	(0.236)
Lagged Fertility Rate		1.217	-2.036		
		(0.791)	(1.420)		
Lagged Reciprocal of Life Expectancy			35.86	-76.90	-124.3
			(209.1)	(71.54)	(161.6)
Openness			-0.0294		-0.0163
			(0.0400)		(0.0317)
Inflation			0.0603	0.266	0.0507
			(0.0826)	(0.187)	(0.0811)
Investment			0.197	0.0140	0.313***
			(0.120)	(0.207)	(0.115)
Lagged Human Capital	0.0459	1.251*			-1.368
	(0.382)	(0.670)			(1.385)
Financial Development	-0.0301	-0.0136		-0.0609	
	(0.0316)	(0.0295)		(0.0708)	
Terms of Trade	0.0686*			0.307**	
	(0.0416)			(0.130)	
Constant	2.291***	-7.941*	4.985	5.817	14.61*
	(0.862)	(4.346)	(6.771)	(6.656)	(8.047)
Observations	1,165	1,168	1,399	1,036	1,399
CD Statistic	1.534	1.170	-0.139	0.383	1.003
P-value CD Statistic	0.125	0.242	0.889	0.702	0.316

Standard errors in parentheses
*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Table 14: Regressions using the Dynamic CCE Estimator for the Least Developed Countries (LDCs): Part 1

Dependent Variable: Growth Rate of Real GDP per Capita							
Regressors	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Lagged Real GDP per Capita	-0.849***	-0.846***	-0.853***	-0.840***	-0.859***	-0.841***	-1.177***
	(0.0703)	(0.0709)	(0.0729)	(0.0696)	(0.0702)	(0.0697)	(0.200)
Lagged Human Capital	-2.664	-2.536	-2.750	-2.653	-2.665	-2.612	-0.915
	(1.752)	(1.712)	(1.825)	(1.757)	(1.651)	(1.741)	(1.319)
Lagged Reciprocal of Life Expectancy	36.88	27.27	47.69	45.83	39.52	45.04	
	(84.73)	(84.69)	(85.18)	(88.28)	(85.22)	(87.86)	
Investment	0.325*	0.338*	0.306*	0.313*	0.306*	0.312*	
	(0.183)	(0.191)	(0.176)	(0.181)	(0.176)	(0.181)	
EVI UN CDP	-0.706*						
	(0.360)						
EVI Concentration Index 75%		-0.641*					
		(0.343)					
EVI Share Agriculture Index 75%			-0.714**				
			(0.351)				
EVI Population Size 50%				-0.795**			
				(0.379)			
EVI Remoteness Index 50%					-0.737**		
					(0.351)		
EVI LECZ Index 50%						-0.789**	
						(0.378)	
EVI Economic Structure Index 50%							-0.870**
							(0.343)
Lagged Fertility Rate							-0.134
							(1.803)
Financial Development							-0.0298
							(0.0475)
Terms of Trade							-0.0690
							(0.0841)
Constant	12.17**	13.42**	10.75*	10.95*	12.09**	10.89*	-3.269
	(5.814)	(5.784)	(5.856)	(5.979)	(5.587)	(5.926)	(6.624)
Observations	509	509	509	509	509	509	448
CD Statistic	-1.477	-1.501	-1.397	-1.284	-1.491	-1.319	-1.233
P-value CD Statistic	0.140	0.133	0.162	0.199	0.136	0.187	0.217

Standard errors in parentheses
*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Table 15: Regressions using the Dynamic CCE Estimator for the Least Developed Countries (LDCs): Part 2

Dependent Variable: Growth Rate of Real GDP per Capita						
Regressors	(1)	(2)	(3)	(4)	(5)	(6)
Lagged Real GDP per Capita	-0.827***	-0.883***	-0.831***	-0.831***	-0.822***	-0.974***
	(0.0716)	(0.0785)	(0.0804)	(0.0698)	(0.0679)	(0.0841)
Lagged Human Capital	-2.310	-2.236	-1.846	-2.044	-2.789	0.316
	(1.630)	(2.094)	(1.730)	(2.044)	(1.743)	(1.480)
Lagged Reciprocal of Life Expectancy	40.53	48.56	41.74	29.86	42.19	
	(92.17)	(75.95)	(86.05)	(81.67)	(92.28)	
Investment	0.341*	0.324*	0.368*	0.328*	0.299*	
	(0.182)	(0.179)	(0.197)	(0.175)	(0.178)	
EVI Disasters Index 75%	-0.622*					
	(0.325)					
EVI instability of Agriculture 75%		-0.583*				
		(0.336)				
EVI Natural Shock Index 75%			-0.827**			
			(0.416)			
EVI Instability Export 75%				-0.397*		
				(0.226)		
EVI Shock Index 75%					-0.553**	
					(0.255)	
EVI Exposure Index 75%						-1.489***
						(0.547)
Lagged Fertility Rate						-2.560
						(3.617)
Financial Development						-0.0273
						(0.0354)
Constant	13.15**	10.35*	13.97**	10.16*	9.910*	1.869
	(5.838)	(5.809)	(6.299)	(5.788)	(5.975)	(5.747)
Observations	509	509	509	509	509	448
CD Statistic	-1.776	-0.925	-1.761	-1.502	-1.227	-0.483
P-value CD Statistic	0.0757	0.355	0.0782	0.133	0.220	0.629

Standard errors in parentheses
*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Table 16: Regressions using the Dynamic CCE Estimator for the Non Least Developed Countries (NLDCs): Part 1

Dependent Variable: Growth Rate of Real GDP per Capita							
Regressors	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Lagged Real GDP per Capita	-0.546***	-0.513***	-0.553***	-0.581***	-0.524***	-0.561***	-0.468***
	(0.0857)	(0.0676)	(0.0953)	(0.0925)	(0.0704)	(0.110)	(0.0636)
Government Consumption	-0.0475*	-0.0506**	-0.0484*	-0.0432	-0.0583**	-0.0432	-0.0497**
	(0.0277)	(0.0255)	(0.0293)	(0.0291)	(0.0283)	(0.0290)	(0.0246)
Terms of Trade	0.0462	0.0560	0.0407	0.0502	0.0506	0.0506	0.0599
	(0.0415)	(0.0432)	(0.0395)	(0.0419)	(0.0422)	(0.0368)	(0.0400)
Investment	0.499***	0.566***	0.474**	0.475**	0.604***	0.437**	0.556***
	(0.179)	(0.132)	(0.197)	(0.189)	(0.128)	(0.209)	(0.124)
EVI UN CDP	-0.502***						
	(0.193)						
EVI Concentration Index 75%		-0.429**					
		(0.172)					
EVI Share Agriculture Index 75%			-0.517***				
			(0.193)				
EVI Population Size 50%				-0.574***			
				(0.206)			
EVI Remoteness Index 50%					-0.340**		
					(0.160)		
EVI LECZ Index 50%						-0.579***	
						(0.210)	
EVI Economic Structure Index 50%							-0.417**
							(0.168)
Constant	1.994*	1.692	2.167*	1.888*	1.929	1.834*	1.179
	(1.185)	(1.202)	(1.190)	(1.094)	(1.183)	(1.062)	(1.185)
Observations	995	995	995	995	995	995	995
CD Statistic	-0.428	-0.0651	-0.721	-0.251	-0.645	-0.139	0.171
P-value CD Statistic	0.668	0.948	0.471	0.802	0.519	0.889	0.864

Standard errors in parentheses
*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Table 17: Regressions using the Dynamic CCE Estimator for the Non Least Developed Countries (NLDCs): Part 2

Dependent Variable: Growth Rate of Real GDP per Capita						
Regressors	(1)	(2)	(3)	(4)	(5)	(6)
Lagged Real GDP per Capita	-0.524***	-0.498***	-0.591***	-0.502***	-0.586***	-0.459***
	(0.0703)	(0.0670)	(0.0755)	(0.0828)	(0.123)	(0.0604)
Government Consumption	-0.0457*	-0.0622**	-0.0280	-0.0563**	-0.0511*	
	(0.0236)	(0.0274)	(0.0254)	(0.0241)	(0.0309)	
Terms of Trade	0.0645*	0.0475	0.0649**	0.0441	0.0561	
	(0.0357)	(0.0489)	(0.0307)	(0.0525)	(0.0371)	
Investment	0.565***	0.592***	0.567***	0.468***	0.404**	0.392***
	(0.117)	(0.133)	(0.130)	(0.176)	(0.200)	(0.111)
EVI Disasters Index 75%	-0.430***					
	(0.165)					
EVI instability of Agriculture 75%		-0.570***				
		(0.187)				
EVI Natural Shock Index 75%			-0.389**			
			(0.184)			
EVI Instability Export 75%				-0.392*		
				(0.237)		
EVI Shock Index 75%					-0.433***	
					(0.140)	
EVI Exposure Index 75%						-0.822**
						(0.413)
Openness						-0.0339
						(0.0368)
Inflation						-0.0938*
						(0.0515)
Constant	1.325	1.939	1.397	1.715	0.558	0.409
	(0.950)	(1.365)	(1.114)	(1.136)	(1.100)	(0.790)
Observations	995	995	995	995	995	998
CD Statistic	-0.461	0.0651	1.071	-0.146	0.621	1.312
P-value CD Statistic	0.645	0.948	0.284	0.884	0.535	0.190

Standard errors in parentheses
*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Table 18: Regressions using the Dynamic CCE Estimator with the Recursive Mean Adjustment Method: Part 1

Dependent Variable: Growth Rate of Real GDP per Capita							
Regressors	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Lagged Real GDP per Capita	-0.674***	-0.656***	-0.689***	-0.674***	-0.701***	-0.657***	-0.654***
	(0.0568)	(0.0586)	(0.0566)	(0.0565)	(0.0602)	(0.0567)	(0.0592)
Government Consumption	-0.0814***	-0.0785***	-0.0818***	-0.0840***	-0.0734***	-0.0826***	-0.0823***
	(0.0256)	(0.0255)	(0.0259)	(0.0253)	(0.0267)	(0.0258)	(0.0263)
Inflation	-0.142***	-0.147***	-0.135***	-0.147***	-0.135***	-0.136***	-0.144***
	(0.0444)	(0.0447)	(0.0444)	(0.0453)	(0.0480)	(0.0432)	(0.0442)
Terms of Trade	0.0444	0.0463	0.0421	0.0518	0.0285	0.0520	0.0530
	(0.0330)	(0.0336)	(0.0331)	(0.0319)	(0.0343)	(0.0320)	(0.0343)
Investment	0.448***	0.465***	0.440***	0.429***	0.475***	0.433***	0.464***
	(0.106)	(0.111)	(0.105)	(0.104)	(0.110)	(0.103)	(0.115)
EVI UN CDP	-0.445**						
	(0.199)						
EVI Concentration Index 75%		-0.412**					
		(0.191)					
EVI Share Agriculture Index 75%			-0.475**				
			(0.212)				
EVI Population Size 50%				-0.480**			
				(0.216)			
EVI Remoteness Index 50%					-0.449**		
					(0.208)		
EVI LECZ Index 50%						-0.452**	
						(0.222)	
EVI Economic Structure Index 50%							-0.444**
							(0.199)
Constant	0.0330	0.0411	0.0225	0.0387	-0.0130	0.0271	0.0522
	(0.0477)	(0.0483)	(0.0474)	(0.0494)	(0.0575)	(0.0472)	(0.0512)
Observations	1,365	1,365	1,365	1,365	1,365	1,365	1,365
CD Statistic	0.753	0.958	0.574	0.777	-0.223	0.456	1.464
P-value CD Statistic	0.452	0.338	0.566	0.437	0.823	0.648	0.143

Standard errors in parentheses
*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Table 19: Regressions using the Dynamic CCE Estimator with the Recursive Mean Adjustment Method: Part 2

Dependent Variable: Growth Rate of Real GDP per Capita						
Regressors	(1)	(2)	(3)	(4)	(5)	(6)
Lagged Real GDP per Capita	-0.602***	-0.716***	-0.627***	-0.686***	-0.632***	-1.293***
	(0.0572)	(0.0642)	(0.0670)	(0.0653)	(0.0566)	(0.103)
Government Consumption	-0.0636***	-0.0956***	-0.0847***	-0.0749***	-0.0830***	
	(0.0244)	(0.0297)	(0.0258)	(0.0271)	(0.0270)	
Inflation	-0.144***	-0.131***	-0.142***	-0.133***	-0.123***	
	(0.0446)	(0.0436)	(0.0456)	(0.0490)	(0.0410)	
Terms of Trade	0.0584*	0.0171	0.0822**	0.00517	0.0550*	-0.0316
	(0.0308)	(0.0372)	(0.0338)	(0.0406)	(0.0311)	(0.0616)
Investment	0.441***	0.423***	0.444***	0.441***	0.417***	0.302*
	(0.106)	(0.107)	(0.101)	(0.114)	(0.0974)	(0.179)
EVI Disasters Index 75%	-0.367*					
	(0.205)					
EVI instability of Agriculture 75%		-0.512**				
		(0.214)				
EVI Natural Shock Index 75%			-0.720**			
			(0.287)			
EVI Instability Export 75%				-0.410*		
				(0.224)		
EVI Shock Index 75%					-0.281*	
					(0.164)	
EVI Exposure Index 75%						-1.243**
						(0.558)
Lagged Fertility Rate						1.975
						(2.941)
Lagged Reciprocal of Life Expectancy						-131.9
						(549.4)
Openness						-0.0209
						(0.0310)
Constant	0.0671	9.89e-05	0.0833	0.000113	0.0144	1.034*
	(0.0524)	(0.0493)	(0.0585)	(0.0563)	(0.0470)	(0.586)
Observations	1,365	1,365	1,365	1,365	1,365	1,299
CD Statistic	0.00926	1.739	1.234	1.294	0.773	0.0338
P-value CD Statistic	0.993	0.0821	0.217	0.196	0.439	0.973

Standard errors in parentheses
*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Table 20: Regressions using the Dynamic CCE Estimator with Sensitivity to the Choice of Lag Orders: Part 1

Dependent Variable: Growth Rate of Real GDP per Capita							
Regressors	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Lagged Real GDP per Capita	-1.130***	-1.088***	-1.086***	-1.084***	-1.033***	-1.109***	-0.591***
	(0.137)	(0.122)	(0.153)	(0.118)	(0.130)	(0.113)	(0.0510)
Lagged Fertility Rate	-2.040	-2.522	-2.210	-1.313	-4.590	-1.509	
	(4.614)	(4.697)	(4.530)	(4.526)	(3.922)	(4.509)	
Lagged Reciprocal of Life Expectancy	-1,477	-1,668	-1,166	-1,560	-693.4	-1,615	
	(1,047)	(1,105)	(1,040)	(1,222)	(847.5)	(1,209)	
Government Consumption	-0.127**	-0.131**	-0.106**	-0.129**	-0.102**	-0.136**	
	(0.0493)	(0.0502)	(0.0514)	(0.0610)	(0.0421)	(0.0591)	
EVI UN CDP	-0.888**						
	(0.406)						
EVI Concentration Index 75%		-0.654*					
		(0.340)					
EVI Share Agriculture Index 75%			-1.292**				
			(0.585)				
EVI Population Size 50%				-0.767*			
				(0.395)			
EVI Remoteness Index 50%					-0.958**		
					(0.387)		
EVI LECZ Index 50%						-0.542*	
						(0.273)	
EVI Economic Structure Index 50%							-0.333*
							(0.196)
Lagged Human Capital							0.855
							(0.617)
Constant	14.49	20.97*	15.96	27.60*	0.198	21.62*	1.294
	(11.73)	(12.32)	(13.75)	(14.12)	(9.070)	(12.35)	(1.096)
Observations	1,348	1,348	1,348	1,348	1,348	1,348	1,454
CD Statistic	0.117	-0.928	0.529	-2.821	-1.495	-2.204	1.005
P-value CD Statistic	0.907	0.353	0.597	0.00479	0.135	0.0275	0.315

Standard errors in parentheses
*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Table 21: Regressions using the Dynamic CCE Estimator with Sensitivity to the Choice of Lag Orders: Part 2

Dependent Variable: Growth Rate of Real GDP per Capita						
Regressors	(1)	(2)	(3)	(4)	(5)	(6)
Lagged Real GDP per Capita	-0.484**	-0.581***	-1.181***	-0.560***	-0.442**	-1.077***
	(0.238)	(0.0496)	(0.127)	(0.0535)	(0.174)	(0.114)
Lagged Fertility Rate			-4.711			-1.512
			(7.521)			(4.519)
Lagged Reciprocal of Life Expectancy			-2,247*			-1,843
			(1,206)			(1,613)
Government Consumption			-0.0608			-0.122*
			(0.0495)			(0.0683)
Lagged Human Capital		0.342		0.345		
		(0.329)		(0.260)		
Financial Development	-0.101				-0.0832	
	(0.0797)				(0.0636)	
Investment	0.663**				0.470***	
	(0.277)				(0.170)	
EVI Disasters Index 75%	-1.090**					
	(0.546)					
EVI instability of Agriculture 75%		-0.516**				
		(0.217)				
EVI Natural Shock Index 75%			-1.400*			
			(0.816)			
EVI Instability Export 75%				-0.412**		
				(0.202)		
EVI Exposure Index 75%					-1.858**	
					(0.914)	
EVI Shock Index 75%						-0.489**
						(0.231)
Constant	-0.0305	2.140***	28.75**	1.902**	0.863	28.99*
	(2.822)	(0.752)	(13.67)	(0.769)	(2.985)	(16.23)
Observations	1,117	1,454	1,348	1,454	1,117	1,348
CD Statistic	-0.140	0.301	-2.432	0.413	1.015	-2.312
P-value CD Statistic	0.889	0.763	0.0150	0.679	0.310	0.0208

Standard errors in parentheses
*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

"Sur quoi la fondera-t-il l'économie du monde qu'il veut gouverner? Sera-ce sur le caprice de chaque particulier? Quelle confusion! Sera-ce sur la justice? Il l'ignore."

Pascal

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