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Inclusive Growth and the Challenges of Economic Vulnerability: A Focused Perspective on Agricultural Transformations in Developing Countries

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Abstract

This article examines the effect of economic vulnerability on inclusive growth across 49 developing countries from 1991 to 2020, focusing on the mitigating role of agricultural structural changes. Then, our study first constructs an inclusive growth index using Principal Component Analysis (PCA). Finally, we estimate the effect of economic vulnerability on this index, taking into account the role played by agricultural structural transformations, using the Generalized Method of Moments (GMM). The findings reveal that economic vulnerability hurts inclusive growth. However, agricultural structural changes significantly mitigate these adverse effects. To strengthen inclusive growth in developing countries, policymakers are advised to promote agricultural structural reforms to reduce economic vulnerability, implement development strategies that integrate resilience to external shocks, and invest in technological advancements to boost agricultural productivity.

Keywords

Economic Vulnerability, Agricultural Structural Changes, Inclusive Growth, Developing Countries

1. Introduction

In developing countries, achieving inclusive growth remains a challenging goal. While some nations have experienced encouraging economic growth rates in recent decades, this progress has often failed to reduce social and economic inequalities significantly. According to the World Bank (2020), approximately 40% of the

Sub-Saharan African population still lives below the poverty line, despite an average GDP growth rate of 3.5% over the past decade. This disconnection between growth and inclusion is largely attributed to these economies' structural economic vulnerabilities, frequent external shocks, over-reliance on commodity exports, and underperforming agricultural sectors (Berdica, 2002). The economies of developing countries are further burdened by fragile structures, excessive dependence on primary sectors, and heightened exposure to external shocks (Guillaumont, 2017). These economic vulnerabilities, coupled with growing inequalities, not only hinder inclusive growth but also restrict governments' ability to establish resilient and equitable systems. In this context, structural transformation within the agricultural sector emerges as a promising strategy for mitigating vulnerability and fostering sustainable and inclusive economic growth.

Agriculture, a cornerstone of many developing economies, serves as a primary source of income for rural populations and a critical driver of food security, exports, and employment. However, traditional agricultural systems, often characterized by low productivity and reliance on non-mechanized methods, struggle to address the challenges posed by economic modernization and the demands of global markets (Johnston & Mellor, 1961). Structural transformation in this sector is therefore essential for enhancing economic resilience and integrating marginalized populations into the development process.

Economic theory links inclusive growth to a nation's ability to generate wealth that equitably benefits all social strata. Yet, in developing countries, economic vulnerability obstructs this dynamic. Guillaumont (2017) conceptualizes vulnerability as a two-tiered phenomenon: external shocks, such as fluctuations in commodity prices and financial crises, and internal structural weaknesses, including inadequate infrastructure and sectoral dependency. These vulnerabilities constrain access to economic opportunities for marginalized groups, perpetuating cycles of economic exclusion. For instance, during the 2008 financial crisis, countries heavily reliant on commodity exports experienced an average growth decline of nearly 5%, intensifying income disparities (Easterly, 2010).

According to Guillaumont (2017), vulnerability is a general phenomenon influenced not only by public policy choices but also by the inability to distinguish between economic shocks and resilience. This perspective is reinforced by numerous studies that establish a connection between vulnerability to external shocks and the well-being of developing countries (Baldwin & Gu, 2003; Dutta & Ahmed, 2004; Collier et al., 2006; Mbabazi, 2008; Haraszti et al., 2014). The consensus highlights that the impact of vulnerability to external shocks is contingent upon industrial policies, public spending, and investments in physical and human capital.

However, Guillaumont (2009) observed that income vulnerability in developing countries also stems from structural shocks, which are generally independent of the actions taken by their leaders. This finding is corroborated by the work of Easterly (2010) and Hugon & Colin, 2015; Hugon, 2016. According to these

authors, countries made vulnerable by their geographical location or an inadequate institutional and economic legacy are often subject to extreme vulnerability, sometimes leading to development traps. Unfortunately, within this framework, only Guillaumont's studies (2017) have assessed the impact of vulnerability on aid policies and foreign direct investment flows. To date, no study has specifically measured the impact of structural vulnerability on the well-being of developing countries.

Given the increasing risks associated with vulnerability, addressing issues such as poverty, income inequality, and the lack of high-quality healthcare and education infrastructure underscores the critical importance of inclusive growth policies.

Several empirical studies have also underscored the positive effects of agricultural transformations in reducing poverty and improving living standards in developing countries (Timmer, 2009; Diao et al., 2010). These transformations include adopting modern technologies, diversifying crops, and developing infrastructure to market agricultural products. Such advancements boost productivity, narrow rural-urban disparities, and stimulate inclusive economic growth.

However, implementing these transformations faces significant challenges, including inadequate investment, limited market access, and the effects of climate change (Barrett et al., 2002). Furthermore, despite extensive research on inclusive growth, two major limitations persist. First, there remains no consensus on how to measure or conceptualize the term. Second, prior analyses of inclusive growth often recommend strategies for equitable redistribution of growth benefits; whether narrowly or broadly defined without adequately addressing the constraints posed by growth rate instability and the structural vulnerabilities inherent in developing economies.

To address this empirical gap, our study analyzes the impact of economic vulnerability on inclusive growth in 49 developing countries between 1991 and 2020, focusing on the mitigating role of agricultural structural transformation. This approach is particularly significant given that previous research highlights the risks of neglecting economic vulnerability in analyses of inclusive growth, which may perpetuate cycles of poor economic performance. Indeed, the notion that structural vulnerability serves as a vicious obstacle to inclusive growth in developing countries warrants close examination, as the fragility of these economies can be explained on three levels: the violence traps identified by Satyanath et al. (2004), the poverty traps outlined by Dercon (2006), and the conflict traps analyzed by Hugon (2016).

Using dynamic panel data analysis through the Generalized Method of Moments (GMM), this study constructs an inclusive growth index to evaluate the interaction between economic vulnerability and agricultural structural transformation. The findings reveal that economic vulnerability negatively impacts inclusive growth. However, agricultural structural transformations significantly mitigate these adverse effects. To enhance inclusive growth in developing countries,

policymakers are advised to promote agricultural structural reforms aimed at reducing economic vulnerability, adopt development strategies that incorporate resilience to external shocks, and invest in technological advancements to improve agricultural productivity.

This article contributes to the existing literature in several ways. First, it illuminates the mechanisms by which agricultural structural transformations can alleviate economic vulnerability while fostering inclusive growth in developing economies. Second, the analysis demonstrates that agricultural reforms facilitate the integration of marginalized rural populations into value chains, thereby increasing their incomes. Lastly, to our knowledge, this is the first study to demonstrate that agricultural structural transformation leads to a more equitable geographical and sectoral distribution of growth. This aligns with Diao et al. (2010), who found that modernized agricultural systems reduce income disparities between urban and rural areas, thereby enhancing social and economic cohesion.

The remainder of the article is structured as follows: Section 2 provides a selective review of the literature. Section 3 outlines the study methodology. Section 4 presents and discusses the results, and Section 5 concludes the article.

2. Vulnerability and Inclusive Growth: A Selective Review of the Literature

2.1. Inclusive Growth: A Concept with Variable Interpretations

The theory of inclusive growth is shaped by its theoretical framework, the influence of international institutions, and a synthesis proposed by Klassen (2010). Despite a consensus on the importance of inclusive growth for national development, its definition and measurement remain subjects of debate.

According to various authors, inclusive growth should ideally represent a strategy for enhancing pro-poor growth by promoting overall well-being (Kakwani & Pernia, 2000). This improvement must involve full employment (Felipe, 2009) and the inclusion of all social strata in the production process (Ranieri & Ramos, 2013). The ultimate goal is to achieve a sustained reduction in unemployment within a framework that ensures equal access to economic opportunities for all individuals (Bourguignon, 2008; World Bank, 2013; Anand et al., 2013). Ali and Son (2007) emphasize that such strategies should particularly target the poorest social groups to counteract income inequalities.

Inclusive growth goes beyond pro-poor growth, which primarily focuses on increasing the purchasing power of the poor and reducing inequalities. It requires fostering control over strategies for participation in production and the equitable distribution of final products (Lokota et al., 2015). Growth can only be considered inclusive when it not only identifies the factors driving development but also ensures the fair distribution of the benefits derived from this growth.

From an institutional perspective, the definition of inclusive growth varies depending on the context and development level of each economy. For UNDP (2020), inclusive growth must be reflected not only in the full participation of the

population in the growth process but also in the equitable sharing of its outcomes. Similarly, the World Bank defines inclusive growth as ensuring equal access to resources and markets within a regulatory environment that benefits everyone (OECD, 2014). This definition adopts both microeconomic and macroeconomic approaches, emphasizing the pace and pattern of economic growth.

For the Asian Development Bank (ADB) and the African Development Bank (AfDB), inclusive growth primarily involves reducing inequalities by expanding access to health, education, social integration, and nutrition for low-income groups. This approach focuses on managing both the processes and outcomes of economic growth.

The numerous definitions outlined above illustrate the complexity of unifying the concept of inclusive growth. To address this challenge, Klassen (2010) conceptualizes inclusive growth as a dual-approach process. The first approach relates to a limited non-monetary dimension, while the second pertains to a broader non-monetary dimension.

The limited non-monetary dimension is focused on enhancing pro-poor growth, emphasizing full employment, reduced inequality, and equitable access for the poor to social opportunities. This approach is advocated by authors such as Felipe (2009), Ali and Son (2007), and Rauniyar and Kanbur (2009). Conversely, the broader non-monetary dimension integrates spatial, environmental, political, economic, and social constraints, recognizing that society may experience a reduction in inequality even as the number of poor individuals rises. Authors like Klassen (2010) and Hakimian (2016) support this perspective.

In summary, inclusive growth is a process of wealth creation that fosters social equity while promoting economic, political, social, spatial, and environmental balance.

2.2. Indirect Link between Inclusive Growth and Economic Vulnerability

The relationship between inclusive growth and vulnerability to external shocks is explained in economic literature through two primary channels: the foreign trade channel and the financial crisis channel. According to classical and neoclassical theories, openness to international trade promotes growth by allowing countries to benefit from comparative advantages such as technology diffusion. Dutta and Ahmed (2004) empirically validate this positive causal relationship in Pakistan, showing that value added to the economy is driven by exports and fiscal devaluation of import costs.

However, studies by Mbabazi (2008) using a sample of 44 developing countries reveal that while exposure to external trade shocks positively affects income, it also exacerbates inequality. They emphasize that the positive effects of trade openness depend on investments in human and physical capital. Furthermore, they highlight the geographic disadvantage of certain African nations, which amplifies the adverse effects of trade shocks on income. Similarly, Thurlow (2007), using a

dynamic general equilibrium model for South Africa, finds that trade liberalization has not promoted pro-poor growth, as it increases income inequality despite boosting overall income.

Conversely, Chukwu (2016), utilizing the generalized method of moments in a sample of 22 African countries, show that real export shocks have had a positive and significant impact on income.

Regarding the financial crisis channel, the pioneering work of Easterly et al. (2001) illustrates the vulnerability of national income to external financial crises using a heterogeneous sample of countries. Dabla-Norris & Gunduz (2014) replicate this study in developing economies and conclude that the extent of vulnerability depends on a country's international reserves. Furthermore, they highlight that institutional quality and structural policies play a critical role in building resilience to shocks.

Berman et al. (2012) suggest that assessing a country's vulnerability to external shocks requires analyzing their effects on prices and income. Price effects reflect the rise in import prices and the fall in commodity export prices during crises, which directly affect the incomes of commodity-importing nations. Building on this framework, Haraszti et al. (2014) use data from 16 African countries to show that their incomes remain vulnerable to fluctuations in GDP per capita in OECD nations, oil price volatility, and U.S. Federal Reserve monetary policies. Public spending and investments in physical and human capital are identified as critical factors in mitigating this vulnerability.

Finally, Haraszti et al. (2014) develop a theoretical model tested in developing countries, demonstrating that their incomes are vulnerable to trade shocks, tourism, external debt, capital flows, remittances, and foreign direct investment.

2.3. The Role of Agricultural Structural Change in the Relationship between Inclusive Growth and Economic Vulnerability in Developing Countries

The interaction of structural changes between economic vulnerability and inclusive growth can be seen through its effects on employment, growth, and poverty.

First of all, the agricultural sector is considered to be one of the sectors providing new jobs. According to Note (2018), 15 million jobs were created by the agricultural sector in 2010. Work by the OECD in 2012 shows that the adjustment of agricultural structures through the adoption of new technologies favors an increase in income. Empirical studies confirm this hypothesis. Irz et al. (2001) show that improving the productivity of agricultural factors in developing countries hurts poverty. Coelli et al. (2003) also demonstrate that structural improvement in the agricultural sector would reduce poverty in Africa. De Janvry and Sadoulet (2010) confirm the same hypothesis for developing countries. The reasons put forward by these authors are based on the fact that structural changes in agriculture boost the incomes of entrepreneurs in the sector, create more jobs, and

guarantee food sufficiency for the economy. Ravallion (1988) use simple regression models to show that agricultural structural change harms income inequality. This literature also shows that the effects of these agricultural structural changes depend on technological innovations. Based on this theoretical framework, Otchia (2014) in the Democratic Republic of Congo demonstrates by ordinary least squares that improved structural change in agriculture positively affects pro-poor growth.

To sum up, we note that the vulnerability of developing countries' incomes has so far been analyzed through the effect of trade shocks and financial crises. Income vulnerability remains dependent on both the economic policies pursued and external shocks, giving greater importance to cyclical variables. On the other hand, a country can be vulnerable because of its geographical, economic, historical, and even institutional heritage. In other words, some countries may be trapped by an original vulnerability (Easterly, 2010). It is becoming important to take structural vulnerability into account in income creation policies. This vulnerability has been developed by Guillaumont (2009) and is measured through the size of shocks and exposure to these shocks. To our knowledge, no study to date has tested the effect of this variable on inclusive growth in developing countries. This article therefore aims to show that the vulnerability of inclusive growth in developing countries depends on structural changes in the agricultural sector. The remainder of the paper first explains the methodology used before commenting on the results.

3. Methodology and Data Analysis

To test our hypothesis, we adopt a two-stage methodological approach. The first is to construct an inclusive growth index. This choice is based on the fact that this variable does not yet exist in the secondary databases. The second stage will define a panel methodological approach within the constraints of the data available to us, which we will describe in detail.

3.1. Composite Index of Inclusive Growth

3.1.1. Choice of Variables

The choice of variables to be combined in the construction of our composite indicator is based on economic realities such as:

- **The informal sector**: this variable captures the influence of the framework Institutional on the willingness of economic agents to accept constraints relating to the tax burden; bureaucracy; economic freedoms and rules protecting property rights (Mai & Schneider, 2016). This complex variable has the highest comparable scores in developing countries. According to the International Labour Organisation, 30% to 90% of jobs outside the agricultural sector in these countries are in the informal sector. Informal economic activity is the highest in the world. The results of Medina et al. (2017) show that, despite the heterogeneous nature of this variable in developing countries, they have the highest level of the informal sector in the world. The evolution of this variable as a

percentage of gross domestic product makes it possible to divide these countries into four groups. In the first group, which includes Mauritius, Argentina, Chile, China, and many other countries, has a rate of between 11% and 30%. In the second group, which includes Lesotho, Cameroon and Niger, the rates are between 30% and 40%. The third group, made up of Côte d'Ivoire and Colombia, has rates of between 40% and 50%. The fourth group, made up of Peru, Sierra Leone, Benin, Gambia, Tanzania, and Guatemala, to name but a few, reaches the ceiling with a rate of over 50%. According to the literature, this variable hurts inclusive growth.

- **Gross domestic product per capita**: This measures the level of development A country. Its effect on inclusive growth should be positive. This variable is taken from the Raykar et al. (2017).
- **Inequalities in**: This is a variable that captures the realities of the redistribution of income between social strata. In developing countries, the poverty rate is estimated at 72%, with a high proportion of young people.[1] In sub-Saharan Africa, for example. It can also be seen that 20% of the wealthy population holds half of the national wealth. Overall, the 06 most unequal countries are in the South, with scores of over 50%. The rest, except North Korea, which has a score of around 20%, have rates of over 30%. This high proportion of inequality would harm inclusive growth. The observable values for this variable come from: Solt (2019).
- **The human development index**: Captures the extent to which the population is **flourishing**.

Population about certain social opportunity functions. For our work, we have chosen to use the "proxies human Assets" Index constructed through collaboration between CERDI AND FERDI. The choice of this proxy is based on the fact that it takes into account five dimensions of human development, namely nutrition, the mortality rate for children under the age of 0 - 5, the adult literacy rate, and enrolment in secondary education. The results of their calculation show that of the 54 countries in our sample, only 17 perform below average. This variable would have a positive influence on inclusive growth.

- **Employment**: Seen as a social opportunity function, employment will make it possible to measure the effect of the active population on the process of inclusive growth. More than 80% of developing countries do not achieve a labor force participation rate of around 90%. The expected sign here must be positive. Its measurable value comes from Raykar et al. (2017).
- **Access to drinking water**: Is drawn from the same database as employment, access to water and sanitation, and access to education.

Drinking water positively affects the process of inclusive growth insofar as good quality water is likely to contribute to the health of those who consume it. The

[1]Between 1990 and 2012, Africa saw a fall in the percentage of the population living below the poverty line, from 57% to 43%. However, this fall in the poverty rate did not match the number of poor people in Africa during this period. The number of poor people rose from 280 million in 1990 to 330 million in 2012, with countries rich in natural resources performing badly (African Development Bank, 2013).

stylized facts on this variable in our study context show that this part of the world still has work to do in this area.

- **Agricultural land**: This variable will enable us to highlight the importance of productive land in the process of economic growth. Since 1995, the amount of agricultural land in our study area, as shown by World Bank statistics, has increased until 2008. After this period, a decrease was observed, certainly due to the relocation of farmers by forestry companies and the development of certain infrastructures. The theoretical sign of this variable, which should be positive, indicates a trend towards an inclusive growth strategy.
- **The carbon dioxide emissions** constructed by the World Bank, this variable.

It will make it possible to take account of environmental degradation caused by activities with negative externalities. It should hurt the process of inclusive growth.

Notice that, the inclusion of government integrity, political globalization, and CO_2 emissions in a composite index of inclusive growth is essential for providing a comprehensive analysis. These variables capture institutional and international dimensions as well as environmental imperatives, as proposed by Kaufmann et al. (2010), Dreher (2006), and Stern (2007). Together, they enable a holistic assessment of an economy's ability to grow sustainably and equitably.

Government integrity, encompassing transparency, accountability, and anti-corruption efforts, plays a critical role in fostering trust among citizens and investors. Kaufmann, Kraay and Mastruzzi (2010) highlight that strong, transparent institutions are associated with more efficient resource allocation, thereby stimulating inclusive growth. Transparency reduces inequality and promotes broader economic participation. The UNDP Human Development Report (2020) emphasizes that governments with integrity create an environment conducive to sustainable economic progress.

Political globalization, referring to a country's integration into international networks, positively impacts inclusive growth by facilitating cooperation and policy alignment. Dreher (2006), through the KOF Globalization Index, demonstrates the influence of political and economic factors on growth. Similarly, the OECD (2019) supports the idea that engagement in international frameworks strengthens national policies, promoting inclusiveness in growth.

CO_2 emissions are a critical indicator of environmental sustainability, integral to long-term inclusive growth. Stern (2007) argues that economic growth ignoring environmental constraints is unsustainable and detrimental to future generations' well-being. The UNDP (2020) underscores the necessity of incorporating environmental dimensions into inclusive growth models, advocating for reduced carbon footprints alongside equitable development.

3.1.2. Technique for Calculating the Inclusive Growth Index

To construct our index of inclusive growth at the base, we adopted Principal Component Analysis and the technique for calculating composite indices proposed by

Pearson (1901) and Hotelling (1933). The objective of this statistical technique is to reduce a multivariate data set to a reduced number of dimensions. The new dimensions each represent a linear combination of the original variables and must be uncorrelated. Obtaining these new statistical dimensions of the variables must respect the constraint of maximizing the variance of the sample while minimizing the loss of information. It sometimes happens that one of the combinations, commonly known as the factorial axis, is responsible for a significant proportion of the variation in the whole sample. The condition for the validation of this axis is that it obtains a score of at least 70%. However, the other axes which have a score greater than or equal to **100/P** (here p represents the number of variables), retain a significant influence on the variance of the sample (Hahn & Macé, 2012).

Algebraically, for a mass of multivariate data, principal component analysis implies that the real variables K_{1i}, ..., K_{ni} by linear combination become new variables with values Z_{1i}, …, Z_{pi}. This means that considering the order of importance from smallest to largest, the Z_{pi} are obtained through the following combinations:

$$Z_{1i} = a_{11}K_{1i} + a_{12}k_{2i} + \cdots + a_{1n}K_{ni}$$

$$Z_{2i} = a_{21}K_{1i} + a_{22}k_{2i} + \cdots + a_{2n}K_{ni}$$

$$(\ldots)$$

$$Z_{pi} = a_{p1}K_{1i} + a_{p2}k_{2i} + \cdots + a_{pn}K_{ni}$$

The weighting coefficients $a_{p1}; a_{p2}; \cdots; a_{pn}$ maximize the respective variances of each of the components $Z_{1i}; Z_{2i}; \cdots; Z_{pi}$ to minimize the loss of information for each sample. The sum of the squares of the weighting coefficients for each component must be equal to unity. The components are compared in ascending order of classification. In other words, the first component has a greater share in explaining the total variance than the second component, and so on. The consequence of such a logic justifies the fact that if the first component explains at least 70% of the sample, it can be retained as the main representative of the whole sample. The other conditions for validating a principal component analysis are based on the Bartlett sphericity test and the Kaiser-Meyer-Olkin (1974) sampling accuracy test. To achieve our goal, we used XLSTAT 2016, which imposes a unit matrix. The results obtained are recorded in **Appendices 3** and **4**.

Finally, the results obtained (see **Appendix 3**) show that inclusive growth has shown an upward trend over the study period. This trend is characterized by two sub-periods. The first, from 1991 to around 2005, was characterized by essentially negative inclusive growth. The second sub-period, from 2005 to 2019, shows positive inclusive growth in value terms. But overall, as shown in **Appendix 3**, on average 41 countries have an average inclusive growth rate above zero and the other have an average score over the period below zero. Overall, however, the level of inclusive growth remains low. Could this low level of inclusive growth in a capitalist world with selfish interests be turning into a vulnerability trap, as was the case with poverty and inequality?

3.2. Empirical Analysis of Vulnerability and Inclusive Growth: Taking Account of Structural Changes in Agriculture

In this section, we present the data, the estimation technique, and the results.

3.2.1. The Data

To measure the interaction of agricultural structural changes between vulnerability and inclusive growth we work with secondary data to which we link our index of inclusive growth.

Our explained variable is the inclusive growth index (***Inclu***), which we construct using principal component analysis. As explanatory variables, we first use the FERDI economic vulnerability index (***VE***) developed by Cariolle (2010) and revised in 2015. Our study uses economic vulnerability to explain inclusive growth. We have not distinguished between structural vulnerability and vulnerability inherent in political decisions. In operational terms, we use the Economic Vulnerability Index (EVI) of the Ferdi (Foundation for International Development Studies and Research). This index is a measurement tool that assesses the economic vulnerability of developing countries (Ben Saad, 2016). The unique feature of the Ferdi EVI is that it takes into account three key dimensions of economic vulnerability: external vulnerability, which measures a country's dependence on exports, imports and capital flows. Internal vulnerability, which measures the fragility of the country's economy, particularly in terms of diversification of production, consumption and investment. Finally, environmental vulnerability, which measures the country's vulnerability to environmental shocks, such as natural disasters, climate change and environmental degradation.

By combining these dimensions, the EVI provides an aggregate measure of economic vulnerability. This index serves as a valuable tool for policymakers, economists, and international organizations in assessing risks and opportunities for economic development in developing countries.

The IVI variable is an arithmetic weighting of phenomena such as the size of shocks and exposure to shocks. Shocks can be commercial or natural. Other elements such as population size, export concentration, distance from the world market, homelessness, instability of exports, and agricultural production are also taken into account (Brooks et al., 2005). Theoretically, economic vulnerability should hurt inclusive growth in developing countries. The second explanatory variable is the interaction between economic vulnerability and changes in agricultural structures (***VE*Tsa***). These changes in agricultural structures are extracted from the "*Structural Change Database*". This variable captures the share of improvements in agricultural policies in developing countries. Its interaction with economic vulnerability should promote inclusive growth.

Concerning the control variables, we distinguish between those that take account of the socio-economic environment and those that include the institutional and political environment. For the economic environment, we use government spending (***Dep_gov***), socio-economic conditions (***soe_cond***), and ethnic tensions

(***eth_ten***). Ethnic tensions and political globalization are vital control variables in analyzing the impact of vulnerability on inclusive growth (Fearon & Laitin, 2003). Ethnic tensions can alter a country's social and political dynamics, influencing economic vulnerability and limiting the effectiveness of inclusive policies. They may also escalate into violent conflicts, undermining political stability and hindering the implementation of inclusive growth strategies (Collier & Hoeffler, 2004). Political globalization introduces external factors that may either support or hinder inclusive development in a given country. Controlling for these variables allows for a nuanced understanding of the mechanisms moderating the relationship between vulnerability and inclusive growth, facilitating tailored policy recommendations for developing countries (Rodrik, 1999).

As for the political and institutional environment, we include government stability (***Stab_gov***) proposed by the same institution. The aim here is to take into account the legislative trend, the unity of the government, and the support of the population. Government integrity (***Gov_int***) proposed by Feulner (2017) is also included to capture realities such as the credibility of politicians, prohibited transactions, transparency of government policies, and the level of corruption. The ***polity*** variable takes into account the level of democracy. Political globalization (***Mondepo***) is taken from the Yay et al. (2016) database. This measures the degree of political integration of countries in the process of political globalization by weighing variables such as the signing of international treaties, diplomatic representations, membership of international organizations, and participation in the United Nations Security Council. This choice is motivated by a concern to take into account globalization, which in this case remains a reality with mixed effects. Other control variables in line with the scientific literature are also included. Descriptive statistics for all the variables described above are presented in **Appendix 2**.

3.2.2. Estimation

We are working with panel data. This approach, which is based on a set of 49 developing countries (**Appendix 1**) observed from 1991 to 2020, not only makes it possible to combine both the individual and temporal dimensions, but also to take account of the unobserved heterogeneity specific to each subject in the sample. However, this methodological approach also poses certain problems, such as the interrelationship between explanatory variables and country effects, as highlighted by the work of Baltagi (2009) and Ali (2007). Furthermore, inclusive growth cannot be explained solely by a limited number of variables. Moreover, its composite index results from the combination of several phenomena. In other words, our analysis would suffer from the problems of omitted variables. Similarly, inclusive growth can also have an impact on vulnerability. In this case, simultaneity bias due to double causality will mar our results. Given these problems, we choose a dynamic panel specification.

However, the introduction of the lagged variable into the model renders the

generalized least squares estimator inefficient (Kiviet, 1995; Baltagi, 2009; Yilmaz et al., 2010). This leads us to adopt the method of generalized moments in a system (GMM) proposed by Blundell-Bond (1998) and Arellano and Bond (1991). In addition to taking into account country effects, this technique corrects for the influence of time-invariant factors. The problems of endogeneity, omitted variables, and simultaneity bias are thus corrected (Roodman, 2009). The model to be estimated is as follows:

$$\begin{cases} \Delta Inclu_{i,t} = \beta_1 \Delta Inclu_{i,t-1} + \beta_2 \Delta VE_{i,t} + \beta_3 \Delta VE * Tsa_{i,t} + \varphi' X_{i,t} + \Delta W_t + \Delta \varepsilon_{i,t} & (1) \\ Inclu_{i,t} = \beta_1 Inclu_{i,t-1} + \beta_2 \Delta V_{i,t} + \beta_3 \Delta VE * Tsa_{i,t} + \varphi' X_{i,t} + W_t + \varepsilon_{i,t} & (2) \end{cases}$$

In this equation, φ' et $X_{i,t}$ are matrices composed of coefficients and control variables respectively. W_t takes into account the time dimension and $\varepsilon_{i,t}$ represents the error term.

4. Analysis and Discussion of the Results

Table 1 shows that our variables of interest show the expected signs. Firstly, the economic vulnerability index has a significant negative impact on the level of inclusive growth in developing countries. In other words, the increase in phenomena such as exogenous shocks, distance from the world market, and the proportion of the population living in poor conditions puts inclusive growth policies into perspective. It should be pointed out that these variables constitute the components of economic vulnerability. Indeed, when economic vulnerability varies by 1%, inclusive growth decreases by 0.036%.

However, the interaction of economic vulnerability with changes in agricultural structures changes the picture. We find that the observed sign is now positive. The interaction of agricultural structural adjustments interacts negatively and significantly with the economic vulnerability of inclusive growth in developing countries. The variation in the percentage of 1% of the crossed variable between the vulnerability and the agricultural structural changes affects positively and significantly the inclusive growth of 0.0024%. This result justifies the view that the greater the agricultural structural changes in developing countries, the less vulnerable their inclusive growth will be to external and natural shocks.

Table 1. Impact of vulnerability on inclusive growth.

	Fixed effect	**Least squares across the board**	**GMM in system**
	Inclusive growth	Inclusive growth	Inclusive growth
Inclut-1			1.049***
			(0.0369)
VE	**−0.195*** **	**−0.0335** **	**−0.104*** **
	(0.025)	(0.0136)	(0.0202)
soe_cond	−0.011	0.0201	−0.0623**
	(0.068)	(0.0298)	(0.0265)

Continued

eth_ten	0.215*	−0.0225	0.0831
	(0.114)	(0.0596)	(0.0620)
gov_stab	0.008	0.0275*	−0.0170
	(0.047)	(0.0152)	(0.0263)
gov_int	−0.048***	−0.00394	−0.00465
	(0.008)	(0.00325)	(0.00761)
polity	0.014**	0.00180	−0.000228
	(0.006)	(0.00152)	(0.00506)
VE*Tsa	**0.0008***	**0.000446****	**0.00247*****
	(0.0005)	(0.000189)	(0.000357)
Dep_gov	0.020***	0.000989	0.00600
	(0.006)	(0.00247)	(0.0111)
mondepo	0.040***	0.0110***	−0.0251***
	(0.009)	(0.00363)	(0.00420)
x	−0.036***	0.00892*	0.00752
	(0.013)	(0.00490)	(0.00766)
m	0.00709	0.00960**	0.00187
	(0.0106)	(0.00406)	(0.00751)
fsan	0.0752***	−0.0204	0.0101
	(0.0272)	(0.0169)	(0.00855)
dvh	0.151***	0.172***	0.0154
	(0.0174)	(0.0124)	(0.0151)
or		−1.255*	0.417
		(0.687)	(0.368)
county		−1.933***	−0.0668
		(0.340)	(0.210)
Constant	−11.66***	−4.900***	1.484
	(2.142)	(1.054)	(1.523)
Comments	784	784	703
R-squared	0.546		
Wald chi2(7)		371.51***	
AR(1) test			z = −8.28***
AR(2) test			Z= −0.64
Sargan test			chi2(30) = 38.66
Number of countries	49	49	45

Note: In brackets, we have the standard deviations corrected for heteroscedasticity and the stars represent the significance thresholds at 1% (***), 5% (**), and 10% (*).

5. Conclusion

The objective of this paper was to analyze the role of agricultural structural change in shaping the effect of economic vulnerability on inclusive growth in developing countries. Using a sample of 49 countries, we first constructed a composite index of inclusive growth through principal component analysis. Our findings confirm that, despite the positive trend in inclusive growth across these countries, the overall level remains very low and highly susceptible to external shocks.

Furthermore, the results from estimating the dynamic panel model using the Generalized Method of Moments (GMM) proposed by Blundell and Bond (1998) validate our hypothesis. Structural changes in agriculture significantly influence the relationship between economic vulnerability and inclusive growth. An increase in economic vulnerability notably reduces the level of inclusive growth. However, when agricultural structural changes are considered, the adverse effect of vulnerability is reversed, turning into a positive impact.

This underscores the imperative for developing countries to implement economic policy measures that prioritize inclusive growth while focusing on transforming agricultural structures. Our findings highlight the importance of addressing vulnerability traps in the design and execution of development policies. These results align with the work of Blancard, Bonnet and Hoarau (2021); Hugon & Colin, 2015; Hugon, 2016; Guillaumont (2006; 2009; 2014; 2017); Goavec and Hoarau (2015); Gnangnon (2017); and Easterly et al. (2001).

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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Appendices

Appendix 1. Sample of countries of the study***.

List of countries included in the analysis principal component				sample selected for GMM analysis of panel data		
South Africa	El Salvador	Madagascar	Dominican Republic	South Africa	Guinea	Sierra Leone
Argentina	Ecuador	Malaysia	Kirghizstan	Argentina	Guinea-Bissau	Sri Lanka
Armenia	Fiji	Malawi	Rwanda	Bangladesh	Honduras	Tunisia
Azerbaijan	Gambia	Mali	Senegal	Bolivia	Iran	Turkey
Bahamas	Ghana	Morocco	Sierra Leone	Botswana	Jordan	Uruguay
Bangladesh	Guatemala	Maurice	Sri Lanka	Brazil	Lebanon	Yemen
Bhutan	Guinea	Mauritania	Swaziland	Burkina Faso	Madagascar	Zimbabwe
Bolivia	Guinea-Bissau	Mexico	Tajikistan	Cameroon	Malaysia	
Botswana	French Guiana	Mongolia	Tanzania	Chile	Malawi	
Brazil	Haiti	Mozambique	Thailand	China	Mali	
Burkina Faso	Honduras	Namibia	Trinidad and Tobago	Colombia	Morocco	
Cape Verde	Indonesia	Nicaragua	Tunisia	Costa Rica	Mexico	
Cambodia	Iran	Niger	Türkiye	Ivory Coast	Namibia	
Cameroon	Jamaica	Nigeria	Uruguay	R. Dominican	Mongolia	
Chile	Jordan	Uganda	Venezuela	Egypt	Nicaragua	
China	Kazakhstan	Pakistan	Yemen	El Salvador	Niger	
Colombia	Laos	Papua NG	Zambia	Ecuador	Nigeria	
North Korea	Ivory Coast	Peru	Zimbabwe	Gambia	Uganda	
Costa Rica	Lesotho	Philippines		Ghana	Philippines	
Egypt	Lebanon	Qatar		Guatemala	Senegal	

***Countries in red are those excluded from the vulnerability trap analysis due to missing data.

Appendix 2. Descriptive statistics by 5-year period.

		1991-1995		1996-2000		2001-2005		2006-2010		2011-2019	
	total	M	δ	M	δ	M	δ	M	δ	M	δ
Vulnerability	320	33.21	10.34	33.10	11.17	32.65	11.23	32.23	11.77	31.50	11.44
Inclusive growth (ACP)	251	−2.366	2.067	−1.423	1.628	−0.189	1.286	1.472	1.639	2.388	2.745
Population size	360	39.20	23.64	38.00	23.53	36.73	23.38	35.45	23.16	34.29	22.99
Distance	360	57.12	23.19	57.00	23.44	55.68	23.66	55.47	23.89	52.64	25.36
Concentration of X	334	33.44	23.95	29.66	21.98	29.77	21.70	30.66	23.57	29.40	22.87
Vulnerable population	360	13.83	22.96	13.79	22.83	13.75	22.71	13.75	22.66	13.75	22.62
Agricultural instability	336	24.84	19.68	23.55	18.10	23.88	19.05	23.39	19.31	22.80	18.85
Instability of X	336	22.13	20.99	21.37	23.09	20.06	23.51	19.14	23.95	19.34	23.20
Disasters	360	52.82	33.65	56.68	30.59	60.38	27.82	62.45	25.45	63.54	26.17

Continued

Resilience	331	35.61	12.34	34.89	12.13	33.92	11.85	33.20	11.95	31.90	12.15
Natural shocks	336	40.34	18.96	40.87	17.71	42.03	15.98	42.81	15.08	43.11	14.84
External shocks	336	31.24	13.85	31.12	14.71	31.04	14.68	30.97	15.15	31.03	14.89
Inclusive growth ALS	287	8.346	0.997	8.297	1.088	8.458	1.099	8.621	1.084	8.939	1.003

Source: Author, using FERDI data (M = mean; δ = standard deviation).

Appendix 3. Composite Index inclusive growth with informal sector.

	ANNEXE 2A: indice de croissance inclusive avec secteur informel													
Pays	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**
Angola	-2,743	-2,649497839	-2,239888381	-1,71894805	-1,381828819	-0,973881481	-0,531980537	0,053550112	0,824769633	1,41556819	1,877593473	2,021803507	2,844226202	3,20223529	
Benin	-3,515710623	-2,98475894	-2,288538634	-1,6061671	-0,69704685	-0,68802686	-0,235936963	-0,123115213	0,569331315	1,556194537	1,856730246	2,308229753	2,603784367	3,245030964	
Botswana	-2,504104962	-1,316289511	-1,580298006	-1,181003358	-1,43761888	-1,013387211	-0,527621526	-0,012862721	0,18734629	1,345816637	1,623103118	2,000872068	2,249892413	2,166155648	
Burkina	-3,10653462	-2,810880606	-1,848066374	-1,977362863	-1,462867762	-1,227363965	-0,933632219	-0,411170905	0,276689577	0,975915328	1,031715879	1,542451541	1,902954591	2,456799776	2,809631514
Cap vert	-3,10653462	-2,810880606	-1,848066374	-1,977362863	-1,462867762	-1,227363965	-0,933632219	-0,411170905	0,276689577	0,975915328	1,031715879	1,542451541	1,902954591	2,456799776	2,809631514
Cameroun	-2,862468926	-2,972229288	-2,804593781	-2,526757565	-2,08304671	-1,432300971	-1,163388066	-0,845126004	-0,107727503	0,582315683	1,602469041	2,049945809	3,142322954	2,887503884	3,239315466
Cote d'Ivoire	-2,955860684	-2,525926846	-2,320925284	-1,822978988	-1,220354972	-0,602353272	-0,193647281	0,140335995	0,731461363	1,074234876	1,174170144	1,377819594	1,435138639	1,571634832	1,89800209
Gambie	-2,227979598	-1,88296949	-1,904426156	-1,618999044	-1,626670565	-1,189721527	-0,533504569	-0,475126661	0,078087587	1,338138824	2,125873874	2,555626943	2,932862988	2,428807393	
Ghana	-3,02520175	-2,714471277	-2,36529615	-2,287254141	-1,646823756	-1,120353129	-0,487626878	-0,537462472	-0,297560111	0,558952605	0,696553944	1,472230689	2,609466544	3,206085251	3,369769022
Guinée	-2,989847639	-2,991173643	-2,749622865	-1,915814518	-1,419660139	-1,067776926	-0,906064649	-0,23771409	0,317324849	1,09737057	1,42824076	2,338970169	2,393376234	2,91293519	3,789456697
Guinée-Bissau	-3,692430442	-2,431492035	-2,004323882	-1,982764439	-1,651251946	-0,874252963	-0,419218106	0,097840951	0,696541084	1,577379365	1,937756241	2,733733413	2,707109012	3,305373747	
Lesotho	-0,961607647	-0,808897475	-1,078986026	-0,573056931	-0,968617842	-0,190491016	-0,517798854	0,060051777	0,242563621	0,318317751	1,313486978	3,165035664			
Madagascar	-3,000067443	-2,411579146	-2,010641232	-2,06994659	-1,529220862	-1,470361063	-0,592841486	-0,03349177	0,934867648	1,328436028	1,47879691	1,999289046	2,396013853	2,397261744	2,583484366
Malawi	-3,281866527	-2,953576847	-2,287195716	-1,666804522	-1,23367617	-0,875285805	-0,243730925	0,256657891	0,103814567	1,147589675	1,627805651	1,897440851	2,433538714	2,385574273	2,68971489
Maurice	-2,836247038	-2,763347675	-2,845004874	-2,199516036	-1,031776995	-0,426011386	0,175308168	0,435496402	0,610742528	1,028840039	1,663882485	1,967466728	2,931272482	3,288895172	
Mali	-3,319289991	-2,911332503	-2,302959879	-1,630553613	-0,216773286	-0,394596495	0,006900478	0,938216439	1,502135113	2,176182739	3,059494075	3,092576924			
Mauritanie	-1,628665034	-1,771636182	-1,489591	-2,05224057	-1,75820621	-1,291319401	-1,041507046	-0,395038422	-0,402040382	0,130560349	0,478149024	1,352881271	1,963963175	2,27493879	2,798799537
Uganda	-2,843398786	-2,507955471	-1,973665915	-1,533531717	-1,038797555	-0,388687869	-0,279918689	0,113688084	0,646981985	1,205097529	1,91929459	2,074412113	2,000245598	2,606236103	
Mozambique	-2,633269127	-2,961962691	-2,531298699	-1,845830088	-1,368994191	-0,396117569	0,349340375	0,735525238	1,508775404	2,570968608	3,064737949	3,508124791			
Namibie	-1,14087054	-1,571709376	-2,090346937	-1,8763926	-1,3949271	-0,900490978	-0,687904491	-0,301220481	1,187286367	1,538167217	1,753921156	1,753799424	1,611462439	2,119225899	
Niger	-3,384325431	-3,494936424	-2,12781555	-2,188845246	-1,392725023	-1,488427726	-0,514236756	-0,001107573	0,410360059	1,369429553	0,929905915	1,951936051	1,7770438	2,747642188	2,551100749
Nigeria	-1,499786658	-1,219098061	-1,248602057	-1,24432115	-1,187266601	-0,485499774	0,028296563	0,269586265	0,756720282	1,533162892	1,744931025	2,551877274			
Rwanda	-2,798081311	-2,144855829	-1,481377512	-1,774325755	-1,189401356	-0,852641112	0,219852365	0,450114023	0,619435258	0,241299339	0,793228245	1,05812987	1,255536732	1,699930823	1,885260431
Sénégal	-2,67557581	-2,255392323	-2,707111067	-2,142883966	-1,500901854	-0,625343277	-0,191287101	-0,051668989	0,311294165	1,393970259	2,084874977	2,371256289	2,098064123	2,009960413	1,880744159
Sierra Leone	-3,079792665	-2,854666662	-2,916832489	-1,556427834	-1,488444172	-0,62485296	-0,322132109	0,2851944	0,678607266	1,145821445	1,405379677	1,825683393	2,255735423	2,365201467	2,881525819
Swaziland	-2,4286359	-2,439388979	-1,898301928	-1,44856887	-0,407268657	0,155822591	0,889555306	1,288436762	1,508981223	1,388678627	0,82933594	1,002048185	1,559305699		
Tanzanie	-2,845661659	-2,286444046	-2,587281914	-2,492188583	-1,680267222	-1,067757055	-0,008086174	0,079478093	0,868619609	0,601048763	1,128214921	1,12359957	1,544205136	2,100762322	2,696989254
Zambie	-3,257905142	-3,145405782	-2,739085824	-2,283978625	-1,220760905	-0,461876487	-0,048209701	0,905339439	1,179707017	1,69089165	2,587570952	3,340803663	3,452909744		

Appendix 4. Inclusive growth composite index excluding informal sector.

Pays	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Angola	-2,7437105	-2,64948741	-2,23987956	-1,71894128	-1,38182338	-0,97387765	-0,53197844	0,0535499	0,82476639	1,41556262	1,87758608	2,02179555	2,844215	3,20222268						
Benin	-3,59677166	-3,30440544	-2,75597304	-2,01932717	-1,4839371	-1,11247511	-0,69731082	-0,18844987	0,38423848	0,47404396	0,81545982	0,9321835	1,36175126	1,73553265	1,88242787	2,16924182	2,50081025	2,90296058		
Botswana	-3,34504627	-2,57784282	-2,25192546	-1,7715763	-1,14029776	-0,32246466	-0,16022676	-0,04773105	-0,0338531	0,40031389	0,63910022	1,21238419	1,48492213	2,41870869	2,53659365	2,88067836				
Burkina	2,76337876	3,21672363	2,82780228	2,5041784	2,29731678	2,10430104	1,84890095	0,77448694	0,97261334	0,32991648	-0,5586922	0,5331313	-0,5696245	-1,45608317	-1,77488201	-2,23581606	-2,61549955	-3,02199018	-3,25127206	-3,28493369
Cap vert	-3,05328837	-3,43981856	-3,24225355	-2,97627407	-2,55768564	-2,23020198	-1,59072643	-1,12189849	-0,82869368	-0,35840136	-0,09150722	0,44427135	0,77728374	1,44734587	1,85564493	2,09128528	2,60136625	2,93787251	3,2498456	3,60287066
Cameroun	-2,36403851	-3,09304351	-3,10375024	-2,59053323	-1,97833355	-2,02119964	-1,5132006	-1,25517597	-0,84528099	-0,4265453	-0,05859578	0,43104722	1,02609889	1,36671732	1,50469687	2,05708592	2,40385645	2,62998807	2,97932128	3,19908865
Côte d'Ivoire	-2,2206724	-2,78650163	-2,94965156	-2,88669196	-2,41919998	-2,15991891	-1,12950593	-0,16099863	0,09333204	0,68606334	0,7563287	0,97650384	1,19885002	1,27697691	1,42688368	1,43760352	1,68043099	1,86300758	1,66045775	2,44447042
Djibouti	2,68576299	2,93705051	2,64336272	2,51912331	2,2936995	1,68823632	1,69719316	1,34024755	0,73630166	0,45506792	0,14093902	-0,45065312	-0,96340831	-1,51964301	-1,88650477	-2,34870069	-2,38035077	-2,78365024	-2,97921957	-2,27235874
Ethiopie	-3,2288825	-2,76155321	-2,41899235	-2,21516444	-2,25559423	-1,18768241	-1,24755039	-0,81673591	-0,29194446	0,85141844	0,97676869	1,38541941	2,10094596	2,38077062	2,84540533	2,81735498	3,06601648			
Gambie	-2,01172985	-2,17680333	-2,10322686	-1,89106086	-1,42684735	-0,65040106	-0,89164711	-0,64149442	0,33175034	0,43491569	0,64392728	1,14403656	1,65127594	2,01748058	2,88172806	2,68809641				
Ghana	-3,38407795	-2,71295313	-2,46231297	-2,06185791	-1,72403018	-1,46349714	-1,16238065	-1,25437809	-0,64583758	-0,14530185	-0,37962596	-0,0866316	0,24107921	0,91474069	1,13628894	2,27715319	2,60303773	3,16747686	3,52255634	0,3425907
Guinée	-2,18052768	-2,04741865	-1,64667863	-2,30461101	-2,2591268	-2,18325124	-1,97448757	-1,04248089	-0,57253187	-0,28138006	-0,16186735	0,4886864	1,05204224	1,57444218	1,95243316	2,16360161	2,5141179	3,03589531	3,87314296	
Guinée-Bissau	-3,85897795	-2,30077844	-1,77690253	-1,77868586	-1,43359355	-0,8369277	-0,31984246	0,16434559	0,68662809	1,28104927	1,71027015	2,54288299	2,58169461	3,33883779						
Lesotho	-1,4716118	-1,21674085	-1,22614153	-1,13875394	-0,9960159	-0,71796408	-0,86192821	-0,37146154	0,14086478	0,6758766	0,71617384	1,02735066	1,39548553	1,64615855	2,3987079					
Madagascar	-2,82782503	-2,21147939	-2,07975889	-1,9980159	-1,68696809	-1,9775485	-1,84867897	-1,37948892	-0,45663503	-0,37604788	0,51520671	0,59533978	0,96218482	1,7448922	2,06331634	2,53744764	2,75494333	2,86217029	2,69984988	
Malawi	3,56570022	2,94843582	2,77855291	2,56447254	2,19830095	1,67960807	1,33240544	0,52566253	0,41529044	0,0006928	0,43852869	1,03291756	0,76837881	1,51716136	1,85799606	2,24736212	2,59383745	2,51281003	2,49455846	2,54418558
Mali	-3,28512814	-2,70877577	-2,10134593	-1,91127682	-1,56430338	-1,07033333	-0,60744405	-0,27240348	0,25709032	0,12860155	0,79323902	1,25062528	1,91844922	2,6427235	3,3123075	3,2179745				
Mauritanie	-2,21222599	-2,40088014	-2,16861805	-2,20480163	-2,41109406	-2,43625547	-1,43997746	-0,96057707	0,01056092	0,69051494	0,68854573	0,7248652	0,69256899	0,85944201	1,33129764	1,38941733	2,13768458	2,58180029	2,51239012	2,61534213
Maurice	2,43795227	2,87562167	2,48100073	2,37165276	1,97338856	1,7743153	2,00256766	1,35571914	0,69833864	0,00752328	-0,70549024	-1,06133029	-1,65453705	-2,04137775	-2,3940346	-2,64579014	-3,52175	-3,95376995		
Mozambique	-2,95707077	-2,44121632	-2,30786702	-2,15781805	-1,46478558	-1,18826818	-0,61795095	0,12379617	0,69299292	1,08666996	1,27254182	1,22163868	1,6742559	2,35348973	2,27637915	2,43321251				
Namibie	-2,15054538	-2,32784456	-1,95437069	-1,6270571	-1,60582113	-0,95680433	-0,6849686	0,06801429	0,25880155	0,7222649	1,25918745	1,03691491	1,41239906	2,0797451	2,17484975	2,29523477				
Niger	-2,90780049	-2,92336664	-2,76778959	-1,95259993	-2,31988582	-2,52837511	-1,24964581	-1,42859379	-0,45435857	-0,62420231	0,21493491	0,54623575	0,93381678	1,80413198	1,42232951	2,2586028	2,36258773	3,2044399	3,01443297	3,39510573
Nigeria	2,75494975	2,46635874	2,58827329	2,01457182	1,38423121	0,70836333	0,48659142	-0,06846548	-0,86135917	-1,10686435	-1,3989062	-1,72852962	-1,76745608	-1,86505584	-1,47472165	-2,13198117				
Rwanda	-4,13502521	-3,52342628	-3,14594515	-2,40882902	-2,2717806	-1,39492733	-0,7795872	-0,44280595	-0,23877394	0,53857452	0,59417899	0,91751463	1,13923326	1,01737847	1,40016893	1,75560476	2,03576163	2,31178934	2,4714439	2,4580638
Sénégal	-2,73430024	-2,3933056	-2,531489	-2,85574945	-1,97128023	-1,55778387	-1,48711171	-1,24058935	-0,66141908	-0,31674602	0,33991392	0,70551299	0,71167049	1,82111869	2,47267463	2,77152869	2,39097171	1,91418852	1,99694506	1,55938422
Sierra Leone	-2,22679197	-1,92619537	-2,3724996	-2,04479497	-1,97815467	-2,21099041	-1,68108136	-1,45330982	-1,30355907	-0,19192011	0,23756832	0,77716336	1,2041834	1,86729394	2,0941846	2,45555897	2,97435613	2,76327071	3,01571793	
Afrique du sud	-3,00633586	-2,4720971	-2,08055267	-1,60571327	-1,65718218	-1,49338562	-1,29115181	-1,0439663	0,00084915	0,59414235	0,45155021	1,03121514	1,37301779	1,33465005	1,85924644	2,46554556	2,91572147	2,62444665		
Swaziland	-2,0639929	-1,798178	-1,57509127	-1,71004935	-1,5889915	-1,70988532	-1,14779314	-0,59589839	0,34070775	0,87729806	1,52417679	1,61816692	1,94003364	1,84702069	1,06760831	1,44760883	-0,71686202			
Tanzanie	-2,76662342	-2,52016514	-2,07151647	-1,77413552	-1,56084082	-1,5764023	-1,57199226	-1,20252901	-1,04850645	-0,36090957	-0,12412685	0,4069288	0,67363401	1,10553175	1,43585545	1,73240545	2,0691046	2,61264218	3,16639732	3,37524826
Ouganda	-2,66264841	-2,63713476	-2,46998356	-2,19229102	-1,85625658	-1,37779728	-1,01400693	-0,59476939	-0,24531899	-0,02431603	0,21248586	0,445771	0,83073624	1,09812784	1,53808246	1,61078062	1,67159273	1,82982506	2,10392801	2,31884127
Zambie	-1,690232	-1,82941728	-1,91782532	-2,12075536	-1,94399903	-1,79487693	-1,44960009	-1,14449289	-0,31082044	0,26123513	0,54753276	1,20596885	1,45998368	1,92973715	2,45920929	3,1013387	3,2370138			
Zimbabwe	2,80940495	2,62750983	2,54246125	2,10222279	2,12385149	1,77093149	1,14720219	0,58755188	0,13875574	-0,49501804	-0,71183181	-1,05682298	-1,38089649	-1,8015039	-2,02806911	-2,23202192	-2,52724819	-1,78958675	-1,82689242	