ERASMUS UNIVERSITEIT ROTTERDAM

Erasmus School of Economics

THE IMPACT OF TRADE OPENNESS ON ECONOMIC GROWTH

Evidence in Developing Countries

MASTER THESIS

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Author: Vasiliki Pigka-Balanika

Thesis supervisor: Maarten Bosker

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Abstract

Many economists generally agree that openness accelerates economic development. This study explores the relationship between trade openness and economic growth using a sample of 71 developing countries over the period 1990 – 2005. Incorporating an augmented Solow growth model in a panel data analysis, both fixed and two-way fixed effects specifications indicate that trade liberalization has a positive and significant effect on economic growth. However, the Sub-Saharan Africa region does appear to be different; high natural barriers to trade, export dependence on primary commodities and poor overland infrastructures to distant large markets can explain why increased trade openness does not contribute to economic growth.

Keywords: *Trade openness, economic growth, neoclassical economic model, developing countries, Sub-Saharan African region.*

Contents

I. Introduction

How trade openness affects economic growth is a topic that has amassed a large amount of research. Many economists support that protectionism may induce faster economic growth while liberal analysts argue that a higher degree of openness leads to a better economic performance. After all, does trade openness really contribute to economic growth? Few questions have been more strongly debated in the history of economic thought. Restricting my attention to 71 developing countries and collecting data from the World Databank, I investigate the exact impact of trade openness on economic growth. Developing countries render a remarkable example as in recent decades; many of them have embarked on programs of external economic liberalization.

Using the framework of a neoclassical Solow model, whose central predictions concern the impact of investments and population growth on real income, I expand it by adding trade openness as the key variable which proxy for the level of technology, with an altering set of controls as well. Incorporating it in a panel data analysis over the period 1990-2005, I examine how differently trade openness affects economic growth by gradually increasing the number of my explanatory variables. Fixed effects model found that trade openness significantly and positively contribute to economic growth after controlling for important causal factors like the initial GDP per capita. The same picture is delivered by a two way fixed effects specification that leads me to more consistent and accurate results, as the country specific heterogeneity is minimized, increasing the explanatory power of my model.

However, as I move forward in the course of my survey, I come across evidence showing that the benefits of openness have shrunk for the poorest developing countries of my sample. Isolating the 30 Sub Saharan African countries of my initial sample, I found that there is no relationship between trade openness and economic growth, even though I control for omitted variables bias. This outcome comes in contrast with the main hypothesis that trade openness is a good growth promoting policy and I suppose that for some regions, so structurally different from the rest of the world, such as the SSA region, global comparisons are particularly meaningless. The factors and conditions that can explain why SSA counties are not benefiting from an open trade regime is the next focus of my research.

Albeit, the rest of the paper is structured as follows: section II analytically refers to how trade openness is defined, section III briefly reviews the theoretical and empirical literature of the openness-growth nexus and section IV sets out my model specification and variables' description. As for section V, it bears details of data and methodology and empirical results are presented in section VI. Finally, section VII concludes.

II. Trade openness: What does it really mean?

It is widely accepted that open economies grow faster compared to closed ones. The globalization movement, which accelerated especially in the 1980s, enforced this situation to come into view more clearly. According to Fischer (2003), globalization is defined as the "ongoing process of greater economic interdependence among countries reflected in the increasing amount of cross-border trade in goods and services, the increasing volume of international financial flows and increasing flows of labor". During most of the 20th century, import substitution strategies (ISI)[1] played a dominant role in most developing countries' development strategies. But, while developing countries in Latin America, following ISI strategies, achieved lower growth rates, East Asian countries that enacted export promotion policies, experienced a higher economic performance. This possibly explains the growing interest of many researchers to investigate the relationship between trade liberalization and economic performance since the late 1970s.

Before analyzing the existing theoretical and empirical literature on the relationship between economic growth and trade openness and my own contribution on this specific field of research, I will try to shed light on an important problem facing researchers today; the lack of a clear definition of "trade liberalization" or "openness". The two concepts while closely related are not identical. Trade liberalization includes policy measures to increase trade openness while increased trade openness is usually considered as an increase in the size of a country's traded sectors in relation to total output. Increased openness can, but need not, be the result of trade liberalization. Recently, the meaning of "openness" has become identical to the idea of "free trade" that is a system where all trade distortions are eradicated. Pritchett (1996) simply defines "openness" as an economy's trade intensity. However, according to Kyrre Stenses (2006), it would be more precise to define openness in relation to barriers to international trade imposed by governments.

New economic geography models (NEG)[2] specifically define international trade openness as low international trade cost which is an abstraction of transport cost, tariffs, subsidies taxes and non-tariffs barriers. Yanikkaya (2003) mentions that this definition has changed over time from one extreme to another. On the one hand, Krueger (1978) argues that trade liberalization can be attained by implementing policies that lower the biases against the exports sector, for instance subsidizing exports or encouraging exports schemes, while on the other hand, Harrison (1996), supports that trade openness could be synonymous with the idea of

[1] Strategies which replace foreign imports with domestic production.
[2] Study about the location, the distribution and the spatial organization of economic activities across the world.

neutrality, the indifference between earning a unit of foreign exchange by exporting and saving a unit of foreign exchange through import substitution. It is crucial to understand this definition problem as there are several openness measures that are differently linked to economic growth. However, the purpose of my research is to provide a description of the growth enhancing potential of trade openness and I will continue my analysis in this direction.

III. Literature review

International trade and economic growth have been explained through "old" and "new" trade and growth theories that explicate why countries trade among each other. Neoclassical trade theories include comparative advantage and Heckscher-Ohlin Samuelson theories in order to explain the basis for trade. In the Ricardian model, as trade becomes more open, any country specializes in producing goods in which it has a comparative productivity advantage, which arises due to differences in technologies or natural resources and not in factor endowments, increasing its welfare gains and benefits from trade. On the other hand, the Heckscher-Ohlin Samuelson model analyzes the welfare gains in a two countries, two factors model that each country exports the good which uses its abundant factor (capital or labor) more intensively. As a result, both countries, with different comparative costs and different terms of trade, are better off under international trade rather than in an autarky situation.

In models of economic growth, there is not a clear relationship between trade and the rate of economic growth. In the early growth models, such as the Harrod-Domar model, where capital is the sole factor of production, a trade liberalization episode has positive growth effects (Srinivansan, 1999). This is possible under the assumption that the marginal product of capital (MPK) is bounded under a positive number[3]. In neoclassical models for closed economies, such as the Solow model (1957), growth is exogenously determined. The remarkable feature of Solow model is that, under the assumption of diminishing returns to scale, there is a steady state level of per capita GDP (gross domestic product) to which developing countries can converge. This implies that two countries with similar saving, depreciation and population rates can converge to similar standards of living in the long run (Ray, 1998). Moreover, Harrison (1994) supports that international trade openness, according to Solow model, creates inflows of capital goods and technology which broaden industrial activity and trade in manufactured products and expand economic growth.

New trade theory is now entering to deal with some of the realities of trade in a more complex manner by incorporating a fuller range of factors. New models that attempt to

[3] If the MPK declines to zero, opening the economy to trade has only temporary effects on the growth rate of output (Solow model).

endogenize growth have been approved. Theories relating trade openness to long run growth are mainly based on models of endogenous technological change. According to these models, developing countries can achieve a long term economic growth which is now endogenously and not exogenously, as neoclassical growth theory predicts, determined. This is possible under the assumption of increasing returns to scale.

Chen and Gupta (2006) support that economies can continually grow, due to the assumption of increasing returns to scale and argue that international trade openness causes knowledge spillovers, augments productivity and improves human capital. In the same line, Romer (1990) suggests that openness provides domestic producers with a broader variety of capital and intermediate goods, enlarging the base of productive knowledge and generating faster productivity growth. Grossman and Helpman (1990), developing endogenous growth theory, indicate that openness and foreign direct investments (FDI) inflows spur economic growth. Technology diffusion provokes technological change which stimulates growth. However, Baldwin et al (2001) introduce a contradictory view of endogenous growth implication on economic growth. They prove that market opening causes global divergence, in which the North industrializes and grows faster diverging from the South.

To sum up, according to the traditional neoclassical theories, growth originates from trade. What endogenous theory does is to show how countries, through the channels of openness, can work with the process of globalization to find complementary activities like education or job training which help them to survive and develop. Overall, it is apparent that neoclassical and new trade theories differ in many points but agree that international trade openness stimulates economic growth among developing countries.

Trade openness - Economic growth

International trade openness is a channel through which FDI, capital inputs, goods and services flow to host countries or regions. These are sources of economic growth to developing countries. The relationship between trade openness and economic growth has been an issue of controversy and verification by academics and researchers in recent years. This section presents the literature and empirical review of the above relationship.

Ever since Adam Smith (1937) and David Ricardo (1973), economists have acknowledged the positive role of openness to trade on economic growth. Trade can directly increase per capita income when countries specialize in producing goods in which they have a comparative advantage but it also can indirectly encourage development via other channels such as technology transfer, product diversity, increasing scale economies, efficient allocation and distribution of resources within the economy and interaction with trading partners.

However, it should be mentioned that in cases where trading partners are asymmetric countries, with significantly different technologies and endowments, economic integration, even if it increases the worldwide growth rates, may unfavorably affect individual countries[4].

Numerous studies have reported the importance of trade in the long run. Macro econometric evidence finds that open economies enjoy faster economic growth while micro econometric evidence supports that firms that experience faster growth, are those which have already entered the export market. Openness raises imports and exports of goods and services and improves domestic technology. Hence, production process is more effective and productivity rises. As a result, economies open to world trade; grow faster than closed ones and increasing openness is assumed to have a positive impact on growth. For this reason, Ben-David and Loewy (1998) proposed that trade barriers should be decreased for an economy to grow. The greater the growth effects, the more countries enact trade barriers reduction policies. However, Adhikary (2011) mentions that a liberalized trade regime results in larger exchange rate depreciation which decreases the aggregate supply of inputs by increasing the prices of the imported inputs used in the production. As a consequence, domestic output tends to be reduced and domestic market becomes less competitive.

According to many empirical studies, the growth rate of GDP is positively related to the growth rate of trade openness (Edwards (1992), Wacziarg (2001), Sinha D. and Sinha T. (2000)). However, not everyone agrees that openness to trade is of outstanding importance. Rodriguez and Rodrik (1999) show that the positive correlation between openness and growth is not robust as a result of problems in openness measures or lack of the appropriate control variables. For instance, Rodrik et al. (2002) demonstrate that the strong effect of trade on growth, in both Alcala and Ciccone (2002) and Dollar and Kraay (2003), comes from their choice of measuring openness by using "real openness"[5], instead of the conventional measures of openness[6], which always results in positive biased estimations of openness on growth. In addition to this, it is possible that omitted variables may create a positive relationship between openness and growth (Rodriguez and Rodrik (2001); Hallak and Levinsohn (2004)). If one includes a geography measure or a measure of institutional quality, then the effect of openness on growth is mitigated and becomes less significant.

Another group of literature supports that trade openness effectively fosters economic growth, only by the improvement of particular policies and sectors or by the existence of

[4] See Grossman and Helpman (1991), Lucas (1998), Rivera-Batiz and Xie (1993) and Young (1991).

[5] Nominal trade divided by GDP adjusted for purchasing power parity.

[6] Nominal trade divided by nominal GDP.

specific preconditions. For international trade openness contribution to be strong in developing countries, Rodrik (1997) proposed the accumulation of human capital, physical infrastructures, macroeconomic stability, private sector development and the rule of law. In addition to this, Abramovitz (1986) and Howitt (2000) support that host economies should have a sufficiently high level of "social capability" in order to successfully implement technology developed in more advanced economies. Finally, the adoption of technology also depends on the "absorptive capacity" of a country which is determined by human capital and R&D investment. The lack of investment in human capital and R&D prevent less developed countries from fully exploiting technology transfers, and hence confines productivity growth.

Even though technological spillovers, international transmission of knowledge and allocative efficiency are more easily achieved with an open trade regime, there are many studies which support that trade openness negatively affects economic growth. According to Alessandro De Matteis (2004), trade liberalization sets exogenous constraints to economic growth. This is specifically detrimental to young economies, since it contributes to enforce their dependence on international demand and to increase their vulnerability to the fluctuations of international markets. In addition to this, Rodrik (1992) mentions that openness may cause macroeconomic instability by augmenting inflation, depreciating exchange rates and leading to balance payment crisis while Levine and Renelt (1992) claim that a higher degree of openness negatively affects domestic investments. Finally, Battra and Slottje (1993) and Leamer (1995) suggest that free trade can be a primary source of economic downturn. Trade liberalization implies lower tariffs, making imports more attractive than domestic production. In this case, the domestic economy may suffer a loss.

To sum up, in view of the studies within the literature, it can be stated that no certain agreement has been achieved on the effect of trade openness on economic growth. Despite the strong theoretical support that growth in trade generates continuous economic growth; many times, the failure of the empirical literature to consistently deliver the same picture is a fact. One part of the explanation for this lack of conclusive evidence is due to the inappropriate way in which trade, defined in terms of trade openness, is measured. Additionally, data and methodology quality are reasons that existing studies have been criticized for.

Do countries with lower policy induced barriers to international trade grow faster? This is the central question of my survey. I will try to investigate the exact impact of trade openness on economic growth, in a panel of developing countries, by altering the set of my control variables. The reason I am doing this, is in order to see whether my results significantly change when I change my control variables. For instance, how does the relationship between the trade share of GDP and economic growth change, when the initial GDP per capita enters

the growth equation? Subsequently, I will examine again the openness growth nexus, by focusing only on the thirty Sub-Saharan African countries of my initial sample. SSA countries are shown to be a long way from the major economic markets in Europe, North America and East Asia than most other regions in the world. This is one of the reasons that motivated me for this further analysis.

IV. Theory

The objective of this research is to investigate the exact effect of international trade openness on economic growth in a survey of 71 developing countries, using cross sectional panel data for the period 1990-2005. The phenomenal differences among the growth rates of East Asian, Latin American and Sub-Saharan African countries motivated me to include developing countries from all over the world, with different economic, political, geographical and institutional features, exploring how trade liberalization influences their economic performance. Data availability was an additional crucial factor to my final choice. In the course of my research I come across evidence that the benefits of openness have weakened for the poorer developing countries, particularly during the onset of the third wave of globalization around 1980. SSA region consists of 47 countries, 34 of which are ranked as the world's poorest countries. This motivated me to continue my survey by isolating the thirty SSA countries of my initial sample and examine again the effect of trade openness on their economic performance.

This research is based on a neoclassical growth theory model. I assume a Cobb-Douglas production function which is given by:

$$Y = K^{\alpha}(AL)^{1-\alpha} \qquad 0 < a < 1 \qquad (1)$$

where Y is the output, K is capital, L is labor and A the level of technology. Labor and technology are assumed to grow exogenously at rates n and g respectively.[7] One part of the output is invested at a constant rate s and the existing capital depreciates at an exogenous rate δ. The model defines k, the capital stock per unit of effective labor, k=K/AL and y, the output per unit of effective labor, y=Y/AL. I use the following equations:

- $\dot{K(t)}=sY(t)-\delta K(t)$, equation of capital accumulation (2)
- $\dot{k}=sf(k)-(n+g+\delta)\kappa$, basic equation of Solow[8] (3)
- $k^{*}=(\frac{s}{n+g+\delta})^{1/(1-\alpha)}$, steady state capital labor ration ($\dot{k}=0$) (4)

[7] L(t)=L(0)e^{nt} and A(t)=A(0)e^{gt}.
[8] The intensive form of the production function, divided both inputs by AL is f(k)=k^{a}.

Substituting equation (4) into the production function and taking logs, I take the steady state income per capita (empirical specification):

- $\ln\frac{Y}{L} = a + \frac{a}{1-a}\, lns - \frac{a}{1-a}\ln(n + g + \delta) + \varepsilon$ (5)

By making the above analysis, I come across evidence that the central predictions of Solow model concern the impact of investments (s) and population growth (n) on real income. Hence, these two variables are included in my basic empirical specification. However, the focus of my research is on economic growth, the growth rate of GDP per capita and not the steady state income level. For this reason, taking the natural log of the Cobb-Douglas production function and then the derivatives with respect to time, I derive the growth rates of my variables and find the following equation:

- $\Delta\left(\frac{Y}{L}\right) = g + a\{s(\frac{Y}{K}) - \delta - n - g\}$ (6)

A more detailed description of the above equations is cited in the Appendix (part 1).

I assume that g and δ are constant across countries. According to Mankiw, Romer and Weil (1992), g reflecting the advancement of knowledge, is not country specific and depreciation rates do not vary greatly across countries. For this reason, I construct my model by focusing on population growth and the fraction of output which is invested. Measuring **n** as the rate of population growth and **s** as the investment share of GDP (including domestic investments), I gradually augment the model, by incorporating: a) trade shares of GDP, as a measure of international trade openness which proxies for the level of technology. Trade openness allows for technology diffusion across countries exposing them to new ideas and more advanced methods of production b) the initial GDP per capita, the growth literature emphasizes the importance of the initial values in explaining subsequent growth rates that are captured by the initial value of GDP c) control variables. I select the set of control variables considering both their importance as growth determinants per se and their potential for affecting the growth response of trade openness. Hence, my final empirical specification can be specified as follows:

$$\Delta(GDPpc)_{it} = \beta_0 + \beta_1\Delta(POP)_{it} + \beta_2(INV)_{i(t-1)} + \beta_3(TO)_{i(t-1)} + \beta_4(Controls)_{i(t-1)} + \beta_5(GDPpc)_{i(t-1)} + \varepsilon_{it} \quad (7)$$

The key variable of this study is trade openness. A brief discussion of this variable is provided below:

Trade openness

It is a remarkable fact that while for some, South Korea has been an open and outward economy (Greenaway and Nam, 1988), for others it is an example of a semi-closed economy in which the government highly intervenes (Wade, 1994). For a long time, economists have attempted to find comparative measures of trade openness but this has proven to be controversial and difficult. To investigate measurement, we acknowledge that openness is a multidimensional concept. However, some studies choose openness measures due to data availability and some other researchers have constructed indices that measure the degree one country exports and imports goods, such as Leamer (1998), Dollar (1992) and Sachs and Warner (1995).

Trade openness has been measured in various ways in the hundreds of studies investigating the issue. Firstly, the most basic measure of openness is trade shares (outcome openness measure), which is exports plus imports divided by GDP, used by a large number of studies that find a positive and strong relationship with growth. The second category includes measures of trade barriers (policy openness measures), such as average tariff rates, export taxes, taxes on international trade and indices of non-tariff barriers (NTBs) which measure the trade restrictiveness of countries. Tariffs, defined as the ratio of tariff revenues to import values, directly measure trade restrictions but their impact on growth is a quite controversial issue.[9] Due to data limitations and the existence of measurement errors, most of these measures are highly ignored in the empirical literature.

Exchange rates are another group of measures. Black market premium is the most widely used measure in this group and indicates the severity of trade restrictions. Nevertheless, it is argued that the black market premium, reflecting general poor economic management, is a good proxy for the overall degree of external sector distortions rather than being a measure of trade policy, due to its high correlation with a number of "bad" policies, such as high inflation or high degree of corruption. Finally, various indices of trade orientation have been constructed to examine the impact of openness on growth. Sachs and Warner (SW) openness index is a binary measure, which ranks countries as closed, if they meet any of the following five criteria: average tariff rates of 40% or more, NTBs covering 40% or more, a socialist economy, a black- market exchange rate depreciated by 20% or more relative to the official exchange rate on average during 1970 or 1980s and a state monopoly on major exports. This index is not often utilized due to its restrictive nature. It only classifies countries as fully liberalized or closed to trade, without estimating the depth of international trade.

[9] Lee (1993), Harisson (1996) and Edwards (1998) proved a significant and negative relationship between trade and growth while Barro Sala I Martin (1997) and Clemens and Williamson (2001) found that this relationship is weak.

Taking into consideration all the above literature, trade shares of GDP, measured as exports plus imports divided by each country's GDP, (X+M/GDP), is used as the key variable in my research, to proxy for the level of trade between the economy and the rest of the world, shedding light on the significance of trade volumes in enhancing economic growth in developing countries. But, why an outcome openness measure and not a policy indicator or a measure of effective protection?

Outcome measures describe the volume of trade or its components. In simple words, the higher the trade share for a particular country, the more open its economy is to trade benefits. Even though this type of indicator is most subject to endogeneity problems with respect to growth (Frankel and Romer, 1999), it focuses on the effects of actual exposure to international markets on economic growth, accounting well for the effective level of interaction in regional and international level.[10] This dimension captures the importance of trade to a particular country. An important advantage of using trade shares of GDP is that they are not contrived.[11] Trade outcomes are clearly defined, well measured and more easily obtainable from objective data sources. All the aboves explain why the majority of empirical studies use trade shares for the hypothesis testing. Nevertheless, a striking anomaly arises when countries are ranked by this measure. Trade shares of GDP take into account only the relative position of a country's trade performance compared with its domestic economy. This results in the ranking of some countries such as Japan, as relatively closed economies.[12]

Overall, as I mentioned before, increased trade openness can result in magnified gains owing to large knowledge spillovers, greater level of competition, product variety and technology transfer. Higher exports increase real output while higher imports mitigate production cost.[13] As a result, it is commonly accepted that a high degree of trade openness is a growth enhancing policy tool.

Main Hypothesis*: Trade openness is an engine for economic growth. Actually, I expect a positive and statistically significant relationship between them.*

[10] Trade interaction within and between countries.
[11] This is in contrast to various indices of trade orientation, constructed by many researchers, such as the arbitrary binary (0, 1) measure proposed by Sachs and Warner (1995).
[12] They are closed in the sense that their trade share of total economic activity is quite low by world standards.
[13] According to the theory of comparative advantage, international trade leads to a more efficient use of a country's resources through the imports of goods and services that otherwise are too costly to produce within the country.

Control Variables:

- **Population growth:** Economic theory offers no consensus to policymakers on the relationship between population and economic growth. The supporters of endogenous growth theory claim that population growth stimulates technological advancement while classical economists argue that a rampant population growth possibly deteriorates GDP per capita. Thus, population growth could be beneficial or detrimental to economic growth.
- **Investments:** In my research the investments variable includes domestic investments which can increase the level of productivity in the economy by improving the quality and quantity of human capital. A positive and statistically significant relationship between growth and investments is expected.
- **Inflation:** Inflation is used as a proxy for macroeconomic stability, but a high value of this variable is assumed to have a negative impact on growth since it confines output growth, savings and the quality of investments.
- **Domestic credit:** Domestic credit by the banking sector as a share of GDP is the financial support that is offered to the private sector as an engine of economic growth. Enacting policies that develop one country's the financial sector would be expected to expand economic growth.
- **Industry:** This is the industrial share of GDP, used to proxy for industrialization processes and technological capacity or depth in developing countries. Along with trade variables, industrial value added works as an impetus affecting economic growth positively.

  A more detailed description of control variables is cited in Appendix, part 2.

V. Data and methodology

In this section, I start to undertake an empirical investigation of the main hypothesis that trade is a good growth promoting policy tool. The dataset used in this research, is an unbalanced panel data consisting of 71 developing countries (Appendix, part 4) covering the years 1990-2005. I chose a relatively long time period[14] in order to examine the specific effects that trade openness has on growth and isolate the influence of other factors. Then, I will try to identify, in the context of the openness-growth relationship, factors that can account for the poor growth performance of sub-Saharan African countries (SSA). Thus, I isolate the thirty SSA countries of my initial sample (Appendix, part 5), and I examine again the main hypothesis. The data[15] has been collected by the World Data Bank.

Particularly, for economic growth, I choose GDP annual growth rates per capita and for my major independent variable, trade openness, I take exports plus imports divided by GDP. As a proxy of investments and population growth, gross capital formation as a share of GDP[16] and annual population growth rates are included in my regression, as the Solow model predicts. Also, GDP deflator, domestic credit and industrial value added, as a share of GDP are used to proxy for macroeconomic stability, financial development and industrialization process respectively.

In each model, I run several regressions controlling one different set of variables at a time. The reason I am doing this is in order to see whether my results significantly change when I change my control variables. Using OLS specification leads me to invalid results. OLS regressions of per capita income on the ratio of exports plus imports and other variables may not indicate the effect of trade on growth due to endogeneity of trade shares. Does trade cause growth or growth cause trade? Countries, whose incomes are already high, for reasons not related to trade, may have higher trade ratios. Also, OLS is likely to be inefficient since it does not control for unobservable individual effects. For the above reasons, I continue to a panel data analysis which includes both random effects (RE) and fixed effects (FE) models. There are several reasons for the increasing interest in panel data models. An important one is that they capture, compared with time series or cross sectional data sets, both inter country and inter temporal variation giving us the possibility to reveal dynamics and information which are difficult to detect with other estimation techniques. Finally, the large number of

[14] According to Sachs and Warner (1995), Edwards (1998) and Rodrik and Rodriquez(2001), 16 years are considered as a long time period

[15] All the observations of my explanatory variables are annual.

[16] Gross capital formation (formerly gross domestic investments consists of outlays on additions to the fixed assets of the economy plus net changes in the level of inventories (World data bank).

observations is an additional advantage which increases the degrees of freedom and the variability of our model, making it more accurate.

- My first model can be specified as follows:

$$\Delta(GDPpc)_{it} = \beta_0 + \beta_1(TO)_{i(t-1)} + \beta_2\Delta(POP)_{it} + \beta_3(INV)_{i(t-1)} + \beta_4(D.CR)_{i(t-1)} + \beta_5(IND)_{i(t-1)} + \beta_6(INFL)_{i(t-1)} + \beta_7(GDPpc)_{i(t-1)} + u_{it} \quad (8)$$

The equation (8) shows the Random effects (RE) model. Due to the fact that economic growth in a current period t also depends on the values of my explanatory variables in a previous period (t-1), the lags of independent variables are used. $u_{it} = \alpha_i + \varepsilon_{it}$, where α_i is time invariant, denoting unobservable individual effects, and ε_{it} denotes the remainder disturbance. In this approach, consistent estimation imposes that α_i is uncorrelated with the regressors.

However, in many applications the assumption that the observable regressors are uncorrelated with the unobservable characteristics is considered not realistic, as there are reasons to believe that E $\{controls, \alpha_i\} \neq 0$ or E $\{TO, \alpha_i\} \neq 0$. That is, the unobserved heterogeneity in α_i, correlated with one or more of my explanatory variables. For instance, countries' geographical characteristics, such as landlockdness, are highly correlated with trade openness and influence its effect on growth. For this reason, many researchers like Dollar and Kraay (2001) and Frankel and Romer (1999), use geographical variables in order to obtain instrumental variables estimates of trade effects on income. The term α_i includes time invariant variables like geographical or climate characteristics. Hence, the possible existence of correlation between unobservable effects and trade openness possibly explains why Random effects model is not the appropriate one for my research and leads me to inconsistent and biased results due to omitted variables. Finally, the Hausman[17] test verifies the above conclusion.

For all the above reasons, I use the fixed effects specification for all the sets of my regressions. In a fixed effects model, the intercept varies across individuals (countries in my survey) and therefore it relies on variation within individuals and not between them.

[17] The Hausman test, tests the null hypothesis that unobservable individual effects are uncorrelated with the explanatory variables against the alternative hypothesis that the unobservable characteristics are correlated with the explanatory variables.

- My model is specified as follows:

$$\Delta(GDPpc)_{it} = a_i + \beta_1(TO)_{i(t-1)} + \beta_2\Delta(POP)_{it} + \beta_3(INV)_{i(t-1)} + \beta_4(D.CR)_{i(t-1)} + \beta_5(IND)_{i(t-1)} + \beta_6(INFL)_{i(t-1)} + \beta_7(GDPpc)_{i(t-1)} + w_{it} \quad (9)$$

where a_i captures all the unobservable heterogeneity across individuals that panel data analysis renders a major attraction for researchers. In this approach, consistent estimation does not impose that a_i is uncorrelated with the explanatory variables.

Further, I extend my analysis, by using the two-way fixed effects model. This specification leads me to even better results than fixed effects model, since it not only captures the unobservable individual effects a_i but also the unobservable time effects, by adding in equation 9 an additional intercept ξ_t.

- The two way fixed effects specification is specified as follows:

$$\Delta(GDP)_{it} = \beta_1(TO)_{i(t-1)} + \beta_2\Delta(POP)_{it} + \beta_3(INV)_{i(t-1)} + \beta_4(D.CR)_{i(t-1)} + \beta_5(IND)_{i(t-1)} + \beta_6(INFL)_{i(t-1)} + \beta_7(GDPpc)_{i(t-1)} + a_i + \xi_t + w_{it} \quad (10)$$

where a_i is the individual unobservable effects which varies across countries and is fixed over time, ξ_t is the timed unobservable effects that varies by year and is fixed across countries and w_{it} is the remainder stochastic error term.

VI. Empirical results

I start the empirical analysis by examining only the effect of trade openness on economic growth without including any control variables (model 1, table 1). Afterwards, I extend the model by adding six control variables one at a time and in this way, I construct the basic specification of my research (model 7, table 1). The reason I am doing this is in order to see whether my key variable, trade openness, significantly changes when I augment the number of the explanatory variables. From model 1 to model 7, trade openness is statistically significant at 5 and 1 percent level. However, its negative sign in the first two specifications (model 1 and model 2), contrasts with the main hypothesis that openness to international trade is an engine for economic growth. This unexpected sign can be attributed to the problem of omitted variables bias since the model leaves out many important causal factors. Lagged independent variables control for many omitted ones. For this reason, when the lag of GDP per capita is included (model 3), trade openness starts to positively contribute to economic growth in all the following sets of regressions and the explanatory power of the model significantly increases (R^2= 0,35). All the other independent variables, apart from domestic credit, have the expected signs. Investments significantly and positively influence economic growth. Population growth and industry value are also beneficial to economic development while inflation carries a negative coefficient, indicating the negative consequence of macroeconomic price instability. The unexpected negative sign of domestic credit on economic growth can be attributed to the fact that the financial sector in many developing countries is still underdeveloped and domestic credit is expensive and scarce. In continue, I enrich my survey, by choosing FE for both cross section and period specific effects (model 7, table 2). Indeed, the two-way fixed effects model presents approximately similar results; giving strong support that trade openness plays a key role to economic growth in a panel of developing countries.

Table 1:

Panel data model: Dependent variable GDP growth per capita

Independ. Variables	**Model 1**	**Model 2**	**Model 3**	**Model 4**	**Model 5**	**Model 6**	**Model 7**
	FE	**FE**	**FE**	**FE**	**FE**	**FE**	**FE**
$(Tr.open)_{t-1}$	-0.04*** (0.01)	-0.04** (0.01)	0.03** (0.01)	0.03** (0.01)	0.05** (0.01)	0.02** (0.01)	0.03** (0.01)
Δ(pop)		0.35** (0.16)	0.26* (0.14)	0.35** (0.14)	0.36** (0.14)	0.33** (0.14)	0.33** (0.14)
$(GDPpc)_{t-1}$			17.1*** (0.89)	17.58*** (0.92)	17.86** (0.93)	17.11*** (0.9)	17,1*** (0.93)
$(Industry)_{t-1}$				0.02 (0.05)	0.006 (0.05)	0.04 (0.05)	0.04 (0.05)

(Dom.cred.)$_{t-1}$					-0.01 (0.01)	-0.01 (0.01)	-0.01 (0.01)
(Invest.)$_{t-1}$						0.17*** (0.03)	0.17*** (0.03)
(Inflation)$_{t-1}$							-0.0005 (0.0005)
Model Summary:							
R^2	0.11	0.11	0.35	0.36	0.37	0.39	0.39
Hausman	0.04	0.002	0.000	0.000	0.001	0.002	0.005
Cross sect.	71	71	71	71	71	71	71
Periods	16	16	15	15	15	15	15
Tot.observ.	1132	1132	1063	1023	1019	1019	1019

Notes: ******* significant at 1% level, ** significant at 5% level, * significant at 10% level. Standard errors are shown in brackets.

Table 2:

Panel data model: Dependent variable GDP growth per capita							
Independ. Variables	**Model 1 Two way FE**	**Model 2 Two way FE**	**Model 3 Two way FE**	**Model 4 Two way FE**	**Model 5 Two way FE**	**Model 6 Two way FE**	**Model 7 Two way FE**
(Tr.open)$_{t-1}$	-0.05*** (0.01)	-0.05*** (0.01)	0.03** (0.01)	0.03** (0.01)	0.05*** (0.01)	0.03** (0.01)	0.03** (0.01)
Δ(pop)		0.44** (0.15)	0.27** (0.14)	0.37** (0.14)	1.38*** (0.14)	0.3** (0.14)	0.3** (0.14)
(GDPpc)$_{t-1}$			17.62*** (0.98)	18.13*** (1.01)	18.66*** (1.03)	17.75*** (1.02)	17.82*** (1.02)
(Industry)$_{t-1}$				0.01 (0.05)	0.007 (0.05)	0.04 (0.05)	0.03 (0.05)
(Dom.cr.)$_{t-1}$					-0.01 (0.01)	-0.01 (0.01)	-0.01 (0.01)
(Invest.)$_{t-1}$						0.18*** (0.03)	0.18*** (0.02)
(Infl.)$_{t-1}$							-0.0004 (0.0005)
Model Summary:							
R^2	0.15	0.16	0.37	0.38	0.42	0.4	0.4
Cross sect.	71	71	71	71	71	71	71
Periods	16	16	15	15	15	15	15
Total observ.	1132	1132	1063	1023	1019	1019	1019

Notes: ******* significant at 1% level, ** significant at 5% level, * significant at 10% level. Standard errors are shown in brackets.

I continue my empirical investigation by focusing on the growth and openness link, limiting the sample of my countries. The SSA region is structurally so different from the rest of the world that global comparisons are not particularly meaningful. Indeed, many African policy makers believe that the lessons from East Asia and Latin America do not apply to them

because the circumstances enormously differ. This stimulated me to isolate the thirty SSA countries from my initial sample and to examine again the main hypothesis. I observe that, in contrast with my previous results, even though I control for omitted variables bias, trade openness is statistically insignificant in all the sets of regressions (table 3) which implies that increased trade openness does not really contribute to economic growth. Various factors can explain this result. Imports increase faster than exports in SSA countries, resulting in a balance of payment deficit that imposes macroeconomic adjustment cost on the economy.[18] Additionally, SSA countries depend more than half of their export earnings on just two primary commodity goods which not only do they attract much gains compared to manufactured ones, but also they are subject to weak and volatile world prices. This situation comes in contrast with other countries with high shares of manufactures in their exports, such as the East Asian countries that are relatively protected from non-stable export earnings, even though they face a competitive world market. Another reason is that SSA countries face 'natural barriers' that raise the cost of trade. This implies that imports are more expensive and exporting more costly. Also, many SSA countries are landlocked and many of those that are not, have large interiors. This means that the primary products they produce should be transported large distances to reach ports; road and rail systems tend to be inefficient and scarce throughout SSA and sea shipping costs are relatively high. As a result, all the above factors plus poor infrastructures, rigidities in technological and industrial capacity and an underdeveloped financial sector can explain why increased trade openness does not enhance economic growth for SSA countries and that the East Asian and Latin America countries of my initial sample drive the previous significant and positive openness - growth nexus. Similar results are presented in table 4 by using the two-way fixed effects model.

Table 3:

Panel data model: Dependent variable GDP growth per capita							
Independ. Variables	**Model 1** **FE**	**Model 2** **FE**	**Model 3** **FE**	**Model 4** **FE**	**Model 5** **FE**	**Model 6** **FE**	**Model 7** **FE**
(Tr.open)$_{t-1}$	-0.09*** (0.02)	-0.09*** (0.02)	0.02 (0.02)	-0.01 (0.01)	-0.007 (0.01)	-0.002 (0.03)	-0.002 (0.03)
Δ(pop)		0.68** (0.21)	0.57** (0.2)	0.59** (0.2)	0.58** (0.2)	0.55** (0.2)	0.55** 0.2
(GDPpc)$_{t-1}$			15.95*** (1.67)	14.23*** (1.8)	14.24*** (1.8)	15*** (1.71)	15*** (1.72)
(Industry)$_{t-1}$				0.19** (0.08)	0.19** (0.08)	0.2** (0.08)	0.2** (0.08)
(Dom.cr.)$_{t-1}$					-0.03 (0.02)	-0.03 (0.02)	-0.03 (0.02)
(Invest.)$_{t-1}$						0.11*	0.12*

[18] An example is provided by Ethiopia, where the trade deficit expanded in the 1990s as imports increase from 12 to 28 per cent of GDP but exports only rose from 6 to 15 per cent of GDP.

						(0.06)	(0.06)
(Infl.)$_{t-1}$							-0.005 (0.01)
Model summary:							
R^2	0.12	0.13	0.28	0.29	0.29	0.3	0.3
Hausman	0.02	0.04	0.005	0.02	0.02	0.02	0.04
Cross sect.	16	16	15	15	15	15	15
Periods	30	30	30	30	30	30	30
Tot.obs.	476	476	448	441	437	439	439

Notes: ******* significant at 1% level, ** significant at 5% level, * significant at 10% level. Standard errors are shown in brackets.

Table 4:

Panel data models: Dependent variable GDP growth per capita

Independ. Variables	**Model 1** **Two way FE**	**Model 2** **Two way FE**	**Model 3** **Two way FE**	**Model 4** **Two way FE**	**Model 5** **Two way FE**	**Model 6** **Two way FE**	**Model 7** **Two way FE**
(Tr.open)$_{t-1}$	-0.08** (0.02)	-0.08** (0.02)	0.02 (0.02)	-0.02 1.74	-0.02 (0.02)	-0.002 (0.03)	-0.001 (0.03)
Δ(pop)		0.67** (0.21)	0.51** (0.2)	0.53** (0.2)	0.51** (0.2)	0.48** 0.2	0.48** (0.2)
(GDPpc)$_{t-1}$			15.96*** (1.97)	14.69*** (2.15)	15.23*** (2.00)	15.8*** (2.02)	15.76*** (2.02)
(Industry)$_{t-1}$				0.19** (0.08)	0.19** (0.08)	0.2** (0.08)	0.2** (0.08)
(Dom.cr.)$_{t-1}$					-0.03 (0.02)	-0.04* (0.02)	-0.03 (0.02)
(Invest.)$_{t-1}$						0.11* (0.06)	0.12* (0.06)
(Infl.)$_{t-1}$							-0.008 (0.01)
Model summary:							
R^2	0.19	0.20	0.31	0.32	0.33	0.34	0.34
Cross sect.	30	30	30	30	30	30	30
Periods	16	16	15	15	15	15	15
Tot.observ.	476	476	448	441	441	439	439

Notes: ******* significant at 1% level, ** significant at 5% level, * significant at 10% level. Standard errors are shown in brackets.

VII. Conclusion

Trade liberalization has been a prominent element of policy advice to developing countries during the last two decades. It is claimed that economic growth is probably the most important benefit originated from it, since increased trade openness promotes the efficient allocation of resources, enhances competition in national and international markets and allows for diffusion of knowledge and technology across countries. But, can this argument confidentially be generalized?

Using an augmented production function based on the standard Solow model and transforming it in a panel data estimation technique, I try to investigate if trade openness plays a key role to economic growth in a sample of 71 developing countries during the period 1990-2005. Both fixed effects and two-way fixed effects models deliver the same outcome; increased trade openness significantly and positively contributes to economic growth in a sample of East Asian, Latin America and Sub-Saharan Africa countries, after controlling for important growth determinants. Using the panel data analysis, I find that unobserved country specific effects are significant and ignoring them introduces a serious omitted variables problem. For this reason, after controlling for important causal factors, like the initial GDP per capital, population growth, proxies for macroeconomic stability, industrialization and financial development, I conclude to growth enhancing effects of trade openness.

Then, even though, until now I find consistent evidence that increased openness promotes growth, when I isolate the 30 SSA countries of my initial sample and examine again the main hypothesis, my empirical results give strong support that there is no evidence of relationship between economic growth and trade openness. Natural barriers that raise the cost of trade, poor overland infrastructures to distant large markets, export dependence only on two primary goods and a low level of human capital, technological capacity and institutional quality are all important reasons that can explain the previous empirical result.

Additionally, evidence has been raised that the relationship between openness and economic growth is not necessarily always positive. I found that an open trade regime brings a lot of benefits to many developing countries such as of East Asia and Latin America region, that drive the previous positive openness-growth nexus, but not for SSA countries. As a result, I suppose that how trade liberalization affects economic growth depends on a large set of determinants, which account for the proposed heterogeneity across countries, including the geographical position, the existing level of development, the macroeconomic stability or the strength of financial sector and domestic institutions and that, many times, global comparisons are not particularly meaningful.

To sum up, during my survey, I faced many difficulties in finding a widely accepted international trade openness measure and a more concrete concept of what openness means. A lot of controversy about these two issues has been raised. There are numerous measures of trade openness and hence an increasing need for further research to construct an openness measure that could capture the existing ones and would further lead to more robust empirical results. However, using trade shares of GDP as the key variable of my research, to measure trade openness can be considered as one of the best options, since trade outcomes are clearly defined, well measured and more easily obtainable from objective data sources. Finally, one possible limitation of my survey could be the fact that the empirical results may be subject to a degree of omitted variable bias (exchange rates, measure of institutional quality).

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Appendix

1. Detailed analysis of equations:

Proof 1: equation of capital accumulation:

- $I = \dot{K} + \delta K, where\ \dot{K} = \frac{dK(t)}{dt}$
- $Y = C + I = C + S = C + sy$

From the two above equations I derive $K\dot{(t)}=sY(t) - \delta K(t)$, equation 2.

Proof 2: basic Solow equation

- $\dot{k} = \left(\frac{\dot{K}}{AL}\right), I\ apply\ chain\ rule\ and\ I\ take\ the\ result\ \dot{k} = \left(\frac{\dot{K}}{AL}\right) - gk - nk, then\ I\ replace\ equation\ 2\ and\ I\ derive\ \dot{k} = sf(k) - (n + g + \delta)\kappa.$

Proof 3: Then I set $\dot{k} = 0$ in order to find the steady state capital labor ratio. I derive by this way the following equation: $k^{*}=(\frac{s}{n+g+\delta})^{1/(1-\alpha)}$.

Proof 4: Proof of equation 5.

- $Y = K^{\alpha}(AL)^{1-a} => Y = (\frac{K}{AL})^{a}AL => \frac{Y}{L} = k^{a}A(0)e^{gt}$. Then I replace the steady state capital labor ratio, I take logs and I derive the following equation at t=0: $\ln\frac{Y}{L} = a + \frac{a}{1-a}\ lns - \frac{a}{1-a}\ln(n + g + \delta) + \varepsilon$, steady state income per capita.[19]

Proof 5: Proof of equation 6

- $Y = K^{a}(AL)^{1-a} => \frac{Y}{L} = A^{1-a}K^{a}L^{-a} => \frac{dln\left(\frac{Y}{L}\right)}{dt} = \frac{(1-a)dlnA}{dt} + \frac{adlnK}{dt} - \frac{adlnL}{dt}$
- $\frac{dlnX(t)}{dt} = X(t)\dot{/}X(t)$, growth rate of X
- So we have $\Delta\left(\frac{Y}{L}\right) = g + a\{s\left(\frac{Y}{K}\right) - \delta - n - g\}$.

2. Detailed description of control variables:

Population growth

Economic theory offers no consensus to policymakers on the relationship between population and economic growth. In this study, population proxy for both growth of the stock of human resources and market for tradable which significantly contribute to economic growth in developing countries.[20]Many economists, influenced by Boserup (1965), rejected the "Malthusian doctrine"[21] and claimed that population growth stimulates technological

[19] Before deriving the equation, I assume that at the zero time moment, lnA (0) = α+ε, capturing factors different between countries – Solow residual.

[20] This conclusion comes from the endogenous growth theory.

[21] According to Malthus, some factors of production like land and national resources are available in finite supply so a continuous increase of the population must eventually bring growth to a halt.

advancement[22], increases competition, improves investment strategies and achieves economic growth. In addition to this, a large population expands within and between countries trade. On the other hand, classical economists support that a rampant population growth would negatively affect economic growth, by confining the development of savings, foreign exchanges, capital formation and natural resources, leading to a possible deteriorating GDP per capita. Some other researchers, however, underpin that there is no causal relationship between economic and population growth (Blanchet, 1991). The annual population growth rates of each country have been used in my regression.

Hypothesis 2: *Population growth could be beneficial or detrimental to economic growth.*

Investments

Among the most fundamental principles in economics is the principle that growth requires investments. In my research, the investments variable includes local investments. According to Adhikary (2011), domestic investments create new job opportunities by enlarging the production bases, additional employment provokes higher savings which induce even more investments; and this chain effect positively influences growth. However, Kendrick (1993) claims that domestic investments alone do not cause growth, but the efficiency in allocating capital from less to more productive sectors, is what leads to economic prosperity. Overall, investments enhance the quality and quantity of human capital by enlarging local capacity in terms of physical infrastructures and social amenities. This can increase the level of productivity in the economy. I measure the impact of investments on a country's economic growth, by using gross capital formation (formerly gross domestic investment) as a share of GDP.

Hypothesis 3: *Investment is expected to positively and significantly contribute to economic growth.*

Inflation

It is widely accepted that a stable macroeconomic framework is necessary though not sufficient for sustainable economic growth. Rapid output growth and low inflation are two of the most common objectives of macroeconomic policy. A host of recent long run evidence indicates that inflation causes a negative long run effect on economic growth (Gillman et al., 2004, Fountas et al., 2006). According to Hodge (2005), inflation decreases output growth, savings and the quality of investment, by reducing real interest rates, and results in a

[22] This happens, since a growing country would have more people to rely on for innovative ideas.

misallocation of resources in market economies.[23] Additionally, inflation negatively affects a country's international competiveness, undermines its export performance, by making exports more expensive abroad, and discourages FDI. Macroeconomic stability and a business environment without fluctuations are crucial factors in the decisions of foreign investors. Nevertheless, many studies acknowledge that a low and positive inflation rate may help the economy to adjust to real shocks if nominal wages and prices show downward rigidity. Akerlof et al. (1996) support that a certain amount of inflation is "good" for economic growth. To sum up, I use the GDP deflator as a proxy for macroeconomic stability which is a key prerequisite to get the maximum gains from trade liberalization. Macroeconomic stability, specifically defined as low inflation, is positively related to economic growth.

Hypothesis 4: *High level of inflation has a negative and statistically significant impact on a country's economic growth.*

Domestic credit

Domestic credit provided by the banking sector (% of GDP) includes all the credit to various sectors on a gross basis, except for the credit to the central government, which is net. [24] In simple terms, it is the financial support that is offered to the private sector as an engine of economic growth. The banking sector includes monetary authorities and deposit money banks as well as other institutions. Early economists such as Schumpeter in 1911 identified the bank's role in facilitating technological innovation through their intermediary role. Banking sector openness can directly increase economic growth by improving the quality of financial services or by increasing funds available and indirectly by enhancing the efficiency of financial intermediaries. Slow growth of investments in many developing countries can be attributed to the absence of affordable credit to finance their expansion. Therefore, policies that develop the financial sector would be expected to raise economic growth.

Hypothesis 5: *Hence, I expect a positive value of the domestic credit's coefficient.*

Industry

This is the industrial share of GDP that comprises value added in mining, manufacturing, construction, electricity and gas[25] and is used to proxy for industrialization process and technological capacity or depth in developing countries. The theoretical and empirical literature regarding the openness of trade, industrial sector and economic growth, has a

[23] Real resources are consumed in seeking protection or to gain advantage from high inflation and as a result they are diverted from their optimal use.
[24] The source of definition: World Data Bank indicators (WDI,2008).
[25] The source of definition: World Data Bank indicators (WDI,2008).

number of contributions by recent development economists. According to Ellahi et al. (2011), an open trade regime causes high competition in world market which makes firms to follow and engage in modern technologies and further augments efficiency resulting in growth. It is a well admitted fact that along with trade variables, industrial value added works as an impetus affecting economic growth positively.

Hypothesis 6: *Industrialization is expected to be positively correlated with economic growth.*

3. Statistical description of variables:

	GDPpc gr.	D(TO)	POP gr.	D(INV)	D(INF.)	D(D.CR.)	D(IND)	D(lnGDPpc)
Mean	1.57	1.13	1.97	0.13	-11	-0.2	-0.01	0.03
Median	1.9	0.96	2.07	0.23	-0.31	0.1	-0.002	0.04
Maximum	37.12	91.37	11.18	19.90	390	198	22.7	0.55
Minimum	-47.28	-71.3	-7.53	-27.8	-6456	-125	-51.3	-0.97
St. deviation	4.72	9.66	1.18	3.9	294	13.6	2.99	0.14
Skewness	-0.9	1.17	-0.36	-0.44	-11.19	1.25	-4.18	-1.41
Kurtosis	17.89	21.12	16.7	8.57	287	67.4	86.8	9.84
Observations	1136	1132	1136	1132	1136	1127	1090	1063

4. List of my sample countries: (classified by World Databank)

Argentina	**Malaysia**
Bahrain	**Mali**
Bangladesh	**Mexico**
Benin	**Mongolia**
Bolivia	**Morocco**
Botswana	**Mozambique**
Brazil	**Namibia**
Bulgaria	**Nicaragua**
B. Faso	**Niger**
Burundi	**Oman**
Cameroon	**Pakistan**
Cape Verde	**Panama**
Central Afr. Rep.	**Papua**
Chad	**Paraguay**
Chile	**Peru**
Colombia	**Philippines**
Comoros	**Romania**
Costa Rica	**Rwanda**

Dominique Rep.	Saudi Arabia
Ecuador	Senegal
Egypt	Sierra Leone
El-Salvador	South Africa
Ethiopia	Sri-Lanka
Fiji	Sudan
Gabon	Swaziland
Ghana	Syria
Guatemala	Tanzania
Guyana	Thailand
Honduras	Togo
India	Tunisia
Indonesia	Turkey
Jordan	Uruguay
Kenya	Venezuela
Lesotho	Zambia
Madagascar	Zimbabwe
Malawi	

5. List of SSA countries

Benin	Malawi
Botswana	Mali
B. Faso	Mozambique
Burundi	Namibia
Cameroon	Niger
Cape Verde	Rwanda
Central Afr. Republic	Senegal
Chad	Sierra Leone
Comoros	South Africa
Ethiopia	Sudan
Gabon	Swaziland
Ghana	Tanzania
Kenya	Togo
Lesotho	Zambia
Madagascar	Zimbabwe