

Trade, Trade Policy and Economic Growth in Sub-Saharan Africa

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in Sub-Saharan Africa**

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Abstract

In the SSA region poor trade and economic growth performances co-exist with a relatively protective trade policy for the past three-decade. Some consider such protective trade policies as the main causes of slow economic growth in the region. With an objective to see the impact of trade and trade policy on economic growth, this paper employs a pure cross-sectional as well as panel data (including panel co-integration) analysis techniques. We have controlled the observed endogeneity of trade by using a simultaneous equations regression (2SLS method), and we also run regressions with robust standard errors to handle problems related to the normality and homogeneity assumptions.

Accordingly, while we have found trade shares (and also import and export shares in GDP) to be significantly and positively correlated with growth, we get no evidence in support of trade liberalization policies. That is, even if the trade policy variables reveal a significantly negative impact on trade, they failed to show the same effect on growth contrary to the conventionally alleged benefits of trade liberalization policies. The results show that there is a positive but insignificant correlation between import tariff and economic growth whereas taxation of exports reveals a positive but insignificant correlation. This shows the “possible” gains and losses from a premeditated import protection and excessive export taxation respectively.

Key words: Trade and economic growth, Trade Policy, Panel data analysis

1 Introduction

1.1. Statement of the Problem

Sub-Saharan Africa (SSA) countries are the poorest and slow growing economies in the world. While other parts of the world show economic progress, economies in this region at most reveal stagnation and dawn turns. This should not, however, conceal the significant variation amongst SSA countries, with some doing very well and others doing badly. Efforts that try to find out factors that significantly explain these variations in economic performances are important to recommend appropriate policies for growth and development.

As is well known, both internal and external forces play important role in explaining countries' economic performances. In today's globalized world, impacts of external forces (both the negative and positive) cannot be undermined. In this regard openness to trade¹ is a very crucial one. "Increased openness to international trade is one of the most obvious aspects of globalization, and indeed one of its defining characteristics. Any attempt, therefore, to assess the effect of globalization on economic growth, development and convergence in income levels across countries must take into account the effects of trade openness" Georgios (2003).

Accordingly, many people believe that openness to trade can explain much of the variation in economic performance observed in SSA and they argue that trade has the power to reverse the observed poor economic performances. Based on the argument that international trade will speed up economic growth, it is common to hear suggestions that support increased trade volumes. Such ideas come from many economists including Edwards (1997), Sachs and Warner (1997), etc and institutions like the WB and IMF. Although the positive and significant impact of trade on economic growth is not that much challenged, some like Rodrik (1997) argue that much attention should be given to economic growth than trade, while others including Dollar and

¹Some classify countries as relatively open and closed based on their respective trade shares in GDP; while others use the restrictiveness of countries' trade policies to make such classifications. In this paper we used the term interchangeably and make distinctions when necessary.

Kraay (2001) and Frankel and Romer (1996) argue that the observed association between trade and growth may reflect the effect of income on trade than otherwise².

If trade is found to be good for growth and explains variations in economic growth of SSA countries, it is also important to know the factors behind variations in trade performance. According to some proponents of trade, anything that puts restrictions to international trade is harmful to growth and consequently they advocate trade liberalization policies. "Many economists have argued that, other things given, countries that have "liberalized" their external sectors, and have reduced their impediments to international trade will out perform those countries that have failed to do so. The WB and the IMF have, in fact endorsed this view; they routinely conditioned funds to their member countries on the implementation of "trade liberalization" policies." Edward (1991). Such arguments are based on the belief that trade restrictions will hinder countries' from exploiting the benefits of trade including specialization according to comparative advantage, exploitation of increasing returns, flows of advanced technologies etc. Further they express their fear that import restrictions can also lead to export restrictions especially in economies where there is foreign exchange constraint and where much of imports constitute intermediate inputs that are necessary in the production of exportable items.

On the contrary others strongly oppose the policy recommendation given in line with dismantling barriers to international trade. Even when trade is found to be good for growth, not all measures that restrict trade produce negative effects on economic growth. It is difficult to get unambiguous link between trade liberalization and economic growth from both the theoretical and empirical studies of openness and economic growth. The results from empirical findings are mixed - some tried to give evidence in support of trade liberalization policies while others try to provide countervailing evidences. This is also true in the theoretical openness-growth literature. Even if it is almost a convention to stand for international trade and oppose any restriction to it; others "...report that countries can benefit from trade restrictions under certain conditions. In addition to new growth theory, the theory of strategic trade policy, the infant industry arguments, and development economics provide a theoretical basis for the hypothesis that trade restrictions can promote growth in certain countries." Yanikkaya (2002).

² But after controlling for the observed endogeneity problem they found a significantly positive impact of trade on economic growth.

Therefore it would be wrong to say trade restriction is detrimental to growth only because it has a trade volume restricting effect. Although trade policy can be detrimental to economic growth through its trade reducing effect, it can also have positive impacts on economic growth - it could be through protecting infant industries from unfair foreign competition, discouraging extravagant consumption behaviors or by promoting individual and public savings³. The final impact of trade policy on economic growth will certainly depend on which one of the above two effects dominates. Moreover, since countries with a relatively protective trade policy could also have higher trade shares due to their economic performance, inflows of foreign capital, and geographical factors; the impact of trade barriers on economic growth cannot be automatic.

In general, to say that trade is good for growth and that it can be well affected via trade policies should not necessarily lead to the conclusion that countries should automatically embark on trade liberalization policies. Thus the question of the impact of trade policy on economic growth is really different from the question of the impact of trade on economic growth and requires an empirical investigation.

1.2. Objective of the Study

The general objective of this research is to see whether there exists a significant relationship between trade and economic growth in SSA countries and to assess whether increased openness (in terms of lowering tariff and non-tariff barriers to trade) helps countries to grow faster. Based on the result, we will comment on the policy recommendation of dismantling barriers to international trade and also on the focus that governments place on international trade.

Specific objectives:

1. To see what explains the variation in growth performance of the SSA countries for the most part.
2. To assess the respective roles of import and exports.

³ as tariff makes significant percentage of government revenue needed to undertake developmental activities.

3. To identify factors that significantly explain variation in trade performance of countries in the region. That is, to analyze the impact of trade policy vis-à-vis other factors such FDI, level of income, and other exogenous factors on the region's trade performance.
4. To assess the respective impacts of import and export restrictions on economic growth.

1.3. Significance of the Study

The issue on the link between openness to trade and economic growth is a highly researched but a still debatable area. It lacks convincing results which leads to disagreements on the impact of trade and (mostly) trade policy on economic growth. Almost all papers dealing with trade and economic growth do not pass without expressing this fact. For example, in their recent review, Walde and Wood (2004) put it like this: "The review finds a surprising lack of convincing evidence that trade or export policies can be used to generate higher growth rate. Interestingly, precious little is known on trade policy and growth links, despite the extensive work undertaken on the issue." Walde and Wood (2004).

Although the debate is not yet over, the new economic order (globalization) which requires countries to be more integrated in to the world economy and influential institutions like the World Bank and IMF are pushing LDCs to open up their economies to international trade. Consequently, efforts that try to resolve the debate and give a clearer picture in the area are very crucial to LDCs as it will help in the formulation of appropriate policies.

In this paper we will try to achieve the above objective by using appropriate methodologies that account for the common methodological problems in the area. As argued by researchers in the area, methodological and measurement problems are the major sources of feeble results. Taking this in to account, we will use a simultaneous panel data regressions on carefully selected variables to be able to control for unobserved country specific characteristics and solve for problems of measurement errors, endogeneity and omitted variables. Further, we also introduce the emerging panel co-integration analysis technique to deal with the issue at hand and cross check the results with that of the pure cross-sectional and panel data analyses.

This paper also explores factors responsible for variations in economic and trade performance of SSA countries, with an objective to see the impact of trade and trade policy on economic growth. If we find trade to be good for growth, we will assess the role of trade policy vis-à-vis other factors in explaining variations in trade; and before we argue for trade liberalization we will assess the impact of trade policy on economic growth. That is, we will check whether the negative impacts of trade policy (the trade reducing effect) overwhelm any of the possible positive impacts of trade restriction before we give such kind of policy recommendation.

Focusing on a sample of SSA economies, which share many similar features, is another important feature of the paper as individual countries can easily draw important lessons from the findings. As Rodrik (1997) put it, “there is much that Sub-Saharan African countries can learn from the successes and failures of their neighbors. The lessons from good practice in trade policies, institutional reforms, and the management of reform are generally more convincing when they emanate from the experiences of countries that are similarly situated (as opposed to those that are half a world away, as in the case of East Asia)”. Rodrik (1997).

1.4. Research Questions and Hypothesis

In an attempt to discover important factors behind variations in economic growth of SSA countries, this paper will focus on the role of international trade. It will make inquiries to know whether increases in the volume of trade is strongly associated with economic growth in SSA countries. Further, we will assess the respective impacts of imports and exports on economic growth. This will provide more information to those who still follow Mercantilists’ by being import skeptic. In general, answering these questions will enable us to assess the emphasis that should be given to internal and external factors of growth.

Knowing the role of trade in economic growth is one thing, and actually the first step to be taken. The second and more important issue is to know factors that significantly explain variations in trade performance of SSA countries. In this regard this paper will try to answer the question whether trade policy is the only (the main) variable that significantly explain variations in trade

shares of SSA countries. Is there any possibility to increase trade while holding trade barriers constant?

Finally, it asks questions like - if trade is found to be good for growth and that it can be well explained via trade policy, what will be the role of trade policy in economic growth? Do more open economies (in terms of lower tariff and non-tariff barriers) grow faster? Will there be a difference between the impacts of import tariffs and export taxes? The answer to these questions will be helpful in challenging (supporting) the conventionally advocated trade liberalization policies.

In line with the above questions, the following research hypotheses are forwarded:

- Increases in the volume of trade significantly explain differences in growth performance of SSA countries.
- Imports and exports are equally important in explaining variations in economic growth.
- Trade barriers can significantly explain variations in trade performance among SSA countries.
- Trade barriers (both import and export barriers) will have a significantly negative impact on economic growth.

1.5. Limitations and Scope of the Study

Lack of data was one of the major limitations we faced in preparing this paper. For example, due to lack of adequate data on non-tariff barriers, we are forced to restrict our trade policy measure only on tariff barriers. Besides, due to the same problem, we desist from attempting to see the impact of trade policy on economic growth using panel co-integration technique.

Though it is well known that trade and trade policy have significant roles in explaining welfare, the present paper doesn't cover the impact of trade and trade policy on welfare of countries under consideration.

2 Discussion of Growth, Trade and Trade Policy Issues in SSA

2.1. Economic Growth Performance of Sub-Saharan African Economies

SSA is the most backward and poorest region of the world and it has showed dismal economic growth performance in the past four decades. It is quite true that the region remains far behind the rest of the world. While other parts of the world show some kind of economic progress this region generally reveals economic slow downs and at most stagnation.

Table 2.1 GDP Per Capita Growth (annual %) in Comparison

Year	World	Sub-Saharan Africa	South Asia	Latin America & Caribbean	East Asia & Pacific
1961-69	3.50	2.28	1.78	2.37	1.81
1970-79	2.07	1.05	0.64	3.32	5.00
1980-89	1.27	-0.67	3.40	-0.15	5.69
1990-02	1.07	-0.33	3.20	0.83	6.08
1961-02	1.88	0.48	2.33	1.52	4.81

Source: Computed from World Bank, 2004. WDI CD-Rom.

As can be seen from the above table, SSA countries have shown poor growth performance since the 1960s. The regions average annual GDP per capita growth rate of about 0.48 percent, averaged for 1961-02, is far less than World and Latin America and Caribbean respective average growth rates of 1.88 and 1.52 percent. Comparing this same figure with that of South Asian as well as East Asian and Pacific respective growth rates of 2.33 and 4.81 percent, gives a clear picture of the regions poor growth performance over the period indicated. As a result of this slow growth, the region is now found in a condition that is hard to believe in any standard.

The above table also clearly demonstrates the fact that the region had had better growth performance in the 1960s (2.28 percent) and 1970s (1.05 percent) than in the 1980s (-0.67 percent) and early 1990s (-0.33 percent). Other writers including Rodrik (1997), Tahari and etal (2004) etc... also indicated the fact that the region showed better growth performances in the

1960s than in the 1990s. As is indicated in Rodrik (1997), one third of the countries (16 out of 48 countries) have had higher per-capita GDPs early in 1960s than they do in the early 1990s. In general, such dismal performances dragged down a significant portion of the region's population much below the poverty line.

In the early times-after the mid 1990s, however, signs of better growth performances are coming up, showing that Africa can grow at the same or greater rate than other regions of the world with the right policies put in place. In 1996, for example, the region registered its highest GDP growth rate of 4.97 percent after 1980. UNCTAD also reported that African LDCs grew faster (5.3 percent) than Asian LDCs (4.5 percent) and Island LDCs (1.6 percent) in the years 2000 to 2002. UNCTAD (2004).

These generalizations by region hide the significant differences in economic performance of countries in the region. For example, in the way up from 1960 to 1990, while some 33 percent of the countries in the region face a decline in real per-capita GDPs, about 40 percent of the countries experienced an increase in real per-capita GDP of about 20 percent. Rodrik (1997). Knowing the factors behind such variations in growth performances is worth taking up for the region's policy makers as it helps them design the right policies for economic growth and development.

One thing that is often considered as a source of slow growth in the region relates to poor trade performance and/or trade policies pursued. Many writers/economists, such as Sachs and Warner (1997), have attributed the slow growth performance and the variation there-of to the prevalence of relatively closed trade policies.

2.2. Trade and Trade Policy in Sub-Saharan African

2.2.1. Trade Performance in SSA

Trade performance of SSA countries has not also been good in the past three or four decades. By quoting UNCTAD (1993); Ng and Yeats (1996) states that "Sub-Saharan Africa accounted for 3.1 percent of global exports in 1955, yet by 1990 this share had fallen to 1.2 percent – a decline

that implies an annual trade loss of approximately \$65 billion.” Ng and Yeats (1993). Such declining trends are still there. While other developing countries are doing better, SSA countries continue to lose their importance in the world trade. “In 1980, African countries accounted for close to 20 percent of all developing country exports. This fell to about 10 percent in 1990... In 1998, the share of African in total developing country exports was a dismal 6 percent and falling”. Mwaba (2000)p16.

Though there is an agreement on the fact that SSA countries are marginalized in world trade, there are still disagreements with respect to the underlying factors that lead to such marginalization. While African governments and policy makers put the blame on the protectionist trade policies of the developed countries, others including the WB and IMF cite inappropriate domestic policies as a cause to the marginalization of Africa in world trade. As a result the WB and IMF recommend Structural Adjustments Programs (SAP), which among other things promote trade liberalization policies, to reverse this unfavorable trade and economic performances.

Scholars on the area such as Rodrik (1997), however, argued that the marginalization of Africa in world trade is not simply related to its trade policies:

Africa's marginalization in world trade is primarily due to the continent's lagging performance in terms of output growth. It is not due to trade ratios (relative to GDP) that are low by cross-country standards....African countries trade on average as much would be expected by international standards once their individual characteristics (such as income levels and size) are taken into account. It is because they have failed to expand their economies at sufficient rates that their importance in world trade has shrunk. Consequently, the way to resolve the trend is not to target the region's trade volumes per se, but to raise overall growth rates....Taking the region as a whole there is little evidence that trade policies have repressed trade volumes below cross-national benchmarks, unless they have done so indirectly through their depressing effect on incomes. Rodrik (1997).

Even if the region as a whole is said to be marginalized in global trade, there is huge variation in trade performance among countries in the region; with some doing good and others experiencing dismal performances. The reasons behind such variations include uncontrollable factors like

geography (access to international water ways, distance from major trading partners, and so on), availability of natural resources, and other policy variables including membership to regional unions, inflows of FDI and trade policy. Since one focus area of this paper is to discuss importance of trade policy in explaining variations in trade and economic growth performance of SSA countries, we shall further see trade policy experience of SSA.

As we have seen above, some attribute the blame for the dismal economic as well as trade performance of the region to the type of trade policy adopted. Here one can observe simple correlations between the weak economic and trade performances and prevalence of restrictive trade policies; all relatively severe in SSA. Does this correlation imply some sort of causation? Chapter five will answer this question; now let's see the trend and severity of trade policies pursued in SSA, in its absolute and comparative perspective.

2.2.2. Trade Policy in SSA

After the colonial era, most African countries adopted protectionist trade policy primarily as a result of the import substitution and infant industry protection arguments which were started in Latin America. Such policies actually aimed at totally restricting import other than those deemed priorities by government. Such restrictions were implemented by making use of tariffs, non-tariff barriers, licensing, and foreign exchange regulations. Mwaba (2000)

Later in the post 1990 period some of the countries have undergone wider reform programs under the Structural Adjustment Program of the World Bank. Although the degree/extent of reform measures implemented vary between countries (Ghana and Uganda being the two most aggressive reformers), trade policy reforms have taken place in many of the countries in the region. As a result the widespread quantitative restrictions on imports have been reduced or replaced by tariffs in many cases. The tariffs themselves have been lowered significantly and their variations narrowed. For example, trade weighted tariffs in many reforming countries averaged about 10 percent, down from levels as high as 35 percent in some cases. Many countries have also liberalized foreign exchange regimes for current account transactions, and even more

have moved to rationalize or eliminate exemptions and preferential treatment of favored sectors including government purchases. (ibid)

Despite the reforms seen in some countries of the region, SSA is still relatively closed when compared to other developing regions of the world. Although the differences are not too large, trade restrictions has been higher in Africa than East Asia and until the 1990s it was comparable with that of Latin America's. However, earlier reforms in Latin America and Eastern Europe countries left SSA as the only region where substantial tariff and non-tariff barriers are the norm than the exception. Rodrik (1997).

3 Related Literature Review

3.1. Review of the Theoretical Literature

The growth-openness link has been a highly debated issue in economics. Unfortunately, economic theory itself does not give a clear answer to this link. “Although there is a near consensus about the positive association between trade flows and growth, the theoretical growth literature which studied the effects of trade restrictions reported that these effects are very complicated in the most general case and the results are mixed as to how trade policies play a special role in economic growth”. Yanikkaya (2003). So in this section, after having a brief overview of the widely used growth models (neoclassical and endogenous), we will assess the theoretical link between trade openness and economic growth.

3.1.1. Overview of Growth Models

Neoclassical growth model, especially those developed in the 1950s and 1960s are widely used in empirical growth studies. Although there are preceding prominent contributors to this model including Ramsey (1928), Harrod (1939), and Domar (1946), here we will focus on the Solow-Swan (1956) growth model (particularly Solow growth model) as it is the one that is widely used in the empirical growth literature. The key assumptions of this neoclassical (Solow-Swan) growth model include: a neoclassical form of the production function, a specification that assumes constant returns to scale, diminishing returns to each input, and some positive and smooth elasticity of substitution between the inputs.

The neoclassical assumption of diminishing returns to capital leads to two important predictions of the model. One is related to the widely known notion of convergence.

If all economies were intrinsically the same, except for their starting capital intensities, then convergence would apply in an absolute sense; that is, poor places would tend to grow faster per capita than rich ones. However, if economies differ in various respects—including propensities to save and have children, willingness to work, access to technology, and government policies—then

the convergence force applies only in a conditional sense. The growth rate tends to be high if the starting per capita GDP is low in relation to its long-run or steady-state position; that is, if an economy begins far below its own target position. For example, a poor country that also has a low long-term position—possibly because its public policies are harmful or its saving rate is low—would not tend to grow rapidly. Barro (1996)p.4

This notion of conditional convergence has also gained much acceptance in empirical studies and initial per-capita GDP (measuring conditional convergence) entered in most empirical growth regressions with a statistically significant negative coefficient. The neoclassical model's central idea of conditional convergence receives strong support from the data: poorer countries grow faster per capita once one holds constant measures of government policy, initial levels of human capital, and so on." Barro (1996).

The second important prediction, in the Solow-Swan growth model, which also arise from the assumption of diminishing returns to capital says "[i]n the absence of continuing improvements in technology, per capita growth must eventually cease." Barro and Sala-i-Martin (1995). This prediction, however, faced serious criticisms as it doesn't reflect the reality that we see in this world today. For example, Robert J. Barro argues that "[t]he long-run data for many countries indicate, however, that positive rates of per capita growth can persist over a century or more and that these growth rates have no clear tendency to decline". Barro (1996).p5

Admitting this problem of the model, neoclassical economists in the 1950s and 1960s try to make amendments by assuming that technological progress occurred in an explained (exogenous) manner. This amendment enables the model to reconcile the theory with a positive, possibly constant per capita growth rate in the long run, while retaining the prediction of conditional convergence. Barro and Sala-i-Martin (1995) p.11.

With this the standard neoclassical growth model relating the growth rate of output to growth of factor supplies – capital and labor – and the factor for technological progress representing growth in total factor productivity (TPF) can be represented by the following equations. Mwuba (2000)

$$Y_t = A_t + f[K_t, L_t] \dots\dots\dots 1$$

Where Y_t is Out put at time t

A_t is level of technology in the economy at time t

K_t is capital input in time t and

L_t is labor input in time t

Taking the proportional change in both sides, we can put the above in its growth form as:

$$\Delta Y/Y = \Delta A/A + \alpha_K \Delta K/K + \alpha_L \Delta L/L \dots\dots\dots 2$$

Where $\Delta Y/Y$ is growth rate of output

$\Delta A/A$ is rate of change of technical progress

$\Delta K/K$ is growth rates in physical capital stock

$\Delta L/L$ is growth rate in labor services

α_L and α_K = elasticity of changes in output with respect to the changes in factor inputs, and it is assumed that $\alpha_L + \alpha_K = 1$.

Thus we can rewrite equation 2 as:

$$\Delta Y/Y = \Delta A/A + (1 - \alpha_L) \Delta K/K + \alpha_L \Delta L/L \dots\dots\dots 2$$

The above equation can tell the contributions of each factor to the growth of output. However, since it was not easy to measure technical change, Solow (1957) and other neoclassical economists computed available information on output, labor and capital to impute the contribution of technical progress as a residual. (Ibid). The above equation (equation 2) also enables us to see the fact that, with neoclassical assumption of diminishing returns to factor inputs, the long run growth rate of output is pegged to the growth rate of technological progress, which is exogenously determined. With this therefore “we end up with a model of growth that explains everything but long-run growth, an obviously unsatisfactory situation” Barro and Sala-i-Martin (1995)

Following an increased interest to know the factors determining long-term growth, a new growth theory emerged to fill the missing gap in the neoclassical growth model. Accordingly, the new growth theorists developed a new growth model which takes technical change as endogenous – determined by an interaction of economic factors within the economy, and hence the name endogenous growth model. The main contribution of this growth model becomes the development of a theory of technical progress, which is one of the central missing elements in the neoclassical model.

This model therefore predicts output growth to result not only from accumulation of physical or traditional factors, but also from deliberate actions in line with advances in human capital and investments in areas that contribute total factor productivity improvement. Mwaba (2000). The inclusion of technological progress in the growth model as an endogenous variable helps to avoid the tendency for diminishing returns to capital and hence makes it possible to predict a positive long run growth rate. In other words, this model throws away the unrealistic neoclassical prediction which requires an eventual cessation of growth rate of per capita growth in the absence of continuing technological progress, and predicts that growth may go indefinitely.

Technological advance involves the creation of new ideas, which are partially nonrival and therefore have aspects of public goods. For a given technology—that is, for a given state of knowledge—it is reasonable to assume constant returns to scale in the standard, rival factors of production, such as raw labor, broad capital, and land. But then, the returns to scale tend to be increasing if the nonrival ideas are included as factors of production. ... [Thus] growth may go on indefinitely because the returns to investment in a broad class of capital goods, which includes human capital, do not necessarily diminish as economies develop. ... [Further] Spillovers of knowledge across producers and external benefits from human capital are parts of this process, but only because they help to avoid the tendency for diminishing returns to capital. Barro and Sala-i-Martin (1995) pp.6 & 7

In developing a theory for technological progress, different researchers focused on different issues. R&D, human capital development, diffusion of technology etc are considered as important sources of technical progress. With these, endogenous growth theorists tried to explain why countries should have a positive long run growth as a result of technological progress.

For example, Romer (1987, 1990) and later Aghion and Howitt (1992) and Grossman and Helpman (1991) have showed how R&D theories in imperfect competition can be incorporated in the growth model. According to these models, “technological advance results from purposive R&D activity, and this activity is rewarded by some form of ex-post monopoly power. If there is no tendency for the economy to run out of ideas, then the growth rate can remain positive in the long run”. Barro and Sala-i-Martin (1995).

Endogenous growth models also include diffusion of technology as an important factor for technological progress and hence speeding up economic growth. Incorporating the theory of diffusion of technology from richer to poorer countries enables endogenous growth model to reconcile itself with the prediction of conditional convergence. “Since imitation tends to be cheaper than innovation, the diffusion model predicts a form of conditional convergence that resembles the prediction of the neoclassical growth model”. (Ibid)

In general we can say that this new growth theory gives better explanations on the basic determinants of economic growth than the neo-classical growth model. But in cross-country growth studies the modified neo-classical growth models are found to be more helpful. As indicated in Barro (1996) the recent cross-country growth empirical growth studies receive their main inspiration from the older neo-classical growth model, which is modified to incorporate government policies, accumulation of human capital, fertility decision and the diffusion of technology.

3.1.2. Theoretical Link Between Trade Openness and Economic Growth

Here we will see the theoretical link between trade openness and economic growth from its theoretical point of view. Pro trade theorists raised a number of ways in which trade can affect economic growth positively. Starting from the time of Adam Smith, proponents of trade mention a number of ways in which trade can stimulate economic growth. These channels include increased specialization, efficient resource allocation according to comparative advantage, diffusion of international knowledge through trade and higher domestic competition.

Trade and Growth in Traditional Classical Trade Theories

The idea about the gains from trade begins with Adam Smith's theory of absolute advantage. According to this theory, when countries specialize in the production of goods and services in which they have absolute advantage and engage in trade for their other needs, both trading partners will benefit from trade. This theory, however, does not explain why countries should engage in trade while one of the countries poses absolute advantage in both goods.

To tackle this problem, David Ricardo comes into the picture with the theory of comparative advantage. Similarly, this theory also asserts if countries specialize in the production and (possibly export) of goods and services in which they have comparative advantage; and engage in trade to meet their other needs, both countries will gain from trade.

Latter, these theories were modified by the then new theories that dwell on the notion of factor abundance. These models include: Hechsher-Ohline (1937), Stolper-Samuelson (1941), and Rybznski (1955) theories. These models preach the gains from trade that will accrue to countries if they specialize in the production (and also export) of goods and services which uses factors abundantly available in the country and import the rest to fulfill their other needs.

The above trade theories "collectively and in various ways predict that an economy will tend to be relatively effective at producing goods that are intensive in the factors with which the country is relatively well endowed. In other words, comparative advantage provides that when nations specialize, they become more efficient in producing a product (indeed a service), and thus if they can trade for their other needs, they and the world will benefit." Mwaba (2000) p. 6

In line with this, these models predict that trade restrictions will reduce growth rates of countries. In other words, they predict that countries with higher trade restrictions will grow slower than countries with no or lower trade restrictions. "This is because tariffs reflect additional direct costs that producers have to absorb, which could reduce output and growth." Mwaba (2000)p.7

Trade and Growth in Neoclassical and Endogenous Growth Models

As we have seen above, in neoclassical growth models long run growth is entirely dependant on exogenously determined technological progress. Which means, since technological progress is exogenous and unaffected by a country's openness to trade, according to the neoclassical growth models, trade and/or trade policy does not affect long run economic growth. And this is also true in the open economy neoclassical growth models which predicts only temporary increase in per-capita income as a result of increased trade openness. That is, an increase in savings, as a result of, for example trade liberalization, will translate into investment that will in turn raise the level of per-capita income and its growth rate.

...this will happen only temporarily, up until the point at which the available savings is only sufficient to cover depreciation and growth in the labor force. Then capital per worker stops increasing, although saving and investment continue to take place. This means that growth in per capita income would also stop, if there were no technological change. Therefore, trade policy has only a short-term (to medium-term) impact on the rate of growth, exactly as the neoclassical trade theory would predict. Felicitas (2003)p.28

From the above discussions we have seen that both the traditional classical trade theories and the neoclassical growth models predict only a temporary or static impact of trade openness on economic growth. "Given the problems of finding large scale gains from static models of trade liberalisation, there has been a long tradition of appealing to 'dynamic gains' to justify trade optimism. Such gains may be associated with capital accumulation, with external economies of scale, with learning by doing, or with technology transfer". Dowrick (n.d).

According to endogenous growth models long term economic growth, among other things, depends on an endogenous technological progress. Accordingly, endogenous growth model theorists consider trade openness as one factor contributing to this technological progress and hence long term economic growth. In endogenous growth models "[t]rade is seen as affecting long run growth through its impact on technological change-i.e. it influences the rate of change in technological progress." Mwaba (2000)p.10.

As a result endogenous growth models, mention at least three channels via which trade can affect a country's technological progress. One, trade impacts a country's technological progress and hence economic growth by enabling diffusion of technology among trading partners. Two, trade increases the size of effective market facing domestic producers and hence raises the returns to innovation and consequently increases economic growth. Three, trade can affect a country's specialization in research intensive technologies and production systems which will possibly increase economic growth.

Similarly, advocates of international trade consider trade restrictions as obstructions to the maximization of benefits to be gained from trade and hence argue for trade liberalization. For example, when tariffs and other non-tariff barriers restrict a country's international trade, it will simultaneously: inhibit countries from importing new products from which they could get new technologies to imitate from (diffusion of technology), lower domestic rivalry and hence will reduce incentives to innovate; and finally by inhibiting market expansions it will lower the returns to innovation.

The aforementioned benefits from trade and ill effects of restrictive trade policies are not however without countervailing arguments. This makes theoretical predictions of the impacts of trade and trade policy on economic growth ambiguous. Harrison (1995), for instance, argued that "[N]ew growth theories....do not predict that trade will unambiguously raise economic growth. To support this proposition, he cited Schumpeter and Grossman and Helpman (1991). Accordingly, as argued by Schumpeter, increased competition could discourage innovation by lowering expected profits and therefore lowering trade barriers will not grant increases in innovation and hence income. Further Grossman and Helpman (1991) point out that intervention in trade could raise long run growth if protection encourages investment in research intensive sectors for countries with an international advantage in these kinds of goods.

Rodriguez and Rodrik (1999) also argued that predictions of endogenous growth models are ambiguous and 'conditional'. That is, they argued that if trade restriction promotes technologically dynamic sectors over other, it might lead to higher growth rates. Further, they argue that "...in the presence of certain market failures, such as positive production externalities

in import-competing sectors, the long run levels of GDP (measured at world prices) can be higher with trade restrictions than without. In such cases, data sets covering relatively short time spans will reveal a positive (partial) association between trade restrictions and growth of output along the path of convergence to the new steady state". Rodriguez and Rodrik (1999).

Baldwin (2003) also shares the argument that the impact of trade restrictions on economic growth is conditional. In this case he argued that impacts of trade restrictions on economic growth are conditional up on the pattern of imports and exports of a country...

If the country is importing the good that only uses human capital as a direct input and exporting the good intensively using unskilled labor, the import duty will raise the relative domestic price of the human capital intensive good and via the Stolper-Samuelson theorem raise the relative wages of skilled labor. This increase in the price of human capital will lower the level of R&D activity by raising its costs and thus lead to a lower equilibrium growth rate. In contrast, if the country imports the unskilled labor-intensive goods, import protection will lower the relative wages of skilled labor and accelerate the growth rate. Thus, in this model there is no definite answer to whether protection increases or decreases the growth rate. It depends on the pattern of imports and exports. Baldwin (2003)p.12

From the above discussions we can clearly see that the theory does not have a clear cut answer to the question about the impacts of trade openness (specially for trade policy) on economic growth. The association between the two depends on several factors. This makes impact of trade openness on economic growth to be conditional on countries' specific economic realities (for example trade patterns) and socio-economic aspects. This in turn makes the need to have country (group) specific empirical studies crucial.

3.2. Review of the Empirical Literature

3.2.1. Trade Openness and Economic Growth-Empirical Relationship

As stated above, the link between trade openness and economic growth is a highly researched but a still debatable issue in the field of economics. Different writers use different methodologies to investigate the link between openness and economic growth. The methodologies differ as to the

data used (pure cross-sectional vs. panel data), and the methodologies used to account for the methodological problems of endogeneity, omitted variables, and measurement error. In this regard some employ simultaneous equations and instrumental variables method while others use alternative measures of trade openness. Below we present a review of papers that looks into the link between openness to trade and economic growth as categorized by the methodologies used to address the issue. Here, when we say trade openness we are referring to either a higher trade shares in GDP or a lower rate of trade restrictions. We make the distinctions clear when ever it deemed necessary.

Pure Cross-sectional OLS Regressions

The empirical literature on the link between openness to trade and economic growth is dominated by the use of pure cross-sectional regressions. Such regressions showed mixed results on the link between trade openness and economic growth. While some economists such as Harrison (1995) argued that strength of the association between the two depends on the type of data used (cross-sectional vs. panel), other such as Edward (1991 and 1997), Sachs and Warner (1997), etc... found significant and positive association between trade openness and growth. However, serious challenges have been put on these findings by Rodrik (1997), Rodriguez and Rodrik (1999) and other group of economists, who presented evidence against the effectiveness of openness in explaining variations in economic growth. Trade openness as measured by trade restrictions received the stronger challenges than openness measured by volume of trade (share of trade in GDP).

Edward (1991) regresses 12 years average GDP per-capita growth on growth of aggregate investment ratio to GDP, gap between the world's and country's stock of knowledge, and different indexes of trade intervention measures. He used six indexes constructed by Leamer as indicators of policy induced trade restrictions (openness) and trade distortions. In all the regressions, he found the coefficients of the openness indicators to be positive and significant at the conventional levels of significance. This proves support to the hypothesis that countries with a more open trade regime, other things given, have the tendency to grow faster. On the other

hand, the coefficients of all but one of the Leamer's intervention indexes are significantly negative, revealing that trade distortions lead to slowdowns in economic growth.

Latter in 1997, Edward reinforces his findings stated above by running weighted least squares⁴ (WLS) and instrumental weighted least squares (IWLS) regressions of TFP growth. Both of these regressions include log of initial GDP per capita, initial level of human capital, and nine alternative measures of trade openness⁵ as explanatory variables. Regarding the results, in all but one of the 18 regressions, the estimated coefficients of the openness indicators have the expected sign and, in vast majority of the cases (13 out of 17) they were significant suggesting that there is a significantly positive relationship between openness and productivity growth. Based on this he claimed that "these results are quite remarkable, suggesting with a tremendous consistency that there is a significantly positive relationship between openness and productivity growth" Edward (1997). Further he argued that these results are robust to the use of openness indicator, estimation technique, time period and functional forms used. This paper, however, faced serious criticisms that reduce the credibility accorded by the writer. For example, it is not reasonable to take TFP growth as a dependant variable in a region where the primary source of growth is factor accumulation than factor productivity. "Growth was driven primarily by factor accumulation with little role for total factor productivity (TFP) growth" Tahari (2004). Further, Rodriguez and Rodrik (1999) argue that:

Edwards' evidence does not warrant such strong claims. The robustness of the regression results...is largely an artifact of weighting and identification assumptions that seem to us to be inappropriate. Of the 19 different specifications reported ..., only 3 produce results that are statistically significant at conventional levels once we qualify these assumptions. Furthermore, the specifications that pass econometric scrutiny are based on data that suffer from serious anomalies and subjectivity bias.
Rodrik (1999)

⁴ Here GDP per-capita in 1985 is used as a weight.

⁵ These indexes include: Measures of Openness proper; Sachs and Warner openness index (OPEN), the World Development Report Outward Orientation Index (WDR), Leamer's Openness Index (Leamer's) and Indexes of Trade Distortions; Average Black Market Premium (BLACK), Average Import Tariff on Manufacturing (TARIFF), Average Coverage of Non Tariff Barriers (QR), The Heritage Foundation Index of Distortions in International Trade (HERITAGE), Collected Trade Taxes Ratio (CTR), and Wolf's Index of Import Distortion (WOLF).

Sachs and Warner (1997) also found a statistically significant and positive association between openness and growth by using a cross-sectional analysis covering a sample of around 78 countries from SSA and other regions of the world. Here their openness indicators measure extent of trade restriction and not volume of trade. The specification in this regression include the Sachs and Warner Openness index, initial per-capita income, openness interacted with income, life expectancy, public savings, institutional quality index, resource abundance, rate of inflation, growth of economically active population relative to general population and dummies for landlocked countries and tropical climate. This regression gives a reasonable goodness of fit with an R^2 value ranging from 0.87 to 0.89. Further, the coefficients in the regressions possess the expected signs and reveal a statistically significant association with the dependant variable (growth of per-capita GDP averaged for 1965-1990).

Rodrik (1997), however, questions the importance of including some of the explanatory variables used in Sachs and Warner (1997) in explaining growth performance with in SSA. According to Rodrik, since the coefficient of variation for some of the variables (dummy for landlocked countries and institutional quality index) is substantially low in a sample limited to SSA and hence can not explain the existing growth variations.

Based on this notion, he restricts his specification with four of the Sachs and Warner (1997) variables⁶ and trade openness measures in his pure cross-section data analysis of 31 SSA countries. While all variables enter the regression with a statistically significant coefficient, none of the trade policy measures⁷, other than export taxation, enter with a significant coefficient. Based on this results the writer argues that the role of trade policy is largely auxiliary and of an enabling nature. So policies should focus on growth and than trade as the most important determinants of growth differentials with in SSA region have been human capital, macro and fiscal policy, demography, export policies (measured by exports taxes) and a catch up factor.

Harrison (1995) also used cross-sectional data analysis to see the link between openness and economic growth. In this paper the writer takes a twenty-seven years average data for each

⁶ (initial per-capita income, life expectancy, public savings, and growth of economically active population to the general population)

⁷ The other variables include: Sachs- Warner Openness Index, Import taxes and Black Market Premium.

country and run a pure cross-section analysis of growth over a range of variables including seven openness measures⁸. The results from this regression shows that all measures of openness calculated as averages over several decades are generally not significant in explaining growth. The only measure with a significant and correct sign is the black market premium. Despite the serious criticism (discussed latter), she includes trade shares in GDP as one proxy to trade policy.

In general, the above cross-country regressions have certain problems in which many of the writers have consent on. One, these regressions ignore the possible reverse causations that run from growth to trade (this is a possible scenario when trade share is used as a measure of openness). A number of economists acknowledge this view and they argued that that “the observed partial correlation between trade and growth may be due to a simple reverse causation from growth to trade.” David and Aart (2001). Similarly, Frankel and Romer (1996) have argued that “although the ratio of trade to GDP (and other variables) show a moderate positive relationship, this relationship may reflect an effect of income on trade than other wise”. Frankel and Romer (1996)

Two, pure cross-sectional regressions are also unable to control for unobserved country specific differences. Although it is known that there are persistent differences across countries such as initial conditions, levels of technical know-how, cultural differences or freer accesses to knowledge, cross-country regressions do not account for this possibly biasing the results. Harrison (1995)p16.

Three, pure cross-sectional studies ignore over time changes as they rely on 20 to 30 years average data. This method conceals the significant variations in individual country growth performances as well as trends in policy changes that took place over this long period of time. “Most developing countries have experienced large swings in commercial and exchange rate policies [and also in growth performances] over the last thirty years, which could render any proxies for openness essentially meaningless.”(ibid) pp15 and 16.

⁸ The seven openness measures include: annual index of trade liberalization for 1960-84 derived from country specific information on exchange rate and commercial policies, index of trade liberalization for 1978-88 derived from country source on tariffs and non-tariff barriers, the Black market premium, trade share, movement's towards international prices, price distortion index as used in Dollar (1991), and indirect bias against agriculture from industrial sector production and overvaluation of exchange rate.

As a way of handling the problems stated above, researchers in the area shift to other analysis techniques such as panel data, instrumental variables, and simultaneous equations regression methods.

Review of Papers Using Panel Data Regressions

In order to increase the degrees of freedom, control for unobserved country specific effects and see the determinants of growth for a medium run (over a decade) as opposed to the long run, researchers shift to panel data analysis techniques. For example, *Rodrik (1997)* run a panel data regression using decade averages of per-capita growth rates on a range of variables including trade policy measures. The results from this regression show statistically significant coefficients for all variables except demography and trade policy indicators. The Sachs-Warner Openness index is the only trade policy variable found significant. Rodrik, however, expressed his doubts regarding the Sachs-Warner index arguing that it might not only show openness to trade but also encompasses broader reform efforts - including economic adjustment and structural reforms going beyond trade liberalization. As his cross-sectional regression, this one also supports the ineffectiveness of trade policy in explaining economic growth.

After stating problems in using period averages in cross-sectional analysis, Harrison (1995) has redone her cross-sectional regressions with fixed effects model. She first uses annual data to regress growth on seven measures of openness and other explanatory variables. The results from these regressions show strong relationship between openness and growth. Out of the seven measures of openness used, three⁹ were found significant at 5 percent level. And except trade share all have the expected signs which reveals that movements towards openness positively affect growth and greater distortions as measured by the black market premium and Dollar's price distortion index affect growth negatively. Arguing that use of annual data may have problems in that short term or cyclical fluctuations could affect the observed relationship between

⁹ Index of trade liberalization for 1978-88 derived from country sources on tariff and non-tariff barriers, Black market premium, and price distortion as modified by Dollar.

policy variables and growth, she used five-year average data. But the results remain almost the same.

Another example of panel data regression is that of Yanikkaya (2003). In this paper 10 year average growth rates of real per-capita GDP is regressed on initial GDP per-capita, physical capital stock per person, initial human capital per person, and other control and environmental variables including war deaths and type of regime, tropical climate, access to international waterways and large number of openness measures.

This paper duly recognizes the possible difference of the impacts of trade volume and restriction on economic growth. Accordingly, Yanikkaya divides the openness measures in to two. While the first one measures trade intensity (as measured by trade share in GDP and population density); the second one focus on the impact of trade restriction (measured by import tariff, export and international trade taxes). In relation to the findings, while estimates based on the former reveal significant and positive association between trade and growth, the second sets of openness indicators show a positive and significant result contradicting the conventional view on the growth effects of trade restrictions, which suggests an adverse association between trade barriers and growth.

Instrumental Variables Regressions

Some writers try to overcome problems of endogeneity and omitted variables observed in cross-sectional and panel data regressions by making use of instrumental variable method. For example, Dollar and Kraay (2001) used instrumental variable method to see the impact of trade policy on post 1980 globalizers. Taking decadal changes in trade volumes as an imperfect proxy for changes in trade policy, they regress growth on lagged growth and changes in the set of explanatory variables. This method is different from the pure cross-sectional regressions as it is based on the with-in country variation and not on the cross-country differences in trade and growth. As argued by the writers, this method is advantageous over the pure cross-sectional regressions as cross-country differences in trade volumes reflect countries' geographical characteristics and tells little about impacts of trade policy. Further, in order to control for shocks

that are common to all countries such as global demand shocks or reduction in transport costs, they include period dummies. And the results from this estimation show that changes in trade volumes (measuring trade policy) are highly correlated with changes in growth. Instrumenting for initial income and trade volumes, the coefficient for trade remains highly significant and this estimate reflects the effect of changes in trade on changes in growth due to the instrumentalization strategy. That is, the strategy enables the results:

One, not to reflect the effect of geography induced differences in trade and not to be tented by the omission of any variable that matter for growth but changes little over time. Two, it also address the possibility of reverse causation from growth to trade. Three, the instrumentalized coefficients will not reflect the superiors omission of time-varying omitted variables as long as they are uncorrelated with the level of trade openness two decades previous. Dollar and Kraay (2001)

Another notable paper in the group that uses instrumental variables method includes Romer and Frankel (1996). This paper attempt to control the problem of endogeneity by using geographical variables as instruments to trade shares in the cross-sectional regression of growth on trade. Here geography is taken as an instrument because, as argued by the writers, geographical isolation can affect a country's income in no other way than by reducing its interaction with other countries (by reducing trade). From these regressions the authors rejected the null hypothesis which of trade has no effect on income at the conventional levels of significance. Further, by comparing the IV regression results with that of the OLS, they argued that OLS estimates understate the impact of trade on economic growth.

3.2.2. Measurement Issues

One serious challenge in the study of openness and economic growth relates to the issue of how to measure openness. In studies that aim to examine impact of trade on economic growth, trade shares (share of imports plus exports in GDP), import penetration ratio, and export shares in GDP, can be effectively used as a proxy for openness. "If the objective of the study is to examine the effects of trade on growth, this [trade share] is certainly adequate". David and Kraay (2001) p. 14. Population density (measured as a ratio of total population to total area) is also used as a proxy for openness to examine effects of trade on economic growth. Here the assumption is that

countries with higher population densities will trade more than countries with lesser population densities.

The problem of measurement becomes serious in the case of analyzing the impact of trade policy on economic growth. Some writers use trade shares as a proxy for trade policy. This is the simplest and probably the most problematic indicator of trade policy. As argued by several researchers including Edward (1997), Harrison (1995), David and Kraay (2001); trade share is at most imperfect proxy for trade policy. Cross-country differences in trade share at most reflect effects of other variables like geographical characteristics and foreign capital inflows than trade policy. As a result, even the most protected economies could have higher trade volumes due to their size, geographical proximity, and amount of foreign investment they receive. This measure is also criticized for being highly endogenous Edward (1997). Meaning, countries that have higher GDP growth rates will tend to trade more than countries with lower GDP growth rates. In general, it will be erroneous to take the positive association between trade shares and economic growth as a clue to the positive impact of trade liberalization policy.

These problems with trade shares as a measure of trade policy led researchers in the area to use other measures of trade policy. Some researchers, for example, try to construct regression-based measures of trade policy. In this case, the difference between the predicted and actual trade shares is taken as an indicator of trade policy. One notable index in this regard is that of Leamer's openness index. As discussed in Edward (1991), Leamer calculates the predicted trade flows and intensities by using an empirical Heckscher-Ohlin model with nine variables¹⁰, 183 commodities at the 3 digit SITC level and 53 countries and deducts the actual trade intensities to get an estimate of trade barriers. Among others, Edward (1991) uses this index of trade barrier and gets a negative and significant association between trade policy and economic growth.

Again, as reported in Edward (1991), there are two limitations concerning this indicator of trade policy. One, it makes two assumptions (trade impediments constitutes the only excluded variable in the estimation of trade flows and trade barriers are uncorrelated with the included variables)

¹⁰ Capital, three types of labor, four types of land and oil

that are with all likelihood violated. Two, the indexes are computed using trade data for one year only (1982) and hence can not be used in other periods.

Gilbert (n.d) also constructed his trade policy indicator from OLS regression of trade shares on GDP, population size, natural endowments, and geographical variables. From this regression, the predicted residual is taken to represent the trade openness policy while the predicted trade from the main exogenous determinants represents natural trade openness.

The other commonly used indicator of trade policy is that of the Sachs and Warner openness index. This is a zero one composite openness index constructed using average tariff rates, non-tariff barriers, economic system (socialist or not), state monopoly of major exports, and the black market premium. It classifies countries into closed or open based on the above criteria. Sachs and Warner (1997), Edward (1997), Rodriguez and Rodrik (1999).

One major critics on this index relates to its being merely a binary classification. According to this index, a country is “either open or closed. As a result, countries with different degrees of trade intervention are equally classified as open.” Edward (1997). After a long discussion on this indicator, Rodriguez and Rodrik, (1999) argued that “the statistical performance power of Sachs-Warner indicator derives not from the direct indicators [tariff and non-tariff barriers] of trade policy it incorporates, but from two components [state monopoly of major exports, and the black market premium] that we have reasons to believe will yield upwardly biased estimates of the effects of trade restriction.” Rodriguez and Rodrik (1999)p.24. Further the Sachs and Warner index is criticized for it is correlated with other determinants of economic growth such as macroeconomic stability, poor institutions, and location in Africa. (Ibid).

The other set of trade policy indicators are based on observed values of trade related variables. These measures include: tariff, nontariff barriers and black market premium. These measures are advantageous as they are drawn from observed data, and that they allow for intermediate situations where countries are neither totally closed nor totally open. Edward (1997).

Tariff as a measure of trade restriction is mostly used in the form of collected trade tax revenue or by dividing tax revenue from all border taxes by the volume of total trade¹¹. Although this measure underestimates the effects of extremely high taxes which result in little revenue, ignores non-tariff barriers and the role of implicit export taxation through commodity boards, and overlooks the role of smuggling, it is an adequate proxy for capturing at least one form of trade restriction. Rodrik (1997). The points that make it an adequate measure of trade policy, as argued by Rodrik, include its availability for a large number of SSA countries, that it is one of the few measures for which consistent time series can be constructed for most SSA countries, and that it is found to be strongly correlated with trade performance. (Ibid).

The other measure of interest here is the coverage ratio of nontariff barriers. This measure is mostly calculated either as a percentage of imports covered by trade barriers, which means that effective barriers that exclude most imports receive little weight or as a percentage of product categories that are subject to import licenses. And in both cases this measure only suggests that barriers to trade exist but cannot measure their effect. Harrison (1995)

The black market premia measures the extent of rationing in the market for foreign currency. The theoretical argument for using the parallel market premium as a measure of trade policy is that, under certain conditions, foreign exchange restriction act as a trade barrier. However, there is a deeper problem in using the black market premia for this purpose. According to *Rodrigues and Rodrik, 1999*:

... it is reasonable to suppose that the existence of sizable black market premia over long periods of time reflects a wide range of policy failures. It is also responsible to think that these failures will be responsible for low growth. What is more debatable, in our view, is the attribution of the adverse growth consequences exclusively to the trade restrictive effects of black market premia. Rodrigues and Rodrik, 1999

¹¹ Or it can be used in the form of import/export tax revenue as a ratio of total imports/exports.

4 Data and Method of Analysis

4.1. Data Source and Type

This paper uses secondary data collected mainly from World Bank's African Development Indicators (2004), World Development Indicators (2004), and International Financial Statistics (2003) CDROMs. We used Shacs and Warner (1997) for data on tropical climate and access to international waterways. Our data for parallel market premium is obtained from the Internet. The description of data and definitions of variables included in the models is given in appendix 1.

4.2. Model Specification

The growth equation specification in this paper will be based on a regression of per-capita GDP growth rates on a range of explanatory variables that are believed to explain cross-country variations in economic growth performance. To this end we used the modified neo-classical growth model which is believed to be better situated to explain cross-country variations in economic growth. The standard neo-classical growth model explains growth rates in output from factor supplies (capital and labor) and technological progress (TFP). Mathematically this can be written as:

$$Y(t) = A(t) f[K(t), L(t)]$$

And in its growth form we can put it as:

$$g_t = P_t + \beta K_t + \alpha L_t \quad \text{Where } g_t \text{ is growth in output}$$

P_t is technological progress

K_t and L_t growth in physical and human capital

β and α represent elasticity of changes in output with respect to the changes in factor inputs, and it is assumed that $\beta + \alpha = 1$.

In the Solow (1956 and 57) growth model, the residual in the above model is considered as technological progress i.e. technological change is computed as a residual and hence is called Solow residual. But in the modified neo-classical growth model, one can include other explanatory variables than capital and labor and technological change is taken care of by the constant term. Mathematically this can be written as:

$$g_t = a + \beta K_t + \alpha L_t + \gamma Z_t + u_t \quad \text{Where: } a \text{ is the constant term}$$

Z_t is a vector of other explanatory variables and

u_t is the usual error term

Different writers used different set of explanatory variables and varying proxies to the included variables. For example, Yanikaya (2003) put per capita GDP growth rate as a function of initial GDP per capita (y_{0t}), physical capital stock per person (K_t), human capital stock (h_t) and vector of control/choice and environmental variables (Z_t). Here he used telephone mainlines per worker and life expectancy as rough proxies to physical and human capital stock respectively. Variables such as trade openness measures, institutional quality index (type of regime), and geographical factors (tropical climate and access to international waterways) are included in variable (Z_t).

In specifying their growth equation, Sachs and Warner (1997) also include all the above variables (except physical stock - telephone mainlines per worker) and other explanatory variables such as public savings, rate of inflation, resource abundance, and growth of economically active population relative to the general population. Rodrik (1997) also follows the same trend except that he excludes the geographical factor (land lockedness) and institutional quality index from the Sachs and Warner (1997) specification. According to Rodrik, these variables do not show enough variability to explain variations in economic growth of a sample limited to SSA countries even if they are important in explaining growth variations in a global sample as that of Sachs and Warner (1997).

The growth equation specification in this paper will therefore follow from the above discussion. Initial level of GDP per-capita is included to account for property of conditional convergence,

which is derived from the neoclassical's concept of diminishing returns to capital. That is, for given values of choice and environmental variables, a higher starting level of per-capita output implies a lower per-capita growth rate. As a result, the coefficient of initial GDP per-capita will have a negative sign.

Growth in economically active population relative to the total population is also believed to explain economic growth performance variation among SSA countries. This variable will help us to account for the growth of the labor force (human capital) while taking demographic characteristics in to consideration. Accordingly, countries with a higher growth rate of the economically active population (ages between 15 and 65) relative to the growth rate of the total population are expected to grow faster.

We also use life expectancy (as an alternative to the above) in order to take account of the impact of human capital stock. It is included in our growth equation specification as a broad indicator of the health of the population and hence can serve as a measure of human capital stock. This variable can measure both the quality of public health institutions as well as the extent of sickness and disease. A lower life expectancy at birth hence reflects lower labor productivity, economic cost of high infant mortality, high morbidity in the population and shorter time horizon for the capital accumulation. (Ibid). Hence, the higher the life expectancy the higher will be the per-capita GDP growth rate.

We use the growth of share of investment in GDP as a rough proxy to growth of physical capital. As indicated in the notes of the data source “[g]ross capital formation (gross domestic investment) consists of outlays on additions to the fixed assets of the economy plus net changes in the level of inventories.” World Bank (2004b). We thus believe that this variable can well explain economic growth variations of SSA countries and will serve as a good proxy to change in physical capital. We expect the sign for this variable to be positive.

The geographical disadvantage of having higher proportion of area covered by tropical climate is also an important factor explaining variations in economic growth performance of SSA countries. According to Sachs and Warner (1997) tropical climate can be detrimental to countries’

economic growth in two ways. First, tropical climate is mostly associated with diseases which lead to lower productivity of labor, and higher medical costs. Second, areas covered by tropical climate are mostly characterized by more fragile soil and less reliable rainfall, prevalence of pests and veterinary diseases, and are also susceptible to frequent natural disaster. This variable therefore measures the proportion of the land area covered by tropical climate and may have a negative effect on the economic growth performance of countries. Accordingly, while countries entirely under tropical climate and countries without a tropical climate have values of one and zero respectively, a fraction representing the approximate proportion of land covered by tropical climates is assigned to countries that are partly under tropical climate.

In order to account for the quality of macroeconomic policy, we used rate of inflation as an indicator. Since higher rate of inflation reduces confidence of investors and generally has a damaging effect on the economic performance of countries, we believe that this will have an important impact in explaining the economic growth variation among countries. The expected sign for this variable thus will be negative. We also use growth in the terms of trade to see the role of external factors (deterioration in terms of trade) has an impact in countries' economic performance. The sign for this variable will be negative if there is a terms of trade deterioration and positive otherwise.

Lastly comes our variable of interest – openness to trade. We have seen openness to trade both in terms of higher trade volumes and severity of barriers to international trade. While we measure the first by share of trade in GDP (and also by share of imports and exports in GDP), we used collected tariff revenues (on total trade, exports, and imports) and parallel market premium to measure the severity of trade barriers. Here the sign and magnitude of these openness indicators will be examined in order to comment on the importance of trade and trade policy in explaining variations in growth performance of SSA countries.

Based on the above discussion, the growth equation can be specified as follows:

$$\begin{array}{cccccccc}
 \text{gdppcg}_{it} = & \text{lngpeap}_{it} & + & \text{epopg}_{it} & + & \text{invg}_{it} & + & \text{inf}_{it} & + & \text{tropics}_{it} & + & \text{totg}_{it} & + & \text{op}_{it} \\
 & - & & + & & + & & - & & - & & & & ?
 \end{array}$$

Where: $gdppcg_{it}$ = growth rate of real GDP per-capita of country i in period t

$Ingpeap_i$ = initial level of real GDP per-capita

$popg_{it}$ = growth of economically active population relative to the total population

inf_{it} = rate of inflation

$tropics_i$ = geographical factor (dummy variable for tropical climate)

$totg_{it}$ = growth in terms of trade

op_{it} = measure of trade openness

In analyzing the determinants of trade performance, we base our trade equation specification on Rodrik (1997). By including explanatory variables such as country size, per-capita income, geographical factor (landlockedness) and trade taxation, he found a reasonable goodness of fit with an R^2 value of 0.82. In our trade regression, however, we include foreign direct investment (FDI) as an additional determinant explaining variations in trade performance of countries in the region. This variable is expected to increase both the import and export of countries and hence will have a positive sign.

Country size and access to international waterways respectively measures the extent of natural endowments and barriers to international trade. That is, since “natural resource endowments relate to the geographical size of each country, a larger country is assumed to be more self-sufficient under free trade than a smaller country.” Lee, (1993)p320. Similarly, lack of access to international water ways act as a barrier to international trade because landlocked countries are forced to pay higher costs due to transportation and port duties. Hence we expect a negative coefficient for each of these two variables.

Based on the above discussion, our trade equation specification can be set as follows:

$$tsh_{it} = CS_i + gdppcg_{it} + access_i + fdi_{it} + TP_{it}$$

- + - + -

Where: tsh_{it} = Trade share of country i at time t

CS = country size (in terms of land size or population size)

$gdppcg$ = GDP per-capita growth

access = dummy for land locked countries

fdi = Foreign Direct Investment

RI = Dummy for Regional Integration

TP= Trade policy measures

4.3. Estimation Techniques

To achieve the first objective of looking at the effects of trade on economic growth performance of SSA countries, trade shares (share of imports plus exports in GDP) is used as a measure of trade openness. However, since growth in trade shares itself could be a function of per-capita increases in GDP growth rates; single equation regressions of growth rates on trade (and other variables) will suffer from problems of simultaneity. In relation to these several writers including David and Aarat (2001) and Frankel and Romer (1996) expressed concern and have argued that the observed partial correlations between trade share and growth may reflect the effect of income on trade than otherwise.

In order to show the presence of simultaneity problem we have employed a formal simultaneity test; namely the Hausman specification error test. A test of simultaneity is essentially a test of whether the regressor suspected to be endogenous (in our case trade share) is correlated with the error term. If it does so, we can say that there is a simultaneity problem which require use of 2SLS or IV method in order to get estimates that are efficient and consistent. In order to deal with this problem, this paper used simultaneous equations regression (and hence 2SLS method) treating trade shares and growth of GDP per-capita as endogenous variables.

Similarly, in analyzing the effects of trade policy on economic growth, different measures of trade restrictions will be used as indicator of trade openness. That is, variables such as the collected trade tax revenue (calculated as a ratio of tax revenue to total trade, import tariff to total imports and export taxes to total exports), and the parallel market premia will be considered alternatively as a measure of trade openness. To be adequate proxies of trade policy, these variables should have to have a strong correlation with trade performance.

In all of regressions we have used regressions with robust standard errors in order to control the possible problems related with the assumption of normality and homogeneity of errors. In regression with robust standard errors the estimates of the regression coefficients are the same as in the standard OLS and 2SLS linear regression but the estimates of the standard errors are more robust to failure to meet assumptions concerning normality and homogeneity of variance of the residuals.

In dealing with the impacts of both trade and trade policy¹² on economic growth, we use three types of techniques in order to cross check the results obtained from these different techniques. Besides, these different techniques will enable us to see the long, intermediate, and short-run determinants of economic growth and/or the impacts of trade and trade policy on economic growth.

First, to identify the determinants of long-term economic growth or to see the impacts of trade and trade policy on the long run economic growth of countries, a cross-sectional data analysis is carried out. Unlike previous studies, however, we make use of a simultaneous equation system (in case of trade shares) in order to account for the problem of endogeneity. That is, since GDP also affects volume and growth of trade, a simultaneous equations regression system will be employed in analyzing the effects of trade on economic growth.

Next to see the short and medium term determinants of economic growth, a panel data analysis is used. This method will enable us to control for unobserved country specific effects, helps to increase the degrees of freedom, and avoids the need to take averages of long year data that will conceal over time effects. Our panel data analyses have two parts. The first one is constructed using ten years average data and gives us three observations (covering period 1970s, 1980s and 1990s) per country unlike the cross-sectional case where we had only one observation per country. Cognizant of the fact that these periods will have their own specific effects, we include period dummies in all our panel data regressions. In general this panel data regression technique will help us to see the main determinants of economic growth over the intermediate run as opposed to the long run. The second one is constructed using annual data which provide us with

¹² Because of lack of data we are not able to use the panel co-integration test in the case of trade policy-growth link.

around 33 observations per country. In this case we employ a panel co-integration analysis in order to see the short and long run relationships between economic growth and its determinants.

As to our knowledge, the use of panel co-integration technique is new development in the area which looks into the impacts of trade on economic growth. It is a well-known fact that regressions based on annual observations of macro data are usually susceptible to presence of spurious regressions as these variables usually show non-stationary behavior. Thus, in this panel co-integration technique we involve panel unit root and co-integration tests as an integral part of the panel estimation process.

Panel Unit Root Tests

The widely known panel unit root tests include Levin and Lin (LL) tests, Im, Pesaran and Shin (IPS) tests, Maddala and Wu (MW) tests and the Hadri test. In this section we will discuss the strong and weak sides of these four panel unit root tests in order to decide which one to use in this paper. As a starting point let's consider the following model:

$$y_{it} = \rho_i y_{i,t-1} + Z_{it} \delta + U_{it}$$

Where Z_{it} is the deterministic component which could have a value of zero, one, the fixed effect or the fixed effect as well as a time trend; t . And U_{it} is a stationary process.

The Levin and Lin (LL) (1992) test assumes U_{it} to be independent identically distributed with zero mean and constant variance $\{U_{it} \text{ are i.i.d}(0, \delta_u^2)\}$ and $\rho_i = \rho$ for all i . These assumptions imply that the coefficient of the lagged dependent variables is assumed to be homogeneous across all cross-section units of the panel and that the individual processes are cross-sectionally independent. LL tests the null hypothesis that each series in the panel contains a unit root, i.e $H_0: \rho=1$ against the alternative hypothesis that all individual series in the panel are stationary, i.e. $H_1 < 1$. Baltagi (2001).

This test, however, draws serious criticisms in relation to its homogeneity assumption and stringent alternative hypothesis. As stated in (Konya, 2001) "the major weakness of the LL test is

its implicit assumption that all individual AR(1) series have a common autocorrelation coefficient. Consequently, under $H_{0,LL}$ each series has a unit root while under $H_{A,LL}$ each of them is stationary....The alternative hypothesis is too restrictive for practical purposes” Konya (2001).

The Im, Pesaran and Shin (IPS) (1997) test relaxes the assumption of homogenous autocorrelation coefficient by allowing for a heterogeneous coefficient of $y_{i,t-1}$ and under the alternative hypothesis it assumes that at least one, but not necessarily all of the series is stationary. Further more, it proposes a separate unit root tests on the N time series of the same length, T instead of pooling the data i.e., it is a test based on averaging individual unit root test statistics. Konya (2001) and Baltagi (2001).

Both the LL and IPS tests share two common drawbacks. First “both require $N \rightarrow \infty$ such that $N/T \rightarrow 0$ i.e. N should be small enough relative to T. This means that both tests may not keep nominal size well when either [T] is small or N is large relative to T” Baltagi (2001). Secondly, both LL and IPS tests are designed for balanced panels. Konya (2001).

The Maddala and Wu (MW) (1999) test, unlike the previous two tests, does not require balanced panel and it can be applied to any test with either first order integrity or stationarity being the null hypothesis. Like IPS, MW is based on N independent tests on the N individuals. That is, this test proposed a Fisher type test which combines the ρ values from unit root tests for each cross-section. Konya (2001) and Baltagi (2001).

As stated in Konya (2001), the above three tests have two drawbacks in common:

1. They assume that the observations are generated independently across individuals so the error terms are not cross-correlated. When this assumptions is violated, and in practice this is likely the case, the tests statistics follow unknown distributions.
2. Rejecting the null hypothesis implies that there is at least one stationary series in the panel, but they do not indicate how many and which particular panel members are stationary.

The Hadri (2000) proposed a residual based Lagrangian Multiplier (LM) test. Unlike the previous three tests, this one tests the null that the time series for each i are stationary – it is a test for stationarity. Hadri considered the following two models Hadri (2000):

$$y_{it} = r_{it} + E_{it} \text{ and}$$

$$y_{it} = r_{it} + B_{it} + E_{it}$$

Where r_{it} is a random walk $\rightarrow r_{it} = r_{it-1} + u_{it}$

E_{it} and U_{it} are mutually independent normals and i.i.d across i and over t with $E[E_{it}] = 0$, $E(E_{it}^2) = \delta_E^2 > 0$ and $E(U_{it}) = 0$ and $E(\delta_u^2) \geq 0$.

Using backward substitution, model 2 can be written as:

$$y_{it} = r_{i0} + B_{it} + \sum U_{it} + E_{it}$$

$$r_{it} = r_{i0} + B_{it} + e_{it} \quad \text{Where } e_{it} = \sum U_{it} + E_{it}$$

The series under investigation will be said stationary if $\delta_u^2 = 0$. Since the E_{it} 's are assumed i.i.d, then under the null hypothesis y_{it} is stationary around level in model 1 and trend stationary in model2 if $\delta_u^2 = 0$. This is true because if $\delta_u^2 = 0$, then e_{it} is reduced to be identical to E_{it} and is ipso facto stationary and y_{it} will be stationary as r_{it} reduced to a constant, where as if $\delta_u^2 \neq 0$, then e_{it} is non-stationary and hence y_{it} too will be non stationary as r_{it} becomes a random walk. Thus the task here is to simply test if $\delta_u^2 = 0$ or not.

This paper also uses the Hadri unit root test for it represents a development on the other unit root tests and that it has received no serious critics contrary to the others. To summarize, as stated above all the other tests (i.e. the Levin and Lin (LL) tests, Im, Pesaran and Shin (IPS) tests, Maddala and Wu (MW) tests) have some drawbacks and requirements (for example of a balance panel) which makes them our least choice when compared with the Hadri test.

Panel Co-integration Tests

Where it is hypothesized that there is a single co-integrating vector, Engle-Granger type procedures are appropriate, where one can apply panel unit root tests on the estimated residuals. Examples of such tests include Kao (1999), Perdoni (1995 and 1999), Mc-Cosky and Kao (1998) tests. Smith (2000) and Baltagi (2001). Unlike these single equation approach co-integration

tests, Larsen, Lyhagen and Lothgren (2001) use a multivariate framework. More specifically they developed a likelihood-based (LR) panel test for co-integrating rank in heterogeneous models based on the average of individual rank trace statistics developed by Johansen (1995) Baltagi (2001). In this paper, therefore, we will use the Larsen, Lyhagen and Lothgren (2001) co-integration test as it is suitable for our multivariate framework.

¹³This test considers panel data constructed with N groups observed over T sample time period for P variables in each group. And the interest here is to test the hypothesis that all of the N groups in the panel have at most r co-integrating relationship among the P variables. Accordingly, they set the following hypothesis:

$$H_0: \text{rank}(\pi_i) = r_i \leq r \quad \text{for all } i = 1 \dots N$$

Against the alternative $H_1: \text{rank}(\pi_i) = P \quad \text{for all } i = 1 \dots N$

By taking the average of the N individual trace statistics $LR_{iT}\{H(r)/H(p)\} = -2\ln Q_i T\{H(r)/H(p)\}$, we get the LR-bar statistics which is given by $LR_{NT}\{H(r)/H(p)\} = 1/N \sum LR_{iT}\{H(r)/H(p)\}$ and from this we can calculate the standardized LR-bar statistic as follows:

$$\mathcal{V}_{LR}\{H(r)/H(p)\} = \frac{N(LR_{NT}\{H(r)/H(p)\} - \sum(Z_k))}{\text{Var}(Z_k)}$$

Where $E(Z_k)$ is the mean and $\text{Var}(Z_k)$ is the variance of the asymptotic trace statistic.

In this one sided test, the null hypothesis is rejected if $\mathcal{V}_{LR}\{H(r)/H(p)\} > Z_{1-\alpha}$ (where $Z_{1-\alpha}$ is the $(1-\alpha)$ standard normal quintile) and the rank estimate r is obtained by following the sequential procedure suggested by Johansen. That is, first $r = 0$ is tested and if this hypothesis is rejected, $r = 1$ is tested and this will continue until the null is not rejected or the hypothesis $r = P-1$ is rejected.

¹³ The following discussion is based on Larsson *et al* (2001)

5 Results and Discussion

5.1. Trade and Economic Growth

In this section we will identify the major variables/factors that explain differences in economic growth performance among Sub-Saharan African countries. Here, however, due emphasis will be given to the role of trade volume in explaining variations in economic growth performance of countries under consideration. To this end we have employed both the cross-sectional and panel data (including panel co-integration) techniques.

One of the major problems in assessing the role of international trade in explaining economic growth variations among a cross-section of countries relates to the possible problem of endogeneity. Although different researchers obtained positive and significant coefficient for trade and conclude that trade is good for growth, others (David and Aarat (2001) and Frankel and Romer (1996)) continue to express their doubt on the direction of causation. As our results in this paper also show, the causation can go in either direction. This indicates the need to take care of such kind of simultaneity (endogeneity) problem. After respective regressions for growth and trade, this paper, therefore, presents a simultaneous equations system as a way of handling the indicated problem of endogeneity.

5.1.1. Trade and Growth in a Cross-Sectional Analysis

Cross-Sectional Growth Regression

As presented in chapter 3 (literature review), cross-sectional studies dominate the empirical literature on trade and economic growth. Although this model causes a problem by hiding the temporal impacts of some variables and fails to control country specific effects, it can give a good picture on the major determinants of long-term economic growth. So, as a starting point, we base our growth-trade regression on a pure cross-sectional regression analysis.

Our cross-sectional growth regression model is constructed by taking 33 years (1970 to 2002) average data on a range of variables from 39 Sub-Saharan African countries. Trade openness (measured as a share of trade in GDP), and other explanatory variables including initial GDP per-

capita, rate of inflation, tropical climate as well as human and physical capital stocks are included in the model. As we are now dealing with a 33 years average data, which can effectively conceal effects of growth variables such as growth of investment share and growth of economically active population, we used telephone mainlines per 1000 people and life expectancy as proxies to physical and human capital respectively. We have also tried to see the individual (separate) effects of imports and exports by dividing trade shares in to import and export shares in GDP. The regression results (see table 5.1) based on this specifications give us a reasonable goodness of fit with an R^2 value ranging from 53 to 58 percent. Besides, all the variables appear to have coefficients with the expected signs and in all but very few cases they are statistically significant. As seen in the table below, exclusion of insignificant variables like terms of trade and tropics in regressions 2 and 3 does not affect the sign and significance of the included variables ensuring the stability of the model.

Table 5.1 Results of Growth Regressions (Cross-Sectional Data)

gdppcg	Reg1.	Reg2.	Reg3.	Reg4.	Reg5.
tsh	.018*** (1.80)	.018*** (1.84)	.021** (2.31)		
msh				.032* (3.34)	
xsh					.036*** (1.90)
lifec	.125*** (1.77)	.125*** (1.89)	.117** (2.53)	.121** (2.47)	.133*** (1.97)
inf	-.004* (-3.10)	-.004* (-3.18)	-.004* (-14.74)	-.004* (-13.49)	-.005* (-3.32)
telmain	.023 (1.15)	.023 (1.19)	.029 (1.63)	.028 (1.49)	.028 (1.46)
lngpea	-1.723* (-3.01)	-1.723* (-3.06)	-1.771** (-2.47)	-1.505** (-2.31)	-1.958* (-3.18)
tropics	-.807 (-0.81)	-.811 (-0.83)			
totg	-.002 (-0.02)				
cons	6.718 (1.44)	6.701 (1.48)	6.413 (1.47)	4.441 (1.13)	7.470 (1.51)
N	35	35	35	35	35
R^2	.57	.58	.56	.56	.53

* 1 % level of significance, **5 % level of significance, ***10 %level of significance
 Figures in the parenthesis represent t-values

As shown in the above table, all indicators of trade openness - as measured by trade share (regression 1-3), import share (regression 4) and export share (regression 5) - have positive and statistically significant coefficients. Some writers used this kind of results to make implications in support of the idea that trade is good for economic growth. However, as argued by other researchers too, this relationship between trade and economic growth can also be due to a reverse causation that runs from GDP growth to trade. Besides the formal test of simultaneity (Hausman Specification Error test presented as appendix 2), the cross-sectional trade regression presented below can indicate the likelihood of this effect via showing the statistically significant impact of economic growth on trade shares.

Cross-Sectional Trade Regression

The cross-sectional trade regression is constructed in the same way as the growth regression presented above. A 33 years average trade share data is regressed on average GDP per capita growth, total population, foreign direct investment, dummy variable for landlocked countries, and trade policy variables. Here we use the so-called direct measures of trade policy - international trade tax, export tax, import tax and also parallel market premium as measures of countries trade restriction. In relation to using the parallel market premium as a proxy to trade policy, we have observed (results not shown) that it fails to be statistically significant and robust to the inclusion of other trade policy variables. As a result we confine our regression to the use of the direct measures of trade policy.

A specification based on the above variables gives a goodness of fit with an R^2 value ranging from 74 to 79 percent. Apart from this, all of the variables have the expected signs and a good number of them have statistically significant coefficients (see table 5.2). As indicated in regression 2 and 5 exclusion of insignificant variable (access) does not affect the sign and significance of the other variables indicating the stability of the model. According to the results from these regressions, foreign direct investment, economic growth, country size - as measured by either size of the total population (regressions 1,2,4 and 5) or land area (regressions 3 and 6), and the trade policy variables play significant role in explaining variations in trade performance observed among SSA countries.

Table 5.2 Results of Trade Regressions (Cross-Sectional Data)

tsh	Reg1.	Reg2.	Reg3.	Reg4.	Reg5.	Reg6.
tttax	-2.242* (-2.97)	-2.223* (-2.91)	-3.080* (-3.27)			
mtax				-.835 (-1.23)	-.706 (-1.06)	-1.282 (-1.61)
xtax				-1.599* (-2.85)	-1.687* (-3.04)	-2.216* (-3.34)
gdppcg	4.217** (2.35)	3.979** (2.20)	5.434* (2.87)	3.448** (1.93)	3.237*** (1.83)	4.369** (2.33)
fdi	10.312* (4.74)	10.172* (4.63)	11.144* (4.78)	9.099* (3.78)	8.745* (3.67)	9.512* (3.68)
pop	-8.562* (-3.72)	-9.079* (-3.96)		-8.707* (-3.73)	-9.041* (-3.91)	
access	-7.725 (-1.29)		-8.519 (-1.31)	-6.214 (-1.01)		-6.430 (-0.97)
lnarea			-5.346* (-2.71)			-5.864* (-2.86)
_cons	201.034* (5.46)	205.51* (5.55)	103.598* (6.44)	201.930* (5.25)	203.527* (5.29)	105.858* (5.80)
N	39	39	39	39	39	39
R ²	.78	.77	.74	.79	.78	.75

* 1 % level of significance, **5 % level of significance, ***10 %level of significance
 Figures in the parenthesis are t-values

From the above trade regression, we can derive two important implications. The first relates to the selection of trade policy variables. As can be seen from table 5.3, both export tax and international trade tax have negative and statistically significant coefficients indicating their power to restrict trade. This makes them good proxies to trade restriction (trade policy). Import tariff, although is not statistically significant, has a consistent negative sign. The reason why this variable does not show a statistically significant coefficient can be attributed to the fact that imports to these countries are mainly composed of compulsory intermediate and capital goods whose demand is highly “tariff” inelastic. Or, it could be due to the problem of aggregation required by cross-sectional analysis.

The second issue has to do with the positive and statistically significant coefficient for per capita GDP growth. The significant coefficient for this variable can be taken as evidence to the presence of simultaneity problem. The formal test of simultaneity (Hausman Specification Error test) also

confirms this simultaneity problem as trade share is found to be correlated with the error term (see the test results in the appendix2). As a result of this endogeneity problem we build the following simultaneous equation model to get a consistent and efficient estimate of trade's impact on economic growth. The important question here is thus whether trade can have such a positive and statistically significant impact on economic growth after one control for the problem of endogeneity.

Simultaneous Equation Model in a Cross-Sectional Data Set

As we have tried to show above, growth and trade affect each other significantly. This means that the inclusion of trade on the right hand side of the growth regression will lead to simultaneity bias. To curb this problem we have designed simultaneous equations model and a 2SLS regression method is used. The results from these regressions are shown in table 5.3 below.

Table 5.3 Table 5.3: 2SLS Regression Results for Growth (Cross-Sectional Data)

gdppcg	Reg1.	Reg2.	Reg3.	Reg4.	Reg5.	Reg6.
tsh	.023** (2.32)	.023** (2.39)	.0198** (2.05)	.020** (2.10)		
msh					.036** (2.40)	
xsh						.052*** (1.71)
lfee	.131** (2.14)	.131** (2.15)	.137** (2.26)	.138** (2.26)	.131** (2.08)	.142** (2.24)
inf	-.004* (-3.47)	-.004* (-3.47)	-.004* (-3.52)	-.004* (-3.52)	-.004* (-3.24)	-.005* (-3.64)
telmain	.035** (2.10)	.035** (2.10)	.0348** (2.05)	.035** (2.05)	.034*** (1.97)	.036** (2.07)
lngpea	-2.013* (-3.81)	-2.014* (-3.82)	-1.975* (-3.71)	-1.977* (-3.72)	-1.670* (-3.11)	-2.457* (-3.64)
cons	7.263*** (1.76)	7.273*** (1.77)	6.858 (1.66)	6.870 (1.66)	4.937 (1.21)	10.044*** (1.92)
N	33	33	33	33	33	33
R ²	.67	.67	.67	.67	.65	.65

* 1 % level of significance, **5 % level of significance, ***10 %level of significance

Figures in the parenthesis represent t-values

Instruments for Reg1: lfee inf telmain lngpea ttax fdi pop

Instruments for Reg2: lfee inf telmain lngpea mtax xt看 fdi totpop

Instruments for Reg3: lfee inf telmain lngpea ttax fdi lnarea

Instruments for Reg4: lfee inf telmain lngpea mtax xt看 fdi lnarea

Instruments for Reg5: lfee inf telmain lngpea ttax fdi pop

Instruments for Reg6: lfee inf telmain lngpea ttax fdi pop

The 2SLS growth regression results are not that much different from those found in the single equation model. In this 2SLS model, that is, after we control for the endogeneity problem, the coefficient for trade share remains positive and becomes a little bit higher. According to the results from the 2SLS regression, a 10 unit increase in trade (as a share of GDP) is associated with a 0.21 percent¹⁴ increase GDP per-capita growth rate per annum. In the case of the single equation OLS regression, however, an equivalent increase in trade share is associated with a 0.20 percent increase in the annual growth rate of per-capita GDP.

Further, as indicated in regression 5 and 6, import and export shares are found to be important in explaining growth differentials of SSA countries. That is, while a 10 unit increase in the share of exports is associated with a 0.52 percent increase in per-capita GDP growth rate, the same level increase in import results in a 0.36 percent increase in per-capita GDP growth rate. Apart from the above trade openness measures, we found physical and human capital stocks, macroeconomic stability, and the conditional convergence factor to be important factors explaining economic growth performance of SSA countries.

5.1.2. Panel Data Analysis of Trade's Impact on Economic Growth

Here we will repeat the above cross-sectional regression by making use of panel data so as to observe the medium term (as opposed to the long term) determinants of growth. Besides, this use of panel data will give us the chance to observe temporal effects (in addition to cross-sectional effects), increase the degrees of freedom (the available information), and control for country specific effects. The panel is constructed by taking decade averages of variables for a sample of 39 Sub-Saharan African countries, ensuing in three observations (covering the 1970s, 1980s and 1990s¹⁵) per country.

As regards to the use of a specific panel data analytic model, we have considered the use of random and fixed effects models as well as running OLS regressions on pooled data. While results from the pooled and random effects models revealed the expected signs with almost all of the variables being statistically significant, coefficient estimates based on fixed effects model are

¹⁴ Average of regressions 1-4

¹⁵ Actually our data for the last period, 1990s, extends to 2002.

mostly statistically insignificant and in some of the cases it does not give the expected signs. These problems with the fixed effects model can be attributed to the existence of multicollinearity (which increases the standard errors and thereby drains the model of statistical power to test the parameters) and losses of degrees of freedom. Both of these problems are the results of too many dummy variables needed to build the fixed effects model Yaffee (2003).

Although the formal specifications test; namely the Hausman specification test recommends use of fixed effects model, we inclined to the random effects model for the following two basic reasons. One, this test compares the coefficient estimates obtained from the fixed and random effects models, and rejects the random effects model if there is a statistically significant variation between the coefficient estimates of the two models. However, as stated in Gujarati (2003), such significant variation between the estimates of the two models is expected when the sample size (N) is large and number of time series data (T) is small. In our specific case, therefore, we cannot reject the random effects model just because the Hausman specification test tells us the obvious/expected significant variation between the estimates of the two models. Secondly, under a similar condition of large sample size and small time series data, random effects model (also called Error Components Model-ECM) is better than the fixed effects model. "If N is large and T is small, and if the assumptions underlying ECM hold, ECM estimates are more efficient than FEM estimates" Gujarati (2003). According to Taylor (1980), quoted in Gujarati (2003) this statement holds for $T \geq 3$ and $(N-K) \geq 9$, where K is the number of regressors.

Since our data structure meets the above conditions and that the assumptions of the random effects model are satisfied, we stick to the random effects model. Particularly, we have tested one of the primary assumptions of the model which requires the unit (or in this case country) specific differences to be handled by a random term whose variance statistically differs from zero. Accordingly, the Breusch and Pagan Lagrangian multiplier test for this assumption rejects the null hypothesis that the variance of the disturbance term is equal to zero supporting the use of random effects model.

To clearly see the differences between the two analytic methods and to understand what the Breusch and Pagan Lagrangian multiplier test investigates, let's see the following functional representations of the models:

$$y_{it} = \alpha_i + \beta X_{it} + e_{it} \dots\dots\dots \text{Eq. 1}$$

The above equation (eq.1) represents the fixed effects model in which all cross-sectional unit (in our case country) has its own (fixed) intercept - α_i . And to ensure this, the fixed effects model incorporates N-1 dummy variables. Unlike the fixed effects model, which includes N-1 dummies to control unobserved country specific effects (and hence consider the intercept as fixed), the random effects model takes the intercept as a random variable with a mean value of α . That is;

$$\alpha_i = \alpha + u_i \dots\dots\dots \text{Eq.2} \quad \text{Where } i = 1, 2, \dots, N$$

$u_i = \text{cross-sectional specific error term.}$

By substituting equation 2 into equation 1, we get the following random effects model.

$$y_{it} = \alpha + u_i + \beta X_{it} + e_{it} \dots\dots\dots \text{Eq.3}$$

Then Breusch and Pagan Lagrangian multiplier test for random effects is a test of whether the variance of the cross-sectional specific error term is zero or not. If it is zero, it means that the variations among cross-sectional units (countries) is fixed and hence implies use of fixed effects model and other wise the random effects model. As an example we present the Breusch and Pagan Lagrangian multiplier test results for one of our regressions presented below.

Breusch and Pagan Lagrangian multiplier test for random effects:

```

gdppcg[cid,t] = Xb + u[cid] + e[cid,t]
Estimated results:
-----|-----
          |      Var      sd = sqrt(Var)
-----|-----
gdppcg   |      7.00756      2.64718
e         |      1.789046     1.337552
u         |      2.590618     1.60954

Test:    Var(u) = 0
          chi2(1) =      12.61
          Prob > chi2 =      0.0004

```

As is indicated in the above test results, the variance of u is found to be different from zero suggesting use of random effects model.

Growth Regression in a Panel Data Set

In this section we run a similar regression as the above cross-sectional regression to see the main factors that explain differences in economic growth performance of SSA countries. More specifically we will see the role of international trade in explaining this differences by taking a ten years average data for each variable. Two exceptional cases in taking decade averages of the variables apply to the geographical variable (dummies for area coverage of tropical climate) and initial GDP per capita. In the latter case we take GDP per capita at the beginning of each period to account for initial income and hence the issue of conditional convergence. Unlike the cross-sectional regression analysis, here we use the growth in the share of investment and growth rate of economically active population as proxies to physical and human capital resources respectively.

Table 5.4 Regressions for GDP Per-Capita Growth (Random Effects Model)

gdppcg	Reg1.	Reg2.	Reg3.	Reg4.	Reg5.
tsh	.032** (2.36)	.032** (2.36)	.0320* (2.72)		
msh				.0479** (2.16)	
xsh					.063** (2.02)
lnigpea	-1.011* (-3.17)	-1.011* (-3.17)	-1.342* (-4.74)	-.796*** (-1.88)	-1.439* (-3.02)
invg	.016 (1.08)	.016 (1.07)		.019 (1.32)	.012 (0.78)
telmain			.023* (3.22)		
eapg	.720** (2.29)	.720** (2.29)	.628*** (1.89)	.753** (2.30)	.652** (2.13)
inf	-.002* (-12.45)	-.002* (-12.62)	-.002* (-12.26)	-.002* (-10.31)	-.002* (-13.88)
tropics	-2.104** (-1.98)	-2.104** (-1.98)	-1.547** (-2.16)	-1.590 (-1.39)	-3.299* (-2.76)
totg	-.000 (-0.00)				
cons	1.453 (0.74)	1.453 (0.75)	1.517 (1.12)	.338 (0.14)	3.895** (2.26)
N	86	86	92	86	86
R ²	52,30,36	52,29,36	39,35,36	50,28,35	52,26,34

* 1 % level of significance, **5 % level of significance, ***10 %level of significance

Figures in the parenthesis represent z-values and R² values are from the standard regression, not from the robust.

The regression results from this model indicate that all the variables have the expected sign and most of them are statistically significant (see table 5.4). The inclusion/exclusion of some variables does not change the sign and significance of the included variables ensuring the stability of the model. For example, the results do not change significantly when the statistically insignificant variable (terms of trade) is excluded from regressions 2-5.

As shown in the above table, all the trade openness measures - share of total trade (regressions 1-3), import shares (regression 4) and export shares (regression 5) - are found to be statistically significant. But to conclude that trade is good for growth based on this coefficient can raise a question as to the direction of causation and/or endogeneity of trade in growth regression. To explore this fact and to see the major determinants of trade, we run the following trade regression.

Trade Regression in a Panel Data Set

In this regression all the included variables except access to international waterways are found to be statistically significant with the expected signs. The exclusion of this insignificant variable (indicated in regressions 2 and 4) in the models does not affect the sign and significance of the included variables ensuring the stability of the model. Access to international waterways does not appear to be a statistically significant even if it has the expected negative sign which shows landlocked countries trade less. Lack of statistical significance for access can be attributed, as is also argued by Rodrik (1997), to its low variability (a variance equal to 0.23). Measures of country size, both in terms of size of the population and area, are found to be statistically significant with a negative sign. This shows the fact that larger countries have lower tendency to engage in trade than smaller countries. One justification for this result lays on the fact that larger countries are more self-sufficient than smaller countries.

Table 5.5 Regressions for Trade Share (Random Effects Model)

tsh	Reg1.	Reg2.	Reg3.	Reg4.
ttax33	-.700*** (-1.87)	-.703*** (-1.89)		
mtax			-.959** (-2.39)	-.928** (-2.34)
xtax			-1.150* (-3.34)	-1.142* (-3.33)
gdppcg	1.190*** (1.70)	1.184*** (1.69)	1.487** (2.16)	1.485** (2.16)
fdi	2.380* (2.98)	2.374* (2.98)	2.443* (3.37)	2.420* (3.35)
pop	-16.420* (-6.90)	-16.503* (-7.00)	-16.394* (-7.29)	-16.449* (-7.33)
access	-3.228 (-0.49)		-4.280 (-0.68)	
_cons	332.524* (8.57)	332.527* (8.63)	339.488* (9.16)	338.202* (9.16)
N	82	82	82	81
R ²	.70	.70	.70	.74

* 1 % level of significance, **5 % level of significance, ***10 %level of significance
 Figures in the parenthesis represent t-values

As shown in the above table trade policy measures, foreign direct investment, GDP per capita growth, and country size are found to be the main determinants of trade performance variations in the region. While the significant coefficient for the trade policy variables indicate that they are good proxies of trade policy, the significant and positive coefficient for GDP per capita growth can be taken as an indicator of the possible endogeneity of trade in our growth regression. As shown in the above results table, a 10 unit increase in total trade tax, export tax and import tariff is associated with a respective reduction in trade share of about 7, 10 and 12 percent.

Simultaneous Equation Model in a Panel Data Set

From the previous two regressions and also from the formal (Hausman) test for endogeneity (see the appendix 3 for the test results) we have learned that trade is an endogenous variable in the specified growth equation. To this end we use a 2SLS regression method where the explanatory variables in the model are used as instruments to trade share. But in doing so we have checked that the explanatory variables in the trade regression are not significantly correlated with per-capita GDP growth rate, while they are significantly correlated with trade fulfilling the criterion for an instrument.

Table 5.6 2SLS Regression for GDP per-capita Growth (Random Effects Model)

gdppcg	Reg1.	Reg2.	Reg3.	Reg4.	Reg5.	Reg6.
tsh	.047** (2.44)	.047* (2.48)	.051* (3.14)	.049* (3.29)		
msh					.075* (3.25)	
xsh						.149* (2.86)
lnigpea	-1.109** (-2.14)	-1.091** (-2.14)	-1.025** (-2.00)	-1.017** (-2.01)	-.254 (-0.56)	-2.378* (-3.27)
lnvg	.033 (1.49)	.033 (1.49)	.033 (1.53)	.034 (1.61)	.033 (1.36)	.033** (1.64)
eaag	.904** (1.94)	.904** (1.96)	.928** (2.02)	.986** (2.18)	-.961** (-1.97)	.854*** (1.91)
lnfg	-.002* (-2.77)	-.002* (-2.80)	-.002* (-2.80)	-.002* (-2.75)	-.002** (-2.36)	-.002* (-3.39)
tropics	-1.178 (-0.67)	-1.135 (-0.66)				
totg	.006 (0.11)					
cons	-.387 (-0.14)	-.459 (-0.17)	-1.890 (-1.35)	-2.017 (-1.41)	-3.061** (-2.13)	.316 (0.22)
N	65	65	65	65	65	65
R ²	.67,.24,.39	.67,.25,.39	.66,.23,.39	.68,.22,.38	.60,.27,.40	.70,.13,.26

* 1 % level of significance, **5 % level of significance, ***10 %level of significance

Figures in the parenthesis are t-values

Instruments for Reg1: lnigpeap invg eaag lnfg tropics totg ttax pop fdi

Instruments for Reg2: lnigpeap invg eaag lnfg tropics ttax pop fdi

Instruments for Reg3: lnigpeap invg eaag lnfg ttax lnpop fdi

Instruments for Reg4: lnigpeap invg eaag lnfg mtax xt看ax pop fdi

Instruments for Reg5&6: lnigpeap invg eaag lnfg ttax pop fdi

In this 2SLS regression, as is expected when endogeneity is controlled, the coefficient for trade openness variables increased a little bit, maintaining their positive sign and statistical significance. As shown in regression 1 - 4 of the above table, a 10 unit increase in trade shares is associated with around 0.5 percent increase in the annual GDP growth rate. For an equivalent increase in trade share, the single equation regression predicts only a 0.3 percent increase in GDP growth rate. From this we can say that international trade has a positive and statistically significant role in explaining growth performance variations among SSA countries and that OLS regression underestimate this impact.

In regressions 5 and 6 we have tried to see the respective impacts of import and export on economic growth. Accordingly the results from these regressions show that import and export

shares are equally important in explaining growth differentials among SSA countries. However, by looking at the magnitudes of the coefficient of these two variables we can say that the impacts/benefits of exports is higher than that of imports. That is, while a 10 unit increase in share of exports leads to a 0.15 percent increase in annual per-capita GDP growth rate, an equivalent increase in imports is associated with only a 0.8 percent increase in per-capita GDP growth rate. When we come to our control variables, we have found growth in economically active population, macroeconomic stability, and conditional convergence factor to be important factors explaining growth differentials of these SSA countries.

5.1.3. Impacts of Trade on Economic Growth: a Panel Co-integration Analysis

Unlike the previous section where we use ten years average panel data analysis, here we use annual data for each country. Because of lack of data we have now restrict our sample size to 24 of the Sub-Saharan African countries. We also use the same specification as given above except the fact that here we take out one variable (initial level of GDP per capita) for it is a country specific variable which will be rejected by the fixed effects model. As we have discussed in chapter four, regressions based on annual macro data are susceptible to be spurious for they usually show non-stationary behavior. To avoid this problem and to see the short and long term relationships between economic growth and its determinants (including impacts of trade) we introduce a panel co-integration technique.

The primary steps in this panel co-integration technique thus include panel unit root and co-integration tests. In relation to the panel unit root test, we have used the Hadri panel unit root test for its methodological excellence discussed in chapter four. According to this panel unit root test, all the variables are found to be non-stationary at levels and become stationary at 1st difference (see the appendix 4 for the results). Once we are sure that the variables are non-stationary (at levels), the next necessary step, before going to the error correction model (ECM) is to check the existence of co-integrating vector(s). The following table contains the individual country-by-country (Johansen) and panel (Larsen) co-integration tests.

Table 5.7 Summary of Co-integration Test Result

Country	LR _{IT} (H _(r) /H ₍₆₎)						rank(r _i)
	r=0	r=1	r=2	r=3	r=4	r=5	
BOTSWANA	147.03	84.70	41.75	23.06	5.35	0.12	1
_BURKINA	134.89	77.51	46.08	25.07	7.95	2.99	1
_CENTRAL	96.95	67.01	41.65	18.79	8.79	0.37	0
_CHAD	145.31	79.14	35.55	16.81	8.71	2.33	1
_CON	136.07	86.75	48.40	19.80	6.83	2.27	2
_CONGO	119.63	70.48	37.59	22.08	7.66	0.69	1
_COTE	103.84	68.53	43.65	24.62	8.37	2.11	0
_GHANA	144.04	75.35	40.59	17.16	6.76	0.37	1
_GUINEA	121.75	78.15	46.76	17.66	6.44	2.01	1
_KENYA	167.56	108.12	65.84	28.38	8.76	1.68	2
_MADAGASC	193.79	81.01	48.47	24.75	9.66	2.67	2
_MALAWI	113.76	68.31	40.62	21.51	10.91	3.87	0
_MAURITAN	166.77	107.67	54.18	27.37	5.43	0.35	2
_MOZAMBIQ	153.06	96.23	58.72	27.10	5.59	1.05	2
_NAMIBIA	152.02	68.51	36.84	14.44	6.22	0.34	0
_NIGER	136.24	89.99	52.47	24.55	10.35	2.80	2
_RWANDA	120.31	61.65	31.22	16.90	8.01	0.57	0
_SENEGAL	166.25	96.22	52.17	27.34	7.71	2.84	2
_SIERRA	137.42	70.58	44.56	22.03	9.09	3.00	1
_SOUTH	152.66	72.84	41.63	17.21	6.80	1.87	1
_SUDAN	200.14	73.25	38.72	17.45	5.49	1.36	1
_SWAZILAN	109.26	74.29	43.55	18.71	5.93	0.89	1
_ZAMBIA	130.59	83.46	44.77	23.47	8.75	3.60	1
_ZIMBABWE	130.54	83.74	38.07	15.64	6.26	0.95	1
LR-bar	140.83	80.15	44.74	21.33	7.58	1.71	
N	24.00	24.00	24.00	24.00	24.00	24.00	
E(Z_k)	64.96	44.39	27.73	14.96	6.09	1.14	
Var(Z_k)	103.45	71.28	45.26	24.73	10.54	2.21	
Stan.LR-bar	36.54	20.75	12.39	6.28	2.25	1.89	

The individual country-by-country co-integration tests that are based on Johansen co-integration tests show for half of the countries (i.e. 12 out of 24 countries) that there is at most one co-integrating vector while in the remaining countries it indicates the presence of at most two and zero co-integrating vectors. But when we return to the panel co-integration test that considers all the countries at once i.e., using Larsen et al (2001) panel co-integration test, we can see that there are at most three co-integrating vectors. This confirms the existence of a common co-integration rank in the panel and that it is possible to see the short and long run relationships. However, the fact that there could be at most three co-integrating vectors indicates that it would be necessary to have three equations (or maximum of three endogenous variables). From our previous discussion we can say that the two endogenous variables are per-capita GDP growth and trade share. Here we admit that we do not go further to check out what these three endogenous variables could be, and due to data problem we are not able to use instrumental variables method which could have enabled us to control the observed endogeneity problem. However, as we have seen in the previous sections the endogeneity of trade in growth regression is not a serious problem.

To see the short and long run relationships between economic growth and its determinants included in our specification (trade, growth in share of investment, growth of economically active population, rate of inflation and growth in terms of trade), we run an Error Correction Model (ECM). In the case of the long run model we have used fixed effects model in order to control the country specific unobserved effects. Besides we include period and country specific weights to take care of the possible period as well as country heterogeneity. The results are presented below in an equation form:

$$GDPPCG = 0.06 + 0.046TSH + 0.022INVG + 0.32EAPG - 0.011INFG + 0.01TOTG$$

t-value	0.066	3.40	3.86	2.10	-3.46	0.70
prob.	(0.946)	(000)	(000)	(0.036)	(000)	(0.485)

Specification Tests:

R-squared = 0.21

Durbin-Watson stat = 1.92

F-statistic = 6.266

Prob(F-statistic) = 000

Wald Test:

F-statistic = 65.901

Probability (0.0000)

Chi-square = 329.508

Probability (000)

This model shows that all the variables have the expected signs. Besides all specification tests listed above show that we have a reasonably good model specification. The results from this regression analysis show that the share of trade in GDP to be a statistically significant determinant of economic growth in SSA region. According to results from this model, a 10 unit increase in share of trade is correlated with a 0.5 percent increase in annual growth rate of GDP per-capita. Apart from openness to trade, we found growth in the share of investment (taken as a proxy to growth of physical capital), and rate of inflation (measuring quality of macroeconomic policy) and growth of economically active population (stand-in for human capital) to be important determinants of economic growth in the long run. Lastly, even if we expect to get a negative sign on terms of trade, at least for such kind of developing countries which are believed to face a secular deterioration in the terms of trade, we get a coefficient with a positive sign. But this variable turns out to be highly statistically insignificant.

In trying to see the short-run relationship, we have used the 1st difference of each explanatory variable together with that of one period lag of the residual obtained from the above long run regression. Results from the ECM (short run) model are presented below with specification tests each confirming that the model is well specified.

$$\mathbf{gdppcg = 0.05TSH + 0.01INVG + 0.21EAPG - 0.01INFG + 0.01TOTG - 0.96ECM}$$

t-value	2.20	3.45	0.19	-3.48	1.11	-23.925
prob.	(0.028)	(000)	(0.268)	(000)	(0.268)	(0.00)

R-squared = 0.49

F-statistic = 125.64

Prob (0.000)

Durbin-Watson stat = 2.030

Wald Test:

F-statistic = 6.784

(000)

Chi-square = 10.2880

(0.068)

The coefficient for the adjustment factor shows the adjustment process to the long run equilibrium from the short run disequilibrium. Its negative coefficient tells us that whatever shock exists in the short run it will adjusted to the long run equilibrium. Accordingly, our results show that there is a statistically significant converging factor. In this short run model also we

found trade to be important in explaining economic growth performance of SSA countries. Similar to the long run model, here also we found a 10 unit increase in trade shares to be associated with a 0.5 percent increase in annual growth rate of GDP per-capita. Among the control variables we found growth in the share of investment and rate of inflation to be important determinants of growth in the short run.

From all the previous analysis of trade and growth link i.e., via the pure cross-sectional, ten years average panel and panel co-integration techniques, we have found international trade to be an important variable explaining growth differentials of SSA countries. Can we take this as a substantial evidence to trade liberalization policies? Even if these trade liberalization policies enable countries to benefit from increases in international trade, they are not without negative impacts. Hence, we refrain from recommending trade liberalization and we opt to see the trade policy-growth link as presented in the next section.

5.2. Trade Policy and Economic Growth

5.2.1. Trade Policy and Economic Growth in a Cross-Sectional Analysis

In this section we will see impacts of trade policy on economic growth using a pure cross-sectional analysis technique. We also make use of the same growth equation specification, as the previous cross-section analysis except the fact that we are now referring to trade openness in terms of trade restrictions than trade volume. Accordingly, trade policy variables such as international trade tax and export tax, which also significantly affected trade volume, and import tariff are used in place of trade shares to measure countries' openness to international trade. The results from the growth regression based on the above specification are reported in table 5.8 below.

Table 5.8 Trade Policy and Economic Growth (Cross-Sectional Regression Results)

gdppcg	Reg1.	Reg2.	Reg3.	Reg4.	Reg5.	Reg6.
ttax	.028 (0.48)	.033 (0.58)	.042 (0.77)			
mtax				.067 (1.11)	.074 (1.27)	.082 (1.43)
xtax				-.005 (-0.08)	-.007 (-0.12)	-.019 (-0.33)
lfee	.195* (2.95)	.178* (2.92)	.180* (3.03)	.182* (3.07)	.169* (3.19)	.172* (3.41)
inf	-.005* (-7.85)	-.005* (-8.79)	-.005* (-8.66)	-.005* (-10.00)	-.004* (-10.88)	-.004* (-10.91)
telmain	.022 (0.95)	.024 (1.05)	.033 (1.44)	.028 (1.14)	.030 (1.26)	.038 (1.62)
lngpea	-1.78** (-2.46)	-1.715** (-2.42)	-1.751** (-2.30)	-1.906** (-2.52)	-1.884 (-2.53)	-1.978** (-2.49)
tropics	-1.305 (-1.42)	-1.277 (-1.41)		-1.212 (-1.49)	-1.177 (-1.48)	
totg	.067 (1.24)			.044 (0.85)		
cons	5.002 (0.89)	5.322 (0.95)	4.162 (0.80)	5.856 (1.04)	6.185 (1.13)	5.584 (1.04)
N	34	34	34	34	34	34
R ²	.57	.57	.53	.59	.59	.56

* 1 % level of significance, **5 % level of significance, ***10 % level of significance
 Figures in the parenthesis are t-values

The above growth regression specification results in an acceptable R² value that ranges from 53 to 59 percent. All the variables included in the regression but the trade policy measures have statistically significant coefficients with the expected signs. Step wise exclusion of insignificant variables as indicated in regressions 2,3,5, and 6 does not change the sign and significance of the other variables indicting the stability of the model. While growth of the economically active population, rate of inflation, initial GDP per-capita, and tropical climate appear with significant coefficients, none of the trade policy variables show a statistically significant coefficient. From this we can say that the commonly advocated trade liberalization policies do not have the alleged impacts on economic growth.

According to these regression results, growth variation among these countries is well explained by the growth of economically active population, macroeconomic stability (as measured the rate of inflation), and a conditional convergence factor. The respective positive and negative signs of import and export taxes can be regarded as suggesting some level of import protection is good for

growth while excessive export taxation is detrimental to economic growth. This explanation, however, should be taken carefully as we are making implications based on coefficients of insignificant variables and also based on the highly criticized model of cross-sectional regressions. Before we make any concrete conclusions we shall see regression results of the following panel based analysis.

5.2.2. Trade Policy and Economic Growth in a Panel Data Setting

For the same reasons presented before, we will be using the random effects model in this section to see the possible impact of trade policy on economic growth. Here also we used a similar specification as the cross-sectional analysis presented above. Two exceptional cases to this include the use of investment shares in GDP and growth of economically active population instead of telephone mainlines and life expectancy to measure physical and human capital respectively. In this model we have found all variables with the expected signs and a good number of them are statistically significant. Again, the exclusion of the insignificant variable (terms of trade in regressions 2 and 4) does not affect the sign and significance of the other variables ensuring the stability of the model.

The results we get from this panel data analysis are more or less similar with that of the cross-sectional regression results. We can say that the results are similar because here also we get no significant relationship between trade policy and economic growth. Same to the results from the cross-sectional regressions analysis, we found import tariff and export taxes to have a respective positive and negative (but insignificant) correlations with economic growth. This could be interpreted as saying; although trade policy is not that important in explaining growth differences among SSA countries, some kind of import protection may be good for growth while export restrictions will have negative impact on growth performances.

Table 5.9 Trade Policy and Economic Growth (Random Effects Model)

gdppcg	Reg1.	Reg2.	Reg.3	Reg4.
tntax	-.016 (-0.30)	-.017 (-0.32)		
mtax			.022 (0.30)	.025 (0.49)
xtax			-.060 (-0.89)	-.042 (-0.62)
lnigpea	-.940*** (-1.76)	-.930*** (-1.75)	-1.226** (-2.26)	-.878*** (-1.66)
invg	.017 (1.15)	.017 (1.12)	.017 (0.85)	.018 (1.21)
eapg	.975*** (1.91)	.969*** (1.88)	-.996** (-2.05)	.967*** (1.86)
inf	-.002* (-8.38)	-.002* (-8.74)	-.002* (-2.47)	-.002* (-9.20)
tropics	-3.685* (-2.73)	-3.682* (-2.74)	-3.907** (-2.34)	-3.547* (-2.81)
totg	-.008 (-0.16)		.014 (0.25)	
cons	4.855** (2.02)	4.827** (2.02)	5.163** (2.05)	4.037*** (1.92)
N	69	69	69	69
R ²	57,11,25	58,10,25	63,8,24	63,8,24

* 1 % level of significance, **5 % level of significance, ***10 %level of significance

Figures in the parenthesis are t-values and R² values are from the ordinary regression not from the robust reg.

It could be puzzling to say trade policy does not affect economic growth while it has a strong negative impact on trade share (on one of the significant positive determinate of economic growth). The fact that trade policy has two opposing (positive and negative) impacts on economic growth and the net effect depends on which one weighs can be one feasible explanation. That is, while trade policy cause negative impacts on economic growth through its trade reducing effect, it can also have positive impacts, for example, by protecting unfair foreign competition. In the case of import restrictions therefore, as our results show, the latter's effect dominates the former and hence import protection will have a positive but insignificant effect on economic growth. Other writers also found similar results as to the impact of trade policy on economic growth. This includes Yanikkaya (2003) who has got a positive and statistically significant relationship between trade barriers and economic growth and argued that there is no simple relationship between the two. According to this writer, the impact of trade policy on growth depends on

certain country characteristics such as developed and developing, big or small and whether the country has comparative advantage in the protected sectors.

From the regression results shown above we have found other factors than trade policy to be important in explaining growth differentials of SSA countries. As we have tried to show in previous sections growth in human resource, macroeconomic policy, conditional convergence factor and area coverage of tropical climate are found to be important determinants of economic growth. This result is also compatible with the findings of other writers including Rodrik (1997) who found most of the above variables to be important in growth and suggested that trade policy play no significant role in economic growth¹⁶.

¹⁶ Actually Rodrik (1997) have got a statistically significant negative relationship between export taxation and economic growth only. For the other measures of trade policy (total trade tax and import tariff) he has got no significant relationship.

6 Conclusion and Policy Implications

6.1. Conclusion

As discussed in chapter two, most SSA countries have shown poor performances when seen from the angles of trade and economic growth. These countries have also pursued a relatively protective trade policy for the past three decades, which is considered by some as the main source of slow growth in the region. In line with this, this paper probes the possible impacts of trade and trade policy on economic growth of countries in the SSA region.

In this study we have basically used three techniques – pure cross-sectional analysis, panel data analysis and panel co-integration techniques - in order to cross check the results from these different techniques. Accordingly, all the three techniques have shown that there is a positive and statistically significant relationship between openness to trade (measured by the shares of trade, imports and exports in GDP) and economic growth. This holds true even after we control for the problem of endogeneity via a simultaneous equations model (2SLS regression method). We believe that this will clear out the doubt articulated by some as to the direction of causation in the growth – trade relationship. It is also observed that the single equation growth model (simple OLS regression) underestimates the impact of trade on economic growth by some margin.

When we talk of the magnitudes of the impact of trade on economic growth, each of the three analysis techniques provided somewhat closer results. In the cross-sectional regression analysis a 10 unit increase in trade shares is correlated with a 0.3 percent increase in annual growth of GDP per-capita, while the same level increase in trade shares leads to a 0.4 and 0.5 percentage points increase in the panel co-integration and panel data analyses techniques, respectively. A similar pattern is also observed for the magnitude of the impacts of import and export shares in GDP. While a 10 unit increase in import share raises annual GDP per-capita growth by about 0.8 percent (in panel data analysis) and 0.4 percent (in cross-sectional analysis), an equal increase in export shares leads to a 1.5 and 0.5 percent increase in per-capita GDP growth in the panel and cross-sectional regression analyses, respectively.

Having observed the positive and statistically significant relationship between trade and economic growth, the next important step in the analysis was to see factors that determine countries' trade performance. Accordingly, we have found trade policy, along with other variables, to be significantly and negatively correlated with trade performance. Both the cross-sectional and panel data regressions, for example, have shown a 0.8 and 1.2 percent decrease in trade shares for every unit increase in import and export duties respectively. Based on this we can say trade restrictions have negative impacts on economic growth through their trade reducing effect; but this tells only one part of the story. That is, since trade barriers do also have positive impacts on economic growth, for example by shielding unfair foreign competition, the final answer to the impact of trade policy on economic growth depends on the net effect of these two.

Consequently, even if we found trade policy measures to be significantly and negatively correlated with trade performance, they have failed to reveal a statistically significant impact on economic growth. In other words, unlike the conventionally alleged significantly negative relationship between trade barriers and economic growth, this paper finds no evidence to follow suite. Rather, according to the results of this paper, trade policy play no significant role in explaining economic growth performance variations of SSA countries. As evidenced by the cross-sectional as well as panel data analysis techniques, import tariff show a positive (but insignificant) correlation with economic growth, while export taxation reveal a negative but insignificant correlation with economic growth. Hence, even if we cannot say protection is good or bad in black and white, we can say excessive export taxation will be detrimental to economic growth, while premeditated protection of imports can be advisable to economies in the SSA region.

6.2. Policy Implications

Since import protection does not seem applicable in today's globalized world, SSA countries should focus their protection only to areas where they have comparative advantages. But this protection again should be limited in time so that beneficiaries will work hard to make a difference in that limited time span.

SSA countries shouldn't necessarily go to trade liberalization policies to benefit more from trade. As we have seen in this paper, economic growth itself is an important determinant of trade performance. Hence, focusing more on the basic determinants of economic growth that include investments on human and physical capital and ensuring macroeconomic stability is pertinent. As Rodrik (1997) put it, "economic policy should focus on growth, not trade".

We believe that there is a serious supply side problem in the SSA region that impedes its trade as well as growth performances. Failures to effectively utilize trade provisions like the African Growth Opportunity Act (AGOA) are simple and clear manifestations of these supply side constraints. We, therefore, recommend SSA countries to redouble their effort in attracting foreign direct investment, which is found to be one of the positive and statistically significant determinants of trade in the region.

Finally, we propose country specific studies based on the Computable General Equilibrium (CGE) modeling in order to investigate the channels through which trade and trade policy affect economic growth.

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Appendices

Appendix 1. Description of Data and Variable Definition

access	Dummy variable for landlocked countries. It takes the value 1 if a country is completely landlocked; 0 otherwise. Source: Sachs and Warner (1997)
bmp	The black market premium, average for 1970-2002 Source: Internet
eapg	Annual Growth rate of economically active population (15-64) relative to Annual total population growth rate Source: world Bank (2004)
dum70s	dummy variable for the 1970s
dum80s	dummy variable for the 1980s
dum90s	dummy variable for the 1990s
fdi	The ratio of Net inflows of Foreign direct investment to GDP Source: world Bank (2004)
gdppcg	Annual percentage growth rate of GDP per capita based on constant local currency Source: World Bank (2004)
inf	Inflation as measured by the annual growth rate of the GDP implicit deflator. And it shows the rate of price change in the economy as a whole. The GDP implicit deflator is the ratio of GDP in current local currency to GDP in constant local currency. Source: World Bank (2004)
invg	Growth of Gross capital formation (gross domestic investment) as a share of GDP. Source: World Bank (2004b)
lifee	Life expectancy at birth indicates the number of years a newborn infant would live if prevailing patterns of mortality at the time of its birth were to stay the same throughout its life. Source: World Bank (2004)
lnarea	Log of the total land area in 10^3 sq.mi Source: Frankel & Romer (1996)
lnigpeap	Log of initial GDP per economically active population in 1969 (for the Cross-sectional) and on 1969, 1979, 1989 (for the Panel)

Source: World Bank (2004)

msh	Share of total imports in GDP Source: World Bank (2004)
pop	Total population Source: World Bank (2004)
mtax	The Ratio Import duty revenue to total imports, Import duties comprise all levies collected on goods at the point of entry into the country. The levies may be imposed for revenue or protection purposes and may be determined on a specific or ad valorem basis, as long as they are restricted to imported products. Source: World Bank (2004)
telmain	Telephone main lines per 1,000 population Source: World Bank (2004b)
totg	Growth in the terms of trade Source: world Bank (2004b)
tropics	Dummy for tropical Climate. With an approximate fraction of a country's land area subject to a tropical climate. Source: Sachs and Warner (1997)
tsh	Share of total international trade in GDP Source: world Bank (2004)
tntax	Ratio of duty revenue in international trade tax to imports plus exports. Taxes on international trade include import duties, export duties, profits of export or import monopolies, exchange profits, and exchange taxes. Source: world Bank (2004)
xsh	Share of total exports in GDP Source: world Bank (2004)
xtax	The ratios of export duties in total exports. Export duties include all levies collected on goods at the point of export. Rebates on exported goods that are repayments of previously paid general consumption taxes, excise taxes, or import duties are deducted from the gross amounts receivable from the respective taxes, not from amounts receivable in this category Source: world Bank (2004)

Appendix 2. Hausman Specification Error Test/ Test for Simultaneity - The case of Cross-Sectional Analysis

We have followed the following steps to do the test

One, run the Reduced form Regression, i.e, trade share on all explanatory variables

Two, predict the error term from the above regression (e_{hat}).

Three, Run the growth regression including the predicted residual (e_{hat})

Four, if this residual is found significant; it implies the presence of simultaneity problem

Step 1. reg tsh ttax gdppcg fdi pop lifee inf telmain lngpea65, robust

Regression with robust standard errors

	Number of obs =	33
	F(8, 24) =	24.16
	Prob > F =	0.0000
	R-squared =	0.7550
	Root MSE =	18.595

tsh	Coef.	Robust Std. Err.	t	P> t	[95% Conf. Interval]	
ttax33	-1.445127	1.001977	-1.44	0.162	-3.513106	.6228529
gdppcg	6.570038	2.571521	2.55	0.017	1.26268	11.8774
fdi	12.58088	3.210907	3.92	0.001	5.953896	19.20787
pop	-5.79e-07	2.05e-07	-2.82	0.009	-1.00e-06	-1.55e-07
lifee	.1451652	.7908486	0.18	0.856	-1.487066	1.777396
inf	.018132	.0145893	1.24	0.226	-.0119788	.0482429
telmain	-.2831722	.3579368	-0.79	0.437	-1.021917	.4555729
lngpea65	21.11413	8.56374	2.47	0.021	3.43944	38.78882
_cons	-95.09234	56.91614	-1.67	0.108	-212.5615	22.3768

Step 2 . predict ehat, resid

Step 3 . reg gdppcg tsh lifee inf telmain lngpea65 ehat, robust

Regression with robust standard errors

	Number of obs =	33
	F(6, 26) =	112.83
	Prob > F =	0.0000
	R-squared =	0.7389
	Root MSE =	1.1061

gdppcg	Coef.	Robust Std. Err.	t	P> t	[95% Conf. Interval]	
tsh	.0382852	.0101543	3.77	0.001	.0174127	.0591577
lifee	.0967273	.0445073	2.17	0.039	.0052413	.1882133
inf	-.0037788	.0002798	-13.51	0.000	-.0043539	-.0032038
telmain	.0376644	.0193578	1.95	0.063	-.0021262	.0774549
lngpea65	-2.191708	.5538486	-3.96	0.001	-3.33016	-1.053256
ehat	-.0382852	.0173959	-2.20	0.037	-.074043	-.0025275
_cons	9.161538	3.685108	2.49	0.020	1.58669	16.73638

Since we found e_{hat} to be statistically significant at 5 percent level of significance, we can say that there is a problem of simultaneity.

Appendix 3. Hausman Specification Error Test / Test For Simultaneity - In the case of Panel Data Analysis

Step1. xtreg tsh ttax gdppcg fdi pop lnigpeap invg eapg inf dum70s dum80s, pa robust

Iteration 1: tolerance = 1.8725282
 ...
 Iteration 14: tolerance = 3.055e-07

GEE population-averaged model
 Group variable: cid
 Link: identity
 Family: Gaussian
 Correlation: exchangeable
 Scale parameter: 327.5151
 Number of obs = 66
 Number of groups = 30
 Obs per group: min = 1
 avg = 2.2
 max = 3
 Wald chi2(10) = 128.59
 Prob > chi2 = 0.0000

(standard errors adjusted for clustering on cid)

tsh	Coef.	Semi-robust Std. Err.	z	P> z	[95% Conf. Interval]	
ttax	-.8067386	.4804297	-1.68	0.093	-1.748363	.1348864
gdppcg	2.333778	.8865106	2.63	0.008	.5962491	4.071307
fdi	2.246914	1.007373	2.23	0.026	.2724987	4.221329
pop	-18.69011	3.731077	-5.01	0.000	-26.00288	-11.37733
lnigpeap	7.560689	4.542732	1.66	0.096	-1.342903	16.46428
invg	-.077954	.1255404	-0.62	0.535	-.3240086	.1681007
eapg	1.28752	2.675323	0.48	0.630	-6.531056	3.956016
inf	.0057988	.0017213	3.37	0.001	.0024251	.0091724
dum70s	-18.23836	6.84122	-2.67	0.008	-31.64691	-4.829814
dum80s	-8.698469	4.630586	-1.88	0.060	-17.77425	.3773126
_cons	351.3429	64.97343	5.41	0.000	223.9973	478.6885

. predict ghat

Step 2. generate ehat = gdppcg - ghat

Step 3. xtreg gdppcg tsh lnigpeap invg eapg inf dum70s dum80s ehat, pa robust

Iteration 1: tolerance = .17516476
 ...
 Iteration 10: tolerance = 3.069e-07

GEE population-averaged model
 Group variable: cid
 Link: identity
 Family: Gaussian
 Correlation: exchangeable
 Number of obs = 66
 Number of groups = 30
 Obs per group: min = 1
 avg = 2.2
 max = 3

Scale parameter: 4.572837 Wald chi2(8) = 3677.31
 Prob > chi2 = 0.0000

(standard errors adjusted for clustering on cid)

gdppcg	Coef.	Semi-robust Std. Err.	z	P> z	[95% Conf. Interval]	
tsh	.0126292	.0141335	0.89	0.372	-.0150719	.0403304
lnigpeap	-1.285491	.5247561	-2.45	0.014	-2.313994	-.2569879
invg	.0123821	.0183124	0.68	0.499	-.0235096	.0482737
eapg	1.024047	.4901934	2.09	0.037	-1.984808	-.0632855
infgdp	-.0017878	.0001887	-9.47	0.000	-.0021576	-.0014179
dum70s	2.936763	.7269228	4.04	0.000	1.512021	4.361506
dum80s	1.204626	.5399157	2.23	0.026	.1464112	2.262842
ehat	-.0564424	.0223666	-2.52	0.012	-.1002801	-.0126046
_cons	-2.611062	1.319309	-1.98	0.048	-5.19686	-.0252635

Since we found e_{hat} to be statistically significant at 5 percent level of significance, we can say that there is simultaneity problem in this growth regression.

Appendix 4. Hadri Panel Unit root Test Results

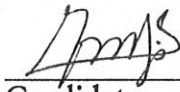
Null Hypothesis: No unit root (common unit root process)

Variable	At levels		First Difference	
	Statistic	Prob.	Statistic	Prob.
gdppcg	4.43182	0.0000	-0.51343	0.6962
tsh	10.1175	0.0000	1.21549	0.1121
dpopg	3.66268	0.0001	0.66089	0.2543
invg	2.77692	0.0027	0.42469	0.3355
inf	11.0258	0.0000	0.02767	0.4890
totg	1.35237	0.0881	0.15705	0.4376

Declaration

The thesis is my original work, has not been presented for a degree in any other university and that all sources of material used for the thesis have been duly acknowledged.

Declared by
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