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Trade Regimes, Liberalization and Macroeconomic Instability in Africa

by

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Abstract

Trade policy has been a very contentious issue in the discourse on African development. Using panel data for 33 African countries spanning the period 1986-2000, we examine the relationship between trade liberalization and macroeconomic instability in Africa. We focus on instabilities in output, consumption and investment, and use both single and system estimation techniques as well as different measures of trade regimes. After controlling for key potential sources of macroeconomic instability, we find no substantial evidence that trade liberalization has a systematic impact on instability in the region. The study shows that the volatilities of inflation and the terms of trade, as well as climatic disasters, the nature of fiscal policy, and the severity of debt are more robust determinants of macroeconomic instability in the region. The paper also argues that policymakers in the region can reduce macroeconomic instability and vulnerability to shocks by diversifying their export structures, using fiscal policy in a countercyclical manner, and improving the functioning of the financial sector.

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1. Introduction

The role of trade policy in economic development has been the subject of recent studies and vigorous debates among economists and policymakers. The prevailing, and still popular, view is that countries with more liberal or open trade policies have better economic performance than those with restrictive trade policies (Sachs and Warner 1995; Krueger 1998). Proponents of this view argue that liberal trade policies enable countries to: produce and allocate resources more efficiently; access new ideas and technologies; and have access to cheap foreign consumption goods.[1] Recently, this view has been questioned by prominent economists. For example, Stiglitz (2002) stresses that there is no conclusive evidence that more open economies have higher growth rates. Rodriguez and Rodrik (2000), have also argued that methodological problems with the empirical strategies used in examining the link between trade policy and growth make it difficult to argue that there is a systematic inverse relationship between trade barriers and economic growth. They stress, however, that their analysis or interpretation of the evidence does not mean that trade protectionism is good for growth. It simply means that, contrary to the claims of proponents of trade liberalization, it is hard to find any systematic relationship between trade policy and economic performance in regressions. This reflects largely the fact that the relationship between the two variables differs across countries and so is difficult to pick up in cross-section or panel data.

In Africa, there is a renewed and increasing interest in the role of trade policy in economic performance (Rodrik 1998a). This is due largely to the disappointing economic performance of several countries in the region in the last two decades and attempts to explain why they have not done well relative to developing countries in Asia and Latin America. For example, while several developing countries increased their share of world trade between 1980 and 2002, Africa's share fell from 4.6 percent to less than 1.8 percent. Furthermore, real Gross Domestic Product (GDP) per capita in Sub-Saharan Africa fell by 1.2 percent over the period 1981-1990 and by 0.4 percent over the period 1991-2000. In contrast, in East Asia, real GDP per capita grew by 5.7 percent from 1981-90 and by 6.4 percent from 1991-2000 (World Bank 2003). Various explanations have been adduced for Africa's dismal economic performance. This includes poor domestic economic policies, geography, colonial legacy, political instability, weak institutions, and an inhospitable external environment. While it is generally acknowledged that the inward-looking trade policies pursued in the region since independence contributed to its poor export performance, the link to growth performance is not well established (Rodrik 1998a).

That said, it is often argued that African countries are very reluctant to open their

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[1] Despite the theoretical or potential advantages of a liberal trade policy, it is common knowledge that countries are generally hesitant to embark upon aggressive trade reforms. For example, the Fifth WTO Ministerial Conference held in Cancun, in September 2003, collapsed in part because trade Ministers, from both developed and developing countries, were reluctant to make serious and binding commitments on eliminating existing trade barriers (see Evenett 2003).

economies.[2] Sharer (1999) points out that most countries in Sub-Saharan Africa have not implemented trade reforms on a sustained basis as in other developing countries, particularly those in East Asia and Latin America. Oyejide (1998) and Rodrik (1998b) argue that trade reforms in the region are replete with policy interruptions and reversals. This reflects largely the fact that African policymakers are not convinced that opening their economies to trade is the best way to achieve their development aspirations. There are several reasons why governments in the region have this attitude towards international trade. The first is that in several countries trade taxes account for a significant portion of government revenue, and so developments in the external sector affect government finance and spending as well as the economy.[3] For the period 1999-2001, import duties as a percentage of total revenue was 34 percent in the Least Developed Countries in Africa compared with 20 percent for the same category in Asia and 15 percent for developing countries as a group.

Second, countries are concerned that they will not be able to compete on the international market because of the small and underdeveloped nature of African economies as well as the power imbalances in the current multilateral trading system. Third, trade reform harms some groups while generating positive welfare benefits for others.[4] In the absence of domestic safety nets or mechanisms to compensate potential losers policymakers are hesitant to increase the pace of reforms for fear of triggering political unrest.

Finally, several countries in the region rely on the export of a few commodities and so are concerned that the more open their economies are, the more exposed they would be to external shocks, with potential consequences for the stability of key macroeconomic variables: output, consumption, investment, and government revenue. Pindyck (1991) provides mechanisms through which uncertainty and volatility could have negative effects on investment. In addition, there are several studies showing that volatility has consequences for economic performance in developing countries (Basu and McLeod 1992; Bleaney and Greenaway 2001). Clearly, African countries are concerned about macroeconomic volatility as well as vulnerability to external shocks because they do not have good markets to insure agents against risk and also do not have a well-diversified production structure. Available data indicate that in 2002 the export concentration index

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[2] Mayda and Rodrik (2005) provide an interesting analysis of why some individuals and countries are more protectionist than others. They show that pro-trade preferences are positively correlated with an individual's level of education and relative economic status. They are however negatively correlated with the degree of nationalism/patriotism and the trade exposure of the sector in which an individual is employed. Guisinger (2003) argues that diffusion mechanisms provide a good explanation of the trade policy choices of countries. The paper treats diffusion as a competitive process where countries emulate the trade liberalization of similar countries.

[3] This is related to the idea that multilateral trade reform and the associated obligations will deny African governments the policy instruments and space needed to address pressing development problems.

[4] Davidson and Matusz (2004) explore the best way to compensate those who lose from trade liberalization. They focus on four labour market policies: wage subsidies, employment subsidies, unemployment assistance and training subsidies. They argue that a temporary targeted wage subsidy is the best way to compensate those who bear the cost of adjusting to reform while a temporary targeted employment subsidy is the best way to compensate those who are trapped in the previously protected sector.

for Africa was 0.49 which is twice the figure for developing countries and four times that for developed economies (see Table 1). Other features that make the region vulnerable to external shocks include the heavy dependence on agriculture and the high degree of indebtedness (see Table 2).

Table 1: Selected indicators on African economies

Indicator	Africa	Developing economies	Developed economies
No. of commodities exported			
• 1992	116	199	231
• 2002	123	210	231
Export concentration index			
• 1992	0.57	0.25	0.10
• 2002	0.49	0.23	0.12
Export diversification index*			
• 1992	0.82	0.60	0.35
• 2002	0.79	0.55	0.35

Source: UNCTAD (2004a)
* Note that this index is constructed such that values close to 1 represent less export diversification.

Table 2: Structure of African economies (% of GDP)

Variable	1980	1990	2000
Agriculture	16.9	17.3	15.3
Industry	41.1	33.0	33.3
• Manufacturing	11.7	14.1	12.7
Services	38.5	44.0	45.7
Merchandise Exports	24.4*	23.1	28.2
Merchandise Imports	23.9*	21.5	24.8
External debt	29.1	59.0	53.4

Source: World Bank (2004)
* Data for 1984

The idea that trade liberalization could lead to macroeconomic instability is not new in the literature. What is surprising, however, is that there is so far limited empirical evidence to bear on the issue. Razin and Rose (1992) examined the impact of openness on volatility of macroeconomic variables using data for 138 countries spanning the period 1950-88. They found no relationship between openness and volatility. On the other hand, Rodrik (1998c) found that the volatility of national income is higher in more open economies. This is consistent with the more recent empirical results of Easterly and Kraay (2000) that small states have higher volatility of national income due in part to their higher volatility of terms of trade shocks. They ascribe the high volatility of terms of trade shocks in small states to their greater openness. A common feature of the abovementioned papers is that they use data for both developed and developing countries and so do not address specifically issues of interest to African countries.

There is a small literature on the sources of macroeconomic volatility in African countries. Using a vector autoregression (VAR) framework, Deaton and Miller (1996) provide evidence on the importance of commodity-based terms of trade shocks. Their study suggests that these shocks play an important role in macroeconomic fluctuations in Africa. Hoffmaister, Roldos, and Wickham (1998) use a structural VAR model to examine the relative importance of external and domestic shocks in macroeconomic fluctuations in Africa. They conclude that domestic shocks account for the bulk of movements in output. They also show that although external shocks play a minor role in output fluctuation, they tend to be more important in CFA compared to non-CFA African countries, reflecting the fact that the former has a fixed exchange rate regime and so the exchange rate cannot respond to terms of trade shocks. Using a stochastic, dynamic, general equilibrium model, Kose and Reizman (2001) present evidence that a large fraction of the volatility of macroeconomic variables in African countries is attributable to trade shocks. They also show that trade shocks account for 87 percent of the variation in investment, 45 percent of the variation in output, 79 percent of the variation in consumption, and 80 percent of the variation in labour supply. Furthermore, their analyses suggest that in contrast with other types of disturbances, adverse trade shocks cause prolonged recessions in Africa.

This paper tests the hypothesis that a more open trade regime leads to higher instability or volatility in macroeconomic variables in Africa. The tests are applied to a panel of 33 African countries for which we have data. Our paper contributes to the existing literature in several ways. First, in contrast to Deaton and Miller (1996) and Hoffmaister et. al. (1998), we consider instabilities in consumption and investment. The addition of consumption and investment is important because instabilities in output do not imply instabilities in other macroeconomic variables. For example, a country with a very volatile output may not experience instabilities in consumption if consumers can borrow to smooth consumption. Besides, output instability is of less concern and consequence to households than consumption instability.[5] Kose and Reizman (2001) also considered instabilities in consumption and investment, but they used a different framework and did not examine explicitly the role of trade regimes. Our paper does that. In particular, we consider three measures of trade policy regimes: one based on outcome or practice (trade/GDP ratio); one based on policy incidence (tariff and non-tariff barriers); and one based on the conventional wisdom that African countries have been relatively more open since the 1990s (Hinkle, Herrou-Aragon, and Kubota 2003).

The second contribution of our paper is that we account for key potential sources of macroeconomic instability in Africa. In the discourse on Africa's economic performance several authors argue that institutional quality, climatic disasters (for example, high incidence of drought), severity of debt and geography play important roles in explaining differences in macroeconomic outcomes across countries in the region (Collier and Gunning 1999; Rodrik 1999; Sachs 2003). Unlike previous studies, we control for these

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[5] There is also a literature on revenue instability. See for example, Bleaney, Gemmell and Greenaway (1995). They argue that tax revenue instability is high in Less Developed Countries (LDCs) and are highest in open economies with low per capita income, high output variance, and inflationary problems.

factors in our estimations. Third, we use both single and system statistical estimation techniques and conduct a battery of sensitivity analysis to examine the robustness of our results.

The organization of the paper is as follows: section 2 presents stylized facts on macroeconomic instability in Africa. Section 3 provides brief background information on Africa's experience with trade liberalization. Section 4 analyzes standard theoretical explanations for the link between trade liberalization and macroeconomic instability. Section 5 presents and discusses the results of the estimations. Finally, section 6 discusses the policy implications of the analyses and offers some recommendations on how to deal with vulnerability to external shocks and reduce macroeconomic instability in the region.

2. Macroeconomic Instability in Africa

This section presents stylized facts on macroeconomic instability in Africa over the period 1986-2000. It focuses on instability in three key macroeconomic variables for which we have data: real output per capita; real consumption per capita; and real investment per capita. Instability is measured by the standard deviation of macroeconomic variables. For ease of analysis, we have classified the countries in the sample into three categories depending on whether they have high, moderate, or low macroeconomic volatility. More specifically, for each variable of interest, a country is classified as high volatility if it has standard deviation greater than 5. It is classified as moderate volatility if it has standard deviation less than 5 but greater than 2. Countries with standard deviation less than or equal to 2 are classified as low volatility. The results based on this classification of the data are presented in Tables 3 to 5.

Table 3: Output Volatility

Country Classification*	1986-90	1991-95	1996-2000
High volatility	Swaziland, Gabon, Mozambique, Ethiopia, Cameroon, Mali, Sierra Leone	Rwanda, Cote d'Ivoire, Togo, Malawi, Ethiopia, Sierra Leone, Morocco, Zimbabwe, Mozambique, Comoros, Zambia,	Guinea-Bissau, Sierra Leone, Rwanda, Lesotho, Morocco, Zimbabwe
Moderate volatility	Morocco, Burkina Faso, Botswana, Nigeria, Cote d'Ivoire, Tunisia, Lesotho, Congo Rep, Guinea-Bissau, Comoros, Rwanda, Zimbabwe, Zambia, Mauritania, Togo, Uganda, Senegal, Malawi, Algeria	Mali, Congo Rep, Gabon, Madagascar, Uganda, Burkina Faso, Cameroon, Senegal, Algeria, South Africa, Tunisia, Kenya	Togo, Gabon, Congo Rep, Ethiopia, Mozambique, Cote d'Ivoire, Zambia, Burkina Faso, Comoros
Low volatility	South Africa, Egypt, Mauritius, Gambia, Madagascar, Kenya, Ghana	Botswana, Nigeria, Guinea-Bissau, Egypt, Mauritania, Swaziland, Gambia, Ghana, Mauritius, Lesotho	Malawi, Uganda, Algeria, Mali, Kenya, Gambia, South Africa, Nigeria, Botswana, Madagascar, Mauritania, Tunisia, Mauritius, Swaziland, Egypt, Ghana, Senegal, Cameroon

Table 4: Consumption Volatility

Country Classification*	1986-90	1991-95	1996-2000
High volatility	Guinea-Bissau, Gabon, Swaziland, Zimbabwe, Mauritania, Zambia, Cameroon, Sierra Leone, Ethiopia, Togo, Burkina Faso, Cote d'Ivoire, Malawi, Gambia, Nigeria, Botswana, Rwanda, Morocco, Mali, Kenya, Madagascar, Mozambique, Algeria	Malawi, Comoros, Sierra Leone, Zambia, Guinea-Bissau, Zimbabwe, Togo, Ethiopia, Mozambique, Mauritania, Swaziland, Nigeria, Morocco, Congo Rep, Rwanda, Gabon, Botswana, Kenya, Cameroon, Cote d'Ivoire, Lesotho, Burkina Faso, Mali	Sierra Leone, Congo Rep, Ghana, Malawi, Nigeria, Guinea-Bissau, Zimbabwe, Togo, Lesotho, Mauritania, Rwanda, Botswana, Gambia, Comoros, Burkina Faso, Morocco, Kenya, Ethiopia, Mozambique, Swaziland
Moderate volatility	Congo Rep, Lesotho, Mauritius, Tunisia, Uganda, Egypt, Senegal	Uganda, Gambia, Algeria, Senegal, Ghana, South Africa	Cameroon, Cote d'Ivoire, Zambia, Senegal, Mali, Uganda
Low volatility	South Africa, Ghana, Comoros	Madagascar, Tunisia, Egypt, Mauritius	Algeria, Madagascar, South Africa, Gabon, Egypt, Tunisia, Mauritius

Table 5: Investment Volatility

Country Classification*	1986-90	1991-95	1996-2000
High volatility	Sierra Leone, Gabon, Swaziland, Ethiopia, Zambia, Nigeria, Guinea-Bissau, Congo Rep, Malawi, Mauritania, Tunisia, Lesotho, Uganda, Ghana, Botswana, South Africa, Zimbabwe, Cameroon, Mali, Gambia, Madagascar, Morocco, Togo, Algeria, Mauritius, Senegal, Comoros, Burkina Faso, Cote d'Ivoire, Egypt, Rwanda, Kenya	Rwanda, Sierra Leone, Ghana, Comoros, Guine-Bissau, Togo, Congo rep, Zambia, Madagascar, Malawi, Nigeria, Ethiopia, Cote d'Ivoire, Burkina Faso, Uganda, Mauritania, Morocco, Swaziland, Mali, Cameroon, Mozambique, Egypt, Zimbabwe, Gabon, Kenya, Tunisia, Gambia, South Africa, Lesotho, Algeria, Senegal	Swaziland, Congo Rep, Ghana, Mozambique, Cote d'Ivoire, Gabon, Guine-Bissau, Mauritania, Togo, Zimbabwe, Gambia, Mali, Nigeria, Rwanda, Morocco, Comoros, Malawi, Senegal, Ethiopia, Burkina Faso, Uganda, South Africa, Botswana, Madagascar, Egypt, Lesotho, Zambia
Moderate volatility	Mozambique	Mauritius, Botswana	Kenya, Mauritius, Sierra Leone, Cameroon, Tunisia
Low volatility			Algeria

The first point to be made from these tables is that for most countries in the sample, the volatility pattern has changed significantly over time. For example, over the period 1986-90 Algeria had moderate output volatility but highly volatile consumption and investment. However, over the period 1996-2000 it had low volatility in output, consumption and investment.

Second, investment is generally more volatile than consumption and output. For example, while Egypt and South Africa had highly volatile investment over the period 1996-2000, the volatilities of output and consumption over the same period was low. This is in line with the results of several studies that investment is the most volatile component of aggregate demand.

Third, more countries seem to have lower output and, to a lesser extent, consumption and investment volatility in the period 1996-2000 compared to 1986-90. In the former period, 7 countries had low output volatility while in the latter period the number was 18. As for consumption, a change is also noticeable although to a much lesser degree. While 3 countries had low consumption volatility over the period 1986-90, the number increased to 7 over the period 1996-2000. Investment seems to be the only variable where there has not been any significant change in the number of countries with low volatility. It is interesting to note that in 10 of the 18 countries that had low output volatility over the period 1996-2000, there was a significant reduction in tariffs over the same period. For example in Uganda average tariffs was 25 percent in the period 1986-90 but fell to 10.9 percent in 1996-2000. Similarly, over the same period, average tariffs fell from 22.3 to 15.9 percent in Mauritania. In Kenya it fell from 40.3 to 17.7 percent. These facts suggest that the reduction of trade barriers do not necessarily lead to more volatility in macroeconomic variables. The pace and sequencing of trade liberalization as well as the nature of domestic economic and social policies may play a role in determining the extent of macroeconomic instability in a country.

3. Trade Policy and Liberalization in Africa

In the 1970s, most countries in Africa used trade restriction as an important instrument for protecting domestic industries and for economic development in general. Since the mid-1980s, several countries in the region have adopted a more outward-looking development strategy. Efforts were made to reduce and or eliminate exchange controls, export taxes, and import-export monopolies. The movement from quantitative controls to tariffs as the main instrument of protection was also a key component of the trade reform programmes. In general, trade reforms in the region have been implemented under three platforms. First, countries that sought assistance under the IMF/World Bank Structural Adjustment Programmes were compelled to embark on unilateral trade liberalization as a major component of macroeconomic stabilization. There was also unilateral liberalization in response to positive external shocks, as occurred in Kenya and Tanzania during the commodity booms of 1976-77. The second source of reforms is membership of regional economic groupings.[6] As members of regional economic groups several countries had to implement certain trade reforms, although the scale or extent of liberalization attributable to this source is quite small. Finally, African countries have also taken part in multilateral

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[6] There are several economic communities in the region. These include the Economic Community of West African States (ECOWAS), Common Market for Eastern and Southern Africa (COMESA), Southern Africa Development Community (SADC), West African Economic and Monetary Union (WAEMU), Southern Africa Customs Union (SACU), and Communaute Economique et Monetaire de l'Afrique Centrale (CEMAC).

trade reforms as a result of their membership of the World Trade Organization (WTO).

Trade reform in Africa occurred in three stages. The first stage involved the rationalization of tariffs and several countries in the region have completed this process. The second stage focused on the reduction of tariff dispersion. This typically involves reducing high tariffs and increasing the lowest tariffs. Several countries in the region have also gone through this process. The final stage, which is still on-going, involves the reduction of average tariffs. Ancharaz (2003) provides evidence on the determinants of trade reforms in Sub-Saharan Africa. His study suggests that larger aid flows, higher levels of urbanization, a strong current account position, economic crises, and a relatively large manufacturing sector enhance the probability that trade reform is adopted. In addition, heavy dependence on trade taxes, greater import competition, and a large government make trade reform less likely.

Although most trade reforms in Africa were initiated in the second half of 1980, substantial progress was not observed in the region until the 1990s (Hinkle, Herrou-Aragon, and Kubota 2003).[7] This is illustrated by the fact that in 1980-85 average tariffs in sub-Saharan Africa was 30 percent. But by 1996-98 it had declined to roughly 18 percent (Martin 2003). Table 6 presents information on trade liberalization episodes in selected African countries.

Table 6: Trade liberalization episodes in selected countries

Countries	Liberalization starting year	Liberalization episodes
Benin	1988	1990-1994
Burkina Faso	1991	1992-present
Burundi	2002	2002-present
Cape Verde	1987	1997-2001
Ethiopia	1992	1996-present
Gambia	1985	1985-1988
Guinea	1985	1985-1997
Lesotho	1984	1994-1999
Madagascar	1988	1988-1996
Malawi	1988	1997-2001
Mali	1986	1991-2000
Mauritania	1992	1992-1997
Mozambique	1987	1992-1993
Senegal	1986	1994-present
Sudan	1992	1996-2000
Togo	1988	1988-1996
Uganda	1981	1991-1996
Tanzania	1984	1990-present
Zambia	1982	1992-1995

Source: UNCTAD (2004b)

Table 6 shows that the pace of reform differs across countries. In the fast liberalizers,

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[7] For example, in 1990 no country in the region had trade regimes that could be classified as open based on the IMF's Index of Aggregate Trade Restrictiveness. By 2001, however, 43 percent of African countries' trade regimes were classified as open (Sharer 2001).

reforms occurred within 1-5 years. Countries in this category include Benin, Cape Verde, Gambia, Malawi, Mozambique, Sudan and Zambia. On the other hand, in countries such as Guinea, Lesotho, Mali, and Togo it was gradual and occurred within 6-15 years. In countries such as Burkina Faso, Burundi, and Ethiopia the process is still ongoing.

While there is agreement that countries in the region made substantial progress in opening their economies in the 1990s, trade policy in Africa is still regarded by some analysts as more protectionist than those of its trading partners and competitors (Sharer 1999; Hinkle, Herrou-Aragon, and Kubota 2003). This conclusion is generally based on the fact that average tariffs in the region are higher than the world average. For example, in 2004, average tariff in Africa was 17.1 percent compared with the world average of 12.1 percent. However, one must be very cautious in using tariff changes alone as an indicator of changes in trade regimes because a country may achieve tariff reduction by simply substituting non-tariff barriers for tariffs. This is an important point because although average tariffs in Africa are high, recent evidence indicates that core non-tariff barriers in Africa are lower than for several developing countries. For example, in 1995-98 core non-tariff barriers in sub-Saharan Africa was 10.4 percent while it was 58.3 and 16.3 percent respectively for South Asia and East Asia and the Pacific (Martin 2003).

4. Transmission Mechanisms and Empirical Methodology

There are two standard explanations for the relationship between trade liberalization and macroeconomic instability (McCulloch, Winters and Cirera 2001). The first is based on the fact that trade liberalization enables countries to exploit economies of scale and specialize in the production of goods in which they have a comparative advantage. The increase in specialization results in more competitiveness as countries are forced to reallocate resources to sectors where they can be utilized more efficiently given existing resource endowments. Although the increase in specialization raises national income, it also increases a country's vulnerability to industry-specific shocks and so may lead to more macroeconomic instability. The problem is even more acute for countries that specialize in the production of primary commodities whose prices experience wide fluctuations. It is also compounded in economies that do not have domestic insurance markets for risk.

The second explanation for the alleged relationship between trade liberalization and mac-roeconomic instability is that liberalization exposes countries to external shocks and so increases the importance of foreign, relative to domestic, shocks. The idea is that if foreign shocks are large relative to domestic shocks, and if there is either positive or no correlation between the two shocks, trade liberalization will increase the overall risk faced by a country. If however foreign shocks are either relatively small or are negatively correlated with domestic shocks, trade liberalization is likely to reduce overall risk.

One simple method to examine the relationship between trade liberalization and macroeconomic instability is to identify periods in a country's history in which trade policy was restricted and periods in which trade policy was liberal and then compute the

variances of the relevant variables across the two samples and test whether or not they are significantly different. This is similar to the "before and after" type of analysis employed by several authors to study the impact of economic policies, programmes, and events in developing countries (Killick 1995; Crafts 1999). The key drawback of this approach is that it implicitly assumes that trade liberalization is the only source of macroeconomic instability. In general, this is not the case. Volatilities in inflation and terms of trade as well as political instability, the nature of fiscal policy, and financial depth, may also affect macroeconomic volatility.

Another approach is to run a regression with volatility as the dependent variable and a measure of trade policy regimes as one of the explanatory variables. This is the standard approach employed in the literature. Its strength is that it allows the researcher to control for factors, other than trade policy, that affect macroeconomic instability. This is the approach we adopt in this paper. In particular, we estimate versions of the following equation:

$$V_{it} = \alpha + \beta TP_{it} + \sum_{j} \lambda_j X_{jt} + \varepsilon_{it} \qquad (1)$$

where i denotes a country, t denotes time, and:

- V is a measure of instability,
- TP is a measure of trade policy or regime,
- X is a set of control variables,
- α and λ are nuisance coefficients, and
- ε is a well-behaved residual.

In the equations we estimate, the coefficient of interest is β. If this coefficient is significantly different from zero then we have evidence that trade liberalization has a significant impact on macroeconomic instability. Given that the dependent variable in each equation is a measure of instability and this can only be estimated over time, all variables used in the analysis are computed over non-overlapping five-year intervals from annual data spanning the period 1986-2000. More specifically, the five-year intervals are 1986-90, 1991-1995, and 1996-2000. This approach yields three observations for each of the 33 countries in the sample.[8] Each of the dependent variable used in the estimation is defined in terms of real per capita growth. Following Ramey and Ramey (1995), we define instability as the standard deviation of the annual growth rate of the variables of interest. For example, for output it is the standard deviation of the growth rate of real output per capita. Instability can also be defined in terms of the level of each variable as in Gavin and Hausman (1996) or the coefficient of variation as in Rose (2004).[9] Equation (1) is estimated using OLS with robust standard errors. It is also estimated using a system approach—the Seemingly Unrelated Regression (SURE)

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[8] Note that Nigeria and Swaziland have two observations instead of three due to missing data.
[9] In the empirical analyses we tried these measures of volatility and found that there was no significant difference in the results.

technique—which accounts for contemporaneous correlation across errors of equations in the system. Furthermore, we include dummies for oil exporters as well as severely indebted countries to control for the fact that oil importers and indebted countries may be more vulnerable to external shocks.

A very contentious issue in the literature on trade liberalization is how to measure the degree of restrictiveness of trade policy. This controversy has led to the development of various measures. Sachs and Warner (1995), Harrison (1996), and Edwards (1998) provide examples of these measures. Rodriguez and Rodrik (2000) present detailed but interesting critique of these measures. Given the lack of consensus on the most appropriate measure of trade policy regimes, it would be misleading to use one approach. This is particularly important because most of these measures are uncorrelated (see Pritchett (1996)). Our way of getting around this problem is to use three representative measures in the analysis. The first measure we use is the trade/GDP ratio, which is an outcome-based measure and so is referred to as openness by practice. The second measure is based on tariffs and non-tariff barriers and so is referred to as an incidence-based measure of openness. The final measure used is based on the popular view that African countries have been relatively more open to trade since the 1990s (Sharer 1999; Hinkle, Herrou-Aragon, and Kubota 2003). We call this openness based on conventional wisdom. Detailed information on the exact definition of variables used in the estimations is in the data appendix.

Another issue that needs to be addressed is the choice of control variables in the regressions. The approach we adopt is to include a broad set of potential explanatory variables suggested either by theory or by recent empirical literature.

- Level of development: the first control variable in the regression is per capita GDP, which was included to capture the size or level of development of the economy. Theory suggests a negative relationship between country size and volatility because large economies tend to have more diverse sectoral structures and so are more immune to sector-specific and external shocks (Head 1995; Acemoglu and Zilibotti 1997).

- Distortionary macroeconomic policies: as reflected in high inflation and exchange rate misalignment have been emphasized by several authors as sources of instability (see for example, Agenor et al. 2000). Since the volatility of inflation in our sample is highly correlated with that of the real exchange rate, to avoid multicollinearity we cannot include both variables in the same regression. Consequently, we use inflation volatility to capture the impact of distortionary macroeconomic policies.

- Terms of trade volatility: based on the work of Razin, Sadka and Coury (2003) we include terms of trade volatility as a variable in the regressions. Deaton and Miller (1996) have also emphasized the importance of commodity-based terms of trade shocks in explaining macroeconomic volatility in Africa. Note that the terms of trade captures the effect of commodity prices since most African countries are

exporters of primary commodities.

- Fiscal policy: economic theory suggests that fiscal policy could be used to cushion the impact of shocks on macroeconomic variables (Kose, Prasad, and Terrones 2003). We examine whether or not fiscal policy is used in a manner that dampens macroeconomic volatility by including the ratio of fiscal deficit to GDP in our regressions.

- Institutional quality: Acemoglu et al (2003) and Rodrik (1999) emphasize the role of institutions in explaining macroeconomic outcomes. The idea is that institutional weaknesses make countries more vulnerable to external shocks. In other words, countries with very weak institutions have limited ability to cushion the impact of shocks and so are likely to have higher macroeconomic volatility. In the regressions, we use the type of political regime in a country—democratic or autocratic—as our proxy for institutional quality. Almeida and Ferreira (2002) present evidence that democracy is associated with less variable macroeconomic outcomes than autocracy. On the link between democracy, governance and growth see Rivera-Batiz (2002).

- Geography: there is a recent literature suggesting that geographic barriers to trade have implications for economic performance (Sachs 2003). For example, it has been suggested that countries that are landlocked or separated from large markets, are likely to have more concentrated export structures and so are predisposed to experience more macroeconomic volatility (Malik and Temple 2005). There are two reasons why landlocked countries may have less diversified exports. The first is that they tend to have high transport costs and this limits their ability to develop competitive manufacturing industries. Radelet and Sachs (1998) show that there is a strong link between high shipping costs and low manufacturing export growth. The second reason why landlocked countries may have more concentrated exports is that their limited access to external markets forces them to specialize in a few export commodities. To capture the impact of geographic barriers we include a dummy variable for landlocked countries.

- Climatic disasters: such as droughts, floods, and extreme weather conditions have also been identified as possible sources of macroeconomic instability in poor countries (Raddatz 2005). To control for this potential source of instability in the regressions we include the incidence of severe drought as a proxy for climatic disasters.

- Financial development: we also control for the degree of domestic financial development, as measured by credit to the private sector as a proportion of total domestic credit. Theory suggests at least two ways in which the degree of financial development can affect the volatility of macroeconomic variables. The first is that it makes diversification possible and the second is that it allows agents to share risk as well as smooth consumption (Easterly et al. 2001). Consequently, theory suggests that countries with good financial systems are in a better position

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to cushion the impact of shocks and so there should be a negative link between domestic financial development and macroeconomic instability.

At this stage it is necessary to justify the fact that we do not include a direct measure of export diversification in the benchmark regressions. There are two reasons for this. The first is that several countries in the sample do not have long and reliable time series on measures of diversification and so including this variable in the regressions will reduce the sample size significantly, and result in imprecise coefficient estimates. The second is that the volatility of the terms of trade is one of the explanatory variables in the regressions and studies suggest that it is highly affected by the degree of export diversification of an economy (Deaton and Miller 1996; Bleaney and Greenaway 2001). Consequently, the terms of trade volatility variable is a good proxy for the degree of diversification. Recall that one of the reasons why African countries are vulnerable to terms of trade shocks is that they export a relatively few export commodities. Given this link between terms of trade volatility and specialization, the inclusion of export diversification in addition to the measure of terms of trade volatility would be inappropriate and also create problems of multicollinearity.

5. The Evidence

In this section, we present results of OLS estimations of equation 1 for each of the three dependent variables of interest—output, consumption, and investment. The standard errors of each equation were corrected for heteroskedasticity and autocorrelation. Furthermore, the estimations involve the use of three measures of trade policy regimes in addition to the set of control variables identified in the previous section. Table 7 presents results of the estimations using the first measure of trade regimes—openness based on policy incidence (tariff and non-tariff barriers).

The regressions have a reasonably good fit as indicated by the fact that the R-squared for each equation is above thirty per cent. The results show that there is no systematic relationship between trade regimes and macroeconomic instability. The trade regime measure is insignificant in the equations for output, consumption and investment. In the output equation, the variables that are significant at conventional levels and have the expected signs are: inflation volatility, volatility of the terms of trade, the ratio of fiscal deficit to GDP, and climatic disasters. The results suggest that distortionary macroeconomic policies, as reflected in the volatility of inflation, lead to more volatility in output. Furthermore, an increase in terms of trade volatility increases output volatility. This is consistent with the findings of Deaton and Miller (1996) that commodity-based terms of trade shocks play an important role in output fluctuations in Africa. Climatic disasters such as an increase in the incidence of drought also increase output volatility in Africa. Interestingly, an increase in the ratio of fiscal deficit to GDP leads to a reduction in output volatility.

Table 7: Benchmark Estimation using Trade Regime Measure 1

	Output volatility	Consumption volatility	Investment volatility
Openness based on policy incidence (Tariff and non-tariff barriers)	-0.780 (0.295)	0.334 (0.845)	-0.951 (0.707)
Volatility of inflation	0.127 (0.010)**	0.161 (0.109)	0.457 (0.053)***
Output per capita	0.144 (0.282)	-0.465 (0.056)***	-0.471 (0.328)
Fiscal deficit (% of GDP)	-0.186 (0.000)*	-0.180 (0.062)***	-0.192 (0.221)
Volatility of terms of trade	0.046 (0.044)**	0.142 (0.040)**	0.177 (0.095)***
Climatic disaster	4.676 (0.017)**	3.956 (0.103)	-1.063 (0.811)
Political regime	-0.021 (0.752)	-0.061 (0.568)	-0.223 (0.246)
Credit to private sector (as % of total credit)	0.002 (0.851)	0.005 (0.664)	-0.047 (0.161)
Landlocked countries	-0.605 (0.442)	0.153 (0.913)	-2.635 (0.263)
Oil exporters	-0.281 (0.793)	-1.709 (0.328)	-3.916 (0.182)
Severity of debt	0.670 (0.305)	3.214 (0.030)**	4.198 (0.035)**
R-squared	0.372	0.365	0.322
F-statistic	5.30 (0.000)*	4.45 (0.000)*	9.75 (0.000)*
No. of observations	97	97	97

Figures in parentheses are p-values
* Significant at the 1% level.
** Significant at the 5% level
*** Significant at the 10% level.

In the consumption equation, output per capita, the ratio of fiscal deficit to GDP, volatility of the terms of trade, and the severity of debt have the expected signs and are significant at conventional levels. The significance of the ratio of fiscal deficit to GDP in both the output and consumption equations suggest that fiscal policy has a role to play in dampening macroeconomic volatility in Africa. Finally, in the investment equation, the variables that have the expected signs and are significant at conventional levels are: the volatility of inflation, the volatility of terms of trade and the severity of debt.

Table 8 presents results of the estimations using our second measure of trade regimes—openness by practice (trade/GDP). The use of this measure does not change the key results of the output equation. However, for the consumption and investment equations, the trade regime measure is now significant at 5 per cent level. This suggests that the more open the trade regime is the higher is the volatility in consumption and investment. The other change that we notice in the consumption equation is that the volatility of inflation is now significant unlike in the previous estimation. As for the investment

equation, the measure of fiscal policy is now significant at 10 per cent level. Results for the other variables are pretty much the same as in the previous estimation.

Table 8: Benchmark Estimation using Trade Regime Measure 2

	Output volatility	Consumption volatility	Investment volatility
Openness by practice (trade/GDP)	-0.120 (0.889)	4.987 (0.026)**	5.797 (0.033)**
Volatility of inflation	0.124 (0.013)**	0.161 (0.091)***	0.452 (0.049)**
Output per capita	0.111 (0.428)	-0.342 (0.097)***	-0.380 (0.394)
Fiscal deficit (% of GDP)	-0.190 (0.000)*	-0.242 (0.012)**	-0.272 (0.076)***
Volatility of terms of trade	0.046 (0.058)***	0.162 (0.027)**	0.201 (0.062)***
Climatic disaster	5.012 (0.013)**	5.056 (0.021)**	0.845 (0.860)
Political regime	-0.034 (0.643)	-0.112 (0.303)	-0.305 (0.141)
Credit to private sector (as % of total credit)	0.003 (0.807)	0.014 (0.225)	-0.035 (0.186)
Landlocked countries	-0.552 (0.500)	-0.230 (0.867)	-3.003 (0.190)
Oil exporters	-0.045 (0.965)	-2.093 (0.197)	-3.969 (0.126)
Severity of debt	0.785 (0.253)	3.057 (0.018)**	4.209 (0.037)**
R-squared	0.365	0.412	0.340
F-statistic	4.84 (0.000)*	5.76 (0.000)*	6.77 (0.000)*
No. of observations	97	97	97

Figures in parentheses are p-values
* Significant at the 1% level.
** Significant at the 5% level
*** Significant at the 10% level.

Table 9 presents the results of estimations using the measure of trade regime based on conventional wisdom. It shows that, the results are qualitatively similar to those of the estimation using the measure of trade regime based on policy incidence.

Table 9: Benchmark Estimation using Trade Regime Measure 3

	Output volatility	Consumption volatility	Investment volatility
Openness based on conventional wisdom	1.107 (0.165)	1.111 (0.433)	2.484 (0.408)
Volatility of inflation	0.119 (0.008)*	0.157 (0.117)	0.442 (0.054)***

Output per capita	0.123 (0.363)	-0.443 (0.054)**	-0.487 (0.256)
Fiscal deficit (% of GDP)	-0.196 (0.000)*	-0.183 (0.064)**	-0.210 (0.186)
Volatility of terms of trade	0.047 (0.033)**	0.143 (0.039)**	0.180 (0.084)***
Climatic disaster	4.686 (0.018)**	3.441 (0.191)	-1.416 (0.765)
Political regime	-0.073 (0.386)	-0.094 (0.361)	-0.325 (0.115)
Credit to private sector (as % of total credit)	0.006 (0.645)	0.007 (0.538)	-0.040 (0.217)
Landlocked countries	-0.566 (0.494)	0.128 (0.928)	-2.593 (0.265)
Oil exporters	-0.178 (0.866)	-1.933 (0.273)	-3.918 (0.183)
Severity of debt	0.732 (0.286)	3.114 (0.023)**	4.221 (0.037)**
R-squared	0.380	0.370	0.328
F-statistic	5.66 (0.000)*	4.73 (0.000)*	7.77 (0.000)*
No. of observations	97	97	97

Figures in parentheses are p-values
* Significant at the 1% level.
** Significant at the 5% level
*** Significant at the 10% level.

Sensitivity Analysis

We conducted a battery of sensitivity analyses to determine whether or not our results are robust to changes in some of the assumptions made in the analysis. In this section, we use the output equation to demonstrate the robustness of our results. The full estimation results are summarized in the charts presented in the next sub-section. The first sensitivity analysis we conducted was to exclude the volatility of the terms of trade as an explanatory variable in the regressions. This is important because one might argue that the mechanism through which the trade regime affects macroeconomic volatility is the terms of trade and so including this variable in addition to the trade regime will make the latter insignificant. Table 10 shows the results of this sensitivity analysis for the output equation across the three measures of trade regimes. Clearly the exclusion of this variable does not change the key result that the trade regime has no systematic relationship with output volatility.

Table 10: Excluding the Terms of Trade

Output Equation	Openness by policy incidence	Openness by practice	Openness by conventional wisdom
Trade regime	-0.807 (0.272)	-0.343 (0.699)	1.078 (0.171)
Volatility of inflation	0.151 (0.016)**	0.147 (0.019)**	0.144 (0.013)**
Output per capita	0.170 (0.207)	0.131 (0.343)	0.149 (0.270)
Fiscal deficit (% of GDP)	-0.187 (0.000)*	-0.189 (0.000)*	-0.198 (0.000)*
Volatility of terms of trade			
Climatic disaster	4.820 (0.017)**	5.111 (0.013)**	4.858 (0.016)**
Political regime	-0.036 (0.603)	-0.046 (0.537)	-0.088 (0.315)
Credit to private sector (as % of total credit)	0.004 (0.764)	0.004 (0.747)	0.008 (0.556)
Landlocked countries	-0.721 (0.372)	-0.648 (0.440)	-0.685 (0.419)
Oil exporters	-0.147 (0.891)	0.108 (0.918)	-0.027 (0.980)
Severity of debt	0.883 (0.214)	1.005 (0.180)	0.960 (0.195)
R-squared	0.357	0.351	0.365
F-statistic	5.49 (0.000)*	4.94 (0.000)*	5.73 (0.000)*
No. of observations	97	97	97

Figures in parentheses are p-values
* Significant at the 1% level.
** Significant at the 5% level
*** Significant at the 10% level.

The second sensitivity analysis involved the exclusion of North African countries in the sample. The idea is that one may argue that countries in Sub-Saharan Africa (SSA) have a different production structure than those in North Africa and as such the relationships may be different. Results of this sensitivity analysis for the output equation are presented in Table 11. The key message from this is that there is no qualitative change in the results. The trade regime variables continue to be insignificant in the output equations.

Table 11: Sub-Saharan Africa

Output Equation	Openness by policy incidence	Openness by practice	Openness by conventional wisdom
Trade regime	-0.552	-0.384	0.838

	(0.414)	(0.661)	(0.369)
Volatility of inflation	0.126 (0.016)**	0.124 (0.018)**	0.121 (0.012)**
Output per capita	0.092 (0.529)	0.065 (0.682)	0.083 (0.575)
Fiscal deficit (% of GDP)	-0.223 (0.000)*	-0.222 (0.000)*	-0.228 (0.000)*
Volatility of terms of trade	0.050 (0.070)***	0.050 (0.083)***	0.050 (0.066)***
Climatic disaster	5.822 (0.012)**	6.015 (0.012)**	5.643 (0.017)**
Political regime	0.006 (0.929)	0.003 (0.971)	-0.031 (0.715)
Credit to private sector (as % of total credit)	0.0003 (0.981)	0.0003 (0.986)	0.003 (0.825)
Landlocked countries	-0.455 (0.562)	-0.380 (0.639)	-0.404 (0.623)
Oil exporters	1.315 (0.340)	1.511 (0.266)	1.303 (0.342)
Severity of debt	0.411 (0.503)	0.510 (0.475)	0.499 (0.477)
R-squared	0.401	0.400	0.406
F-statistic	7.08 (0.000)*	6.51 (0.000)*	7.05 (0.000)*
No. of observations	85	85	85

Figures in parentheses are p-values
* Significant at the 1% level.
** Significant at the 5% level
*** Significant at the 10% level.

Finally we conducted sensitivity analyses using a system as opposed to a single equation method. The system approach we employ is the Seemingly Unrelated Regression (SURE) technique which allows us to account for contemporaneous correlation across equations of the system. For each dependent variable of interest, we estimated three equations capturing the three measures of trade regimes. We also did a Breusch-Pagan test to determine whether or not there is evidence of contemporaneous correlation across residuals of the equations in the system. The test rejects the assumption of independence of the residuals at the 1 percent level, thereby providing justification for the use of the SURE technique. The estimation results are presented in Table 12. Once again, the results indicate that the trade regime has no systematic impact on output volatility in the region. In addition, there is no qualitative change in the results for the other variables.

Table 12: System Estimation (SURE)

Output Equation	Openness by policy incidence	Openness by practice	Openness by conventional wisdom
Trade regime	-0.013	0.002	0.033

	(0.861)	(0.981)	(0.758)
Volatility of inflation	0.124	0.124	0.124
	(0.011)**	(0.012)**	(0.011)**
Output per capita	0.114	0.114	0.114
	(0.411)	(0.415)	(0.409)
Fiscal deficit (% of GDP)	-0.191	-0.191	-0.191
	(0.000)*	(0.000)*	(0.000)*
Volatility of terms of trade	0.046	0.046	0.046
	(0.133)	(0.135)	(0.130)
Climatic disaster	5.036	5.043	5.032
	(0.004)*	(0.004)*	(0.004)*
Political regime	-0.035	-0.035	-0.036
	(0.565	(0.564)	(0.548)
Credit to private sector (as % of total credit)	0.003	0.004	0.004
	(0.718)	(0.718)	(0.709)
Landlocked countries	-0.562	-0.561	-0.561
	(0.452)	(0.455)	(0.450)
Oil exporters	-0.056	-0.052	-0.056
	(0.951)	(0.955)	(0.951)
Severity of debt	0.781	0.783	0.781
	(0.254)	(0.255)	(0.251)
R-squared	0.365	0.365	0.366
Chi-square statistic	56.39	55.81	57.26
	(0.000)*	(0.000)*	(0.000)*
No. of observations	97	97	97

Figures in parentheses are p-values
* Significant at the 1% level.
** Significant at the 5% level
*** Significant at the 10% level.

Summary of Results

For ease of comprehension, we have summarized the results of all the estimations in Figures 1-3. For each dependent variable, these figures show the percentage of estimations in which an explanatory variable was significant and of the expected sign. Starting with the output equation, Figure 1 shows that openness based on the three measures was not significant in any of the estimations. This suggests that the trade regime is not a major source of instability in real output in the African region. Inflation volatility is significant and of the expected sign in 100 percent of the estimations, indicating that instability in domestic macroeconomic policy as reflected in inflation volatility results in instabilities in the growth of real output per capita. The results also suggest that volatility of the terms of trade leads to instability in the growth of real output per capita. The terms-of-trade variable was significant and of the expected sign in 67 percent of the estimations. Climatic disasters, as reflected in the incidence of drought was significant and of the expected sign in 100 percent of the estimations, suggesting that extreme weather conditions contribute to real output instability in the region.

Another variable that emerged as important in explaining output instability is the ratio of fiscal deficit to GDP. This is particularly interesting because it suggests that fiscal policy has a role to play in dampening the effects of shocks in the region. Interestingly, variables such as output per capita, credit to the private sector, the political regime, and dummies for oil exporters, landlocked and severely indebted countries were not significant in the estimations.

Figure 1: Output Equation
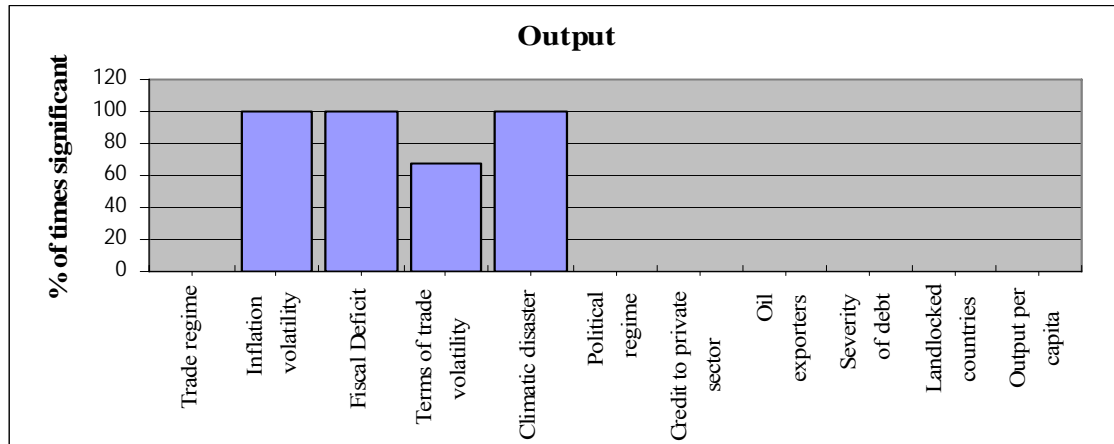
Turning to the volatility of the growth of real consumption per capita, we see that the variable capturing our measures of trade regimes is significant and of the expected sign in less than 20 percent of the estimations. This indicates that there is weak evidence that trade liberalization is a source of instability in consumption in the region. It is interesting to note that the trade/GDP ratio is the measure of trade regime that accounts for the significant relationships observed. The other measures were insignificant in all the estimations.

Fiscal policy and the volatility of terms-of-trade growth are the most important drivers of instability in the growth rate of real consumption per capita. The two variables are significant and of the expected signs in all the estimations. In other words, volatile terms of trade lead to more instability in the growth of real consumption per capita whereas more expansionary fiscal policy dampens instability in consumption. In contrast to the output equation, the level of development of an economy as measured by real output per capita is also important in explaining instability in consumption. This variable was significant and of the expected sign (negative) in 75 per cent of the estimations. The volatility of inflation is also significant in 67 per cent of the estimations while climatic disasters and the severity of debt were significant in 50 per cent of the estimations. The other variables were not significant in the regressions.

Figure 2: Consumption equation

Consumption
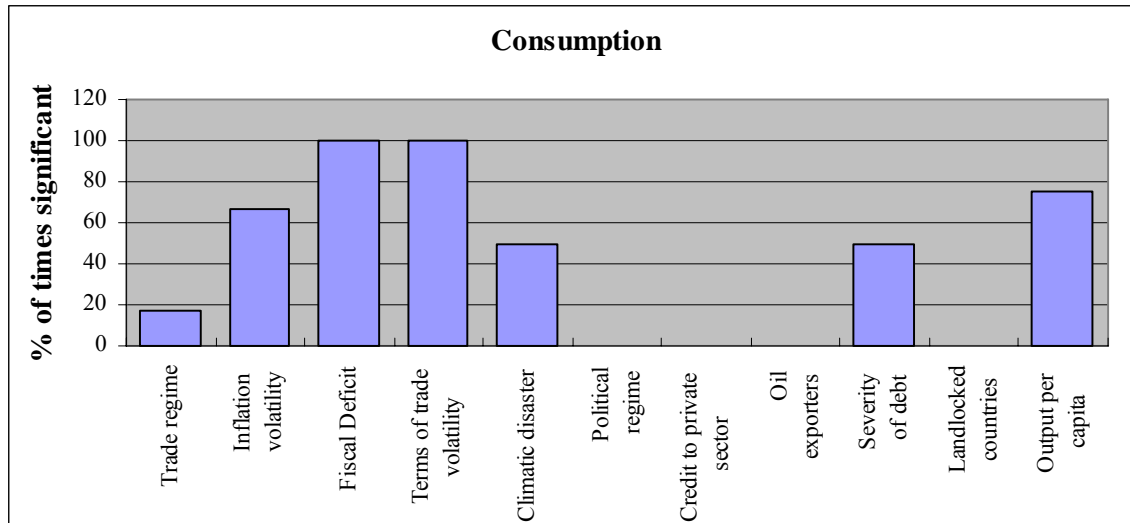
Regarding the equation for instability in the growth of real investment per capita, the results provide weak evidence that the trade regime contributes to instability in the dependent variable. The measures of trade regime were significant and positive in 17 percent of the estimations, suggesting that trade liberalization contributes mildly to instability in the growth of real investment per capita.

Figure 3: Investment equation
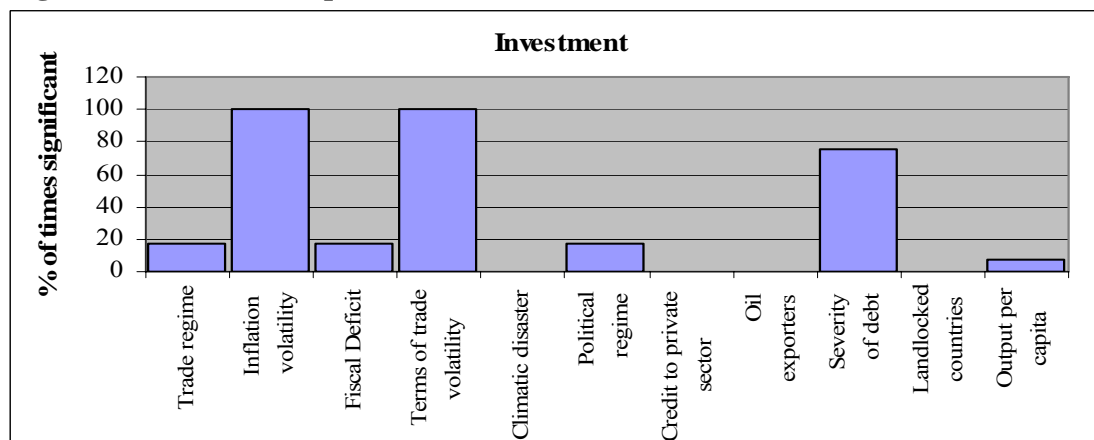
Investment

The most important factors explaining instability in investment are the volatilities of inflation and terms-of-trade growth. The two variables were significant and of the expected sign (positive) in 100 percent of the estimations. The results also suggest that severely indebted countries have more volatile growth of real investment per capita. It was significant and of the expected sign in 75 percent of the estimations. Furthermore, the political regime variable which is a proxy for institutional quality was significant and of the expected sign (negative) in 17 percent of the cases. The fiscal policy variable was

also significant in 17 per cent of the cases. Climatic disasters, the dummy for oil exporters, credit to the private sector as a percentage of total domestic credit, and the dummy for landlocked countries were insignificant in all the estimations.

6. Policy Implications and Recommendations

In this paper, we examine the effect of trade liberalization on macroeconomic instability using a reasonably-sized panel of annual data on 33 African countries spanning the period 1986 to 2000. In all specifications, we find no evidence that trade liberalization has any systematic effect on output instability. However, there is some, albeit weak, evidence that liberalization increases instability in consumption and investment. The evidence is weak because it is sensitive to the method of estimation adopted as well as the measure of trade policy used. In particular, the impact of liberalization on consumption and investment volatilities is significant when we use the trade/GDP as a measure of openness. It is not significant when we measure openness by tariff/non-tariff barriers or by conventional wisdom. In summary, there is no compelling evidence that trade liberalization is a major source of macroeconomic instability in African countries. Any impact that liberalization has on macroeconomic instability in the region is subtle and weak. Factors such as the volatility of inflation, the volatility of terms of trade, the nature of fiscal policy, climatic disasters, and the severity of debt are more robust determinants of macroeconomic instability in the region.

The results of our empirical analyses have serious implications for government policy in Africa. More specifically, although countries can use trade restriction as an important instrument for protecting domestic industries and enhancing their industrialization efforts, it is not the most appropriate way to deal with vulnerability to external shocks or macroeconomic instability in the region. These shocks could be more effectively dealt with through other means. In particular, we see at least three ways of dealing with vulnerability to external shocks in the region: reducing terms of trade volatility through diversification of the production and export structure; using fiscal policy in a countercyclical manner; and financial sector development.

Diversification: our empirical results show that terms of trade volatility contribute to macroeconomic volatility in the region. And one of the reasons African countries have high terms of trade volatility is that they have highly concentrated production and export structures. In particular, their exports are concentrated in primary commodities with very unstable and volatile prices. Consequently, one effective method to reduce the region's vulnerability to trade shocks is to expand its export base through diversification of the production structure. For diversification efforts to be successful, however, policymakers in the region must find ways to deal with the problems posed by supply constraints. They must also create appropriate domestic conditions and capacity for export of dynamic products. It is clear that inadequate human and physical capital as well as infrastructure inhibits export development in the region. In this regard, there is the urgent need for African countries to intensify regional integration efforts in the area of infrastructure so as to reduce transactions costs and make exports more competitive.

Fiscal policy: another mechanism for dealing with external shocks available to African policymakers it to use fiscal policy in a countercyclical manner. In other words, governments can run fiscal surplus in periods of positive external shocks and a deficit in bad times. This will enable countries to cushion the effects of these shocks and reduce macroeconomic volatility.

Financial sector development: enhancing access to credit for firms and consumers will also help countries to reduce the impact of negative external shocks. In several countries in the region, the financial sector is not developed. Consequently, access to credit is not a s easy as it should be in a well-functioning society. In most African countries, consumers have serious difficulties obtaining loans from banks to smooth consumption intertemporally and firms also face severe credit constraints. Policy makers in the region can increase financial depth and minimize the impact of shocks by improving the efficiency and functioning of the financial sector.

Data Appendix

The data used in the analysis were obtained from the 2004 World Bank's Africa Database, and the 2003 International Financial Statistics published by the IMF. The variable used to proxy political stability was obtained from the Polity IV database available at: http/www.cidcm.umd.edu/inscr/polity. The 33 African countries in the sample are: Burkina Faso, Botswana, Ivory Coast, Cameroon, Congo, Comoros, Algeria, Egypt, Ethiopia, Gabon, Ghana, Gambia, Guinea-Bissau, Kenya, Lesotho, Morocco, Madagascar, Mali, Mozambique, Mauritania, Mauritius, Malawi, Nigeria, Rwanda, Senegal, Sierra Leone, Swaziland, Togo, Tunisia, Uganda, South Africa, Zambia, and Zimbabwe.

The variables used in the estimations are defined as follows:

1. Openness by practice is defined as the ratio of trade to GDP.
2. Openness based on policy incidence is a dummy variable capturing the extent of tariff and non-tariff barriers. In any year, the dummy takes the value 1 if average tariffs are below 20 percent and the coverage ratio for non-tariff barriers is not more than 20 percent. It is zero otherwise. If the dummy is 1 the country is said to be open and if it is zero it is said to have a restricted trade regime.
3. Openness by conventional wisdom is a dummy capturing the popular view that African countries have been relatively more open to trade since the 1990s. The dummy takes the value 1 for any year greater than 1990. It is zero otherwise.
4. Volatility of inflation is defined as the standard deviation of inflation as computed using the GDP deflator.
5. Output per capita is defined as real GDP divided by population.
6. Volatility of terms of trade growth is the standard deviation of the growth rate of the net barter terms of trade.
7. Landlocked country is a proxy for geographic barriers. It is a dummy which takes the value 1 if a country is landlocked and zero otherwise.
8. The incidence of drought is used as a proxy for climatic disasters. This variable is a dummy capturing severe shortage of rainfall available in the World Bank Africa Database.
9. Institutional quality is measured by the type of political regime in a country as depicted by the Polity IV database. This variable takes the value -10 for strongly autocratic regimes and 10 for strongly democratic regimes.
10. Credit to the private sector is defined as claims on the private sector as a percentage of total domestic credit.
11. Fiscal deficit is the ratio of fiscal deficit to GDP.
12. Dummy for oil exporters is equal to 1 if the country is oil exporter.
13. Dummy for severely indebted countries is equal to 1 for countries classified as severely indebted in the World Bank Africa database.
14. Output instability or volatility is defined as the standard deviation of the growth rate of real GDP per capita.
15. Investment instability or volatility is defined as the standard deviation of the

growth rate of real investment per capita.
16. Consumption instability or volatility is defined as the standard deviation of the growth rate of real consumption per capita.

References

Acemoglu, D., and Zilibotti, F. (1997). Was Prometheus unbound by chance? Risk, diversification, and growth. *Journal of Political Economy*, Vol. 105, 1167-1200.

Acemoglu, D., Johnson, S., Robinson, J., and Thaicharoen, Y. (2003). Institutional causes, macroeconomic symptoms: volatility, crises, and growth. *Journal of Monetary Economics*, Vol. 50.

Agenor, P. R., McDermott, C. J., and Prasad, E. S. (2000). Macroeconomic fluctuations in developing countries: some stylized facts. *World Bank Economic Review*, Vol. 14, 251-285.

Almeida, H., and Ferreira, D. (2002). Democracy and the variability of economic performance. *Economics and Politics*, Vol. 14, 225-257.

Ancharaz, V. D. (2003). Determinants of trade policy reform in Sub-Saharan Africa. *Journal of African Economies*, Vol. 12, 417-443.

Basu, P., and McLeod, D. (1992). Terms of trade fluctuations and economic growth in developing economies. *Journal of Development Economics*, Vol. 37, 89-110.

Bleaney, M., Gemmell, N., and Greenaway, D. (1995). Tax revenue instability, with particular reference to sub-Saharan Africa. *Journal of Development Studies*, Vol. 31, 883-902.

Bleaney, M., and Greenaway, D. (2001). The impact of terms of trade and real exchange rate volatility on investment and growth in sub-Saharan Africa. *Journal of Development Economics*, Vol. 65, 491-500.

Collier, P., and Gunning, J. W. (1999). Why has Africa grown slowly? *Journal of Economic Perspectives*, Vol. 13, 3-22.

Crafts, N. (1999). East Asian growth before and after the crisis. *IMF Staff Papers*, 46, 2, June, 139-166.

Davidson, C., and Matusz, S. J. (2004). Trade liberalization and compensation. Mimeo, Michigan State University.

Deaton, A., and Miller, R. (1996). International commodity prices, macroeconomic performance and politics in sub-Saharan Africa. *Journal of African Economies*, Vol. 5, 99-191.

Easterly, W., and Kraay, A. (2000). Small states, small problems? income, growth, and volatility in small states. *World Development*, Vol. 28, 2013-27

Edwards, S. (1998). Openness, productivity and growth: what do we really know? *Economic Journal*, Vol. 108, 383-398.

Evenett, S. J. (2003). The failure of the WTO ministerial meeting in Cancun: what implication for future research on the world trading system. *CESifo Forum*, Vol. 4, Autumn, 11-17.

Gavin, M., and Hausman, R. (1996). Securing stability and growth in a shock prone region: the policy challenges for Latin America. In R. Hausman and H. Reisen (Ed.), *Securing stability and growth in Latin America.* Paris: OECD.

Guisinger, A. (2003). Patterns of trade protection and liberalization: is there a role for diffusion? Mimeo, Yale University.

Harrison, A. (1996). Openness and growth: a time series, cross-country analysis for developing countries. *Journal of Development Economics*, Vol. 48, 419-447.

Head, A. (1995). Country size, aggregate fluctuations, and international risk sharing. *Canadian Journal of Economics*, Vol. 28, 1096-1119.

Hinkle, L., Herrou-Aragon, A., and Kubota, K. (2003). How far did Africa's first generation trade reforms go? An intermediate methodology for comparative analysis of trade policies (World Bank Africa Region Working Paper No. 58a).

Hoffmaister, A. W., Roldos, J. E., and Wickham, P. (1998). Macroeconomic fluctuations in sub-Saharan Africa. *IMF Staff Papers*, Vol. 45, 132-160.

Killick, T. (1995). *IMF programmes in developing countries: design and impact*. London: Routledge.

Kose, A., Prasad, E., and Terrones, M. (2003). Financial integration and macroeconomic volatility. *IMF Staff Papers*, Vol. 50, 119-42.

Kose, M. A., and Reizman, R., (2001). Trade shocks and macroeconomic fluctuations in Africa. *Journal of Development Economics*, Vol. 65, 55-80.

Krueger, A. (1998). Why trade liberalization is good for growth. *The Economic Journal*, 108, 1513-1522.

Malik, A., and Temple, J. R. (2005). The geography of output volatility. (CSAE Working Paper No. WPS/2005-07).

Martin, W. (2003). Developing countries' changing participation in world trade. *The World Bank Research Observer*, Vol. 18, 187-203.

Mayda, A. M., and Rodrik, D. (2005). Why are some people and countries more protectionist than others. *European Economic Review*, Vol. 49, 1393-1430.

McCullock, N., Winters, L. A., and Cirera, X. (2001). *Trade liberalization and poverty: a handbook*. London: DFID

Oyejide, A. (1998). Trade policy and regional integration in the development context: emerging patterns, issues and lessons for sub-Saharan Africa. *Journal of African Economies*, Vol. 7, 108-145.

Pindyck, R. S. (1991). Irreversibility, uncertainty and investment. *Journal of Economic Literature*, Vol. 29, 1110-1148.

Pritchett, L. (1996). Measuring outward orientation in LDCs: can it be done? *Journal of Development Economics*, Vol. 49, 307-335.

Raddatz, C. (2005). Are external shocks responsible for the instability of output in low-income countries? (World Bank Policy Research Working Paper 3680).

Radelet, S., and Sachs, J. (1998). Shipping costs, manufactured exports, and economic growth. Paper presented at the American Economic Association annual meeting.

Ramey, G., and Ramey, V. (1995). Cross-country evidence on the link between volatility and growth. *American Economic Review*, Vol. 85, 1138-1151.

Razin, A., and Rose, A. K. (1992). Business cycle volatility and openness: an exploratory cross-sectional analysis. In L. Leiderman and A. Razin (Ed.), *Capital mobility: the impact on consumption, investment, and growth*. Cambridge: Cambridge University Press.

Razin, A., Sadka, E., and Coury, T. (2003). Trade openness, investment instability and terms of trade volatility. *Journal of International Economics*, Vol. 61, 285-306.

Rivera-Batiz, F. L. (2002). Democracy, governance, and economic growth: theory and evidence. *Review of Development Economics*, Vol. 6, 225-247.

Rodriguez, F., and Rodrik, D. (2000). Trade policy and economic growth: a skeptic's guide to the cross-national evidence. *NBER Macroeconomics Annual*, 261-338.

Rodrik, D. (1998a). Trade policy and economic performance in Africa. (National Bureau of Economic Research Working Paper No. 6562).

Rodrik, D. (1998b). Why is trade reform so difficult in Africa? *Journal of African Economies*, Vol 7, Supplement 1, 10-36.

Rodrik, D. (1998c). Why do more open economies have bigger governments? *Journal of Political Economy*, Vol. 106, 997-1032.

Rodrik, D. (1999). Where did all the growth go? External shocks, social conflict, and growth collapses. *Journal of Economic Growth*, Vol. 4, 385-412.

Rose, A. (2004). Does the WTO make trade more stable? (National Bureau of Economic Research Working Paper No. 10207) forthcoming Open Economies Review.

Sachs, J. D. (2003). Institutions don't rule: direct effects of geography on per capita income. (National Bureau of Economic Research Working Paper No. 9490).

Sachs, J. D., and Warner, A. (1995). Economic reform and the process of global integration. *Brookings Papers on Economic Activity*, 1-118.

Sharer, R. (1999). Trade: an engine of growth for Africa. *Finance & Development*, Vol. 36, 26-29

Sharer, R. (2001). An agenda for trade, investment, and regional integration. *Finance & Development*, Vol. 38.

Stiglitz, J. (2002). *Globalization and its Discontents*. New York: W. W. Norton and Company.

UNCTAD (2004a). *UNCTAD Handbook of Statistics*. Geneva: United Nations Conference on Trade and Development (UNCTAD).

UNCTAD (2004b). *The least developed countries report 2004*. Geneva: United Nations.

Wolf, H. (2004). Accounting for consumption volatility differences. *IMF Staff Papers*, Vol. 51, 109-125.

World Bank (2003). *Global Development Finance: Striving for Stability in Development Finance*. Washington, DC: World Bank.

World Bank (2004). *World Bank Africa Database*.