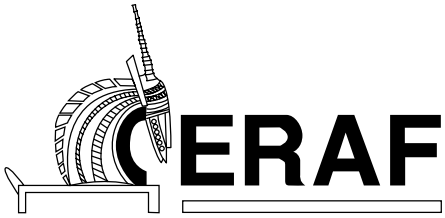

Center For Economic Research on Africa
School of Business
Montclair State University
Upper Montclair, New Jersey 07043

Foreign Direct Investment and Uncertainty: Empirical Evidence from Africa

December 2001

Adugna Lemi and Sisay Asefa
Department of Economics
Western Michigan University
And Panos Varangis, Ph.D.
Kalamazoo, MI, 49008
Email: adugna.lemi@wmich.edu

Abstract

This paper examines the impact of economic and political uncertainty on foreign direct investment (FDI) flow to African economies. Total foreign direct investment flow from all source countries, total U.S. FDI, U.S. manufacturing FDI, and U.S. non-manufacturing FDI flow to sample host countries in Africa are analyzed in this study. Generalized autoregressive heteroscedastic (GARCH) model is used to generate economic uncertainty indicators of the inflation rate and the real exchange rate. The results of the study show the impact of uncertainty on the flow of FDI from all source countries is insignificant. For aggregate U.S. FDI, economic and political uncertainties are not major concerns. However, for U.S. manufacturing FDI, only political instability and government policy commitment are important factors, whereas for U.S. non-manufacturing FDI, economic uncertainties are the major impediments only when coupled with political instability and debt burden of host countries. Other economic factors such as labor, trade connection, size of export sector, external debt, and market size are also significant in affecting FDI flow to African economies.

JEL Classification: D81; F21

Keywords: Africa, foreign direct investment, uncertainty

Paper prepared for the Allied Social Science Association Annual meeting to be held in Atlanta, GA January 4-6, 2002.

We thank Dr. Matthew Higgins and Dr. Michael Ryan of the Department of Economics, Western Michigan University for their invaluable and constructive comments on the first draft of this paper.

1. Introduction

As economies of the world become more integrated, capital flows to developing countries have grown significantly. Capital flow is a vehicle to mitigate the problem of capital shortage in developing countries, particularly in African economies. The purpose of this paper is to analyze the role of uncertainty in affecting capital flow to African economies. Uncertainty may emanate from macroeconomic variables like exchange rates, resource prices, interest rates, and changes in policies and rules of business transactions. In Africa, economic and political instability plays a significant role in hampering capital flow along with other macroeconomic and policy uncertainties (Collier, 1994; Senbet, 1996). Empirical results, which support these hypotheses, are so far very weak in the contexts of developing countries.

A multinational firm's investment in a host country takes different forms of entry. This is partly due to firm specific factor, which is affected by the size, efficiency and technological advancement of the multinational firm. In deciding location and form of entry, a firm must also take into account the international business environment and factors associated with a host country, such as policy, resource base, and uncertainty of major economic indicators. As the nature of the sectors and industrial group these firms target are important in choosing location and form of investment, the role of uncertainty may also differ accordingly. Previous studies disregard how the role of uncertainty differs by industrial group, and focus only on the analysis of aggregate foreign direct investment (FDI)[1].

Uncertainty affects manufacturing and non-manufacturing firms differently, due to differences in linkage to the host country market and resource use. Some manufacturing firms enter a host country to exploit untapped resources, and not for the host country market; non-manufacturing firms typically enter to provide services for the host country customers. Source of input (domestic or foreign) and destination products (local sale or export) also influence the extent to which a foreign firm is exposed to uncertainty. The focus of this study is to address the relationship between economic and political uncertainty and FDI flow in African economies. Total FDI flow from all source countries, total U.S. FDI flow, U.S. manufacturing[2] FDI, and U.S. non-manufacturing[3] FDI flow to a sample of host countries in Africa are analyzed in this study.

By incorporating economic uncertainty and political instability indicators, this study examines the role of uncertainty in affecting FDI flow. Indicators of the inflation rate and the real exchange rate uncertainty are generated from generalized autoregressive

---

[1] Even though commonly used statistics on FDI raise conceptual questions, the working definition of FDI used in most empirical works is that FDI occurs when an investor based in one country (the home country) acquires an asset (10% of an existing company) in another country (host country) with the intent to manage that asset. FDI comprises three components: new equity from the parent company to the subsidiary, reinvested profits of the subsidiary, and long and short term net loans from the parent to the subsidiary.

[2] U.S. manufacturing sub-sector includes food, chemical, metals, machinery and equipment, electronics, and transportation industries.

[3] U.S. non-manufacturing sub-sector includes whole sale trade, banking, finance, insurance and other service industries.

heteroscedasticity (GARCH) models for a sample of host countries, and these indicators are used with political instability indicators in the FDI model.

The results of this study show the impact of uncertainty on flow of FDI from all source countries is insignificant. For aggregate U.S. FDI, economic and political uncertainties are not major concerns. However, for U.S. manufacturing FDI, political uncertainty and government policy commitment are important factors, whereas for U.S. non-manufacturing FDI, inflation and real exchange rate uncertainties are major determinants of FDI flow. Other economic factors such as labor, trade connection, size of export sector, external debt, and market size or potential are significant in affecting the flow of FDI to Africa economies.

Section 2 presents a review of theoretical and empirical literature on the relationship between uncertainty and FDI. Section 3 discusses the theoretical foundation, model variables, econometric techniques and specification. The fourth section presents estimation procedures, preliminary data analysis, and results. The last section provides conclusions.

2. Literature Review

Apart from firm-specific advantages and motives to internalize externality benefits, multinational corporations (MNCs) determine the location of production according to a host country's characteristics (Grossman and Razin, 1984, 1985). Host country characteristics are most important, as it is the main focus of those investing in developing countries where most economic and political stability indicators are highly volatile[4]. The study by Lucas (1990) found three factors for a slow capital inflow to capital scarce countries- differences in human capital, external benefits of human capital, and capital market imperfections, which Lucas labeled as political risk.

In the decision to enter through FDI, when uncertainty emanates from macroeconomic variables, then the political, social, and institutional system may also be a major concern for foreign investors. In developing countries, these political and institutional factors are the main factors affecting investors' confidence, which is also hampered by market failure that results in price and exchange rate uncertainty. Some uncertainty measures affect only particular industries and source countries, the fact that different countries target different industries according to their comparative advantage.

Theoretical works arrive at different results, mainly due to different assumptions used in developing respective models. These different assumptions are about the investors' risk attitudes and the source of volatility. Most of these studies focused only on aggregate level of FDI from all countries and its response to uncertainty (Ramasamy, 1999; Brunetti and Weder, 1998). The results of such studies may change if one considers disaggregated industrial groups and different source countries.

At this point, it is important to discuss the explanations of possible directions of relationships between economic uncertainty and FDI. The objectives of multinational

[4] The role of government policy was also addressed as a determinant in attracting FDI (see Teece, 1985; Mudambi, 1993; Dunning and Narula, 1996).

firms to diversify location of production (increase market share) and to have the option of production flexibility often lead to the conclusion of positive relationship between uncertainty and FDI. This is because firms give more weight to larger market share and production flexibility advantage than to the risk of uncertainty. The classical view that the higher the uncertainty, the higher is the expected marginal productivity (return) to factors of production (capital) supports the positive sign of uncertainty impact on FDI inflow (Abel, 1983). Negative sign is expected particularly for the flow of capital to developing countries, due to the existence of option value elsewhere that delays investment or diverts it to other forms or locations of investment (Dixit and Pindyck, 1994; Episcopos, 1995 and Price, 1995; Campa, 1993).

Other explanations are mixed in the sense that uncertainty matters only when it is combined with other social and political instability and when investors start to worry about uncertainty. In developing countries, evidence shows uncertainty is not a major concern for foreign investors in cases where other economic factors such as infrastructure and technology significantly determine the level of investment flow (Dehn, 2000)[5]. Lucas and Prescott (1971) incorporated shifting demand and cost of varying capacity in a general equilibrium framework, in order to study the behavior of capital stock, output, and price. They found demand shift leads capital stock to settle down, with either certainty or on average to a long term equilibrium level, which is determined by interest rates, adjustment costs, and average demand levels.

The literature on hysteresis (Dixit, 1989, 1992) revealed delays in FDI inflow in the presence of uncertainty. Dixit showed the intrinsic character of FDI- irreversibility due to a large sunk cost and tendency to delay due to ownership advantage- widens the Marshallian range of inaction. Some of the advantages indicated in the Dunning's (1988) Ownership-Location-Internalization (OLI) framework, which justifies FDI flow, are also viewed as factors to delay investment and result in irreversibility (Rivoli and Salorio, 1996; Blandon, 2001). Thomas and Worral (1994) addressed the impact of uncertainty through risk of expropriation in a dynamic context, which resulted in lowered current capital inflow. For the case of developing countries, uncertainty through risk of expropriation (security risks), macroeconomic policy instability and political risks are major concerns of potential investors.

On the other hand, some FDI models found a positive connection between uncertainty and FDI flow. These models were developed under different risk and production assumptions; some of the examples are model developed by Itagaki (1981) under different tax structure and covered forward exchange, Goldberg and Kolstad (1995) under production flexibility argument, and Sung and Lapan (2000) for the case of strategic FDI. Cushman (1985) also analyzed the connection between real exchange rate uncertainty and FDI assuming various relationships between foreign and domestic production. He

[5] Similar studies that used different methodologies and data sets arrive at different results. For instance see the studies by Abel 1983, Aiznman and Marion 1996, Ramey and Ramey 1995, Lehmann 1999, and Huizenga 1993.

concluded that in response to [exchange rate] risk multinational firms reduce exports to the foreign country but offsets this by increasing foreign capital input and production[6].

The study by Firoozi (1997, 1998) attempted to resolve contradicting results about the FDI-uncertainty connection. He used a different cost as a source of uncertainty and made no functional form assumptions on the degree of risk aversion. Firoozi showed uncertainty in the cost of production deters FDI inflow. His model predicted the FDI-uncertainty connection depends on important model parameters such as degree of risk aversion, production technologies and prior level of investment[7].

The current surge in FDI flow in the world economy raises concern following the Asian and Latin American financial crises. Lipsey (2001) studied response of FDI flow during the period of financial crisis and found no change. Edgington and Hayter (2001) also found Japanese FDI into Asia have been steady during a period of crisis. This may be due to the hysteresis effect of Dixit (1989), where the response of FDI to such a shock is slow due to the large sunk cost of FDI[8].

Empirical works on the connection between FDI and uncertainty in the case of developing countries are very few[9]. The exceptions are studies by Ramasamy (1999) for Malaysia and Lehmann (1999) for developing countries. These studies conclude that a negative connection exists between uncertainty and FDI in developing countries. A negative impact of real exchange rate volatility on FDI inflow were found by Campa (1993) for the case of the U.S., by Ramsasmy (1999) for Malaysia, and by Serven (1998) for developing countries. Most empirical works lump together all forms of private investment (foreign and domestic) to analyze the effect of uncertainty. Some examples are studies by Serven (1998) and Dehn (2000) for cases of developing economies. Serven sampled 94 developing countries to see the impact of uncertainty on total private investment, and concluded real exchange rate uncertainty affects private investment negatively. On the other hand, Dehn's study, using 44 developing countries and different indicators of economic uncertainty, found no significant impact of uncertainty on private investment, but found positive commodity price shocks to have a positive impact on private investment.

---

[6] The International tax minimization and production flexibility arguments are viewed as efficiency advantages to exploit differences in host and source country resources and incentive policies, which compensate for uncertainty costs. However, the argument of Sung and Lapan was based on the advantages of strategic moves to deter entry of potential competitors, and to increase market share in host countries.

[7] Tse and Wong (1998) questioned the results of Firoozi's study, on the grounds that different assumptions about functional forms of the utility function change the findings.

[8] Fernadez and Hausmann (2001) advised that developing countries benefits by attracting FDI instead of crisis-prone non-FDI investments, in which case rate of outflow of FDI is modest even during financial crises compared to portfolio investment.

[9] Most theoretical works indicated above empirically test prediction of their model in the context of developed countries mostly U.S. and U.K.; for instance see Cushman (1985), Campa (1993), and Goldberg and Kolstand (1995)

Few studies address the connection of FDI to uncertainty for the case of African economies. Studies by Abekah (1998), Nnadozie (2000), Bennell (1995), and Pigato (2000) highlighted the role that both economic and political uncertainty plays in the case of African economies. However, none of these works formally address the impact of both economic and political uncertainty for representative countries and periods in the context of African economies.

There is no empirical work that formally tests the impact of uncertainty on the flow of disaggregated FDI to African economies. Specifically, the role of uncertainty on the disaggregated sub-sector from a particular host country was not addressed in any of the previous studies. This paper attempts to fill this gap by looking into the connection between uncertainty and the flow of total FDI from all source countries, total U.S. FDI, U.S. manufacturing, and U.S. non-manufacturing FDI flow to African economies.

The approach of previous studies in generating uncertainty indicators is a point of concern. Most studies used simple standard deviation of a variable of interest, while others used auto regressive integrated moving average (ARIMA) technique to generate uncertainty indicators. Autoregressive heteroscedastic (ARCH)/ generalized autoregressive heteroscedatic (GARCH) models are most popular in studying volatility, as it generates conditional variances of a variable. This technique is used in this study to generate conditional variances of the real exchange rate and the inflation rate.

3. Theoretical Foundation and Econometric Specification

3.1.Theoretical foundation

Following the model developed by Goldberg and Kolstad (1995), which incorporates both the exchange rate and demand uncertainty, this study tests the predication of the model by augmenting it with host country characteristics. Foreign investors divide their production capacity across borders according to the distributions and correlations of exchange rate and demand shocks.

The profit function of a source country firm that produces only for a foreign market, with a combination of domestic capacity and foreign capacity is given by:

$$\Pi(q_{d,}q_f, e, \sigma) = e(p(q) + \delta)q - q_d - eq_f \qquad (1)$$

Where $p(q)$ is total demand in the host country for the product of affiliate firm, q_d and q_f are home and foreign capacity[10] costs respectively, δ is demand shock, and e is exchange rate (local currency per foreign currency) of a host country. Typically, the firm decides the level of production both in the domestic market and abroad before uncertainty is resolved. The model becomes more complex when other factors are taken into account. For example, foreign firms invest in a given host country not only to produce and sell products in the host country market, but also to export products either back to the parent firm or to neighboring countries.

[10] It is assumed that the firm operates in full capacity so that capacity cost is same as cost of production.

From the above model, expected profit is a function of exchange rate and demand shock uncertainty and the correlation between the two. Therefore, level of production in the domestic market and abroad is a function of demand (price) and exchange rate uncertainties. As foreign firms cross boundaries, other factors pertinent for foreign investors include political instability and host country government polices; these factors are important because, in most cases, they treat foreign firms differently. Other macroeconomic determinants of investment, such as total and skilled labor force, market size and potential, cost of capital, productivity (technology), infrastructure, size of export sector, investors confidence, and image of a host country in the international business community are commonly used control variables for the study of investment behavior of multinational firms.

The traditional investment model is given by:

$$K_{it} = f(Y_{it}, IR_{it}) \qquad (2)$$
$$\text{i=1,.....,N and t=1,.....,T}$$

Where K_{it} is the desired capital stock, Y_{it} is output and IR_{it} is real user cost of capital in a host country[11]. The basic model refers to the traditional determinants of investment for domestic investors. However, as seen in Equation 1 a multinational firms' investment is affected by other host country characteristics, which alter exchange rate, and demand.

Therefore, this model is augmented based on the premise that in Equation 1 both revenue and cost functions are subject to host country uncertainties and instabilities. Revenue is also affected by market size, degree of trade orientation and labor force of the host country. As indicated by Thomas and Worral (1994), other forms of uncertainty emanate from risk of expropriation, and can be guaranteed only through signing bilateral and/or multilateral investment guarantees to protect foreign investors. Baker (1999) reinforced the role played by the Multinational Investment Guarantee Agency (MIGA) to increase flow of FDI. The level of exchange rate becomes a determinant factor, as indicated by Campa (1993), for the case of FDI inflow to U.S., and also by Baek and Okawa (2001) for Japanese FDI in Asia. Previous empirical works have not addressed the roles of some of these uncertainty indicators and polices. Furthermore, robustness of their results to different host and source countries and industrial groups is questionable. This study tries to fill the empirical gap for the case of African economies and for disaggregated FDI by the major sub sectors of manufacturing and non-manufacturing.

The expected sign for the measure of uncertainty is not clear from economic theory. Positive sign implies that firms invest more in a foreign market to diversify production, use a market as a shock absorber, or to compete with rival competitor, which is a strategic motive. Cushman (1985) argued that uncertainty affects FDI positively, as multinational firms tend to serve foreign market through FDI than through export when investors start to worry about uncertainty. On the other hand, the theory of hysteresis and option value imply that firms lower investment when there is uncertainty, due to high sunk cost which

[11] It is assumed that, at least partly, foreign investors use capital from host country. Although this assumption seems invalid for the case of African economies, it is a signal for the presence of domestic investors that provide support to help attract foreign investors.

further delays investment. The predictions of these models have never been tested in the context of African economies. The purpose of this paper is to fill this gap.

3.2. Model variables and data

3. Definitions and sources of model variables are presented in the Appendix. The period of analysis for the flow of FDI from all source countries is 1987-1999; whereas for U.S. FDI flow available data spans from 1989-1998. The variables used in the estimation are in annual frequency. The monthly inflation rate and real exchange rate series are used to compute uncertainty indicators. Monthly uncertainty indicators are aggregated into annual by taking average of the conditional variances of the inflation rate and the real exchange rate. The explanatory variables are grouped into economic uncertainty, political instability and government policy, investor's confidence, labor force availability, domestic market size, potential and cost of capital, and size of export sector. Investors' confidence is proxied by two indicators: ratio of total external debt of a host country to gross domestic product (GDP) (REDEBT) and the ratio of receipts from international tourist arrivals as percentage of GDP (RINTOUE). Investors' confidence is expected to be high in cases where the debt burden is low, so that there is no future tax obligation on the business community to pay back the debt. Arrival of international tourists is a proxy for new information about the host country and shows confidence in the existing political and social system[12].

It is difficult, if not impossible, to incorporate the different forms and objectives of policies that host countries have towards the flow of FDI. It is also argued that most policies designed by host countries may not be enforceable and do not address what foreign investors seek in guaranteeing security and benefits. Mostly initiated by source country, host countries sign bilateral and multilateral agreements to show their commitment and to secure their benefits and those of foreign investors. The number of Bilateral Investment Treaties (BIT) signed by a host country and membership in Multilateral Investment Guarantee Agency (MIGA) are used as proxies for government policy and commitment.

3.Econometric Methodology

This study addresses the role of economic uncertainty and political instability in affecting FDI flow to African economies. The rate of inflation and the real exchange rate uncertainty, as well as political instability are expected to impede FDI flow to African economies. Apart from these uncertainty indicators, host country economic policy parameters, investors' confidence, market size and potential, size of export sector, labor force availability, and technology and infrastructure facilities are factors in deciding to invest in a host country. These control variables are expected to contribute to the flow of FDI. Studies show the flow of FDI to African economies is to exploit cheap labor and a large export sector (mainly to extract resources) (Nnadozie, 2000; Allaoua and Atkin, 1993). It is evident from similar studies that the role of advanced communication,

[12] The use of RINTOUE may raise concerns about the appropriateness to proxy confidence. However, investors get information about a given host country from tourist or investors themselves first visit the country of their interest before they decide to invest. Particularly, in Africa this argument makes sense as investors look for any first hand information about the political and social system of a given host country.

infrastructure, and suitable policy environment is critical. By using proxy variables for the uncertainty indicators and other control variables, this study estimates FDI model for a sample of African countries.

Different methods used to generate measures of uncertainty include lagged market prices of a variable, unconditional standard deviation and conditional variance of a variable[13]. The ARCH/GARCH model is a popular method in finance literature as a vehicle to model volatility (Engle, 1982; Bollerslev, 1986). The ARCH model takes the form of a univariate autoregressive (AR) process of a variable in question and the variance as a function of squared innovations from this AR process. For the purpose of this study, two different ways of estimating uncertainty are used. First, simple unconditional standard deviations are generated for the inflation rate and the real exchange rate. The unconditional standard deviations are computed by taking the standard deviation of the monthly series for each year. Hence, the standard deviations are time variant but not conditional on previous observations. Second, conditional variances of the two series are also generated from GARCH model. Unlike the unconditional variance and lag values of a variable, conditional variance uses the previous information to measure volatility after the deterministic component of the series are taken out of the series.

The generalized form of the above ARCH model, which includes variance of the error term in the AR process, is GARCH (p, q), which is given by:

$$y_t = x_t'\phi + \varepsilon_t, \qquad (3)$$

$$where$$

$$\varepsilon_t | \psi_{t-1} \sim N(0, h_t)$$

$$h_t = \alpha_0 + \alpha_1 \varepsilon_{t-1}^2 + ... + \alpha_p \varepsilon_{t-p}^2 + \theta_1 h_{t-1} + ... + \theta_q h_{t-q}$$

$$t = 1,.....T$$

Ψ_{t-1} is the information set, and h_t is the conditional variance of the error term. x_t is the conditional mean of the series; often AR processes are used as conditional mean. In this paper the series are fitted to AR (p) for the sample countries, where p is the lag length of the conditional mean. The lag length (p) is selected based Akiake information criterion (AIC). For both the inflation rate and real exchange rate, most lag length turn out to be 12, that captures information of one year[14]. This model can be estimated by maximum likelihood to obtain an estimate of the conditional variance $\hat{h}_t$.

Most empirical work finds that the GARCH (1,1) adequately represents the conditional variance [see Bollerslev, Chou and Kroner (1992)][15]. In this paper conditional variances from both GARCH (p, q) and GARCH (1,1) are used to generate conditional variances of inflation rate and real exchange rate. Since, there is no significant qualitative change in the

[13] See Carruth and et al., 1998 for the detailed discussion of the various methodologies to measure uncertainty.

[14] This may also be due to seasonality in the series.

[15] In cases where GARCH (1,1) model does not fit the series well, ARCH (1) is often adequate.

results in using conditional variances from GARCH (p, q) and GARCH (1,1), only the results that use GARCH (p, q) are reported. GARCH (p, q) model is estimated for the inflation rate and the rate of return of the exchange rate of selected African economies. After the conditional variances are obtained from the series, it is related to net FDI in the different specifications of FDI models.

To exploit the possibility of nonlinear relationship of the variables square terms of the variables of interest are also used in the model. The square of variance of inflation rate, variance of the real exchange rate, and political instability indicators and their interaction terms are used.

Two separate models are estimated to see the effect of variance of the inflation rate and variance of the real exchange rate for different measures of uncertainty indicators, which are conditional and unconditional variance together with political instability indicator.

For the conditional variances generated from GARCH (p, q) the following model is estimated:

$$Y_{it} = \beta_1 + \beta_2 VINF_{it} + \beta_3 VRER_{it} + \beta_4 VINF2_{it} + \beta_5 VRER2_{it} + \beta_6 POLI_{it} + \beta_7 POL2_{it} + \beta_8 POLINFA_{it} + \beta_9 POLRERA_{it} + \beta_{10} DEBTINF_{it} + \beta_{11} DEBTRER_{it} + \alpha X_{it} + \varepsilon_{it} \quad (4)$$

Y_{it} is a vector [(RNFDI, RUSFDI, RUSFDIM, RUSFDINM)′] of dependent variables, which measures ratios of FDI to GDP of a host country, VINF is conditional variance of inflation, VRER is conditional variance of real exchange rate, and POLI= political freedom indicator. X_{it} is a vector of explanatory variables that measure market size (GDPPC, RIMPFUS), infrastructure (TELM), productivity (TVADD), labor force availability (RLFT), skilled labor (LITRAR), investors' confidence indicators (REDEBT, RINTOUR), government policy and commitment (MIGA, BIT, USBIT), and size of export sector (REXPO, NREXPO, REXPTUS). Interaction terms between inflation uncertainty and real exchange rate with political instability (POLIINF and POLIRER) and external debt (DEBTINF and DEBTRER) are also used in the FDI model.

A Similar model is estimated for the unconditional (simple standard deviation) variance:

$$Y_{it} = \beta_1 + \beta_2 INFSTD_{it} + \beta_3 RERSTD_{it} + \beta_4 INF2_{it} + \beta_5 RER2_{it} + \beta_6 POLI_{it} + \beta_7 POL2 + \beta_8 POLINF_{it} + \beta_9 POLRER_{it} + \beta_{10} PDEBTINFS_{it} + \beta_{11} DEBTRERS_{it} + \alpha X_{it} + \varepsilon_{it} \quad (5)$$

Y_{it} and X_{it} are as defined above. INFSTD and RERSTD are the unconditional standard deviation of the inflation rate and the real exchange rate respectively, POLI is political freedom indicator, and the other terms are squared term of inflation, real exchange rate and interaction term with political indicator.

Positive signs are expected for RLFT, GDPPC, RINTOUE, BIT, USBIT, and MIGA. GDPPC is a measure of effective market size of the country, and foreign firms may sell products to domestic consumers, even though their goal is exporting to neighboring

markets. MIGA captures commitment from the government side, and positive sign may imply investors take advantage of policies and government commitment [after controlling for political freedom indicator (POL)]. Market potential is often measured by growth rate of GDP. Again, high growth rate may encourage investment, unless there is crowed out effect by domestic firms.

4. Estimation and Results

Popular specifications for FDI models are translog functions and gravity models. Wheeler and Mody (1992) adopted the modified version of a translog specification to analyze the international investment location decision. Huang (1997) used a gravity model to investigate the determinants of U.S. and Japanese FDI across countries and industries[16]. Two-way FDI flows and firm-level resource use are required for the gravity model and translog specifications respectively, which are either insignificant or difficult to obtain in the case of developing countries. Recently, count and duration models have become popular[17]. In this paper, given the nature of data-aggregate net flow from all source countries and U.S. to host countries in Africa, panel data techniques that take into account country-specific effects are most appropriate.

For each specification, four separate regressions are run with different dependent variables. The dependent variables are total FDI flow, total U.S. FDI flow, U.S. manufacturing FDI flow, and U.S. non-manufacturing FDI flow to sample host countries in Africa. For the total FDI flow the period of analysis is 1987-1999, whereas for the U.S. FDI the period for which data is available is 1989-1998. Hence, even though sample countries are the same for all the dependent variables, the time-series range is different. Furthermore, U.S. FDI data reports have censored values.

The censoring is of two kinds. First, observations below some threshold level are not reported, and secondly, in cases where there are only few firms in a given host country, the values are not revealed to keep the information of the firms confidential[18]. It is assumed that in the second case the censored values are not high since only few firms enter the country during that period. The two censorings are converted to zero. The appropriate technique used to account for the censored values is panel Tobit model. Once the sample period is reduced to 1989-1998, some variables become constant for some countries during the whole sample period, which leads us to estimate only a random effects model for the case of U.S. FDI. Hence, to see the robustness of the results, both the Standard Random Effects model and Tobit Random Effects model estimates are reported for the case of total, manufacturing and non-manufacturing U.S. FDI.

Results are reported for both the full sample and Sub-Saharan African (SSA) countries excluding Nigeria and South Africa[19]. To compare the results of the two different

[16] Also see Summary and Summary (1995) for the case of U.S.
[17] see Tomlin (2000) for count data estimation and Chen and Wu (1996) for duration model.
[18] For instance, in cases where only one or two firms enter a country, it is not that difficult to know investment level of that firm if the total value is know. Hence, not to reveal this information, the values are not reported.
[19] Both Nigeria and South Africa are grouped as advanced large economies compared to other countries in SSA.

techniques in measuring uncertainty (conditional variance and unconditional standard deviation), estimation is also made using unconditional standard deviation as an indicator of uncertainty.

4.1.Preliminary Data Analysis

Sample countries are selected based on availability of data for FDI and monthly inflation rate and real exchange rate. Then, in order to incorporate measures of uncertainty based on the methodology discussed above, countries are selected based on availability of data and as to whether ARCH or GARCH is present in the inflation rates and the real exchange rate series of the sample countries to generate conditional variance. In the Appendix Table 1a and 1b show for the inflation rate and the rate of return of the real exchange rate AR processes, kurtosis statistics of the residuals of from AR process as well as the coefficients of GARCH (p, q) estimation. Some countries are excluded from the analysis either due to absence of ARCH/GARCH and/or lack of information on some other explanatory variables. In almost all cases test for presence of ARCH shows there is autoregressive heteroscadasticity. The coefficients of fitted GARCH (p, q) have the theoretical signs and magnitude although insignificant in some cases. Figures 1- 4 also show plots of the residuals of the inflation rate and the real exchange rate for the sample countries as well as the conditional variances from GARCH (p, q) estimation. Clusters of the residuals are also an indication of the presence of ARCH in the residuals. Conditional variances from GARCH (p, q) for inflation rates of Botswana and Zimbabwe are constant, which proves poor fit of the data. However, the exclusion of these two countries from the FDI model has no change on the overall result.

The inflation rate and the real exchange rate series are tested both for the presence of ARCH and for stationarity. For the series of the inflation rate, the null hypothesis of unit root cannot be rejected using the Phillips-Perron unit root test. First, differences of the inflation rate of the sample countries are used to fit GARCH and to generate conditional variance. Since the series of the nominal exchange rates are deflated by the ratio of U.S. to domestic consumer price indices, the results show that the null hypothesis of unit root is rejected.

The LM test of Engle (1982) is used to test for presence of ARCH. For each country in the sample, the test result shows presence of ARCH in the series. Even though the kurtosis of some of the sample countries is very small, the test for presence of ARCH for most of the countries is significant.

For the variables expressed in values, ratios to GDP of the host country are used to account for the effect of country size[20]. The unit root test is not conducted for the explanatory variables for each country separately or for the panel as a group. However, as the variables are normalized by GDP of host countries, unit root is not a serious concern.

Two econometric issues can be raised in estimation of these models: collinearity and heteroscedasticity. Collinearity is due to the use of ratio of final consumption expenditure

[20] In some cases, the use of ratio of a variable to GDP or other variables with trend is also argued as a solution to unit root problem.

and growth of GDP as regressors, which may be correlated. One solution for the collinearity problem is to drop one of the correlated variables. Secondly, heteroscedasticity may result from the pooling of heterogeneous sample countries in which case white's heteroscedastic corrected variance is often applied. In this study, the degree of collinearity between the suspected variables is tested to see if variables are correlated. The maximum correlation coefficient obtained is 0.4, which shows collinearlity is not a concern.

4.2. Results

The results of the study are presented in Tables 2-9. Each table reports the results both for full sample and Sub-Saharan Africa excluding South African and Nigeria. Tables 2 and 3 present the results for the total FDI flow from all source countries to Africa for conditional variance and unconditional standard deviation, respectively. Similarly, for U.S. total FDI flow the results are reported in Tables 4 and 5. For U.S. manufacturing FDI results are shown in Tables 6 and 7, and for non-manufacturing FDI, results are contained in Tables 8 and 9. For U.S. total, manufacturing, and non-manufacturing FDI, both standard random effects and Tobit random effects are reported. For all cases of U.S. FDI flow, since the Tobit model is appropriate, only the results from Tobit random effects estimation are discussed. The results of the Tobit random effects model can be compared with the standard random effects model presented in Tables 4-9. White's heteroscedaticity corrected standard errors are used for the suspected group heteroscedasticity in the panel data of such a diverse group of countries[21].

In most cases, the Hausman test results show that there is no correlation between the country specific factor and the residuals, which implies that both the fixed and random effects models are consistent, but fixed effect is not efficient. Hence, estimation of random effects model is warranted for the nature of data used in this study. The exception is for the estimation of total U.S. FDI using unconditional standard deviation, where the Hausman test implies coefficients of the random effects model are inconsistent.

In almost all models estimated by the fixed effects model, the result for the test of the presence of unobserved country-specific effects is significant. Similarly, for the models estimated by the random effects, the Lagrange multiplier is used to test for the presence of error components; the result supports the error components model compared to classical regression model.

The results of using both conditional variance and unconditional standard deviation are similar in most cases. Even though in some cases unconditional uncertainty indicators become highly significant for the Sub-Saharan Africa (SSA) sub-sample, for the other control variables the results are similar for the full sample and SSA.

The fixed effects result shown in Table 2 indicates that, of all the uncertainty indicators, only the square term of real exchange rate uncertainty and political instability are significant for the case of SSA sample. Most of the other variables have the expected sign. For example, cost of capital (RLR), labor force (RLFT), and debt burden (REDEBT)

[21] The heteroscedasticty correction is used only for the fixed effects and the standard random effects model.

have negative signs as expected. The negative coefficient on labor force occurs because labor skill is controlled by literacy rate (LITRAR), and the remaining only accounts for the unskilled labor force. Gross domestic product per capita has a negative sign though insignificant. The implication of negative sign is that economic growth or larger market size can hinder the flow of foreign capital. One explanation may be that when the market gets saturated, then foreign investors see little future expansion of demand to enter the market. Abekah (1998) argued that the negative sign implies that as GDP expands, some capital requirements are met locally, which leads to lower FDI flow.

Total factor productivity per capita (TVADD), literacy rate (LITRAR), investors' confidence indicator (RINTOUE) and size of export sector (REXPO) have the expected positive signs. These results support the view that foreign firms enter host countries with high labor productivity and skilled labor forces. Investors' confidence, measured by receipts from international tourists arrivals and the external debt burden of a host country also show how the image of a host country in the international business community plays a significant role in attracting more capital inflow.

The results in Table 3 similar estimation results like the one in Table 2 except the fact that the uncertainty indicators are unconditional standard deviation. In Table 3, the interaction terms of inflation rate and exchange rate with political instability have significant negative sign. This implies that it is only when economic and political uncertainty are combined that affects the flow of FDI to African economies (Lemi and Asefa, 2001).

In Table 4, the results for total U.S. FDI show even though most of the coefficients of uncertainty indicators have the expected signs; none of them are statistically significant. This implies that for the overall U.S. FDI inflow to African economies, both political and economic uncertainties are not significant determinants. However, other control variables play significant roles in affecting the flow of U.S. FDI. Exports of a host country to the U.S. (REXPTUS) lower overall U.S. FDI flow to the host country, whereas exports to all other countries other than to the U.S. (NREXPO) increases FDI inflow to the sample African economies. On the other hand, the larger import of the host country from the U.S. (RIMPFUS), the greater the inflow of capital from the U.S. to Africa. This result supports the view that if a source country obtains the resource and processed products they need through export from a host country, then, there is no reason for firms to invest in that host country. However, more imports from the U.S. to a host country show a demand for U.S products by customers of a host country, and firms become interested in entering the host country and serving domestic customers through local production.

The indicator of investors' confidence has unexpected negative sign. The unexpected sign on indicators of investors' confidence may be the fact that confidence is a function of other factors and it is difficult to proxy it using only macro economic and social stability indicators. The use of unconditional uncertainty indicators did not change the results of the impact of uncertainty on U.S. capital flow to Africa. However, there are some minor changes in the significances and signs of other variables in the model (see Table 5). In Table 5, which uses unconditional standard deviation to proxy economic uncertainty, the

results are not consistent across the models considered to rely on the findings. Overall, the results show significant impact of uncertainty and their interaction with political instability. It is argued by Dehn (2001) that unconditional standard deviation overestimates uncertainty, as the trends and the deterministic part of the series are not accounted for before they are used as a measure of uncertainty.

Results for the U.S. manufacturing FDI flow to Africa are presented in Tables 6 and 7 for the conditional and unconditional uncertainty indicators, respectively. For the U.S. manufacturing FDI, both the linear (POLI) and the square term (POL2) of political instability indicator as well as host country government policy commitment (MIGA) play significant roles in attracting more manufacturing firms. Political uncertainty becomes a concern to foreign investors only when it passes a point where investors start to worry about uncertainty. It is also important to note the signs and insignificance of the total per capital factor productivity (TVADD) and on the trade link indicators (REXPTUS and RIMPFUS). For the U.S. manufacturing firms, total per capita factor productivity and trade links are not a significant determinant of U.S. manufacturing FDI in Africa.

The role economic uncertainty plays is evident from the results of U.S. non-manufacturing firms in African economies. The results in Tables 8 and 9 show economic uncertainties taken alone have in general positive impact in attracting U.S. non-manufacturing FDI to African economies. However, most of the interaction terms have negative impact. This again supports the view that economic uncertainty is binding only when it is combined with political and other economic conditions of the host country. Wholesale trade, finance and insurance are the dominant forms of U.S. non-manufacturing sub-sector in Africa, in which case political and long term policy commitment of the government are not major concerns. Rather, economic uncertainty coupled with political instability and external debt affect flow of trade and finance-related FDI flow to African economies.

5. Conclusion

This study examines how uncertainty affects FDI flow to African economies. Total FDI flow from all source countries, total U.S. FDI flow, U.S. manufacturing FDI and U.S. non-manufacturing FDI flow to sample host countries in Africa are analyzed in this study. Generalized autoregressive heteroscedastic (GARCH) model is used to generate uncertainty indicators of the inflation rate and the real exchange rate.

The results of the study show the impact of uncertainty on the flow of FDI from all source countries is insignificant. For aggregate U.S. FDI, economic and political uncertainties are not major concerns. However, for U.S. manufacturing FDI, only political instability and government policy commitment are important factors, whereas for U.S. non-manufacturing FDI, economic uncertainties are the major impediments only when coupled with political instability and debt burden of host countries. Other economic factors such as labor, trade connection, size of export sector, external debt, and market size are also significant in affecting FDI flow to African economies.

The contribution of this paper is two fold. First, this study is the first in formally dealing with the role of political and economic uncertainty in affecting FDI in Africa using GARCH model to generate uncertainty. Second, previous studies did not address response of disaggregated FDI flow to political and economic uncertainty, which this paper analyzed. The period of analysis and sample countries are also large enough for the result to be robust, which other studies did not consider.

Study on African economies alone is not enough to ascertain the determinants of FDI to developing countries, without considering determinants of capital flow to the rest of the world. But, many African economies are a major a major development challenge in the 21st century to which FDI will make a major contribution. This study also makes a modest contribution to this emerging policy challenges of FDI in Africa and the role U.S. can play in that regard. As the economies of the world become more integrated, it is crucial to learn and draw lessons from similar developing countries in Asia and Latin America, which makes comparative analysis worth considering for future research.

The results shown in this study imply the trade link between the host country and the source country plays a significant role in affecting the flow of capital. Further study on the link between trade and FDI flow would be beneficial and warranted. Host countries are concerned about the welfare impact of FDI, as it also plays a significant role to transfer technology, improve productivity of local firms, and crowd in local firms through economies of scale (externality) advantages. There are costs associated with the flow of FDI to a host country, particularly in developing countries where absorptive capacity is very low to tap the benefits of the foreign firms. The net welfare effect of the presence of foreign firms on welfare of less developed countries needs for further analysis.

References

Abekah, Joseph Y. (1998) "Overseas Private Investment Corporation and Its Effects on U.S. Direct Investment in Africa", *Journal of African Finance and Economic Development*, Vol. 3, No.1.

Abel, Andrew B. (1983) "Optimal Investment Under Uncertainty", *American Economic Review*, Vol. 73, No. 1, March, 228-233.

Aizemman, Joshua and Marion, Nancy P. (1996) "Volatility and the Investment Response", NBER working paper 5841.

Allaoua, Abdelkader and Atkin, Micheal (1993) "FDI in Africa: Trends, Constraints and Challenges", Economic Commission for Africa (ECA), Addis Ababa, Ethiopia.

Baek, In-Mee and Okawa, Tamami. (2001). "Foreign Exchange Rates and Japanese Foreign Direct Investment in Asia', *Journal of Economics and Business* 53, 69-84.

Baker, C. James (1999). *Foreign Direct Investment in Less Developed Countries: The Role of ICSID and MIGA*, (Boston: Quorum Books).

Bennell Paul (1995) "British Manufacturing Investment in Sub-Saharan Africa: Corporate Responses During Structural Adjustment", *The Journal of Development Studies*, Vol 32, No.2, December.

Blandon, Joseph G. (2001). "The Timing of Foreign Direct Investment Under Uncertainty: Evidence from the Spanish Banking Sector" *Journal of Economic Behavior and Organization*, vol 45, 2.

Bollerslev, T. (1986) "Generalized Autoregressive Conditional Heteroskedasticity", *Journal of Econometrics*, 31, 307-327.

Bollerslev, T., Chou, R. Y. and Kroner, K. F. (1992) "ARCH Modeling in Finance: A Review of the Theory and Empirical Evidence", *Journal of Econometrics,* 52, 5-59.

Brunetti, Aymo and Weder, Beatrice. (1998). "Investment and Institutional Uncertainty: a Comparative Study of Different Uncertainty Measures", *Weltwirtschaftliches archiv,* vol. 134, 3.

Campa, Jose' Manuel. (1993). "Entry by Foreign Firms in the United States Under Exchange Rate Uncertainty", *The Review of Economics and Statistics*, vol. 75, no. 4: 614-22.

Carruth, Alan, Dickrson, Andy and Henley, Andrew. (1998). "What Do We Know About Investment Under Uncertainty?" Department of Economics, Keynes College, University of Kent, UK.

Chen, Tain-Jy., and Wu, Grace. (1996). "Determinants of Divestment of FDI in Taiwan", *Weltwirtschftliches archiv*, vol. 132, no. 1.

Collier, Paul (1994) "The Marginalization of Africa", Center for the Study of African Economies, *mimeo.*

Cuddington, J., Liang, H., and Lu, S. (1995). "Uncertainty, Trade, and Capital Flows in Sub-Saharan Africa", Working Paper, Economics Department, Georgetown University, Washington, DC.

Cushman, O. David (1985). "Real Exchange Rate Risk, Expectations, and The level of Direct Investment", *The Review of Economics and Statistics*, Vol. 67, Issue 2, May: 297-308.

Dehn, Jan (2000) "Private Investment in Developing Countries: The Effects of Commodity Shocks and Uncertainty, Center for the Study of African Economies", University of Oxford, Working paper series 2000-11.

Dixit Avinash (1992). "Investment and Hystersis"*, Journal of Economic Perspectives*, vol. 6, no. 1, 107-132

Dixit, Avinash (1989). "Entry and Exit Decision Under Uncertainty", *Journal of Political Economy,* vol. 97, no. 3.

Dixit, Avinash and Robert S. Pindyck (1994) *Investment Under Uncertainty*, Princeton University Press, Princeton, New Jersey.

Dunning, John H. (1988). "The Eclectic Paradigm of International Production: A Restatement and Some Possible Extensions", *Journal of International Business Studies*, spring, no. 1.

Dunning, John H. and Narula, Rajneesh. (1996). The investment development path revisited, in Dunning, John H. and Narula, Rajneesh (ed.) *Foreign Direct Investment and Governments: Catalysts for Economic Restructuring,* Routledge Studies in International Business and the World Economy, Routledge.

Edgington, David W. and Hayter, Roger. (2001). "Japanese Direct Foreign Investment and The Asian Financial Crisis", *Geoform* 32, 103-120.

Engle, R.F. (1982), "Autoregressive Conditional Heteroscedasticity with Estimates of the Variance of United Kingdom Inflation", *Econometrica,* 50, 987--1007.

Episcopos, Athanasios (1995) "Evidence on the relationship between uncertainty and Irreversible Investment", *Quarterly Review of Economics and Finance,*35 (1), 41-52.

Fernandez-Arias, Eduardo and Hausmann, Ricardo. (2001). "Is Foreign Direct Investment a Safer Form of Financing?" *Emerging Markets Review*, 2, 34-49.

Firoozi, Fathali. (1997). Multinationals FDI and Uncertainty: An Exposition", *Journal of Multinational Finance Management*, 7, 265-273.

Firoozi, Fathali. (1998). "Multinationals FDI and Uncertainty: A Reply", *Journal of Multinational Finance Management*, 8, 455-456.

Freedom House, *Annual Survey of Freedom Country Ratings 1972-73 to 1999-00*, 2000

Goldberg, Linda S. and Kolstad, Charles D. (1995). "Foreign Direct Investment, Exchange Rate Variability and Demand Uncertainty", *International Economic Review*, 36:4.

Greene, William (1997) *Econometric Analysis*, third edition, Prentice Hall

Grossman, Gene M. and Rizan, Assaf (1984). "International Capital Movements under Uncertainty" *The Journal of Political Economy*, vol. 92, issue 2, 286-306.

Grossman, Gene M. and Rizan, Assaf (1985). "Direct Foreign Investment and The Choice of Technique Under Uncertainty", *Oxford Economic Papers*, 37, 606-620.

Huang, Gene. (1997). *Determinants of United States- Japanese Foreign Direct Investment: A Comparison Across Countries and Industries,* (Boston: Garland Publishing.).

Huizenga, John (1993). "Inflation Uncertainty, and Investment in U.S Manufacturing", *Journal of Money, Credit and Banking,* Vol.25. Issue 3.

Itagaki, Takao. (1981). "The Theory of Multinational Firm Under Exchange Rate Uncertainty", *Canadian Journal of Economics*, XIV, No.2.

Lehmann, Alexander. (1999). "Country Risks and the Investment Activity of U.S. Multinationals in Developing Countries", IMF working paper 133.

Lemi, Adugna and Asefa, Sisay (2001). "Foreign Direct Investment and Uncertainty: The Case of African Economies", *Proceedings of the International Business and Economics Research Conference*, October 8-12, 2001, Reno, Nevada.

Lipsey, Robert E. (2001) "Foreign Direct Investment in Three Financial Crisis", NBER Working Paper 8084.

Lucas, Robert E. (1990). « Why Doesn't Capital Flow from Rich to Poor Countries? "*American Economic Review,* 1990, vol.80 no.2.

Lucas, Robert E. and Prescott, Edward C. (1971) "Investment Under Uncertainty", *Econometrica*, Vol.39, Issue 5, September.

Mudambi, Ram. (1993). "Government Policy toward MNEs in the Presence of Foreign Exchange Scarcity", *Eastern Economic Journal*, vol. 19, no.1.

Nnadozie, Emmanuel (2000) "What Determines US Direct Investment in African Countries?" Truman State University, mimeo.

Pigato, Miria (2000) "Foreign Direct Investment in Africa: Old tales and New Evidence", Africa Region Working paper series, November.

Price, Simon (1995) "Aggregate Uncertainty, Capacity Utilization and Manufacturing Investment", *Applied Economics*, 27, 147-154

Ramasamy, Bala. (1999). "Foreign Direct Investment under Uncertainty: Lessons from Malaysia". *Conference Proceedings, International Conference on the challenges of globalization*, Thammassat University, Bangkok, Thailand.

Rivioli, Pietra. and Salorio, Eugene. (1996). "Foreign Direct Investment and Investment Under Uncertainty", *Journal of International Business Studies*, Second quarter.

Senbet, W. Lemma. (1996). "Perspective on African Finance and Economic Development", *Journal of African Finance and Economic Development*, V2, 1: 1-22.

Serven, Luis. (1998). "Macroeconomic Uncertainty and Private Investment in LDCs: An Empirical Investigation", The World Bank.

Summary, Rebecca M. and Summary, Larry J. (1995). "The Political Economy of United States Foreign Direct Investment in Developing Countries: An Empirical Analysis", *Quarterly Journal of Business and Economics*, vol. 34, no. 3, Summer.

Sung, Hongmo and Lapan, Harvey. (2000). "Strategic Foreign Direct Investment and Exchange Rate Uncertainty", *International Economic Review*, vol. 41, no.2.

Teece, David J. (1985). "Multinational Enterprise, Internal Governance, and industrial Organization", *AEA Papers and Proceedings*.

Thomas, Jonathan and Worral, Tim. (1994). "Foreign Direct Investment and the Risk of Expropriation"*, Review of Economics Studies* 61.

Tomlin, Kasaundra M. (2000). "The Effects of Model Specification on Foreign Direct Investment Models: An Application of Count Data Models". *Southern Economic Journal,* 67, 2.

Tse, M.K.S. and Wong, K.P. (1998). "Multinationals FDI and Uncertainty: A Comment", *Journal of Multinational Finance Management*, 8, 451-454.

Wheeler, David and Mody, Ashoka. (1992). "International Investment Location Decisions: The case of U.S. firms". *Journal of International Economics*, 33.

Appendix: Data

All the variables used in this paper are in annual frequency. The monthly rate of inflation and real exchange rate are used in the ARCH/GARCH model to generate uncertainty indicators and then aggregated to annual frequency to be used in the foreign direct investment model. The following are list of variables used in the regression analysis. The main source of data for the U.S. foreign direct investment is Bureau of Economic Analysis (BEA) publication (U.S. Direct Investment Abroad: Operations of U.S. Parent Companies and Their Foreign Affiliates (table 17 U.S. Direct Investment Position Abroad on a Historical-Cost Basis). All other variables except bilateral trade, bilateral investment treaty, membership in multilateral investment guarantee, and political instability are taken from the World Development Indicators and International Financial Statistics of International Monetary Fund (IMF) CD-ROMs. Data on bilateral trade (export and import) is taken from direction of trade statistical yearbook; bilateral investment treaty and membership in multilateral investment guarantee agency is compiled from United Nations and World Bank publications (UN, Bilateral Investment Treaties 1959-1999, 2000; World Bank, Convention Establishing the Multinational Investment Guarantee Agency (MIGA), 2001). The Freedom House provided the political instability indicator (Freedom House, Annual Survey of Freedom Country Ratings 1972-73 to 1999-00, 2001).

The variables are annual net total foreign direct investment (NFDI) from 1987-1999, U.S. net foreign direct investment, U.S. manufacturing FDI, U.S. non-manufacturing FDI from 1987-1998, monthly consumer price index from 1987-1999, monthly real exchange rate[22] from 1987-1999, international tourism receipts, and political freedom index for the sample African economies. Other control variables including economically active labor force (LFT), literacy rate (LITRAR), growth rate of real gross domestic product per capita, dummy for periods of membership in Multilateral Investment Guarantee Agency (MIGA), number of bilateral investment treaties signed by the host countries (BIT), dummy for the bilateral investment treaty between U.S. and host country (USBIT), external debt (EDEBT), telephone main lines per 1000 people (TELM), and GDP per capita. To account for the size of the host economies, most variables are normalized by the GDP of a host country.

The following variables are used in the regression:

Dependent variables

RNFDI= ratio of net foreign direct investment in host a country to gross domestic product [23].

RUSFDI=ratio of U.S. net foreign direct investment in a host country to gross domestic product

RUSFDIM= ratio of U.S. net foreign direct investment in the manufacturing sector in a host country to gross domestic product.

---

[22] Real exchange rate is computed by multiplying the nominal exchange rate of a host country by the ratio of U.S. CPI to host country CPI.

[23] Net of inflow and outflow is used in this paper; in similar studies authors used only inflow, however, in countries where outflow is large using only inflow will bias the result. For the case of African economies, since outflow is very minimal use of net inflow will not bias the result.

RUSFDINM=ratio of U.S. net foreign direct investment in the non-manufacturing sector in a host country to gross domestic product.

Economic uncertainty indicators

VINF= conditional variance of inflation generated by GARCH (p, q) model from the monthly inflation rate of host countries and aggregated to annual frequency to relate it to the FDI model.

VRER = conditional variance of real exchange rate generated by the GARCH (p, q) model.

INFSTD= Standard deviation of inflation rate for each host country.

RERSTD= Standard deviation of real exchange rate for each host country.

Investor's confidence indicator

REDEBT= ratio of total external debt of a host country to GDP.

RINTOUE= receipts from international tourist arrivals as a ratio to total exports

Labor force availability

RLFT= ratio of economically active labor force with age between 15-64 to total population.

LITRAR= persons able to read and write as a percent of people ages 15 and above.

Domestic market size, cost of capital, technology and infrastructure

GDPPC= GDP per capita, which is given by GDP divided by total population of the host country.

RLR= real leading rate defined as nominal leading rate minus inflation.

TVADD= total value added (total production-capital formation) per economically active population.

TELM= telephone mainlines per 1000 people.

Political freedom and government commitment indicators

POLI= political freedom indicators measured on a one-to-seven scale, with one representing the highest degree of political freedom and seven the lowest.

MIGA= dummy variable for periods of membership in Multilateral Investment Guarantee Agency (MIGA); it takes value of 1 for the years that a host country signed the agreement and 0 otherwise.

BIT = number of bilateral investment treaty among host country and all other countries.

USBIT= dummy variable for bilateral investment treaty between U.S. and a host country.

Size of export sector indicators

REXPO= ratio of value of total export of goods and services to GDP.

DMINI= dummy variable for countries with a large mining sector that exports minerals and other natural resources; it takes value of 1 for countries with such large mining sector and 0 for others. Countries listed with large mining sector are Algeria, Morocco, Tunisia, Egypt, Mozambique,

Nigeria, Madgascar, South Africa, Ghana, Zimbabwe, Tanzania, Zambia, Democratic Republic of Congo, Angola, Sierra Leone, Namibia, Zambia, and Botswana.

NREXPO=ratio of total export of a host country net of export to U.S. to GDP.
REXPOTUS=ratio of export to U.S. to GDP
RIMPOFUS= ratio of import from U.S. to GDP.

Table 1A.
Estimation Results of GARCH to Generate Variances for the Inflation Rate

Country	Autoregresive process	Kurtosis of residual	GARCH model	Coefficients of GARCH				
				α_1	α_2	α_3	α_4	θ
ALGERIA@	AR (1)	5.94	GARCH (q=(2), p=1)		0.1* (1.78)			0.84*** (10.6)
BOTSWANA	AR (12)	6.33	GARCH (q=2, p=1)	-0.0001*** (-8.7)	0.0001*** (24)			0.002 (0.42)
BURKINAF	AR (1)	4.62	GARCH (q=1, p=1)	0.14* (1.95)				0.44 (1.43)
CAMEROON	AR (12)	13.17	GARCH (q=1)	1.49*** (4.54)				
CHAD	AR (12)	9.91	GARCH (q=1)	0.51*** (3.19)				
CONGODR	AR (12)	110.81	GARCH (q=(3))			1.96* (1.77)		
CONGOR	AR (12)	23.09	GARCH (q=2)	1.09*** (6.79)				
COTEDIVORE	AR (3)	6.88	GARCH (q=1)	0.26*** (2.75)				
EGYPT@	AR (12)	8.12	GARCH (q=1)	0.53*** (2.87)				
ETHIOPIA	AR (12)	7.65	GARCH (q=1, p=1)	1.67*** (5.40)				0.19*** (3.41)
GABON	AR (12)	4.60	GARCH (q=1, p=1)	0.12* (1.9)				0.82*** (7.02)
GHANA	AR (12)	9.88	GARCH (q=1)	2.47*** (7.26)				
GUINEA	AR (12)	43.81	GARCH (q=1)	3.48*** (6.85)				
KENYA	AR (12)	7.27	GARCH (q=(1 3), p=1)	0.42*** (2.71)			0.31*** (2.27)	0.41*** (3.14)
MADAGASCAR	AR (12)	7.56	GARCH (q=1, p=1)	0.47*** (4.02)				0.66*** (9.83)
MALAWI	AR (12)	5.04	GARCH (q=1)	0.62*** (4.16)				
MAURITIUS	AR (12)	5.30	GARCH (q=1)	0.61*** (3.55)				
MOROCCO@	AR (12)	4.08	GARCH (q=(2), p=1)	0.12 (1.38)				0.77*** (5.95)
MOZAMBIQUE	AR (12)	20.92	GARCH (q=(3))			2.4*** (4.1)		
NAMIBIA	AR (12)	11.50	GARCH (q=1)	2.31*** (3.75)				
NIGER	AR (12)	10.70	GARCH (q=1)	0.81*** (4.37)				
NIGERIA@	AR (12)	9.67	GARCH (q=(3))			0.89*** (3.68)		
SENEGAL	AR (12)	12.63	GARCH (q=1, p=1)	0.23*** (3.1)				0.80*** (16.93)
SIERRALEONE	AR (12)	19.98	GARCH (q=(3))			0.39*** (2.79)		
SOUTHAFRICA@	AR (12)	4.79	GARCH (q=2, p=1)	0.38*** (2.67)	-0.01*** (-3.11)			0.02*** (2.83)
SWAZILAND	AR (12)	6.77	GARCH (q=1)	0.14* (1.72)				
TANZANIA	AR (4)	31.13	GARCH (q=1)	0.29* (1.66)				
TOGO	AR (12)	69.27	GARCH (q=1)	1.10*** (4.34)				
TUNISIA@	AR (12)	5.33	GARCH (q=1, p=1)	0.15* (1.92)				0.79*** (9.75)
UGANDA	AR (1)	11.76	GARCH (q=1, p=1)	0.39*** (3.92)				0.69*** (11.29)
ZAMBIA	AR (12)	5.92	GARCH (q=1, p=1)	2.47*** (5.89)				0.12*** (3.86)
ZIMBABWE	AR (12)	16.78	GARCH (q=1, p=1)	0.001 (0.0001)				0.001 (0.0001)

*P<0.10, **P<0.05, ***P<0.01

Note: First the series for all countries are tested for stationarity, and where needed appropriate differencing is made to get stationary series. Autoregressive (AR) processes of each series is selected based on Akiakie information criteria (AIC) as reported in the second column. Residuals from the AR process are first tested for white noise and then for presence of ARCH. Only two countries fail the test for presence of ARCH (Botswana and Togo). Values in parentheses are t-ratios.

@ Countries excluded from the full sample to form Sub-Saharan Africa sub-sample.

Table 1B.
Estimation Results of GARCH to Generate Variances for the Real Exchange Rate

	Autoregressive proces	Kurtosis of residual	GARCH model	fffCCoeffi Coe coefficients of GARCH				
				α_1	α_2	α_3	α_4	θ
ALGERIA@	AR(1)	25.32	GARCH (q=1)	1.24*** (4.86)				
BOTSWANA	AR(12)	14.16	GARCH (q=1, p=1)	0.81*** (6.97)				0.19** (2.27)
BURKINAF	AR(1)	111.76	GARCH (q=1, p=1)	0.17 (1.43)				0.52 (1.57)
CAMEROON	AR(1)	97.40	GARCH (q=1, p=1)	0.23*** (3.83)				0.66 (8.03)
CHAD	AR(2)	112.53	GARCH (q=1, p=1)	0.53*** (2.76)				0.17 (1.02)
CONGODR	AR(12)	22.99	GARCH (q=1)	1.32* (1.86)				
CONGOR	AR(12)	42.99	GARCH (q=1)	0.008 (0.05)				
COTEDIVORE	AR(1)	107.44	GARCH (q=1, p=1)	0.20** (2.26)				0.69*** (5.64)
EGYPT@	AR(12)	44.65	GARCH (q=1, p=1)	2.92*** (8.2)				0.09 (1.62)
ETHIOPIA	AR(1)	115.60	GARCH (q=1, p=1)	0.001*** (5.17)				0.41*** (6.10)
GABON	AR(9)	71.41	GARCH (q=1)	0.10 (0.98)				
GHANA	AR(12)	8.24	GARCH (q=3)	0.15* (1.74)	0.14* (1.90)	0.75*** (3.81)		
GUINEA	AR(12)	94.12	GARCH (q=1)	2.63 (1.44)				
KENYA	AR(12)	9.03	GARCH (q=1, p=1)	1.45*** (5.40)				0.1 (1.54)
MADAGASCAR	AR(1)	45.81	GARCH (q=1)	1.001*** (4.37)				
MALAWI	AR(12)	13.23	GARCH (q=1)	1.51*** (5.07)				
MAURITIUS	AR(1)	3.47	GARCH (q=(3), p=1)				0.04 (0.92)	0.92*** (8.42)
MOROCCO@	AR(12)	4.52	GARCH (q=(2), p=1)		0.47*** (3.45)			0.38*** (2.67)
MOZAMBIQUE	AR(12)	32.47	GARCH (q=1)	1.03* (1.81)				
NAMIBIA	AR(12)	8.13	GARCH (q=1, p=1)	1.01*** (5.03)				0.054 (0.60)
NIGER	AR(12)	114.75	GARCH (q=(2))	0.23** (2.07)				
NIGERIA@	AR(12)	46.11	GARCH (q=1, p=1)	0.001 (0.05)				0.02 (0.01)
SENEGAL	AR(12)	101.70	GARCH (q=1)	1.37* (1.65)				
SIERRALEONE	AR(12)	18.98	GARCH (q=1)	0.11 (1.19)				
SOUTHAFRICA@	AR(12)	11.78	GARCH (q=1, p=1)	0.87*** (4.18)				0.35*** (4.48)
SWAZILAND	AR(12)	13.63	GARCH (q=1, p=1)	0.54*** (4.44)				0.57*** (9.15)
TANZANIA	AR(7)	11.70	GARCH (q=1)	0.93*** (3.95)				
TOGO	AR(12)	97.79	GARCH (q=1)	0.14* (1.72)				
TUNISIA@	AR(4)	3.54	GARCH (q=(2))		0.17 (1.58)			
UGANDA	AR(12)	10.76	GARCH (q=1)	0.29* (1.87)				
ZAMBIA	AR(12)	24.53	GARCH (q=1)	0.92 (1.60)				
ZIMBABWE	AR(12)	16.57	GARCH (q=1, p=1)	0.81*** (4.18)				0.48*** (5.26)

*P<0.10, **P<0.05, ***P<0.01

Note: First the series for all countries are tested for stationarity, and where needed appropriate differencing is made to get stationary series. Autoregressive (AR) processes of each series is selected based on Akiakie information criteria (AIC) as

reported in the second column. Residuals from the AR process are first tested for white noise and then for presence of ARCH. All the countries listed in the table passed the test.

@ Countries excluded from the full sample to form Sub-Saharan Africa sub-sample.

Table 2.
Regression Results of the Fixed Effects Model of Net Foreign Direct Investment
Specifications:
Total Net Foreign Direct Investment (RNFDI)
Using Conditional Variance from GARCH (p, q)

	Full Sample		Sub-Saharan Africa[a]	
Variable (description)	Coefficient	t-ratio	Coefficient	t-ratio
POLI (political instability)	17.49	0.57	58.78*	1.69
POL2	-1.37	-0.42	-6.02*	-1.69
VINF (variance of inflation)	-0.001	-0.68	-0.0016	-1.31
VINF2	0.001	1.08	0.0001	0.99
VRER (real exchange rate variance)	0.16	1.61	0.15	1.62
VRER2	0.001*	1.84	0.0001**	1.97
POLIRERA (interaction term)	-0.07	-1.52	-0.07	-1.52
POLIINFA (interaction term)	0.001	0.71	0.0002	0.97
DEBTINF (debt inflation interaction)	-0.001	-0.75	-0.0003	-0.505
DEBTRER(debt exchange rate interaction)	-0.12	-1.31	-0.11	-1.21
RLR (real lending rate)	-0.006*	-1.91	0.008**	-2.56
GDPPC (GDP per capita)	-0.19	-0.97	-0.27	-1.43
TVADD (per capita productivity)	11.51	1.38	17.12*	1.69
BIT (Investment treaty)	-3.37	-0.78	1.79	0.15
MIGA (Investment Guarantee)	-29.65	-1.36	-60.69**	-2.33
TELM (Telephone main lines)	0.04	0.04	0.20	0.14
RLFT (labour force)	-3786***	-3.04	-4897***	-2.78
LITRAR (literacy rate)	11.19***	4.89	14.1***	4.88
RINTOUE (international touristes)	0.04***	2.62	0.05	1.53
REDEBT (external debt)	-113.86**	-2.07	-186.1***	-2.89
REXPO (total export)	114.17**	2.08	186.47**	2.89
No. of Countries	29		23	
No. of Observations	406		325	
Fixed effects	Yes		YES	
F (regression)	23.2***		23.77***	
Adjusted R-square	0.73		0.75	

*P<0.10 **P<0.05 ***P<0.01

[a]Full sample excluding Egypt, Algeria, Morocco, Tunisia, Nigeria and South Africa

Table 3.
Regression Results of the Fixed Effects Model of Net Foreign Direct Investment Specifications:
Total Net Foreign Direct Investment (RNFDI)
Using Unconditional Standard Deviation

	Full Sample		Sub-Saharan Africa[a]	
Variable (description)	Coefficient	t-ratio	Coefficient	t-ratio
POLI (political instability)	15.973	0.516	55.495	1.565
POL2	-0.747	-0.226	-4.951	-1.355
INFSTD (variance of inflation)	0.061	0.591	0.017	0.163
INF2	0.0001	-0.571	0.0001	-1.647
RERSTD (real exchange rate variance)	0.08	0.901	0.049	0.550
RER2	0.0001	1.181	0.0001	0.622
POLIRER (interaction term)	-0.015*	-1.900	-0.013	-1.607
POLIINF (interaction term)	-0.04*	-1.703	-0.05**	-2.036
DEBTINFS (debt inflation interaction)	-0.018	-0.513	-0.023	-0.616
DEBTRERS (debt exchange rate interaction)	0.119	1.073	0.19*	1.692
RLR (real lending rate)	-0.031	-1.150	-0.011	-0.400
GDPPC (GDP per capita)	-0.216	-1.088	-0.278	-1.507
TVADD (per capita productivity)	124.1	1.520	186.68*	1.874
BIT (Investment treaty)	-2.951	-0.707	1.841	0.165
MIGA (Investment Guarantee)	-37.3*	-1.670	-74.2***	-2.818
TELM (Telephone main lines)	0.003	0.004	0.011	0.007
RLFT (labour force)	-3903.6***	-3.075	-5215.9***	-2.893
LITRAR (literacy rate)	12.855***	5.354	16.66***	5.499
RINTOUE (international touristes)	0.043***	2.754	0.057*	1.686
REDEBT (external debt)	-85.569*	-1.912	-160.17***	-3.057
REXPO (total export)	85.689*	1.916	160.27***	3.060
No. of Countries	29		23	
No. of Observations	406		325	
Fixed effects	YES		YES	
F (regression)	23.39***		23.87***	
Adjusted R-square	0.74		0.76	

*P<0.10 **P<0.05 ***P<0.01

[a]Full sample excluding Egypt, Algeria, Morocco, Tunisia, Nigeria and South Africa

Table 4.
Regression Results of the Random Effects Model of U.S. Net Foreign Direct Investment
Specifications:
U.S. Net Foreign Direct Investment (RUSFDI)
Using Conditional Variance from GARCH (p, q)[a]

	Random Effects				Tobit Random Effect			
	Full sample		SSA[b]		Full Sample		SSA[b]	
Variable	Coefficient	t-ratio	Coefficient	t-ratio	Coefficient	z-score	Coefficient	z-score
POLI	2.71509	0.96000	4.792	1.274	3.77	0.96	4.99	0.91
POL2	-0.26623	-0.85300	-0.582	-1.424	-0.23	-0.53	-0.38	-0.65
VINF	-0.00005	-0.10600	0.0001	-0.228	0.001	-0.20	0.001	-0.15
VINF2	0.00000	0.61700	0.0001	0.490	0.001	0.02	0.001	0.17
VRER	-0.04092	-0.52200	-0.038	-0.476	0.03	0.11	0.001	-0.01
VRER2	0.00001	0.29800	0.0001	0.202	0.001	0.17	0.001	-0.03
POLIRERA	-0.00237	-0.20900	0.0001	-0.005	0.001	-0.12	0.001	-0.03
POLIINFA	0.00001	0.19100	0.0001	0.318	0.001	0.10	0.001	0.15
DEBTINF	-0.00007	-0.51900	0.0001	-0.453	0.001	0.09	0.001	-0.09
DEBTRER	0.02198	0.60500	0.017	0.444	-0.02	-0.10	0.01	0.05
RLR	-0.00017	-0.25600	0.0001	-0.359	0.001	-0.27	0.001	-0.02
GDPPC	0.00210	0.83400	0.004	0.858	-0.02	-0.79	-0.01	-0.20
REXPTUS	-0.03380***	-2.77800	-0.047***	-2.979	-33.1	-0.88	-91.81	-1.29
RIMPFUS	0.15328*	1.67400	0.125	1.184	265.2*	1.87	201.39	1.08
TVADD	0.00393	0.60100	0.0001	-0.026	4.31	0.50	6.79	0.20
USBIT	4.01165	1.11400	11.149**	2.103	3.30	0.67	10.16	1.32
MIGA	4.74529**	2.30300	0.896	0.376	11.60***	3.51	5.99	1.59
TELM	-0.00425	-0.07200	-0.004	-0.050	0.17*	1.89	0.06	0.51
RLFT	35.14206	0.92500	69.398	0.942	23.61	0.39	125.07	1.46
LITRAR	-0.01543*	-1.70700	-0.015	-1.118	0.15	1.28	0.04	0.30
RINTOUE	0.00581	1.23400	0.004	0.832	-26867***	-3.26	-20420*	-1.90
REDEBT	-0.01331	-0.34800	-0.008	-0.192	-8.46**	-2.07	-1.81	-0.34
NREXPO	0.03396***	2.78200	0.049***	3.111	32.16**	2.29	47.50***	2.93
Constant	-17.72422	-0.90600	-33.710	-0.944	-29.78	-0.92	-81.24*	-1.72
No. of Countries	29		23		29		23	
No. of Observations	310		250		310		250	
R-squared	0.18		0.24					
LM test	90.59***		78.8***					
Wald χ^2					46.07***		27.88	

*P<0.10 **P<0.05 ***P<0.01

[a] t-ratios are used for the standard random effects model and z-score for the Tobit random effects model (normality is assumed here).

[b]Full sample excluding Egypt, Algeria, Morocco, Tunisia, Nigeria and South Africa

Table 5.
Regression Results of the Random Effects Model of U.S. Net Foreign Direct Investment
Specifications:
U.S. Net Foreign Direct Investment (RUSFDI)
Using Unconditional Standard Deviation

	Random Effects				Tobit Random Effect			
	Full sample		SSA[a]		Full Sample		SSA[a]	
Variable	Coefficient	t-ratio	Coefficient	t-ratio	Coefficient	z-score	Coefficient	z-score
POLI	1.057	0.361	3.441	0.913	2.64	0.68	2.51	0.46
POL2	-0.095	-0.298	-0.422	-1.033	-0.17	-0.41	-0.20	-0.34
INFSTD	0.060**	2.472	0.058**	2.304	0.05	0.38	0.04	0.31
INF2	0.0001	-0.064	0.0001	0.021	0.001	1.31	0.001	1.50
REXRSTD	-0.006	-0.574	-0.01	-0.918	-0.26***	-2.80	-0.26***	-2.85
RER2	0.0001	-0.796	0.0001	-0.472	-0.001***	-2.23	0.001**	-2.35
POLIRER	0.001	0.836	0.001	0.963	0.01	1.23	0.01	1.18
POLIINF	-0.012*	-1.789	-0.013*	-1.892	0.01	0.30	0.01	0.49
DEBINFS	0.013	0.579	0.016	0.715	-0.05	-1.51	-0.07*	-1.86
DEBRERS	0.002	0.638	0.003	0.850	0.11***	2.80	0.12***	2.98
RLR	0.004	0.624	0.003	0.541	0.001	0.45	0.001	0.45
GDPPC	-0.003	-0.886	-0.004	-0.889	-0.01	-0.73	-0.03	-0.38
REXPTUS	-0.053***	-3.972	-0.047***	-3.129	-54.29	-1.44	-141	-1.98
RIMPFUS	0.141	1.396	0.120	1.076	202.87	1.47	117.02	0.64
TVADD	0.0001	0.029	-0.009	-0.989	2.87	0.33	12.04	0.38
USBIT	2.376	0.615	10.787**	2.114	2.20	0.44	7.95	1.07
MIGA	5.087**	2.409	0.646	0.268	10.56***	3.25	5.41	1.48
TELM	0.072	1.108	0.076	1.051	0.19**	2.10	0.07	0.63
RLFT	2.791	0.061	-7.538	-0.125	18.66	0.30	140.85*	1.73
LITRAR	-0.057***	-3.367	-0.060***	-3.214	0.19*	1.72	0.09	0.75
RINTOUE	0.001	0.256	0.002	0.487	-29774***	-3.56	-26536**	-2.52
REDEBT	-0.007	-0.294	-0.015	-0.603	-9.81**	-2.40	-2.45	-0.49
NREXPO	0.054***	4.021	0.049***	3.232	27.09*	1.93	41.68**	2.63
Constant	6.192	0.264	9.542	0.311	-16.42	-0.49	-74.95*	-1.65
No. of Countries	29		23		29		23	
No. of Observations	310		250		310		250	
R-square	0.23		0.31					
LM test	79.28***		67.3***					
Wald χ^2					56.68***		39.12**	

*P<0.10 **P<0.05 ***P<0.01

[a] Full sample excluding Egypt, Algeria, Morocco, Tunisia, Nigeria and South Africa

Table 6.
Regression Results of the Random Effects Model of U.S. Net Foreign Direct Investment Specifications:
Manufacturing Net Foreign Direct Investment (RUSFDIM)
Using Conditional Variance from GARCH (p, q)

	Random Effects				Tobit Random Effect			
	Full sample		SSA[a]		Full Sample		SSA[a]	
Variable	Coefficient	t-ratio	Coefficient	t-ratio	Coefficient	z-score	Coefficient	z-score
POLI	9.390*	1.681	6.363	0.676	3.78**	2.65	5.66**	2.01
POL2	-1.122*	-1.800	-0.951	-0.933	-0.46***	-2.92	-0.63**	-2.07
VINF	0.0001	0.094	0.0001	0.114	0.03	0.69	0.02	1.33
VINF2	0.0001	0.252	0.0001	0.072	0.001	-0.72	0.001	-1.49
VRER	-0.034	-0.204	-0.073	-0.376	-0.14	-0.66	-0.37	-1.10
VRER2	0.0001	-0.221	0.0001	-0.171	0.001	-0.08	0.001	-0.34
POLIRERA	-0.002	-0.092	0.011	0.377	0.001	0.31	0.001	0.05
POLIINFA	0.0001	-0.032	0.0001	-0.062	0.001	-0.69	0.001	-1.30
DEBTINF	0.0001	-0.248	0.0001	-0.108	-0.01	-0.67	0.001	-1.16
DEBTRER	0.035	0.460	0.013	0.137	0.07	0.62	0.21	1.18
RLR	0.0001	0.059	0.0001	-0.036	0.001	-0.55	0.001	0.07
GDPPC	0.001	0.194	0.0001	0.005	-0.01	-0.67	0.07	2.02
REXPTUS	-0.006	-0.320	0.001	0.014	-19.6*	-1.99	-59.97	-1.46
RIMPFUS	0.147	0.867	-0.081	-0.310	-13.11	-0.22	75.87	0.78
TVADD	0.003	0.397	0.003	0.038	1.75	0.47	-31.7**	-2.09
USBIT	-4.506	-0.709	-0.95	-0.067	2.80	1.54	0.83	0.25
MIGA	7.966*	1.852	11.2*	1.901	4.61***	3.14	4.55*	1.91
TELM	0.103	0.929	-0.009	-0.044	0.08	1.46	-0.24	-0.93
RLFT	50.922	0.999	453.1	1.479	0.08	0.001	4.27	0.12
LITRAR	0.008	0.689	0.024	0.348	0.10**	2.56	0.19***	3.45
RINTOUE	0.016*	1.897	0.006	0.452	-4604**	-2.04	-3238	-0.77
REDEBT	-0.022	-0.279	-0.013	-0.099	0.32	0.22	2.30	1.15
NREXPO	0.012	0.622	-0.003	-0.077	6.30	1.47	18.98**	2.47
Constant	-36.281	-1.238	-208.5	-1.437	-19.52	-1.64	-37.94*	-1.86
No. of Countries	29		23					
No. of Observations	310		250					
R-square	0.99		0.10					
LM test	121.6***		76.1***					
Wald χ^2					64.27***		71.23***	

*P<0.10 **P<0.05 ***P<0.01

[a] Full sample excluding Egypt, Algeria, Morocco, Tunisia, Nigeria and South Africa

Table 7.
Regression Results of the Random Effects Model of U.S. Net Foreign Direct Investment
Specifications:
Manufacturing U.S. Net Foreign Direct Investment (RUSFDIM)
Using Unconditional Standard Deviation

	Random Effects				Tobit Random Effect			
	Full sample		SSA[a]		Full Sample		SSA[a]	
Variable	Coefficient	t-ratio	Coefficient	t-ratio	Coefficient	z-score	Coefficient	z-score
POLI	6.837	1.095	26.6***	3.600	3.79***	2.72	5.48*	1.75
POL2	-0.911	-1.327	-2.904***	-3.552	-0.48***	-3.12	-0.62**	-1.94
INFSTD	-0.018	-0.392	-0.048	-1.233	0.09	0.43	0.60	1.25
INF2	0.0001	0.076	0.0001	-0.324	0.001	1.11	0.001	1.10
REXRSTD	0.003	0.120	-0.001	-0.034	-0.03	-0.68	-0.14	-2.25
RER2	0.0001	-0.180	0.0001	-0.531	0.001	-1.22	0.001**	-2.03
POLIRER	0.0001	0.208	0.0001	0.169	0.001	0.75	0.01	1.72
POLIINF	0.006	0.407	0.008	0.590	0.001	0.06	-0.05	-1.00
DEBINFS	-0.010	-0.214	-0.003	-0.051	-0.08	-1.40	-0.2	-1.01
DEBRERS	-0.001	-0.168	0.002	0.280	0.01	0.72	0.06*	1.94
RLR	0.001	0.050	-0.002	-0.175	-0.01	-1.17	0.001	0.03
GDPPC	0.003	0.438	0.008	1.545	0.001	-0.20	0.08**	2.25
REXPTUS	-0.003	-0.107	-0.004	-0.152	-15.25*	-1.93	-81.7*	-1.89
RIMPFUS	0.061	0.291	0.183	0.801	19.41	0.37	77.25	0.77
TVADD	0.005	0.390	0.007	0.698	0.04	0.01	-36.1**	-2.28
USBIT	-1.577	-0.201	-10.14	-1.338	2.14	1.28	1.17	0.35
MIGA	8.482*	1.858	6.856	1.289	4.79***	3.23	5.30**	2.19
TELM	0.066	0.491	-0.007	-0.049	0.05	1.03	-0.35	-1.27
RLFT	71.766	0.894	55.9	0.939	-5.34	-0.32	-4.36	-0.12
LITRAR	0.025	0.842	0.046**	2.128	0.11***	3.63	0.19***	3.75
RINTOUE	0.013	1.290	0.020**	2.108	-5355**	-2.51	-4752	-1.13
REDEBT	0.028	0.560	0.012	0.238	-0.74	-0.62	2.19	1.06
NREXPO	0.004	0.156	0.016	0.636	11.76***	2.75	18.57**	2.47
Constant	-40.215	-0.928	-79.9**	-2.165	-18.18*	-1.79	-33.49	-1.57
No. of Countries	29.000		23		29		23	
No. of Observations	310		250		310		250	
R-square	0.11		0.11					
LM test	104.1***		63.8***					
Wald χ^2					84.3***		63.48***	

*P<0.10 **P<0.05 ***P<0.01

[a] Full sample excluding Egypt, Algeria, Morocco, Tunisia, Nigeria and South Africa

Table 8.
Regression Results of the Random Effects Model of U.S. Net Foreign Direct Investment Specifications:
Non-Manufacturing U.S. Net Foreign Direct Investment (RUSFDINM)
Using Conditional Variance from GARCH (p, q)

	Random Effects				Tobit Random Effect			
	Full sample		SSA[a]		Full Sample		SSA[a]	
Variable	Coefficient	t-ratio	Coefficient	t-ratio	Coefficient	z-score	Coefficient	z-score
POLI	69.568	0.494	215.114	1.146	-0.27	-1.00	0.22	0.36
POL2	-13.244	-0.845	-24.245	-1.176	0.03	0.97	-0.02	-0.23
VINF	0.035	1.380	0.034	1.297	0.001	0.25	0.001	-0.12
VINF2	0.0001***	4.721	0.0001***	4.236	0.001	0.31	0.001	-0.08
VRER	11.682***	2.810	14.19***	3.293	0.01	0.67	0.04	1.36
VRER2	0.005**	1.964	0.006**	2.442	0.001	-0.66	0.001	0.73
POLIRERA	-1.795***	-3.039	-1.903***	-3.096	0.001	-0.28	0.001	-0.69
POLIINFA	-0.002	-0.506	-0.002	-0.470	0.001	-0.23	0.001	0.12
DEBTINF	-0.028***	-3.984	-0.026*	-3.602	0.001	-0.26	0.001	0.10
DEBTRER	-1.829	-0.969	-3.328*	-1.679	0.001	-0.01	-0.02	-1.08
RLR	-0.093***	-2.661	-0.110***	-3.031	0.001	0.01	0.001	-0.79
GDPPC	0.216**	2.198	0.245**	1.839	-0.01***	-4.69	0.05***	5.00
REXPTUS	-1.041**	-2.015	-0.429	-0.606	1.63	0.82	-46.93**	-2.30
RIMPFUS	17.750***	4.081	5.834	1.082	23.66**	2.42	46.83**	2.37
TVADD	0.659***	2.943	0.473	1.426	3.73***	4.41	-25.20***	-5.15
USBIT	122.259	0.742	-119.3	-0.513	-0.18	-0.49	2.55**	2.19
MIGA	181.867*	1.698	136.3	1.069	0.70**	2.63	0.28	0.55
TELM	-5.341**	-1.890	-9.6***	-2.921	0.04***	4.49	0.001	0.09
RLFT	1260.924	0.913	2573.1	1.225	6.38	1.40	-10.21	-1.18
LITRAR	0.200	0.607	0.553	1.389	0.01*	1.87	0.01	0.56
RINTOUE	0.687***	3.100	0.239	0.951	-12.12	-0.02	-1557.26	-1.53
REDEBT	2.006	1.030	3.22	1.571	-0.40	-1.33	1.55**	2.36
NREXPO	1.141**	2.188	0.54	0.759	1.87	1.42	5.27**	2.44
Constant	-684.531	-0.884	-1581.4	-1.439	-4.93**	-2.02	-0.86	-0.18
No. of Countries	29		23		29		23	
No. of Observations	310		250		310		250	
R-square	0.41		0.35					
LM test	51.1		57.5***					
Wald χ^2					136.13***		80.74	

*P<0.10 **P<0.05 ***P<0.01

[a] Full sample excluding Egypt, Algeria, Morocco, Tunisia, Nigeria and South Africa

Table 9.
Regression Results of the Random Effects Model of U.S. Net Foreign Direct Investment Specifications:
Non-Manufacturing U.S. Net Foreign Direct Investment (RUSFDINM)
Using Unconditional Standard Deviation

	Random Effects				Tobit Random Effect			
	Full sample		SSA[a]		Full Sample		SSA[a]	
Variable	Coefficient	t-ratio	Coefficient	t-ratio	Coefficient	z-score	Coefficient	z-score
POLI	214.286	1.444	63.684	0.276	-0.35	-1.26	-0.63	-0.83
POL2	-28.754*	-1.748	-8.340	-0.335	0.03	0.96	0.05	0.72
INFSTD	-1.571*	-1.645	-2.481	-0.932	-0.03	-0.92	-0.04	-0.80
INF2	-0.0001***	-4.157	-0.0001***	-4.041	0.001	-1.28	0.001	0.60
REXRSTD	1.021*	1.729	0.969	1.446	0.001	-0.48	-0.03	-1.61
RER2	0.0001***	4.007	0.0001***	3.580	0.001*	-1.72	0.001*	-1.96
POLIRER	-0.198***	-4.390	-0.182***	-3.404	0.001	0.92	0.001	0.95
POLIINF	0.480	1.449	0.701	1.259	0.01	1.05	0.01	1.11
DEBINFS	-0.038	-0.032	-0.251	-0.191	-0.01	-1.19	-0.02*	-1.78
DEBRERS	-0.445**	-2.545	-0.503**	-2.561	0.001	0.38	0.02**	1.99
RLR	0.147	0.439	0.132	0.345	0.001	-0.44	0.001	-0.62
GDPPC	0.342***	3.028	0.439	0.958	-0.01***	-4.38	0.05***	4.84
REXPTUS	-1.020*	-1.919	0.100	0.100	0.87	0.46	-41.38**	-2.35
RIMPFUS	26.441***	5.737	7.538	1.103	0.89	0.08	36.78*	1.85
TVADD	0.767***	3.644	0.801	0.592	2.96***	4.04	-26.11***	-5.03
USBIT	50.183	0.303	-39.6	-0.111	0.04	0.10	3.37***	3.15
MIGA	122.9	1.097	131.3	0.903	0.62**	2.30	0.41	0.77
TELM	-6.39**	-2.084	-13.66**	-2.602	0.03***	3.48	0.001	0.17
RLFT	3202.5**	2.284	7865.6	1.161	5.41	1.25	-11.58	-1.35
LITRAR	0.94*	1.766	2.013	0.927	0.02***	3.46	0.001	0.20
RINTOUE	0.591**	2.584	0.280	0.910	172.42	0.34	-1545.06	-1.56
REDEBT	0.689	0.563	0.665	0.299	0.10	0.29	1.22*	1.76
NREXPO	1.209**	2.244	-0.092	-0.093	0.57	0.42	4.50**	2.01
Constant	-1975.9**	-2.367	-3802.2	-1.171	-3.97	-1.60	3.37	0.65
No of Countries	29		23		29		23	
No. of Observations	310		250		310		250	
R-square	0.38		0.33					
LM test	28.9***		25.7***					
Wald χ^2					100.64***		82.02***	

*P<0.10 **P<0.05 ***P<0.01

[a] Full sample excluding Egypt, Algeria, Morocco, Tunisia, Nigeria and South Africa

Figure 1. Residuals of inflation rate in first differences: 1983:1-1999:4

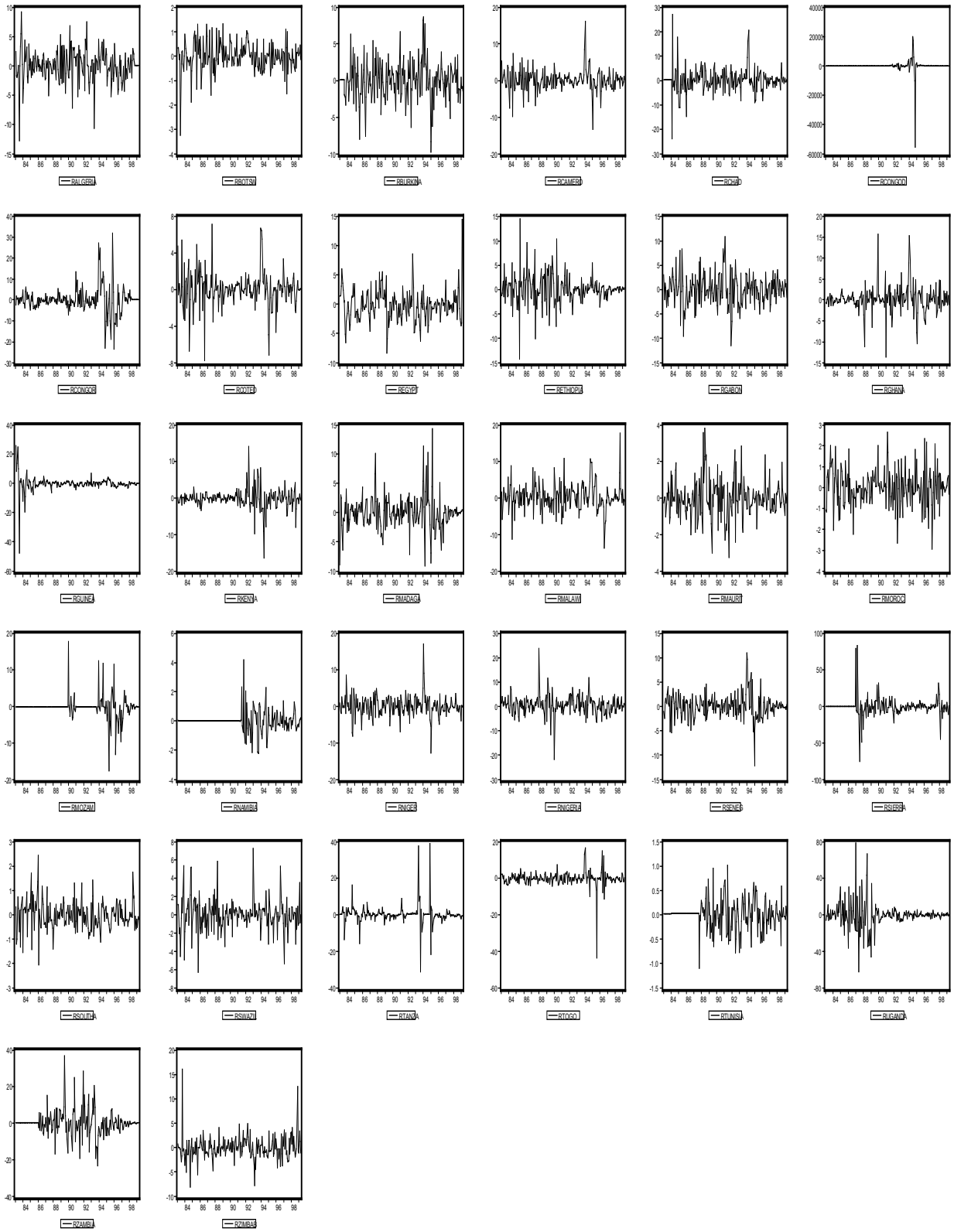

Figure 2. Conditional Variances of inflation rate in first differences:1983:1-1999:4

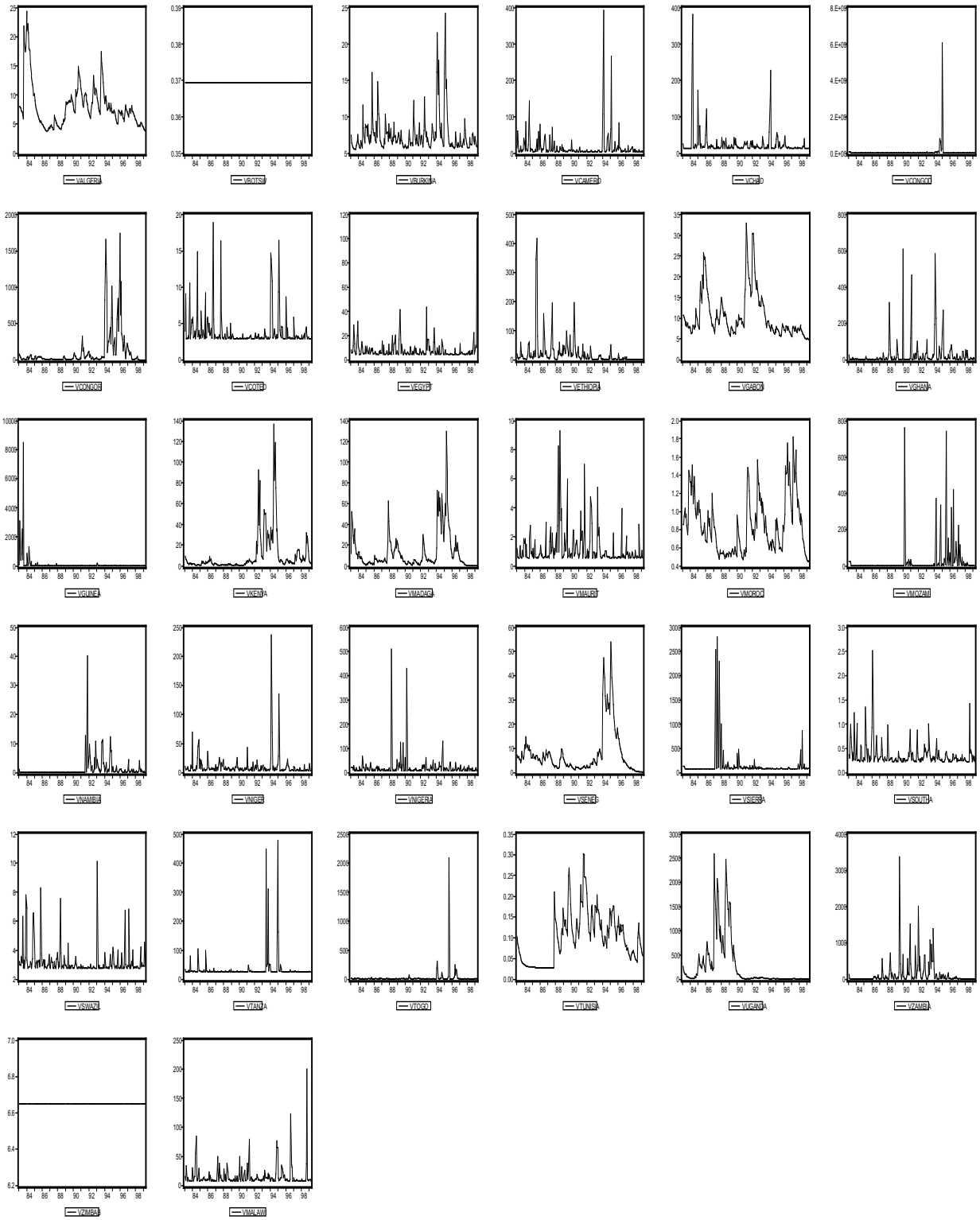

Figure 3. Residuals of real exchange rate in first differences:1983:1-1999:4

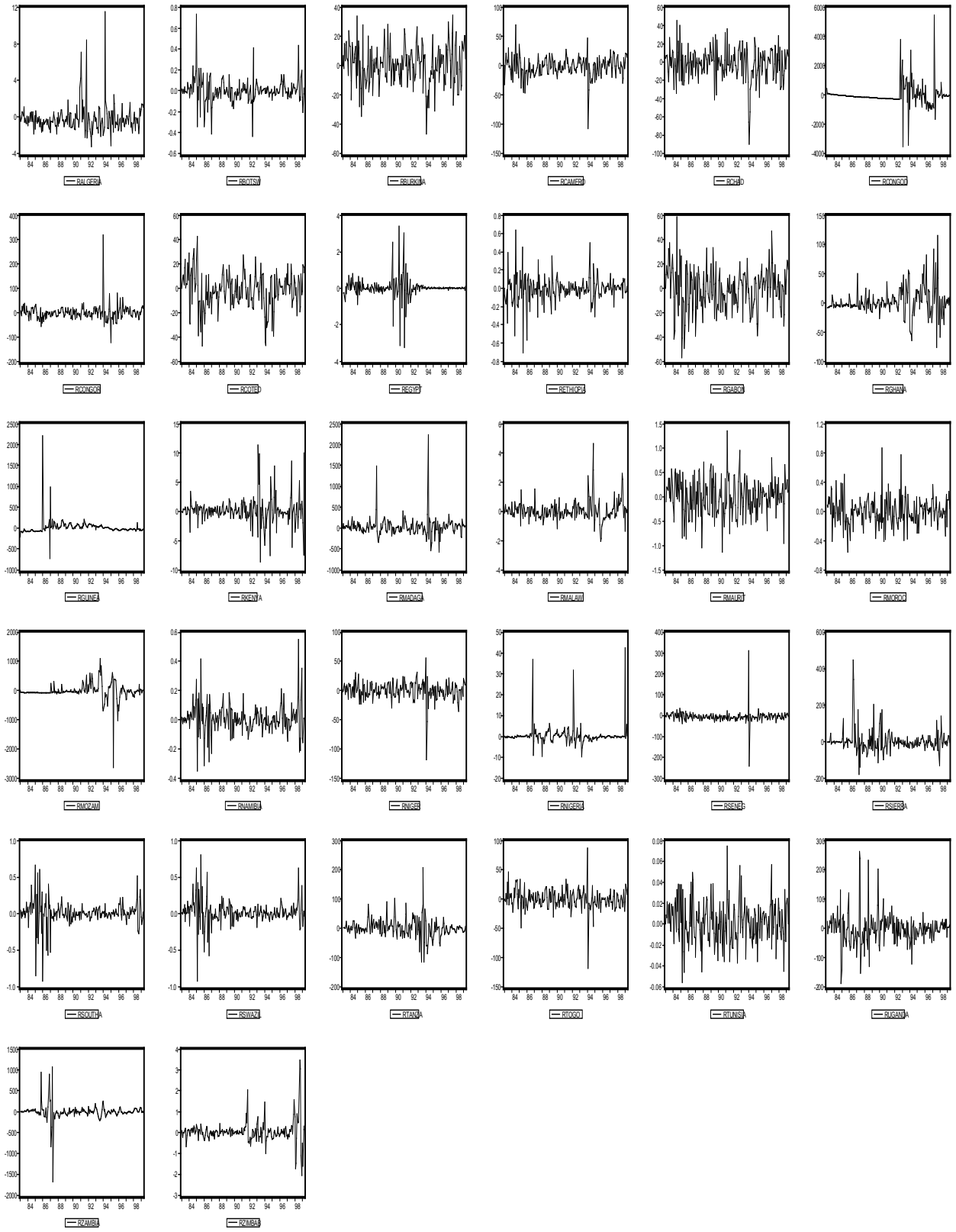

Figure 4. Conditional variance of real exchange rate in first differences: 1983:1-199:4