8-2003

Foreign Direct Investment in Developing Countries: Uncertainty, Trade and Welfare

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FOREIGN DIRECT INVESTMENT IN DEVELOPING COUNTRIES: UNCERTAINTY, TRADE AND WELFARE

by

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A Dissertation
Submitted to the
Faculty of The Graduate College
in partial fulfillment of the
requirements for the
Degree of Doctor of Philosophy
Department of Economics

Western Michigan University
Kalamazoo, Michigan
April 2003

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Western Michigan University, 2002

The objectives of this three-essay thesis are first, to analyze the role of economic and political uncertainty in affecting FDI flows; second, to test competing hypotheses that explain the determinants of sales of affiliates of U.S. multinational firms to alternative destinations; and third, to investigate the welfare impact of FDI flow on local firms in a host country. These issues are interrelated, as uncertainty is one of the main impediments in developing countries to attract foreign direct investment, and uncertainty in turn affects business practices of foreign affiliates in a host country. The combined effects of uncertainty and business practices of affiliate firms can be reflected on the welfare effects of foreign affiliates on local firms in developing countries.

The results of the study reveal that economic and political uncertainty impedes the flow of FDI only when combined with other instability indicators, such as debt burden. Due to these impacts of uncertainty and motives for international tax minimization, foreign affiliates of U.S. multinational firms trade more with other affiliate firms than non-affiliate persons. Efficiency motives are also observed in host countries where there is improved infrastructure and skilled labor. Business practices of

affiliate firms including intra-firm trade and transfer pricing affect the extent of the spillover effects on local firms. The tests for spillover effects of U.S. and Japanese firms show no positive impact on productivity and export of a sample of developing countries.

ACKNOWLEDGMENTS

This dissertation could not have been finished if it were not for the understanding and support of the following people. I would like to thank my dissertation committee chair Prof. Sisay Asefa for the critical discussion and guidance throughout this period of dissertation writing. I am also very grateful to Professor Matthew Higgins for his invaluable comments on the econometric methodology part of this dissertation and Professor Michael Ryan for his suggestions and constructive comments. My thanks also go to Professor Inayat Mangla for helpful discussions and comments

I also would like to thank my family, especially my parents and my wife, for their full support during my years of study. Without them, this dissertation could not have even existed.

My thanks also go to the faculty and staff of the Department of Economics, Western Michigan University for providing me with a friendly working environment. I am also indebted to all my classmates, and graduate students of the Department of Economics for making it easy for me to feel at home.

Adugna Lemi
April 2003

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I. 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 how uncertainty affects capital flows to African economies. Uncertainty may emanate from macroeconomic variables like exchange rates, resource prices, interest rates, and changes in policies and business transactions rules. 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 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 factors, which are 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 associated with major economic indicators. In choosing location and forms of entry, different firms also target different sectors and industrial groups; 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 their 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 marketing the case of African economies; non-manufacturing firms typically enter to provide services for the host country customers, while others follow manufacturing FDI from same source country. Source of input (domestic or foreign) and destination of 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 disaggregated U.S. FDI flows in African economies. Total FDI flow from all source countries, total U.S. FDI flow, U.S. manufacturing[2] FDI flow, and U.S. non-manufacturing[3] FDI flow to a sample of host countries in Africa are analyzed in this study.

This study incorporates economic uncertainty and political instability indicators to examine the role of uncertainty in affecting FDI flow. Uncertainty associated with the inflation rate and the real exchange rate is generated from generalized autoregressive heteroscedasticity (GARCH) models for a sample of host countries, and these indicators

[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, chemicals, metals, machinery and equipment, electronics, and transportation industries.
[3] U.S. non-manufacturing sub-sector includes wholesale trade, banking, finance, insurance and other service industries.

are used with political instability indicators in the FDI model. The contributions of this paper are two fold. First, this study is the first that empirically tests the role of political and economic uncertainty in affecting FDI flows in Africa using GARCH model to generate uncertainty. Second, previous studies did not address responses of disaggregated FDI flows by major industrial groups to political and economic uncertainty, which this paper analyzed. The sample periods of analysis and the number of sample countries used in this paper are relatively longer and larger compared to samples used in previous studies. This study also makes a modest contribution to the emerging policy challenges of FDI in Africa and the role that the U.S. can play in that regard.

The results of the study show that 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 flow, political instability, and real exchange rate uncertainty are the major impediments. Inflation uncertainty impedes flows of U.S. manufacturing FDI only when combined with political instability and external debt burden. Whereas for U.S. non-manufacturing FDI, both exchange rate and inflation uncertainties are the major impediments only when they occur with political instability and debt burden of host countries. Other economic factors such as labor, trade connection, external debt burden, size of export sector, and market size are also significant in affecting FDI flow to African economies.

Section II presents a review of theoretical and empirical literature on the relationship between uncertainty and FDI. Section III 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.

II. 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 they are 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) pointed out three factors for a slow capital inflow to capital scarce countries- differences in human capital, external benefits of human capital, and capital market imperfections. Lucas labeled these factors as political risk.

In deciding to enter a host country through FDI, firms consider not only uncertainties that emanate from macroeconomic variables, but also political, social, and institutional instabilities are also be a major concern for foreign investors. In developing countries, these political and institutional factors are a main factors affecting investors' confidence, which is exaggerated by market failure that results in price and exchange rate uncertainty. Some uncertainty measures affect only particular industries and source countries, due to 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

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

investors' risk attitudes and the source of volatility. Most of these studies focus 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 considerably if one considers disaggregated industrial groups and different source countries.

There are arguments and empirical results for the different possible directions of relationships between economic uncertainty and FDI. The objectives of multinational firms to diversify location of production (increase market share) and to have the option of production flexibility often lead to the conclusion of a 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 the expected marginal productivity (return) to factors of production (capital), which supports the positive sign of uncertainty impact on FDI inflow as well (Abel, 1983). A 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 that economic 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

[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).

capacity in a general equilibrium framework to study the behavior of capital stock, output, and price. They found that 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 (1989) 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 models developed by Itagaki (1981) under various tax structure and covered forward exchange, Goldberg and Kolstad (1995) under the 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 concluded that in response to (exchange rate) risk, multinational firms

reduce exports to the foreign country, but offset 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's results showed that uncertainty in the cost of production deters FDI inflow. His model predicted that 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 is of some concern following the Asian and Latin American financial crises of 1997 and 1998. Lipsey (2001) studied responses of FDI flow during the period of financial crisis and found no change. Edgington and Hayter (2001) also found that Japanese FDI into Asia has been steady during periods of crisis. This may be due to the hysteresis effect of Dixit (1989), under which 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 a sample of developing countries. These studies

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[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 basis that different assumptions about functional forms of the utility function change the findings.

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

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

conclude that a negative connection exists between uncertainty and FDI in developing countries. Previous studies found a negative impact of real exchange rate volatility on FDI inflow; for instance, study by Ramsasmy (1999) for Malaysia, and by Serven (1998) for a sample of developing countries. Most empirical works lump together all forms of private investment (foreign and domestic) to analyze effects of uncertainty. Some examples are studies by Serven (1998) and Dehn (2000) for cases of developing economies. Serven took a sample of 94 developing countries to see the impact of uncertainty on total private investment and concluded that the 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.

Few studies addressed 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 uncertainties play in the case of African economies. Asiedu (2002) showed that for Africa, unlike other developing countries, infrastructure and rate of return are important to attract FDI. However, none of these works formally addresses the impact of both economic and political uncertainty for representative countries and sample periods in the context of African economies. A recent study by Rogoff and Reinhart (2002) shows the importance of currency crashes and hyperinflation in affecting FDI flow to Africa. They also compared the episodes of crashes and hyperinflation to other regions and concluded that the case of Africa is different.

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 FDI, 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 often used in studying volatility, as they generate 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.

III. MODEL AND ECONOMETRIC SPECIFICATION

3.1. Model

Following the model developed by Goldberg and Kolstad (1995), which incorporates both 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:

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

where $p(q)$ is total demand in the host country for the product of affiliate firm, q is total output by the multinational firm, q_d and q_f are home and foreign capacity[10] costs respectively, $\boldsymbol{d}$ is demand shock, and e is exchange rate (local currency per foreign currency) of a host country. Typically, the firm decides on the level of production both in the domestic market and abroad before uncertainty is resolved. The model becomes more complex if 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.

From the above model, expected profit is a function of exchange rate and demand shock uncertainty and the correlation between the two. Therefore, the level of production in the domestic market and abroad is a function of demand (price) and exchange rate uncertainties. As foreign firms cross boundaries of different countries, other factors including political instability and host country government polices become important as these foreign firms are treated 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.

A traditional investment model is given by:

$$K_{it} = f(Y_{it}, IR_{it}) \qquad (2)$$

i=1,.....,N and t=1,.....,T

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

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 firm's investment is affected by other host country characteristics which alter the exchange rate and demand.

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 the risk of expropriation and it 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 in developing countries context. Furthermore, robustness of previous results to different host and source countries and industrial groups has not been addressed. This study tries to fill the empirical gap for the case of African economies.

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 with the motive to diversify production, use a foreign market as a shock absorber or compete with rival competitors, which is a strategic motive. Cushman (1985) argued that uncertainty affects

[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.

FDI positively, as multinational firms tend to serve foreign markets through FDI rather than through export, when they start to worry about uncertainty. On the other hand, the theory of hysteresis and option value implies that firms lower investment when there is uncertainty, due to high sunk cost which further delays investment. The predictions of these models have never been tested in the context of African economies.

3.2. Model variables and data

The period of analysis for the flows of FDI from all source countries is 1987-1999; whereas for U.S. FDI flows, 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 frequency by taking the 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, investors' 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 ratio of receipts from international tourist arrivals to total export (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 and international image about the host country and shows confidence in the existing political and social system[12]. Definitions and sources of model variables are presented in the Appendix.

[12] The use of RINTOUE may raise concerns about the appropriateness to proxy confidence. However, investors get information about a host country from visitors review, or investors themselves first visit the

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 the source country, host countries sign bilateral and multilateral agreements to show their commitment and to secure their benefits and those of foreign investors. In this paper, 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.

3.3. Econometric Methodology

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 whether or not to invest in a host country. These control variables are expected to contribute to the flow of FDI. Studies show that 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 roles of advanced communication, infrastructure, and suitable policy environment are critical. By using proxy variables for the uncertainty indicators and other control variables, this study estimates the FDI model for a sample of African countries.

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country of 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.

Different methods that are 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 Auto-Regressive (AR) process of a variable and the variance of the error term is modeled as a function of squared innovations from this AR process. For the purpose of this study, two different techniques are used to generate uncertainty indicators. 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 the GARCH model. Unlike the unconditional variance, conditional variance uses previous information to measure volatility after the deterministic components of the series are taken out of the series.

The original ARCH model proposed by Engle (1982) modeled the variance of the error term from the conditional mean as a linear function of lagged values of the squared regression disturbances. ARCH (m) model can be written as:

$$y_t = X_t b + e_t \qquad \text{(conditional mean)}$$
$$s_t^2 = g_0 + g_1 e_{t-1}^2 + g_2 e_{t-2}^2 + \ldots\ldots + g_m e_{t-m}^2 \qquad \text{(conditional variance)} \qquad (3)$$

where

$e_t \sim N(0, s_t^2)$

e_t^2 is the squared residuals

g_i are the ARCH parameters

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

This model was generalized by Bollerslev (1986) to include lagged values of the conditional variance (GARCH model). The GARCH (m, k) model is written as

$$y_t = X_t b + e_t$$
$$s_t^2 = d_0 + g_1 e_{t-1}^2 + \ldots\ldots\ldots + g_m e_{t-m}^2 + d_1 s_{t-1}^2 + \ldots\ldots + d_k s_{t-k}^2 \qquad (4)$$

where

g_i are the ARCH parameters
d_i are the GARCH parameters

σ_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 on Akiake Information Criterion (AIC). For the inflation rate and the real exchange rate, most lag lengths turn out to be 12; that captures information for one year[14]. This model can be estimated by maximum likelihood to obtain an estimate of the conditional variance $\hat{s}_t^2$.

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. First, the GARCH (1,1) is estimated for each series, when this fails to fit the data GARCH (p, q) model is estimated for the sample African economies. After the conditional variances are obtained from the series, it is related to net FDI in the different specifications of FDI models.

[14] This may also be due to seasonality in the series.
[15] In cases where the GARCH (1,1) model does not fit the series well, ARCH (1) is often adequate.

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

Two separate models are estimated to see the effects of the variance of the inflation rate and the variance of the real exchange rate for different measures of uncertainty indicators obtained from two techniques - conditional and unconditional variance of the variables.

The general form of the model is as given below:

$$Y_{it} = X_{it}\beta + \alpha_i + U_{it} \qquad \text{where i} = 1, \ldots\ldots\ldots, \text{N and t} = 1, \ldots\ldots\text{T} \tag{5}$$

The assumptions of this model are that X_{it} is a 1x k vector of time varying regressor, α_i denotes the unobservable country specific effects and U_{it} denotes the remainder disturbance and is i.i.d. N (0, σ_e^2). $\alpha_{i'}$'s can be fixed or random. The random effects model assumes that α_i and U_{it} are mutually uncorrelated. Hausman (1978) provides a test for the correlation and one has to conduct the test before one decides which estimator to use. An overall scalar constant term can also be added in the model (Baltagi, 1995). In any case, the fixed effect model is consistent, but when the fixed effect model is true, the random effect is inconsistent. When the random effect is true, fixed effect is still consistent but inefficient. Beside, there are many parameters in the fixed effects model and the loss of degrees of freedom can be avoided if the country specific effects are assumed random. For the case of FDI from all source countries (RFDI), fixed effect model is estimated, as the error components are better explained by fixed rather than random effects and hauseman test also rejects random effect model.

In the above specification, the overall error term is assumed to follow the usual Gauess-Markove's assumptions. But in the context of panel data where the sample is drawn from heterogeneous countries, the assumptions may not hold. In practice, panel (group-wise) heteroscedasticity is assumed in the model and panel-corrected estimation procedure is used to estimate the model (Beck and Katz, 1995). The model takes the following form:

$$Y_{it} = X_{it}\boldsymbol{b} + +U_{it}$$
$$\text{where i} = 1, \ldots\ldots\ldots, \text{N and t} = 1, \ldots\ldots\ldots \text{T} \quad \text{and} \quad \text{U}_{\text{it}} \sim N(0, \boldsymbol{s}_i^2) \qquad (6)$$

In this case, the country specific effects and the remainder disturbance are lumped together as overall error terms and panel-heteroscedasticity is introduced. In this paper, as the test for homoscedasticity fails even after accounting for the country effects for the case of FDI flow from the U.S., panel-heteroscedasticity corrected model is estimated and it explains the data better than the usual fixed or random effect models.

Censored values of the U.S. FDI data calls for estimation of Tobit model that accounts for the unobserved values of the data. The censoring is of two kinds. First, observations below some threshold levels are not reported, and second, in cases where there are only few firms in a host country, the values are not revealed to keep the information of the firms confidential[16]. It is assumed that in the second case the censored values are not high since only few firms entered the country during that period. These censored values are converted to zero. The appropriate technique used to account for the censored values is the panel Tobit model. More specifically, given the panel nature of the

[16] 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 known. Hence, in order to not reveal this information, the values are not reported by BEA.

data, a random-effects Tobit model is used in this paper. One of the advantages of panel Tobit model is that it is able to capture not only the effects that observable variables have on the dependent variable, but also the effects of relevant unobservable or non-measurable influences. In the random effects Tobit model, the unobservable or non-measurable factors that differentiate cross-section units are assumed to be best characterized as randomly distributed variables.

Tobit random effects model has the form:

$$Y_{it}^{*} = X_{it}\boldsymbol{b} + \boldsymbol{a}_i + U_{it} \qquad \text{where i} = 1, \ldots\ldots, \text{N and t} = 1, \ldots\ldots \text{T} \tag{7}$$

where U_{it} is i.i.d with N(0, $\boldsymbol{s}_u^2$) and only Y_{it} =max(0, Y_{it}^{*}) is observed. As defined above in equation (4), $\boldsymbol{a}_i$ is the country specific factor that is allowed to be random. Tobit models use the advantage of unobserved measures of the dependent variables. In this paper, censored observations of the U.S. FDI to the sample African economies are incorporated. Tobit models are often used in estimating trade flow between countries, especially to test the Linder hypothesis (Mcpherson, et.al.,1998), and determinants of export performance (Roper and Love, 2001).

Y_{it} is a vector [(RNFDI, RUSFDI, RUSFDIM, RUSFDINM)′] of dependent variables, which measure ratios of U.S. FDI to GDP of a host country; VINF is conditional variance of inflation; VRER is conditional variance of real exchange rate, and POLI is political freedom indicator. Squared terms of the three uncertainty indicators (VINF2, VRER2 and POL2) are also included. Apart from these uncertainty indicators, X_{it} also contains explanatory variables that measure market size (GDPPC, RIMPFUS), infrastructure (TELM), productivity (TVADD), labor force availability (RLFT), skilled

labor (LITRAR), investors' confidence indicators (REDEBT, RINTOUE), 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 of the inflation rate and the real exchange rate, where Y_{it} and X_{it} are as defined above. The only change is that unconditional standard deviations of rate of inflation, INFSTD, and rate of exchange rate, RERSTD replace the conditional uncertainty measures of inflation rate and rate of exchange rate, respectively. The interaction terms also change accordingly. The other explanatory variables remain the same as defined in equation above.

Positive signs are expected for RLFT, GDPPC, NEXPO, RIMPOFUS, 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 government of a host country, and positive sign may imply that investors take advantage of policies and government commitment [after controlling for political freedom indicator (POL)]. Imports from the U.S. and total export to the rest of the world are also expected to attract U.S. FDI. Signs on uncertainty indicators are not clear from theory and no *a priori* expectation is made here.

IV. 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[17]. 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[18]. 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 FDI from all source countries, fixed effects model is estimated. White's estimation is used to correct for the problem of heteroscedasticity in the fixed effects model. For U.S. FDI both panel-heteroscedasticity corrected and Tobit random effect models are estimated. Results are reported for both the full sample and Sub-Saharan African (SSA) countries excluding countries of Northern Africa, Nigeria and South Africa[19]. To compare the results of the two different techniques in measuring uncertainty (conditional variance and unconditional standard deviation), estimation is also made using unconditional standard deviation as an indicator of uncertainty.

[17] Also see Summary and Summary (1995) for the case of U.S.
[18] see Tomlin (2000) for count data estimation and Chen and Wu (1996) for duration model.
[19] Both Nigeria and South Africa are grouped as advanced large economies compared to other countries in SSA.

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 rate and the real exchange rate series of the sample countries to generate conditional variance.

Table 1 presents mean values of some of the variables used in the estimation of FDI models over the sample period 1987-1998. Even though U.S. FDI flows, reported by Bureau of Economic Analysis, have censored values, it still shades some light as to the distribution of U.S. FDI in each country in the sample. U.S. FDI flows target countries with large market size like Egypt and Nigeria and countries with large resource base (especially oil) like Chad and Gabon. Investments of U.S. manufacturing FDI seem to be followed by U.S. non-manufacturing FDI in Egypt, Kenya, South Africa and Zimbabwe. In these countries the shares of manufacturing and non-manufacturing U.S. FDI are large compared to other countries in the continent. The table also shows the mean values of the variance of the inflation rate and the real exchange rate. Only one country, Congo Democratic Republic, shows extraordinarily large variance values. This country has history of hyperinflation and it is dropped from the sample as an outlier. Mean values of GDP per capita and external debt is also reported in the table. The top ranking countries in terms of external debt burden are Mozambique, Congo Republic, Zambia, Ethiopia, Congo Democratic Republic and Cote D'Ivory. As can be seen from the flow of U.S. FDI, these countries have received the lowest U.S. FDI flows during the sample period.

The inflation rate and the real exchange rate series are tested for both 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.

Table 2a and 2b in the appendix show AR processes, kurtosis statistics of the residuals from AR processes as well as the coefficients of GARCH (p, q) estimation for the inflation rate and the real exchange rate. Some countries are excluded from the analysis either due to absence of ARCH/GARCH and/or lack of information on some other explanatory variables. 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.

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.

4.2. *Results*

The results of the study show that the impact of uncertainty on the flow of FDI from all source countries is insignificant. For aggregate U.S. FDI flow, economic and political uncertainties are not major concerns. However, for U.S. manufacturing FDI flow, political instability, and real exchange rate uncertainty are major impediments. Inflation uncertainty impedes flows of U.S. manufacturing FDI only when combined with political instability and external debt burden. Whereas for U.S. non-manufacturing FDI, both exchange rate and inflation uncertainties are the major impediments only when they occur with political instability and debt burden of host countries. Other economic factors such as labor, trade connection, external debt burden, size of export sector, and market size are also significant in affecting FDI flow to African economies.

The results of the study are presented in Tables 3-10. Each table reports the results both for full sample and Sub-Saharan Africa, excluding Northern African economies as well as South Africa and Nigeria. Tables 3 and 4 present the results for the total FDI flows from all source countries to Africa for conditional variance and unconditional standard deviation, respectively. Similarly, for total U.S. FDI flows, the results are reported in Tables 5 and 6. For U.S. manufacturing FDI flows, results are shown in Tables 7 and 8, and for U.S. non-manufacturing FDI, results are contained in

[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 the unit root problem.

Tables 9 and 10. For U.S. total, manufacturing, and non-manufacturing FDI, both the panel-heteroscedasticity corrected GLS and the Tobit random effects are reported. The results of the Tobit random effects model can be compared with the panel-heteroscedasticty corrected results presented in Tables 5-10.

For FDI from all source countries, the Hausman test results show that there is correlation between the country specific factor and the residuals, which implies that only fixed effect model is consistent. 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 other models estimated by the panel-corrected GLS, the Berusch Pagan lagrange multiplier is used to test for the presence of error components; the result supports the error components model compared to the classical regression model. For the Tobit random effects model, wald test performs similar test of the significance of the panel error component. For the overall performance of the model for both the GLS and the Tobit models, wald tests are also reported.

The results of both conditional variance and unconditional standard deviation are similar in most cases. Even though, in some cases, unconditional uncertainty indicators overestimate the impact of uncertainty, especially for the case 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 3 indicates that most of the uncertainty indicators are not important to impede the inflow of FDI from all source countries. The exception to this result is political instability for the Sub-Saharan sub-sample. Most other variables have the expected sign. For example, labor force (RLFT) and debt burden

(REDEBT) have negative signs as expected. The negative coefficient on labor force is due to the fact that labor skill is controlled by literacy rate (LITRAR), which has positive impact for FDI inflow, and the remaining only accounts for the unskilled labor force. Gross domestic product per capita has a negative sign, though insignificant. One explanation for the negative sign may be that when the market gets saturated as a result of GDP growth, 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, which is measured by ratio of receipts from arrivals of international tourists to total export, 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 foreign capital inflow. In Table 4 similar estimation results are obtained except the fact that the uncertainty indicators are taken from unconditional standard deviation. The interaction terms of inflation rate and exchange rate with political instability have significant negative signs. This implies that, it is only when economic and political uncertainties are combined that affects the flow of FDI to African economies (Lemi and Asefa, 2001).

In Table 5, the results for total U.S. FDI show that even though most of the coefficients of uncertainty indicators have the expected signs; none of them are statistically significant. The exception to this is the impact of political instability for the

SSA sub-sample. 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 host countries to all other countries other than to the U.S. (NREXPO) increase FDI inflow to the sample African economies. The result also shows that the larger the import of a host country from the U.S. (RIMPFUS), the greater the inflow of capital from the U.S. to Africa. This result implies that these firms target other neighboring markets so that both import of a host country and export of a host country attracts more U.S. FDI firms. However, more imports from the U.S. to a host country show a demand for U.S products in a host country or in neighboring markets, and firms become interested in entering the host country to and serve domestic customers through local production.

Unlike the result for the FDI from all source countries, the indicator of investors' confidence has an unexpected negative sign. The unexpected sign on indicators of investors' confidence may be the fact that confidence is a function of other factors, for the case of U.S. firms and it is difficult to proxy it using only macro economic and social stability indicators. The use of unconditional uncertainty indicators changed the significance of the impact of uncertainty on U.S. capital flow to Africa. The results show that most economic uncertainty indicators constrain inflow of U.S. FDI.

Overall, the results show that the impact of uncertainty and their interaction with political instability is significant. Dehn (2001) argued 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 7 and 8 for the conditional and unconditional uncertainty indicators, respectively. For the U.S. manufacturing FDI, political instability, and real exchange rate uncertainty are the major impediments. Inflation uncertainty impedes flows of manufacturing FDI only when combined with political instability and external debt burden. Here inflation uncertainty may capture demand in that market and taken alone it may not hinder manufacturing firms. Political uncertainty becomes a concern to foreign investors only when it becomes severe so that investors start to worry about uncertainty. It is also important to note the signs and significance of the total per capital factor productivity (TVADD) and trade link indicators (REXPTUS and RIMPFUS). For the U.S. manufacturing firms, total per capita factor productivity (TVADD) and export to U.S. (REXPTUS) hinders flow of U.S. manufacturing FDI to the sample countries. Except the impact of uncertainty, most other variables have similar impact on flow of U.S. manufacturing as they do on total U.S. FDI flow.

The role that economic and political uncertainty plays is even more evident from their impacts on U.S. non-manufacturing firms in African economies. For U.S. non-manufacturing FDI, both exchange rate and inflation uncertainties are the major impediments only when they occur with political instability and debt burden of host countries.

The results in Tables 9 and 10 show that taken alone economic uncertainties have in general a positive impact in attracting U.S. non-manufacturing FDI to African economies. However, most of the interaction terms of economic uncertainty with political instability and debt burden have a 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 the 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 burden affect flow of trade and finance-related U.S. FDI flow to African economies.

Table 11 presents the full effects of each of the uncertainty indicators. The full effects are computed as:

$$\partial y / \partial x = \alpha + \varphi x + \beta z$$

Where y is the explanatory variable (FDI) and x is indicator of uncertainty. z is another uncertainty indicator, which is interacted with x to estimate interaction tern coefficient, it is taken at mean value. Taking each uncertainty indicators alone, the results of the full effect confirm that, external debt is the main restraint for FDI to enter African economies. Politcical instability matters only in the case of U.S. non-manufacturing, whereas exchange rate affects negatively only the inflow of U.S. manufacturing FDI. Inflation has no effect in most cases but hinders inflow of U.S. manufacturing FDI, but facilitates U.S. non-manufacturing FDI.

V. CONCLUSIONS AND EXTENSIONS

This study examines how uncertainty affects FDI flows to African economies. Flows of total FDI from all source countries, total U.S. FDI, U.S. manufacturing FDI and U.S. non-manufacturing FDI to a sample of host countries in Africa are analyzed in this study. A generalized autoregressive heteroscedastic (GARCH) model is used to generate

uncertainty indicators of the inflation rate and the real exchange rate and these indicators are incorporated in the FDI model.

The results of the study show that 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 flow, political instability, and real exchange rate uncertainty are the major impediments. Inflation uncertainty impedes flows of manufacturing FDI only when combined with political instability and external debt burden. Whereas for U.S. non-manufacturing FDI, both exchange rate and inflation uncertainties are the major impediments only when they occur with political instability and debt burden of host countries. Other economic factors such as labor, trade connection, external debt burden, size of export sector, and market size are also significant in affecting FDI flow to African economies.

The results also show that compared to the results for the whole Africa, SSA countries are different in that the impact of political instability is more severe in impeding FDI flow. For the U.S. manufacturing FDI, the impact of inflation uncertainty, which is believed to capture shifts in demand, is not significant for the case of SSA sample. This reflects that inflation in SSA may happen without a rise in demand. For the U.S. non-manufacturing FDI, the impact of the interaction of economic uncertainty and external debt is more severe in the case of SSA.

Although many African economies face economic challenges in the 21st century, one of which is competition to attract FDI, 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. 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. This makes comparative analysis of the impact of uncertainty on FDI worth considering for future research.

The results shown in this study imply that 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 flows would be beneficial and warranted. Host countries are concerned about the welfare impact of FDI, as it also plays a significant role in technology transfer, improves the productivity of local firms, and crowds 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 the welfare of less developed countries needs further analysis.

Recently, one of the major targets of FDI is regional market in Africa rather than small national markets. Countries well integrated tend to receive more FDI due to their access to the regional market. Perhaps governments of African economies should look into ways to strengthen regional economic integrations to be attractive place for FDI destination. In this regard, study that link regional integration and FDI flow to member countries needs to be investigated further.

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APPENDIX: DATA

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 for each country over the sample period (Freedom House, Annual Survey of Freedom Country Ratings 1972-73 to 1999-00, 2001).

The variables used in the models are annual net total foreign direct investment (NFDI) from 1987-1999, U.S. 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[21] from 1987-1999. Other control variables include international tourism receipts, and political freedom index, economically active labor force (LFT), literacy rate (LITRAR)[22], 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 taken as a ratio to 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.

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

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[21] 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.

[22] Literacy rate is obtained by subtracting the percentage of illiteracy rate from 100% population.

[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.

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 the inflation rate.

RERSTD= Standard deviation of the real exchange rate.

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 for each period.

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

Trade Linkage

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

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 I.1. Mean of some of the variables used in FDI models: 1987-1998

COUNTRY	RNFDI	USFDINO	RUSFDI	RUSFDIMT	RUSFDINM	POLI	VINF	VRER	GDPPC	REDEBT
Algeria	2.13	9.1	15.27	0	0.08	5.9	0.66	0.13	1541.8	0.71
Botswana	32.69	4.5	-2.87	0.77	0	1.6	0.04	0	3318.48	0.13
Burkina Faso	56.83	1	0.74	0	0	5.3	5.66	0.43	239.96	0.47
Cameroon	-1.92	8.9	16.78	0.07	-0.12	6.4	33.92	0.75	672.31	0.96
Chad	102.36	3.3	37.22	0	0	6.2	11.96	0.92	226.26	0.54
Congo, Dem. Rep.	-0.12	8	8.56	0.15	-0.5	6.7	>100	504.06	157.9	1.89
Congo, Rep.	25.14	6.4	10.04	0	0	5.1	18.96	2.9	1012.18	2.05
Cote d'Ivoire	123.04	11.9	6.86	0.23	-0.16	6	1.38	0.42	749.53	1.78
Egypt	145.14	62.7	24.43	2.32	1.95	5.6	0.74	0.62	1019.44	0.59
Ethiopia	55.1	1.9	2.18	0	0.41	5.4	1.85	0.01	100.98	1.72
Gabon	71.52	18.7	39.91	0.19	0.18	4.8	4.31	1.33	4497.9	0.86
Ghana	128.99	6.1	28.71	1.87	0	4.6	1.42	0.78	372.85	0.84
Guinea	47.4	1.3	0.67	0	0	6.1	4.22	60.59	553.29	0.83
Kenya	25.95	24.8	14.86	4.88	1.23	5.9	1.35	0.22	341.05	0.79
Madagascar	45.04	0.7	0.29	0	0	2.9	0.66	29.44	249.09	1.25
Malawi	92.63	13.4	5.19	0.94	-0.34	4.3	0.8	0.08	146.38	1.41
Mauritius	82.52	4.1	0.97	0	-0.36	1.3	0.16	0.01	3385.84	0.38
Morocco	81.72	17.1	2.25	1.29	0.13	4.9	0.31	0	1322.64	0.65
Mozambique	174.41	0.5	0.54	0	0	4.5	2.21	73.03	152.81	2.62
Niger	32.87	1.7	0.58	0	0	5.4	2.37	0.85	216.89	0.83
Nigeria	457.45	49	21.5	1.85	-0.05	6.2	1.3	0.9	256.38	1.16
Senegal	97.6	7.2	6.88	0.24	0.63	4	6.43	5.16	550.08	0.83
South Africa	47.99	130.3	8.53	4.2	1.45	3.2	0.03	0	3944.41	0.15
Swaziland	603.57	2.1	11.56	3.17	0	6	0.34	0	1414.24	0.21
Tanzania	108.95	4.1	0.86	0.54	0.14	5.6	1.59	5.17	181.78	1.34
Togo	92.17	2.5	4.97	0	0	6.1	10.08	1.06	335.05	1.04
Tunisia	201.22	16.2	4.12	0.53	0.45	5.7	0.03	0	1992.38	0.54
Uganda	139.48	1.6	0.74	0	0	5.2	31.66	3.53	282.9	0.61
Zambia	337.27	8.6	8.76	2.96	0.32	4	1.73	110.63	432.33	1.84
Zimbabwe	116.42	20.3	15.42	8.54	1.91	5.2	0.3	0.05	676.46	0.58

Note: NFDI= Ratio of Total Foreign Direct Investment (FDI) to GDP, USFDINO = Number of U.S. FDI firms in a host country, RUSFDI=Ratio of Total U.S. FDI to GDP, RUSFDIM = Ratio of U.S. Manufacturing FDI to total U.S. FDI, RUSFDINM= Ratio of U.S. Non-Manufacturing FDI to Total U.S. FDI, POLI= Political Instability Indicator Index, VINF= Variance of Inflation, VRER= Variance of Real Exchange Rate, GDPPC= GDP per Capita, EDEBT= Ratio of External Debt to GDP

Table I.2a. Estimation results of GARCH (p, q) to generate variances for the inflation rate for a sample of African economies

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)
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)				
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, values in parentheses are t-ratios. @ Countries excluded from the full sample to form Sub-Saharan Africa sub-sample.

Table I.2b. Estimation results of GARCH (p, q) to generate variances for the real exchange rate for a sample of African economies

	Autoregressive proces	Kurtosis of residual	GARCH model	ffCCoeffi 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)				
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)				
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, values in parentheses are t-ratios

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

Table I.3. Regression results of the fixed effect 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 I.4. 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 I.5. Regression results for the U.S. net foreign direct investment (RUSFDI) specifications using conditional variance from GARCH (p, q)

	Panel-heteroscedasticity Corrected GLS				Tobit Random Effect			
	Full sample		SSA[a]		Full Sample		SSA[a]	
Variable	Coefficient	t-ratio	Coefficient	t-ratio	Coefficient	t-ratio	Coefficient	t-ratio
POLI	0.549	0.474	3.715**	2.509	3.770	0.96	4.990	0.91
POL2	-0.026	-0.189	-0.367**	-2.229	-0.230	-0.53	-0.380	-0.65
VINF	-0.001	-0.436	-0.001	-0.548	-0.001	-0.20	-0.001	-0.15
VINF2	0.001	0.771	0.001	0.866	0.001	0.02	0.001	0.17
VRER	-0.001	-0.007	-0.003	-0.045	0.03	0.11	-0.001	-0.01
VRER2	0.001	0.001	0.001	0.345	0.001	0.17	-0.001	-0.03
POLIRERA	-0.002	-0.465	-0.006	-1.112	-0.001	-0.12	-0.001	-0.03
POLIINFA	0.001	0.325	0.001	0.552	0.001	0.10	0.001	0.15
DEBTINF	-0.001	-0.353	-0.001	-0.553	0.001	0.09	-0.001	-0.09
DEBTRER	0.011	0.252	0.013	0.279	-0.020	-0.10	0.010	0.05
RLR	-0.001	-0.421	-0.001	-0.163	-0.001	-0.27	0.001	-0.02
GDPPC	-0.005	-0.698	0.053**	2.172	-0.020	-0.79	-0.010	-0.20
REXPTUS	-0.572	-0.034	24.528	0.950	-33.10	-0.88	-91.81	-1.29
RIMPFUS	292.32***	6.424	95.380**	1.992	265.2*	1.87	201.39	1.08
TVADD	-0.041	-0.014	-28.022**	-2.458	4.31	0.50	6.79	0.20
USBIT	3.973**	2.039	10.637***	3.551	3.30	0.67	10.16	1.32
MIGA	3.619**	2.740	-0.131	-0.096	11.60***	3.51	5.99	1.59
TELM	0.096**	2.640	0.030	0.966	0.17*	1.89	0.06	0.51
RLFT	-6.277	-0.320	-39.029	-1.496	23.61	0.39	125.07	1.46
LITRAR	0.139***	4.926	0.083**	2.781	0.15	1.28	0.04	0.30
RINTOUE	-16365.5***	-7.949	-5231.696	-1.590	-26867***	-3.26	-20420*	-1.90
REDEBT	-7.258***	-5.944	-2.470	-1.488	-8.46**	-2.07	-1.81	-0.34
NREXPO	25.738***	4.205	31.342***	4.997	32.16**	2.29	47.50***	2.93
Constant	-0.134	-0.013	6.957	0.507	-29.78	-0.92	-81.24*	-1.72
No. of Coun.	29		23		29		23	
No. of Obser.	310		250		310		250	
LM /Wald test	90.59***		78.8***		14.32***		11.3***	
Wald χ^2	267.2***		189.8***		46.07***		27.88	

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

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

Table I.6. Regression results for the U.S. net foreign direct investment (RUSFDI) specifications using unconditional standard deviation

	Panel-heteroscedasticity Corrected GLS				Tobit Random Effect			
	Full sample		SSA[a]		Full Sample		SSA[a]	
Variable	Coefficient	t-ratio	Coefficient	t-ratio	Coefficient	t-ratio	Coefficient	t-ratio
POLI	-0.164	-0.142	2.706*	1.707	2.64	0.68	2.51	0.46
POL2	0.045	0.330	-0.271	-1.610	-0.17	-0.41	-0.20	-0.34
INFSTD	-0.075**	-2.468	-0.093***	-3.125	0.05	0.38	0.04	0.31
INF2	-0.001	-0.155	-0.001	-0.090	0.001	1.31	0.001	1.50
REXRSTD	-0.038***	-3.509	-0.030**	-2.897	-0.26***	-2.80	-0.26***	-2.85
RER2	-0.001*	-1.720	-0.001	-1.053	-0.001***	-2.23	0.001**	-2.35
POLIRER	-0.004**	-2.345	-0.004**	-2.391	0.01	1.23	0.01	1.18
POLIINF	0.017**	2.685	0.020***	3.176	0.01	0.30	0.01	0.49
DEBINFS	-0.022**	-2.046	-0.023**	-2.188	-0.05	-1.51	-0.07*	-1.86
DEBRERS	0.038**	2.916	0.030**	2.359	0.11**	2.80	0.12**	2.98
RLR	-0.003	-1.163	-0.004*	-1.670	0.001	0.45	0.001	0.45
GDPPC	-0.009	-1.258	0.030	1.290	-0.01	-0.73	-0.03	-0.38
REXPTUS	-3.319	-0.207	13.794	0.550	-54.29	-1.44	-141	-1.98
RIMPFUS	236.428***	4.875	58.131	1.326	202.87	1.47	117.02	0.64
TVADD	1.726	0.572	-16.882	-1.589	2.87	0.33	12.04	0.38
USBIT	4.703**	2.287	8.331***	3.121	2.20	0.44	7.95	1.07
MIGA	3.381**	2.607	0.336	0.270	10.56***	3.25	5.41	1.48
TELM	0.097**	2.627	0.040	1.354	0.19**	2.10	0.07	0.63
RLFT	6.708	0.358	-14.593	-0.577	18.66	0.30	140.85*	1.73
LITRAR	0.148***	6.028	0.106***	3.778	0.19*	1.72	0.09	0.75
RINTOUE	-146767***	-7.402	-6312.17**	-2.007	-29774***	-3.56	-26536**	-2.52
REDEBT	-6.889***	-6.041	-3.067**	-1.970	-9.81**	-2.40	-2.45	-0.49
NREXPO	22.036***	3.726	27.997***	4.497	27.09*	1.93	41.68**	2.63
Constant	-2.490	-0.247	0.300	0.023	-16.42	-0.49	-74.95*	-1.65
No. of Coun.	29		23		29		23	
No. of Obser.	310		250		310		250	
LM/Wald test	79.28***		67.3***		17.46***		14.4***	
Wald χ^2	280.3***		239.2***		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 I.7. Regression results for the U.S. manufacturing net foreign direct investment (RUSFDIM) specifications using conditional variance from GARCH (p, q)

	Panel-heteroscedasticity Corrected GLS				Tobit Random Effect			
	Full sample		SSA[a]		Full Sample		SSA[a]	
Variable	Coefficient	t-ratio	Coefficient	t-ratio	Coefficient	t-score	Coefficient	t-score
POLI	0.641**	2.216	0.827*	1.938	3.78**	2.65	5.66**	2.01
POL2	-0.069**	-2.159	-0.071	-1.562	-0.46***	-2.92	-0.63**	-2.07
VINF	0.001**	2.609	0.001	1.541	0.03	0.69	0.02	1.33
VINF2	0.001***	3.400	0.001*	1.960	-0.001	-0.72	-0.001	-1.49
VRER	-0.034***	-2.994	-0.022	-1.411	-0.14	-0.66	-0.37	-1.10
VRER2	-0.001***	-4.297	-0.001**	-2.146	-0.001	-0.08	-0.001	-0.34
POLIRERA	0.002**	2.025	0.001	0.741	0.001	0.31	0.001	0.05
POLIINFA	-0.001	-1.472	-0.001	-1.096	-0.001	-0.69	-0.001	-1.30
DEBTINF	-0.001***	-3.378	-0.001*	-1.845	-0.01	-0.67	-0.001	-1.16
DEBTRER	0.030***	3.766	0.020**	1.957	0.07	0.62	0.21	1.18
RLR	0.001***	3.351	0.001**	2.110	-0.001	-0.55	0.001	0.07
GDPPC	0.003**	2.491	0.013**	1.994	-0.01	-0.67	0.07	2.02
REXPTUS	-3.689**	-2.237	2.103	0.438	-19.6*	-1.99	-59.97	-1.46
RIMPFUS	68.114***	7.194	27.115*	1.836	-13.11	-0.22	75.87	0.78
TVADD	-1.312**	-2.558	-6.651**	-2.193	1.75	0.47	-31.7**	-2.09
USBIT	-1.585***	-6.344	-0.553	-1.122	2.80	1.54	0.83	0.25
MIGA	0.425	1.363	0.102	0.291	4.61***	3.14	4.55*	1.91
TELM	0.002	0.281	0.001	0.131	0.08	1.46	-0.24	-0.93
RLFT	0.420	0.122	-0.806	-0.141	0.08	0.001	4.27	0.12
LITRAR	0.054***	8.354	0.043***	5.925	0.10**	2.56	0.19***	3.45
RINTOUE	-2375.7***	-4.266	-413.557	-0.383	-4604**	-2.04	-3238	-0.77
REDEBT	-1.089***	-4.154	-0.463	-1.017	0.32	0.22	2.30	1.15
NREXPO	-0.506	-0.440	4.138***	2.935	6.30	1.47	18.98**	2.47
Constant	-2.841	-1.426	-3.514	-1.058	-19.52	-1.64	-37.94*	-1.86
No. of Coun.	29		23		29		23	
No. of Obser.	310		250		310		250	
LM/WALD test	121.6***		76.1***		29.1***		-	
Wald χ^2	304.3***		176.4***		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 I.8. Regression results for the U.S. manufacturing U.S. net foreign direct investment (RUSFDIM) specifications using unconditional standard deviation

	Panel-heteroscedasticity Corrected GLS				Tobit Random Effect			
	Full sample		SSA[a]		Full Sample		SSA[a]	
Variable	Coefficient	t-ratio	Coefficient	t-ratio	Coefficient	t-ratio	Coefficient	t-ratio
POLI	0.685**	2.205	0.630	1.503	3.79***	2.72	5.48*	1.75
POL2	-0.073**	-2.154	-0.054	-1.266	-0.48***	-3.12	-0.62*	-1.94
INFSTD	0.008	0.965	-0.006	-1.207	0.09	0.43	0.60	1.25
INF2	0.001	0.246	0.001	0.969	0.001	1.11	0.001	1.10
REXRSTD	-0.007***	-3.292	-0.005**	-2.652	-0.03	-0.68	-0.14	-2.25
RER2	-0.001*	-1.807	-0.001	-0.838	-0.001	-1.22	-0.001**	-2.03
POLIRER	-0.001	-0.908	-0.001	-1.442	0.001	0.75	0.01	1.72
POLIINF	0.001	0.016	0.003**	2.370	0.001	0.06	-0.05	-1.00
DEBINFS	-0.003	-1.321	-0.006***	-3.501	-0.08	-1.40	-0.2	-1.01
DEBRERS	0.007**	2.567	0.004**	1.999	0.01	0.72	0.06*	1.94
RLR	0.001	1.268	0.001	0.206	-0.01	-1.17	0.001	0.03
GDPPC	0.003**	2.375	0.018***	3.170	-0.001	-0.20	0.08**	2.25
REXPTUS	-6.501***	-3.935	2.907	0.673	-15.25*	-1.93	-81.7*	-1.89
RIMPFUS	67.198***	7.033	12.505	0.958	19.41	0.37	77.25	0.77
TVADD	-1.466**	-2.701	-9.250***	-3.476	0.04	0.01	-36.1**	-2.28
USBIT	-1.872***	-6.905	-0.206	-0.444	2.14	1.28	1.17	0.35
MIGA	0.355	1.136	0.054	0.157	4.79***	3.23	5.30**	2.19
TELM	0.005	0.808	0.001	0.179	0.05	1.03	-0.35	-1.27
RLFT	0.685	0.193	-2.132	-0.404	-5.34	-0.32	-4.36	-0.12
LITRAR	0.067***	10.995	0.049***	7.273	0.11***	3.63	0.19***	3.75
RINTOUE	-2740.71***	-5.014	-1191.46	-1.258	-5355**	-2.51	-4752	-1.13
REDEBT	-1.077***	-4.012	-0.281	-0.647	-0.74	-0.62	2.19	1.06
NREXPO	-0.201	-0.174	4.640***	3.604	11.76***	2.75	18.57**	2.47
Constant	-3.185	-1.565	-2.292	-0.743	-18.18*	-1.79	-33.49	-1.57
No. of Coun.	29		23		29		23	
No. of Obser.	310		250		310		250	
LM/Wald test	104.1***		63.8***		32.6***		-	
Wald χ^2	225.8***		218.2***		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 I.9. Regression results for U.S. non-manufacturing U.S. net foreign direct investment (RUSFDINM) specifications using conditional variance from GARCH (p, q).

	Panel-heteroscedasticity Corrected GLS				Tobit Random Effect			
	Full sample		SSA[a]		Full Sample		SSA[a]	
Variable	Coefficient	t-ratio	Coefficient	t-ratio	Coefficient	t-ratio	Coefficient	t-ratio
POLI	0.221	1.605	0.244*	1.883	-0.27	-1.00	0.22	0.36
POL2	-0.027*	-1.887	-0.024*	-1.810	0.03	0.97	-0.02	-0.23
VINF	0.001*	1.733	0.001*	1.791	0.001	0.25	-0.001	-0.12
VINF2	0.001**	2.956	0.001**	2.952	0.001	0.31	-0.001	-0.08
VRER	0.021***	3.281	0.023***	3.609	0.01	0.67	0.04	1.36
VRER2	0.001	1.064	0.001**	2.140	-0.001	-0.66	0.001	0.73
POLIRERA	-0.001	-1.376	-0.001	-1.609	-0.001	-0.28	-0.001	-0.69
POLIINFA	-0.001	-1.365	-0.001*	-1.913	-0.001	-0.23	0.001	0.12
DEBTINF	-0.001**	-2.206	-0.00**	-2.009	-0.001	-0.26	0.001	0.10
DEBTRER	-0.010**	-2.530	-0.012***	-3.687	-0.001	-0.01	-0.02	-1.08
RLR	-0.001**	-2.728	-0.001***	-3.538	0.001	0.01	0.001	-0.79
GDPPC	0.001*	1.737	0.005**	2.704	-0.01***	-4.69	0.05***	5.00
REXPTUS	-2.075**	-2.471	2.690**	2.148	1.63	0.82	-46.93**	-2.30
RIMPFUS	33.844***	8.626	14.809***	3.550	23.66**	2.42	46.83**	2.37
TVADD	-0.229	-1.336	-2.365**	-2.968	3.73***	4.41	-25.20***	-5.15
USBIT	0.006	0.066	0.148	1.258	-0.18	-0.49	2.55**	2.19
MIGA	0.023	0.304	-0.047	-0.708	0.70**	2.63	0.28	0.55
TELM	-0.001	-0.204	-0.006	-0.947	0.04***	4.49	0.001	0.09
RLFT	1.150	0.948	-2.742**	-2.292	6.38	1.40	-10.21	-1.18
LITRAR	0.004*	1.919	0.002	0.943	0.01*	1.87	0.01	0.56
RINTOUE	53.117	0.266	384.990	1.632	-12.12	-0.02	-1557.26	-1.53
REDEBT	-0.252***	-3.278	-0.080	-0.859	-0.40	-1.33	1.55**	2.36
NREXPO	-0.341	-1.117	0.184	0.586	1.87	1.42	5.27**	2.44
Constant	-1.092	-1.539	0.559	0.796	-4.93**	-2.02	-0.86	-0.18
No. of Coun.	29		23		29		23	
No. of Obser.	310		250		310		250	
LM/Wald test	51.1		57.5***		44.5***		0.1	
Wald χ^2	1101.6***		2625.2***		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 I.10. Regression results for the U.S. non-manufacturing foreign direct investment (RUSFDINM) specifications using unconditional standard deviation

	Panel-heteroscedasticity Corrected GLS				Tobit Random Effect			
	Full sample		SSA[a]		Full Sample		SSA[a]	
Variable	Coefficient	t-ratio	Coefficient	t-ratio	Coefficient	t-ratio	Coefficient	t-ratio
POLI	0.142	0.935	0.175	1.241	-0.35	-1.26	-0.63	-0.83
POL2	-0.020	-1.267	-0.018	-1.242	0.03	0.96	0.05	0.72
INFSTD	-0.006	-1.284	-0.007*	-1.746	-0.03	-0.92	-0.04	-0.80
INF2	-0.001***	-3.567	-0.001***	-3.179	-0.001	-1.28	0.001	0.60
REXRSTD	-0.001	-0.229	0.001	0.068	-0.001	-0.48	-0.03	-1.61
RER2	-0.001*	-1.873	-0.001**	-2.032	-0.001*	-1.72	0.001*	-1.96
POLIRER	-0.001	-1.607	-0.001**	-2.333	0.001	0.92	0.001	0.95
POLIINF	0.001	1.266	0.001	1.633	0.01	1.05	0.01	1.11
DEBINFS	-0.001	-0.216	-0.001	-0.349	-0.01	-1.19	-0.02*	-1.78
DEBRERS	0.001	1.031	0.001	1.075	0.001	0.38	0.02**	1.99
RLR	-0.001	-0.490	-0.001	-0.930	-0.001	-0.44	-0.001	-0.62
GDPPC	0.001	1.630	0.005**	2.503	-0.01***	-4.38	0.05***	4.84
REXPTUS	-2.448**	-2.870	1.870	1.340	0.87	0.46	-41.38**	-2.35
RIMPFUS	34.742***	8.680	16.779***	3.727	0.89	0.08	36.78*	1.85
TVADD	-0.222	-1.224	-2.248**	-2.657	2.96***	4.04	-26.11***	-5.03
USBIT	-0.019	-0.175	0.123	0.885	0.04	0.10	3.37***	3.15
MIGA	0.024	0.286	-0.086	-1.191	0.62**	2.30	0.41	0.77
TELM	-0.002	-0.438	-0.009	-1.300	0.03***	3.48	0.001	0.17
RLFT	1.336	1.002	-2.141	-1.512	5.41	1.25	-11.58	-1.35
LITRAR	0.005**	2.267	0.003	1.350	0.02***	3.46	0.001	0.20
RINTOUE	51.062	0.245	399.862	1.609	172.42	0.34	-1545.06	-1.56
REDEBT	-0.267***	-3.151	-0.099	-0.985	0.10	0.29	1.22*	1.76
NREXPO	-0.388	-1.228	0.086	0.258	0.57	0.42	4.50**	2.01
Constant	-0.979	-1.248	0.487	0.617	-3.97	-1.60	3.37	0.65
No. of Coun.	29		23		29		23	
No. of Obser.	310		250		310		250	
LM test	28.9***		25.7***		48.2***		0.1	
Wald χ^2	262.6***		202.7***		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

Table I.11. Impact of Uncertainty on FDI: Full effects of each indicator

	Inflation	Exchange rate	Political instability	External Debt
Total FDI				
SSA	-	0.0026	28.8	***-186.1***
Africa	-	0.028	-	***-113.86***
Total U.S. FDI				
SSA	-	-	3.3	-
Africa	-	-	-	***-7.26***
U.S. manufacturing FDI				
SSA	***-0.007***	***-0.01***	0.827	***-63.1***
Africa	0.001	***-0.03***	0.5	***-51.6***
U.S. non-manufacturing FDI				
SSA	62.6	0.01	***-62.1***	***-63.1***
Africa	62.1	0.01	***-0.09***	***-51.5***

Note: full effect is computed at the mean of each variable.

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

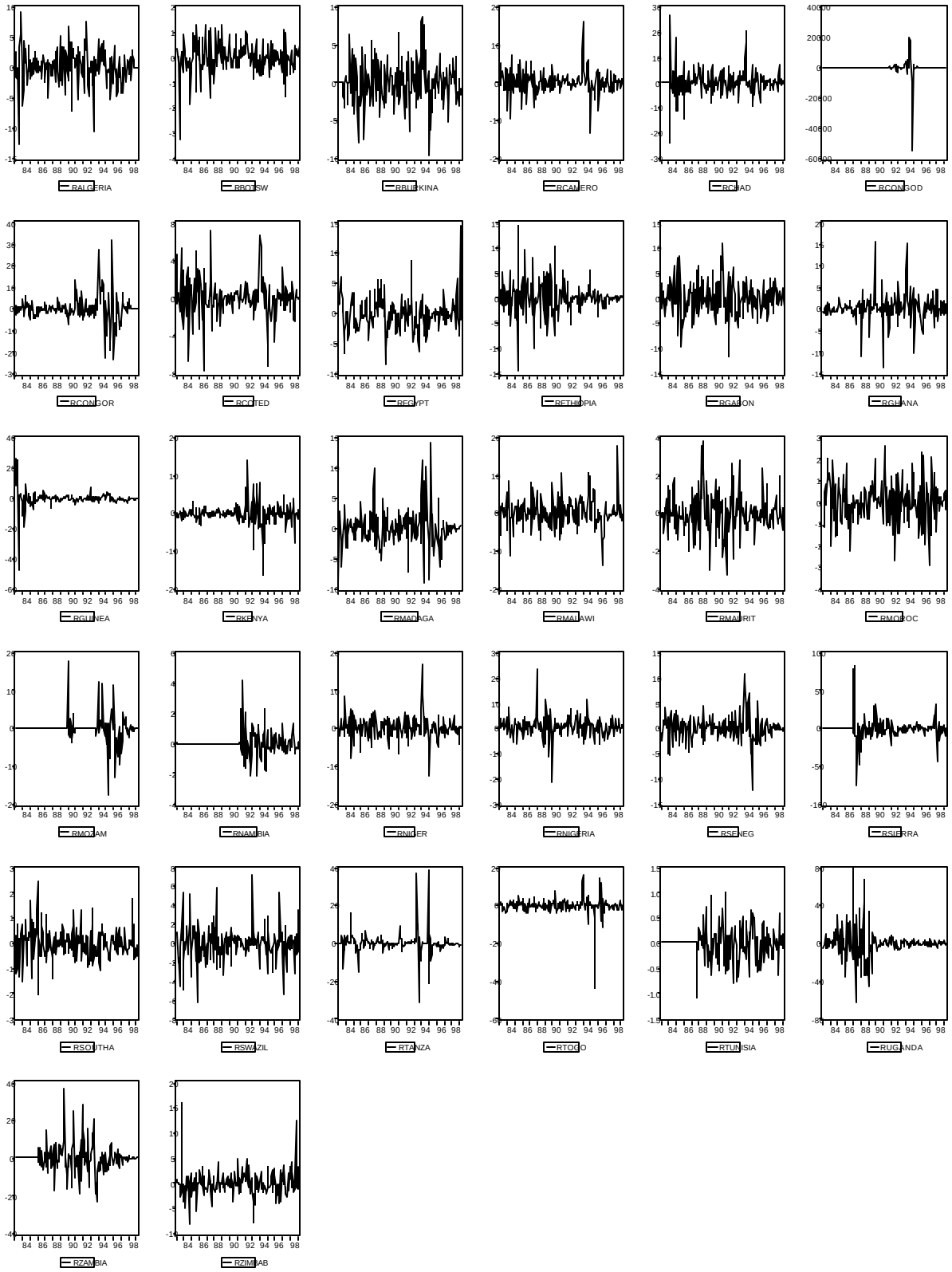


Figure 2. Conditional Variances of inflation rate in first differences:1983:1-1999:4

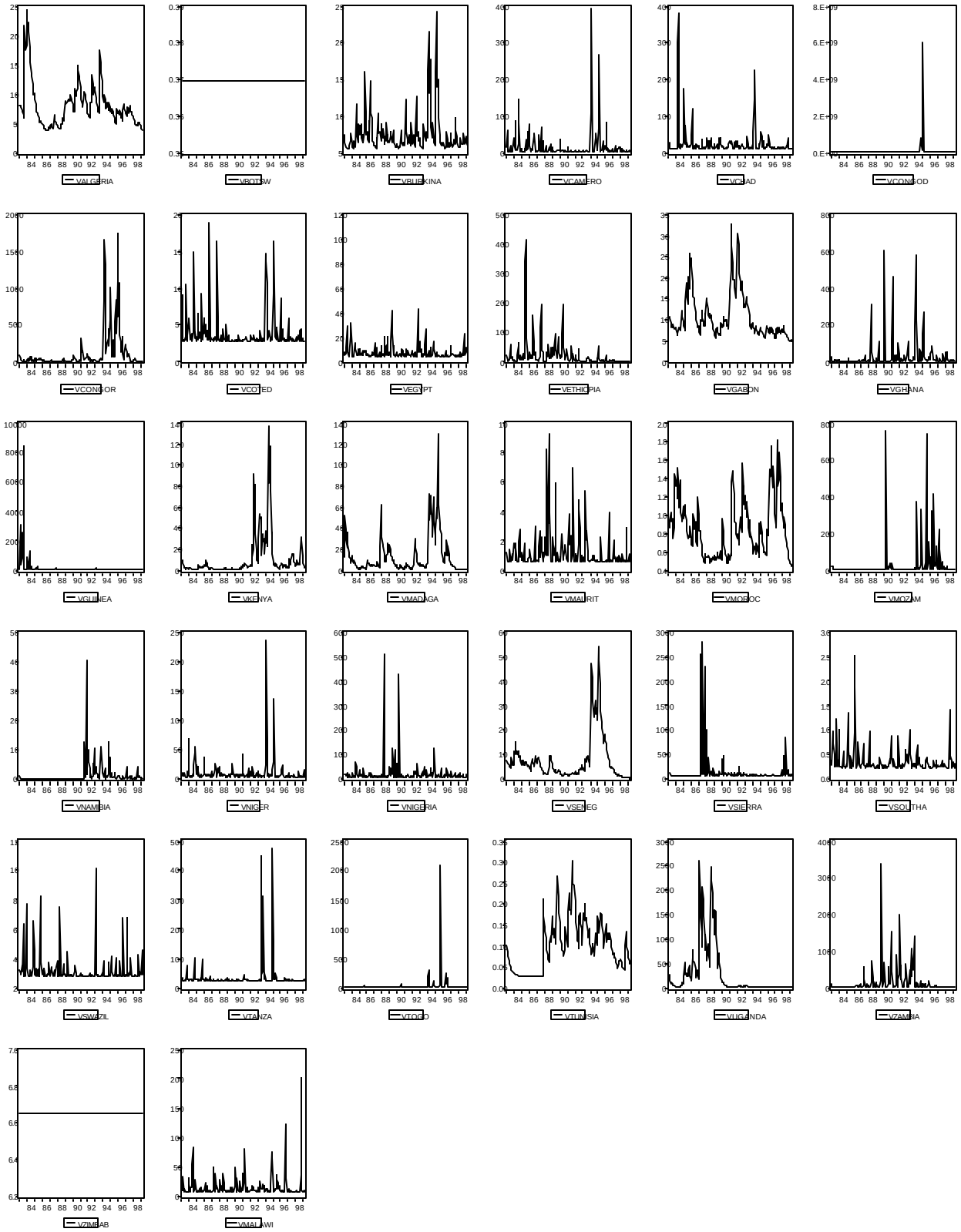


Figure 3. Residuals of real exchange rate in first differences:1983:1-1999:4

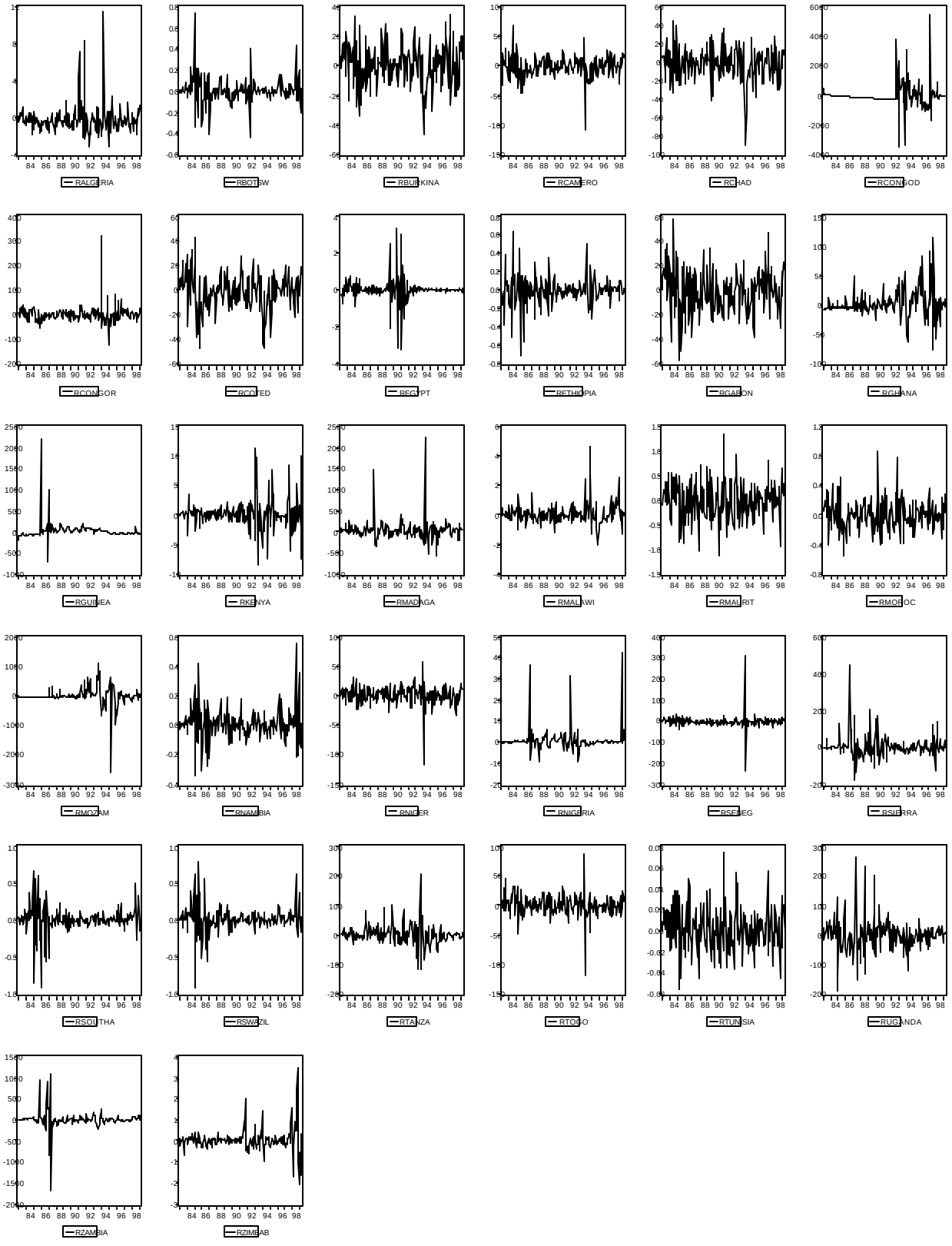
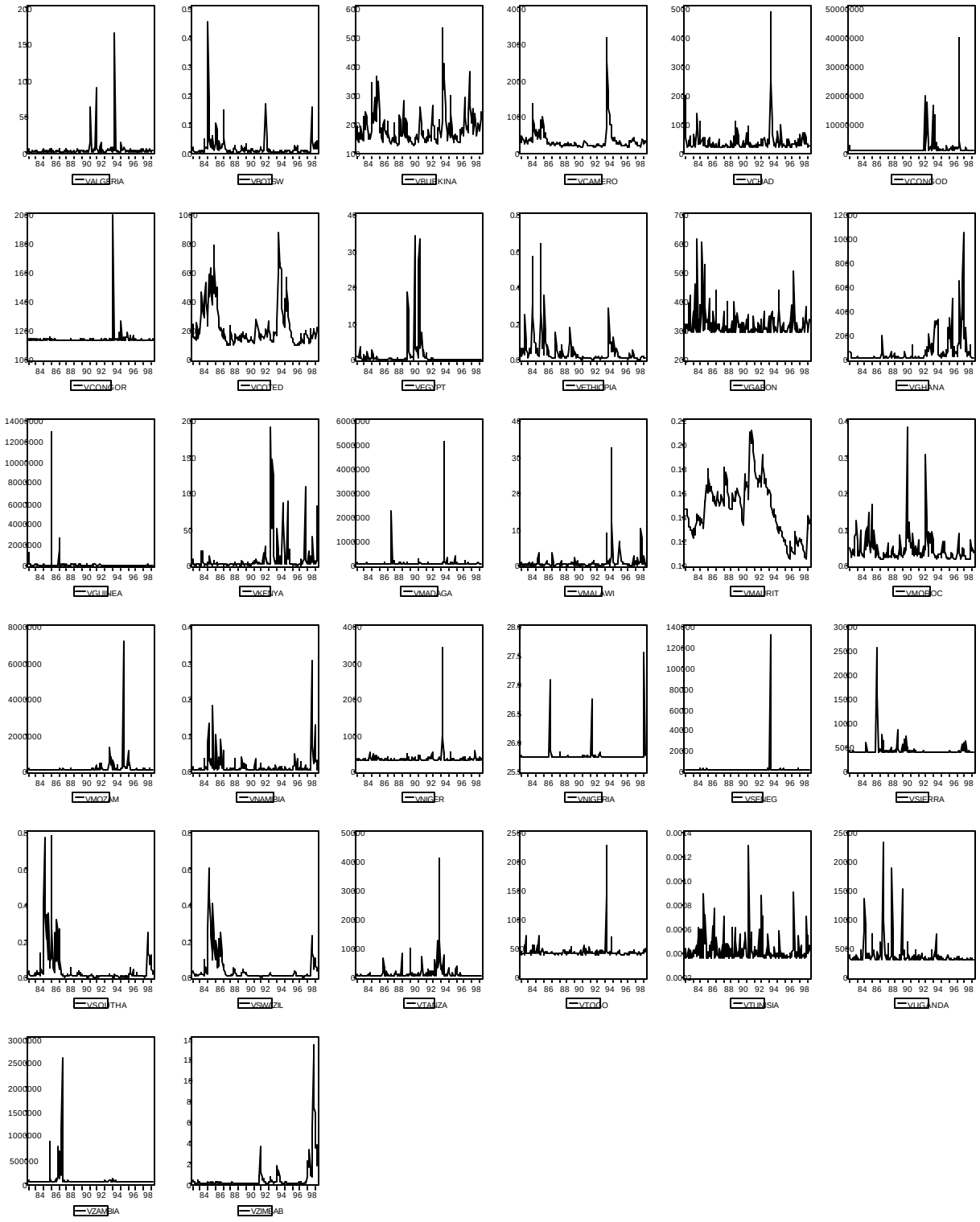


Figure 4. Conditional variance of real exchange rate in first differences: 1983:1-199:4



CHAPTER II. MULTINATIONAL CORPORATIONS, INTRA-FIRM TRADE AND AFFILIATE FIRMS' SALES: THE ROLE OF HOST COUNTRY CHARACTERISTICS

I. INTRODUCTION

Multinational Corporations (MNCs) locate their affiliate firms in different host countries to in part exploit advantages of a large domestic or other neighboring markets, resource bases, cheap labor, and different tax regulations. The amount of production and sales in the different markets by the affiliates as well as the magnitude of transaction among the affiliates and the parent firms are important decision variables for MNCs. Intra-firm trade (among the affiliates and the parents of a MNC) and the volume of affiliates' sales in a host or a source country are believed to be motivated by factors specific to the firm and/or external factors to which firms respond by engaging in different business practices.

The purpose of this paper is to investigate the determinants of affiliates' sales in host and source country markets. There are three alternative destinations of sales an affiliate firm including (1) sales back to the source country, (2) local sales, and (3) sales to other countries other than the host country and the source country[24]. Sales to a source country include sales to parent firms and non-affiliate persons; a parent firm also exports to affiliates in a host country. In this study the two major destinations of affiliates' sales, namely sales to source country and local sales, are analyzed. In each of the two destinations, sales to both affiliate firms and non-affiliate persons are

[24] Each of these three sales can be further divided into sales to affiliate firms and non-affiliate persons. For instance, sales to a source country include sales to parent firms (intra-firm sale) and sales to unaffiliated persons. An affiliate firm in a given host country also imports from other sources including imports from parent firms (intra-firm trade) and imports from other affiliated and unaffiliated firms from other countries.

considered. Hence, there are four sale variables considered in this study, which are sales to affiliate (parent) firms in a source country, sales to non-affiliate persons in a source country, sales to affiliate local firms in a host country, and sales to non-affiliate persons in a host country. Figure 1 presents the direction and destinations of sales of U.S. affiliates based in a foreign country. Some of these transactions are motivated by minimization of international tax (Kant, 1988) and cost differences between the host and source countries (efficiency reasons) (Markusen, 1997).

Affiliates' sales data of U.S. multinational firms from 1983-1999 obtained from the Bureau of Economic Analysis (BEA) to alternative destinations are used to empirically test these competing hypotheses for the case of U.S. multinational firms in developing countries. For each destination, separate equations are estimated to examine the role of host country characteristics.

Apart from resource bases that characterize a host country, other control variables believed to affect business practices of MNC including corporate tax rates, volume of total and bilateral trade between host and source[25] countries, uncertainty indicators, and distance between the host and source countries are also included in the sales model. The signs and magnitude of the coefficients on some of the explanatory variables imply the motives behind sales in different markets and to different agents.

The results of the study reveal that there is evidence that affiliate firms of U.S. multinationals manipulate sales to minimize international taxation. This is supported by the result that host country corporate income tax affects sales of affiliates to other affiliate firms favorably, unlike its impact on sales to non-affiliate persons in both host and source country

[25] In this paper 'source' and 'home' countries are used interchangeably and both refer to U.S. market.

markets. Host country international trade tax lowers affiliates production and sales in most markets. Affiliates located in host countries where economically active and skilled labor force is abundant tend to sell more to non-affiliate persons. Host country economic policy reforms and membership in multinational investment guarantee facilitate affiliates' sales to other affiliate firms. Considering all markets together, economic and political uncertainties have minimal impact on sales among affiliates compared to its impact on sales to non-affiliates. Trade orientation of a host country both with the rest of the world and with the U.S. is also found to be significant determinants of affiliates' sales. The result, however, rejects the complementarity of trade and FDI between the U.S. and sample developing countries.

The next section presents a review of the theoretical and empirical literature on the competing hypotheses to explain the motives of multinational firms' business practices. The third section discusses the model and econometric specification. The fourth section presents estimation techniques and results. The last section provides conclusions.

II. LITERATURE REVIEW

As the world becomes highly integrated, both the flows of foreign direct investment and trade have grown significantly (Katseli, 1997). More importantly, trade between MNC affiliates in different host countries also has grown and continues to play a crucial role in the operation of MNCs (Zeile, 1997). It becomes difficult to explain this kind of trade by the traditional international trade theory. Recently, (industrial organization approach) trade theories incorporate multinational firms in trade models to explain the behavior of MNCs, particularly the factors behind intra-firm trade [Markusen,

1997; Carr, Markusen and Markus (CMM hereafter), 1998; Kant, 1988a, 1998b 1995; and Clausing, 1998]. Once MNCs decide to invest and spend sunk cost in a host country through FDI, the costs may outweigh the benefits to reverse entry in case other unexpected uncertainty occurs while in operation. However, MNC affiliates can engage in different business practices, such as trade with the parent and other affiliate firms in different countries, in response to some of the unexpected changes. These business practices are also viewed as a mechanism to exploit the advantages of expected changes. This explanation seems to hinge upon host and source country characteristics in terms of differences in resource base and firm-specific internal factors.

The volume of intra-firm trade among affiliates of U.S. MNCs grew following the increase in capital outflow from the U.S. In 1995, trade involving U.S. MNC parents, their affiliates, or both accounted for 62% of all U.S. exports of goods and for 39% of all U.S. imports of goods (BEA, 1995). Sales by affiliates have different destinations other than trade with parent firms (intra-firm trade). Affiliates may sell products to local firms or consumers in the host country, other affiliate firms in other countries, and non-affiliate consumers both in the host and source countries. The decision to distribute the sale of a given affiliate between these alternative destinations depends on both firm-specific internal factors and external factors [Kant (1988, 1995); Madan (2001); Markusen (1997); CMM (1998)].

There are two competing hypotheses to explain the factors behind intra-firm trade. The study by Kant (1988, 1995) shows that the motive to engage in intra-firm trade is to minimize international taxation (avoidance of tax) or to maximize global profit. Affiliates and parents arrange intra-firm trade and adjust transfer prices so as to minimize

international taxation. The presumption here is that firms have intra-firm trade and transfer pricing as decision variables to manipulate prices and the volume of intra-firm trade to maximize global profit. The practices of transfer pricing by multinational firms as a decision variable or as a way to shift profit and mitigate problem of uncertainty is addressed previous studies (Grubert and Mutti, 1991; Clausing, 2002; Fraedrich and Bateman, 1996). Madan (2001), however, indicated that transfer pricing is rather a constraint on profit maximization due to government regulation; hence, MNCs maximize global profits subject to the limit on transfer pricing. In practice, most firms engage in such transaction despite regulation, as the current laws are not exhaustive and also due to asymmetric information between the host country governments and the MNCs in regard to costs and revenue.

Another stance, led by Markusen (1997) and CMM (1998), justifies intra-firm trade as a means to enhance efficiency by allocating production and sales according to differences in resource costs in different host and source countries. Their models predict that MNCs engage in intra-firm trade due to the difference between the host and source countries in terms of resource base, skilled manpower, and investment and trade cost differences.

Another explanation given for intra-firm trade is that it is a means to solve the problem of asymmetric information between both MNCs and host country governments and between the parents and affiliate firms located in different countries [Donnenfeld and Prusa (1995), Konrad and Lonmerud (2001) and Kotebe and Murray (1996)]. Firm and product specific characteristics are also documented as the determinants of intra-firm trade [Kotabe and Murray (1996)]. The existence of market failure and the resulting

minimization of transaction costs are also seen as motives to undertake internal transactions [Siddharthan and Kumar (1990) for the case of U.S. manufacturing MNCs].

Empirical works, which subject the predictions of these theories to empirical tests, are very few. The exceptions are Clausing (1998) and CMM (1998). The study by Clausing tested intra-firm trade as a means to avoid or minimize international taxation through transfer pricing, whereas CMM investigated the role of differences in resource costs and incentive policies between source and host countries. These studies considered either only intra-firm trade between the affiliates and the parent (Clausing, 1998) or aggregate sales by affiliates to all destinations (CMM, 1998) without considering disaggregated sales to the alternative destinations. There is no similar study for the case of developing countries as a group or for an individual country. Some previous empirical works also focus on intra-industry trade determinants between U.S. and developing countries (Clark and Stanley, 1999).

The study by CMM (1998) concluded that outward investment from a source country to affiliates in a host country (proxied by affiliate sales or total production) is increasing in the sum of the countries' economic sizes, similarity in size, the relative skilled-labor abundance of the parent nation, and the interaction between size and relative endowment differences. The study also indicated that an increase in host country trade costs increases inward affiliate production. They also concluded that convergence in country size between the U.S. and a host country will increase affiliates sales in both directions, and that skilled labor abundance also increases outward affiliate sales.

The results of the study by Clausing (1998) support the view that multinational firms engage in the manipulation of intra-firm transactions to minimize international

taxation. Her study shows how taxes have substantial influence on intra-firm trade flows between U.S. parent firms and their affiliates abroad, and that the U.S. has a less favorable intra-firm trade balance with low tax countries. If host country taxes are low and firms systematically employ transfer pricing to shift profits to low tax countries, one would expect the U.S. intra-firm trade balance to be less favorable with such countries, as intra-firm exports from the U.S. are under-priced (as they intend to export more), and intra-firm imports into the United States are over-priced. Therefore, Clausings' study found a positive sign on the tax coefficient in the trade balance model.

Both theoretical and empirical studies cover mostly the intra-firm trade part of affiliates' sales. However, there are other alternative sale destinations for any given affiliate in a host country. This paper attempts to fill in the empirical gap by considering the alternative destinations of sales for the cases of US MNC affiliates in developing countries. Apart from that, host countries used in the above studies are mostly developed countries, which makes it difficult to compare results with the findings of this study. However, it is still possible to compare results for the case of developed and developing countries.

This paper contributes to the empirical literature of multinational firms and trade in three ways. First, unlike previous studies, this paper focuses on sales to different destinations and the impact of host country tax on affiliates' sales. Second, the study analyzes the determinants of affiliates' sales of U.S. multinational firms in developing countries. Third, to account for the censoring in the sales data from BEA, the Tobit panel data technique as well as panel-heteroscedasticity corrected GLS models are estimated.

There are four alternative sales destinations available to the affiliates, which include sales to affiliates in a source country (TPAR), sales to unaffiliated persons in a source country (TUSNAFF), sales to other affiliates in a host country (RTAFFIL), and sales to unaffiliated persons in a host country (RTNAFF). These four sales destinations are base for the MNCs to make decisions on the distribution of production and sales in different host countries. In addition to sales by affiliates to alternative destinations, affiliates in a host country also import from parent firms (TIMPFP). Affiliates' imports from parent firms (TIMPFP) can either be sold in the host country or exported to other neighboring country markets. Based on the predictions of the competing hypotheses, the motivating factors on deciding the share of sales to each destination are to minimize international taxation, enhance efficiency based on production costs of different host countries, and minimize asymmetric information problem between host country governments and MNCs. This study tests for the roles of tax minimization efforts and host country characteristics in making decisions to sell products to alternative destinations. Figures 1 and 2 show the direction and sales share of U.S. multinational affiliates to all destinations in 1998 as well as the volume of total affiliates' sales in each host country, respectively. Comparison over time reveals importance of affiliates' sales in a host country market in recent years.

III. MODEL AND ECONOMETRIC SPECIFICATION

3.1. Model

Kant (1988, 1995) formulated the global profit function of a multinational firm as:

$$\Pi = (1-t_h)\Pi_h + (1-t_f)\Pi_f \qquad (1)$$

where t_h and t_f are home and host (foreign) country corporate profit tax rates, and

$$\begin{aligned} \Pi_h &= R_h(S_h) - C_h(S_h + m) + Pm \\ \Pi_f &= R_f(S_f) - C_f(S_f - m) - P(1+t)m \end{aligned} \tag{2}$$

where P=transfer price, t = tariff rate, m=intra-firm sale, R_i and C_i are revenue and cost functions respectively, and S_i is production or sales by affiliates. Profit maximization by MNCs gives optimal transfer price and level of intra-firm trade as a function of home and host country cost parameters and tax structure, given second order conditions are satisfied. The purpose of this paper is to find what determines the share of production in source and host countries (value of S_i in each country). Furthermore, this study seeks not only the determinants of total sales share in each host countries but also the share of sales to affiliates and non-affiliates within the home country and the host country markets.

In this model, as the MNC decides on transfer price and the share of sales to each destination to maximize the global profit, host country characteristics and tax differences between the host and source countries affect revenue and cost functions of the firms. This in turn affects the decision of the MNCs about their affiliates' sales in each country and as to how much to sell to affiliates and non-affiliates. Hence, this paper augments the model by host country characteristics as determinants of sales to affiliates and non-affiliates in home and host country markets.

The proponents of both competing theories to explain the factors behind intra-firm trade and affiliates' sales to different destinations presented empirical results that supported predictions of their models (Clausing, 1998; and CMM, 1998). CMM (1998) provided numerical simulation results for aggregate sales to all destinations, whereas Clausing (1998) examined U.S. MNCs affiliates' sales only to two destinations: intra-firm trade and sales to affiliates in other countries. It is worthwhile to consider sales to

affiliates and non-affiliates in both host and home countries to test the predictions of the competing theories.

3.2. Econometric Specification

The sample countries used are selected from three regions (Africa, Asia and Latin America), which forms a heterogeneous group of countries. Some factors that cause the heterogeneity, like gross domestic product, labor force and value of trade flows, are controlled for in the model. However, there still remain some other factors that create heterogeneity, such as differences in trade policies, infrastructure. Hence it is expected that the variance of the error term differ by country but constant over time. This assumption is the usual panel (group-wise) heteroscedasticity (Beck and Katz, 1995).

Another assumption that is plausible in the case of trade flow model between multinational firms and host developing countries is the impact of macroeconomic shock. In an increasingly integrated economy, it is expected that shocks in a country affect the economy of trading partners. Shocks to the US economy affect multinational firms' trade and investment abroad, and hence, trade flow between multinational firms and host countries is affected. Therefore, it is expected that in each model the error terms correlated across time. However, due to information needed to estimate correlated error structure, only panel-heteroscedastic error structure models are estimated in this paper.

The following panel model is specified including the above assumption:

$$Y_{it} = X_{it}\boldsymbol{b} + \boldsymbol{e}_{it} \quad \text{where i} = 1,\ldots\ldots, \text{N and t} = 1,\ldots\ldots, \text{T} \qquad (3)$$

Panel heteroscedasticity is assumed where the error follow the form:

$$E(\boldsymbol{e}_{it}\boldsymbol{e}_{js}) = \begin{cases} \boldsymbol{s}_i^2 \text{ if i} = \text{j and s} = \text{t} \\ 0 \text{ otherwise} \end{cases}$$

It differs from simple heteroscedasticity in that the error variances are constant within a unit. The Generalized Lease Square (GLS) correction of panel heteroscedasticityis to estimate σ_i^2 from the residuals and then use those estimates in weighted least square procedure.

On the other hand, censored values of sales of U.S. affiliates call for estimation of Tobit model that accounts for the unobserved values of the data. More specifically, given the panel nature of the data, the Tobit random-effect model is used in this paper. One of the advantages of panel Tobit model is that it is able to measure not only the effects that observable variables have on the dependent variable, but also the effects of relevant unobservable or non-measurable influences. In the Tobit random effect model, the unobservable or non-measurable factors that differentiate cross-section units are assumed to be best characterized as randomly distributed variables[26].

Tobit random effects model has the form:

$$Y_{it}^{*} = X_{it}\beta + Z_i\gamma + \alpha_i + U_{it} \qquad \text{where } i = 1,.....,N \text{ and } \quad t = 1,.....T \qquad (4)$$

where U_{it} is IID with N(0, σ_u^2) and only Y_{it} =max(0, Y_{it}^{*}) is observed. α_i is the country specific factors that is allowed to be random. Tobit model uses the advantage of unobserved measures of the dependent variables. Tobit model is often used in estimating trade flow between countries, especially to test the Linder hypothesis (Mcpherson, et.al.,1998), determinants of export performance (Roper and Love, 2001) and success of regional trade blocks (Longo and Sekkat, 2001).

[26] Estimation technique that accounts for both the country effects (and heteroscedasticity) and censored values is not readily available or at least it is not well developed.

For the purpose of estimation Y_{it} measures dependent variables and X_{it} measures explanatory variables as follows:

$$Y_{it} = [RTAFFIL_{it} \;\; RTNAFF_{it} \;\; TPAR_{it} \;\; TUSNAFF_{it} \;\; LOAFFI_{it} \;\; LONAFFI_{it} \;\; TIMPFP_{it}]'$$

$$X_{it} = [\; TAX_{it} \; EXR_{it} \; UNCER_{it} \; TRADE_{it} \; DIST_{it} \; HOSTCHAR_{it} \;]$$

The dependent variable, Y_{it}, are sales to all affiliates (RTAFFIL), to all non-affiliates (RTNAFF), to affiliates in a source country (TPAR), to unaffiliated persons in a source country (TUSNAFF), sales to affiliates in a host country (RLOAFF), sales to unaffiliated persons in a host country (RLONAF) and affiliates imports from parent firms (TIMPFP). Total sales in the host (RTLOCAL) and source (RTUS) countries are also included. X_{it} is a vector of explanatory variables that measures host country tax, uncertainty and other characteristics. TAX represents three tax variables two of which indicate corporate income tax. To check for robustness of the results both ratio of host country corporate income tax to total tax revenue and ratio of foreign income tax paid to total income earned as reported by affiliate firms are used to test the impact of income tax. At the same tax as indicator of cost of trade host country international trade tax is also used in the model. EXR represents level of exchange rate of host countries that proxy prices of imports and exports. UNCER measures three separate uncertainty indicators, the uncertainty of the real exchange rate, the inflation rate, and political instability indicators. Square terms of each of the uncertainty indicators are also used in the estimation to exploit possible non-linear relations in uncertainty. This is to see if there is some tolerance level of uncertainty where firms benefit from the volatility and only concerned after a point where uncertainty is excessively large. Real exchange rate and inflation

uncertainty indicators are generated from generalized autoregressive heteroscedastic (GARCH) models for each country using monthly data (Lemi, 2001). For each country, GARCH (p, q) models are estimated, and variances are generated for the rate of exchange rate and the rate of inflation. See Tables 2a and 2b for the lists of countries and GARCH (p, q) coefficients for the rate of inflation and real exchange rate. First autoregressive processes of each series are fitted after selecting the lag length by Akiake information criteria. The kurtoses of the residuals from the autoregressive processes are also reported in the table, which shows heavy tail of the series for each country.

TRADE measures two separate trade variables, the total value of exports and imports at aggregate level, net of trade with the U.S., and aggregate bilateral trade flows (imports and exports) between host countries and the U.S., net of intra-firm trade. DIST measures distance between U.S. and host countries. HOSTCHAR are host country characteristics that measure five separate variables, the gross domestic product per capita, economically active labor force, skilled labor force, infrastructure, and economic policy reform. Multinational and bilateral agreements are also captured by membership of a host country in multilateral investment guarantee agency (MIGA) and bilateral tax treaties (BTXT) signed between the U.S. and the host country. Bilateral tax treaties are often signed to avoid double taxation of the income earned by affiliate firms.` The roles played by the bilateral tax treaties are also addressed in Blonigen and Davies (2001). Other than bilateral tax treaties, as indicated by these studies, U.S. foreign tax policy on income earned by foreign affiliates applies to all affiliates in all countries and hence does not affect the results of this study. Definitions of the variables used in the estimation are presented in the Appendix.

To compare results with earlier studies, similar models are also estimated for total sales by affiliates in a host country (TOTSALE)[27], and trade balance between the affiliates and parent firms (TRADBA). For these regression models, the explanatory variables are the same as in the above models; this is based on the assumption that multinational firms decide on the sales and production of a given affiliate, taking into account all the factors both in the host and source countries as well as the their sales in all the destinations.

A priori expectation on the coefficients depends on the hypothesis of alternative theories that attempt to explain the variation in sales of the affiliates. A positive sign is expected for host country resource and human capital indicators in affecting sales in the host and source country markets. On the other hand, uncertainty in the domestic market (both economic and political) impedes sales in the domestic market and forces affiliates either to sell to other affiliate firms or sell back to parent firms in the source country. The number of U.S. affiliate firms in a host country is also expected to increase sales both to local affiliate firms and parent firms in the source country. Host country membership in a multilateral investment agency and economic reform programs open the host country market to the external world and make it easier for affiliate firms to sell to parent firms or other affiliates outside of a host country. A positive sign is also expected for EXR and TRADE, as these facilitate sales outside of a host country and between affiliate firms. The signs of the other variables, including TAX, are ambiguous in affecting the volume of affiliates' sales to the alternative destinations.

[27] TOTSALE is also a good proxy for total affiliate production in a host country.

IV. ESTIMATION AND RESULTS

4.1. Estimation and Data

Beck and Katz (1995) introduced panel data technique that correct for group-wise heteroscedasticity and correlation. Estimation that accounts for both heteroscedasticity and correlation between the error terms requires large data, since many covariance parameters have to be estimated. Generalized least square (GLS) method that corrects for heteroscedasticity is estimated for all the models as indicated in equation 3.

After estimating the model with and without country dummies, the residuals are tested for the presence of heteroscedasticity. In both cases, the result confirms the presence of heteroscedasticity. A test for the presence of panel error component also shows that there is panel error component in the model estimated. Hence the need to estimate panel-heteroscedasticity corrected GLS.

Sales of affiliates data from BEA is censored if the amount of sale is below some minimum level during a given year and if there are only a few firms in a host country during a given period. To take into account these censoring and country specific factors, panel Tobit is the appropriate technique. To compare results, both the Tobit random effects and the GLS models are estimated in this paper. There are both advantages and disadvantages in using both specifications. The Tobit random effect has the advantage in that it accounts for the censored values in the data. On the other hand, GLS corrects for the heteroscedasticity that characterizes the data set. Results from the estimation of both the Tobit random effects and the GLS are reported. In most variables, the results from Tobit random effects and GLS estimation are similar. Differences in the results occur for uncertainty indicators, where Tobit random effect and GLS give different results. This

may be due to the differences in assumption in each specification. Descriptive statistics of the uncertainty indicators show that there is a significant difference between countries. Wald statistics that tests for the overall fitness of the model and the Log-likelihood of each model are also reported.

For the purpose of the analysis, data on affiliates' sales of U.S. multinational firms for the period 1983-1999 obtained from Bureau of Economic Analysis (BEA) is used in this paper. 22 sample host countries from three regions (Africa, Asia and Latin America) during the sample periods are used for the purpose of estimation. Sample countries are selected based on availability of data for all the sample periods. Data from all sample countries is pooled together and estimation is made for all sample host countries together[28]. Since some of the variables in the model are time invariant (distance and regional dummies), the random effects model is estimated using the data from sample host countries.

Table 1 presents mean values of the variables used in the estimation of sales models. As one can expect total affiliates' sales is high in countries that progressed much in development and in countries where there are more U.S. multinational firms. These countries include Singapore, Brazil, Mexico, Hong Kong and Malaysia. However, total sale does not tell much as to which market is the target of the sale (home or local). High local sales are recorded for countries with larger domestic market size like Nigeria, Venezuela, Thailand, South Africa and Chile. As can be seen from sales to other countries, other than host and home, some countries serve as a base to serve regional markets. These are countries like Indonesia, Hong Kong and Singapore. Two income tax indicators are also shown in the table: ratio of host country corporate income and profit

[28] Regional dummies are used for countries from the same region to capture regional effects.

tax to total tax revenue and ratio of foreign income tax paid by the affiliates to total income earned. Ratio of host country international trade tax (import and export) to total tax revenue is also reported. In terms of foreign income tax paid by affiliates of U.S. multinationals, Nigeria, Indonesia, Trinidad-Tobago and Egypt are some of the countries labeled as high tax countries. Asian countries including Philippines, India, Thailand and Malaysia top the list of countries with high international trade tax.

4.2. Results and Discussion

The results of the study reveal that there is evidence that affiliate firms of U.S. multinationals manipulate sales to minimize international taxation. This is supported by the result that host country corporate income tax affects sales of affiliates to other affiliate firms favorably, unlike its impact on sales to non-affiliate persons in both host and source country markets. Only the result that uses ratio of foreign income tax paid by affiliates to total income is reported in this study. Similar result is obtained when ratio host country corporate income tax to total tax revenue is used. Host country international trade tax lowers affiliates production and sales in most markets. Affiliates located in host countries where economically active and skilled labor force is abundant tend to sell more to non-affiliate persons. Host country economic policy reforms and membership in multinational investment guarantee facilitate affiliates' sales to other affiliate firms. Considering all markets together, economic and political uncertainties have minimal impact on sales among affiliates compared to its impact on sales to non-affiliate persons. Trade orientation of a host country both with the rest of the world and the U.S. are also found to be significant determinants of affiliates' sales. The result, however, rejects the complementarity of trade and FDI between the U.S. and

sample developing countries. Subsequent sections provide results for the determinants of affiliates sales to different destinations.

4.2.1. Total sales of Affiliates in All Markets

Total sales to all destinations (total affiliate production in the host country) are affected by both host country and source country characteristics (Table 3). Source country factors like U.S. GDP, number of U.S. multinational firms in a host country, and trade link of U.S. with a host country as well as host country GDP and distance increase affiliates total sales (production) in a host country. Affiliates in Africa and Asia compared to their country parts in Latin America, produce and sale. Most uncertainty indicators have no impact on the total sales except the real exchange rate uncertainty, which lowers total sales at its lower level.

The unexpected result of this estimation is that host country resource basis, skilled labor, economically active labor force and a proxy for infrastructure lower affiliates total sale (production) in a host country. Real exchange rate uncertainty also lowers total sales. Host country corporate income tax (INTAX) affects total production in the host country positively. This result, however, lumps the reaction of affiliate sales to other affiliates and non-affiliates and it is difficult to interpret.

Source country characteristics such as the number of U.S. multinational firms in the host country (NOUSFDI) and U.S. GDP per capita (USGDPC) also have significant positive impacts to raise total sales (production) of the affiliates in a host country. Intensity of trade link of host countries with the rest of the world (NTRADE) negatively affects total affiliates' sales in host country. Whereas, the trade link with the U.S. (NTRADUS) increases total sales by the affiliates. This again implies that trade

connection with the source country plays significant role to increase affiliates' total sales (production) in a host country. The findings support the view that trade and foreign direct investments are complements, as U.S. multinational firms production (total sales) in a host country increases with the bilateral trade between the U.S. and a host country. However, as the destinations of these total sales can be any where from sales back to source country to sale to other countries, the complementarity result cannot be generalized from this result.

4.2.2. Sales to Affiliates and Non-affiliates in All Markets

This section provides results that compare the determinants of affiliates' sales to other affiliate firms and non-affiliate persons in all markets (Table 5). The results provide a test for the hypothesis that the nature of multinational firms transaction among the affiliates is different compared to transaction with non-affiliate persons. If the explanatory variables in the models, particularly host county taxes, affect the two components of affiliates' sales [sales to other affiliates and non-affiliates] differently, this supports the view that U.S. multilateral firms practice internal transactions to maximize international profit. The role of a host country's tax is important in this case, as affiliates divert sales to other affiliates and to parents to evade tax or choose to sell to non-affiliate persons in the market where the tax rate is lower.

Host country skilled labor (LITERA), and economically active labor force (LABOR) lower sales to other affiliates in both the host country and the source country markets. However, the same variables affect sales to non-affiliate persons positively. This implies that in situation where there is large labor force and skilled labor for that matter, affiliate firms tend to sale more to non-affiliate persons but sell less to other

affiliate firms. The role of corporate income tax reveals even more about the business practice of multinational firms. Corporate income tax (INTAX) of a host country lowers affiliates' sales to non-affiliate persons, but raise sales to other affiliate firms. This confirms that affiliates evade tax by trading among themselves in a country where tax rate is high. In a host country with high corporate tax, affiliate firms sell less to non-affiliate persons. International trade tax affects sales to both affiliates and non-affiliates negatively. Most uncertainty indicators affect only sales of affiliates to non-affiliate persons. If there is any effect from uncertainty indicators they affect affiliates sales to other affiliates and non-affiliate persons differently.

Other determinants of sale affect sales to both affiliates and non-affiliates in the same fashion. These variables are taxes on international trade, the number of U.S. affiliates in a host country, U.S. GDP per capita, and trade orientation of host countries with the rest of the world. Trade orientation with the U.S., however, has different impact on sales to other affiliates and non-affiliates. Trade orientation with the U.S. facilitates sale to other affiliates but lowers sales to non-affiliate persons.

The next section presents estimation results for sales of the affiliates in the host country and the source country markets. Affiliates' sales in each market are further divided as sales to other affiliates and non-affiliates. This approach solves the problem faced in this section, which lumps affiliates' sales to other affiliates in all markets as well as sales to non-affiliates in all markets.

4.2.3. Sales in the Host and Source Country Markets

Most variables affect sales in the host and source country markets in similar fashion. But there are some exceptions. For instance, U.S. GDP per capita and

international trade tax facilitate sales back to the source country (the U.S.), but lowers sales in host country market. The result is in line with the findings of CMM (1998) in that trade costs diminish incentives to locate plants abroad, as it makes trade with parents expensive. The impact of U.S. GDP per capita is expected as it increases demand for the product of the affiliate. As stated above, the role of international trade tax is to lower production in a host country, which in effect lowers sales in the host country. Again since the sale can be to affiliates or non-affiliates, it is not clear to conclude from this result.

Unlike its effect on total sales (production), availability of skilled labor, economically active labor and exchange rate facilitates sales in both host and source country markets. On the other hand, trade link of host countries with the rest of the world (NTRADE), and GDP per capita of the host countries lowers affiliates' sales in both host and source country markets (Table 4). The negative coefficient for host country GDP per capita may be a support for the argument that in developing countries as income rises, local firms substitute activity of foreign firms in the host country. The result is inline with the view that trade link with the rest of the world increases export of the country to other destinations and lowers sales both in the host country and source country markets.

Most uncertainty indicators affect only sales in the source country. Exchange rate uncertainty and political instability have similar effect in that at lower levels both facilitate trade back to the U.S., at higher levels both lowers sales back to the U.S. For inflation uncertainty, as it picks shifts in demand in the host country, it lowers sales back to the U.S. None of these uncertainty indicators has effect on sales in the local market.

4.2.3.1. Sales to Affiliates and Non-affiliates in the Host Country Market

The results show an interesting pattern for the case of affiliates' sale in the host country market, in which the difference between affiliates transaction with other affiliates and non-affiliate persons can be seen clearly (Table 6). The impact of corporate income tax (INTAX) again confirms the above findings in the host country market. Corporate income tax lowers affiliates' sales to non-affiliate persons in the host country market, but has no impact on sales to other affiliate firms in the host country market. Similarly, trade link with U.S. (NTRADUS) and U.S. GDP per capita increases sales to other affiliates but decreases sales to non-affiliate persons in the local market. This result again confirms that complemetarity of trade and FDI is valid only for trade among affiliate firms, although it may raise another question as to whether transactions between affiliates can be considered as evidence for the complementarity of trade and FDI.

Only exchange rate uncertainty affects sales to both affiliates and non-affiliates in the host country market. At lower level of exchange rate uncertainty, affiliates sell less to other affiliates, but sell more to non-affiliates. At higher levels, affiliates sell more to other affiliates, but sell less to non-affiliate persons. This proves that even in the host country market, affiliates shift sales to other affiliates in cases of severe exchange rate uncertainty.

4.2.3.2. Sales to Affiliates and Non-affiliates in the Source Country Market

Sales back to the U.S. market may go either to the affiliate (parent firm) or to non-affiliate persons in the U.S. market. What is interesting here is that most variables affect sales to U.S. non-affiliate persons, but do not affect sales to parent firm. Affiliates located in Africa (compared to those in Latin America) and located in countries with larger economically active and skilled labor force tend to sell more to non-affiliate persons in the U.S. This is in line with the hypothesis that affiliates takes advantage of availability of cheap labor to produce in a host country to serve source country market (Table 7). On the other hand, both corporate income and international trade tax lower sales back to the U.S. non-affiliate persons. Exchange rate uncertainty and political instability indicators affects sales back to U.S. non-affiliates in the same fashion. At lower levels of exchange rate uncertainty and political instability, affiliates sell more to non-affiliate persons in the U.S., but at higher levels they tend to sell less. Probably they shifted the sale to other affiliates firms when uncertainty becomes sever.

Similar result is obtained here on the impact of income tax on sales of affiliates to affiliates and non-affiliates in the source country. Corporate income tax increases affiliates sales to parent firms and decrease sales to non-affiliate persons in the U.S. market. One can also infer for the impact of uncertainty how affiliates shift sales when there is sever uncertainty in the host country market.

4.2.4. Affiliate Firms' Imports from Parent Firms

It has been indicated in previous studies that, FDI in developing countries is dominated by wholesale-trade and that affiliates import products from parent firms to distribute in the host country's market or neighboring markets. This section presents the

results for the determinants of affiliates' imports from parent firms, which mostly refers to firms engaged in wholesale trade in the host country (Table 8).

The result confirms that affiliates located in countries with larger GDP per capita, with better infrastructure, and which undertook economic reform program import more from parent firms. It seems that affiliates import to serve the local markets form the above results. However, the results further show that affiliates in countries that host more U.S. FDI firms also import more from parent firms. Hence the import could be an intermediate good for the U.S. affiliates in the host country or it could be final good to serve local or neighboring markets.

Inflation and political uncertainty indicators also affect affiliate imports from parent firm. At lower levels of inflation and political instability, affiliates tend to import more but as uncertainty gets severe, affiliates import less. The case of inflation uncertainty is expected as it measures up ward swing in demand one expects increased import by affiliates. Political uncertainty has also expected result in that initially at lower level of political instability affiliates tend to import more from parent firms, but as uncertainty gets larger and larger, firms lower their import from parent firms.

4.2.5. Parent Firms Trade Balance with the Affiliates

The results in this section can be compared with a similar study conducted by Clausing (1998). The trade balance of parent firms is computed as the difference between a parent firm's exports to the affiliates in a host country and imports from affiliates in a host country.

Parent firms in the U.S. have a favorable trade balance with affiliates in countries where there is large skilled labor (LITERA), and large economically active labor force

(LABOR) and with affiliates in Africa and Asia compared to those in Latin America. On the other hand, a parent firm has a less favorable trade balance with affiliates in those countries which have high GDP per capita (GDPPC) and high corporate income tax (INTAX) and international trade tax (TRADETAX) (Table 9). The results for the impact of corporate income tax are contrary to what Clausing (1998) obtained for the overall sample. These results agree with his sub-sample estimation, which includes only those countries with an average tax rate above that of the U.S. In this study, since the sample countries are all developing countries, the average corporate income tax rate is higher than the U.S. This implies that in countries where corporate income tax is high, parent firms export less but import more to shift income from high tax countries. Hence, the hypothesis that multinational firms manipulate intra-firm trade to minimize international tax is valid in the cases of trade between U.S. and developing countries.

Uncertainties of real exchange rate (VRER) and inflation (VINF) initially have favorable effect on trade balance, but eventually at higher level of uncertainty, both inflation and real exchange rate uncertainties have negative effect on trade balance. This implies that the parent firms benefit from devaluation and upward demand fluctuations only at lower level of uncertainty.

However, the trade link with the U.S. (NTRADUS) leads to a less favorable trade balance for parent firms. Similar result is obtained by Clausing for those countries with an average tax rate above that of the U.S. This supports the above results that trade and FDI of the U.S. are substitutes in the case of developing countries. U.S. multinational parent firms export less if there is trade link between the source and the host countries.

V. CONCLUSIONS

There are very few empirical works that test the motives of MNC to divide their sales between affiliates and non-affiliates both in the host country and in the source country markets. One theory argues that firms have objectives to minimize international taxation (to maximize global profit) in order to divide sales to take advantage of lower taxes in the host or the source country markets. Another stance of literature argues that production in a host country and sales either back to a source country or in a host country are functions of characteristics of both countries. These characteristics are mainly differences in the resource bases, such as skilled labor, trade and investment cost and infrastructure. These theories were not subjected to empirical test, particularly in the case of developing countries.

Previous studies consider only the determinants of total affiliates' sales and do not address the factors behind sales to affiliates and non-affiliates. Furthermore, to have better understanding of the behavior of a MNC in terms of intra-firm trade, it is also important to consider imports by affiliate firms from parent firms. The contribution of this paper is to test the hypotheses that host country characteristics, especially corporate income tax, affect sales behavior of MNCs. These host country characteristics are the availability of labor force, infrastructure, per capita income, economic as well as political uncertainty and corporate income tax and international trade taxes. Unlike previous studies, this paper analyzes sales to other affiliate firms and non-affiliate persons as well as determinants of imports by affiliates from parent firms.

The results of the study reveal that there is evidence that affiliate firms of U.S. multinationals manipulate sales to minimize international taxation. This is supported by the result that host country corporate income tax affects sales of affiliates to other affiliate firms favorably, unlike its impact on sales to non-affiliate persons in both host and source country markets. Host country international trade tax lowers affiliates production and sales in most markets. Affiliates located in host countries where economically active and skilled labor force is abundant tend to sell more to non-affiliate persons. Host country economic policy reforms and membership in multinational investment guarantee facilitate sales of affiliates to other affiliate firms. Considering all markets together, economic and political uncertainties have minimal impact on sales of affiliates to other affiliate firms compared to its impact on sales to non-affiliate persons. Trade orientation of a host country both with the rest of the world and the U.S. are also found to be significant determinants of affiliates' sales. The result, however, rejects the complementarity of trade and FDI between the U.S. and sample developing countries.

Given the results of this study that MNC firms behave in such a way to divert sales to benefit from their international investment, host countries should make sure that the expected benefits from MNC are realized. Future research should focus on the implication of affiliates' trade pattern on the productivity of local firms in particular and on the welfare impacts on host country in general.

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APPENDIX: DATA

Affiliates' sales data for U.S. multinational corporations and foreign income tax paid by the affiliates are obtained from Bureau of Economic Analysis (BEA), U.S. Direct Investment Abroad: Operations of U.S. Parent Companies and Their Foreign Affiliates (Table 39, Sales of Goods by Affiliates, Country of Affiliate by Destination). All other variables except for bilateral trade and distance are taken from the CD-ROMs of the World Development Indicators and International Financial Statistics of International Monetary Fund. Bilateral trade data is taken from the Direction of Trade statistics yearbook, whereas distance data is compiled from Raymond Robertson's international trade data website http://www.macalester.edu/~robertson).

1. Sales of U.S. MNC Affiliates in a host country with to parent firms in U.S., Intra-firm trade (TPAR).
2. Local sales by U.S. affiliates in a host country to other local affiliates (LOAFFI).
3. Local sales by U.S. affiliates in a host country to unaffiliated persons (LONAFFI).
4. Total Sales in the host country market (TLOCAL)
5. Total Sales in the source country market (TUS)
6. Total sales to other affiliate firms in the host and source country markets (TAFFIL)
7. Total sales to non-affiliate persons in the host and source country markets (TNAFFI)
8. Total Sales of Affiliates in all markets (including the parent firm) (TOTSALE).
9. Sales by U.S. affiliates to unaffiliated persons in the U.S. (TUSNAFF).
10. Imports by affiliates in a host country from parent firms (TIMPFP).
11. Difference between parent firms' exports and imports to and from affiliates in host countries [Intra-firm trade balance (TRADBA)].
12. Ratio of foreign Income tax paid to total income earned by affiliates. As an alternative measure of corporate income tax, corporate income tax imposed by host countries as % of total tax revenue is also used (INTAX)
13. Export tax and import tariff by host countries (trade barriers) (as % of total tax revenue) (TRADETAX)
14. Exchange rate defined as national currency/U.S. dollar for host countries and the generated uncertainty (monthly frequency) (RER and VRER)
15. Uncertainty of rate of Consumer Price Index (CPI) for host countries (monthly frequency) (VINF)
16. Total volume of exports and imports by host countries (excluding bilateral trade with U.S.) (NTRADE)
17. Bilateral trade (exports and imports) between the host and source countries (U.S.) (NTRADUS)
18. GDP of host countries and U.S. (GDPPC and USGDPC)
19. Gross fixed capital formation of host countries (GFCF)
20. Number of U.S. multinational affiliates in a host country (NOUSFDI)
21. Total economically active labor force in host countries (LABOR)
22. Skilled labor force measured by literacy rate in the host countries (LITERA)
23. Distance between host countries and U.S. (DIST)
24. Political instability indicator taken from Freedom House Annual Survey (POLI)
25. Membership in Multilateral Investment Guarantee Agency (MIGA)
26. Infrastructure proxied by telephone mainlines per 1000 people (TELEM)
27. Bilateral Tax Treaty between U.S. and host countries (BTXT)
28. Dummy variables for regions [Africa (DFRICA) and Asia (DSIA)]

Table II.1. Mean of some of the variables used in affiliates of U.S. multinational firms sales models: 1983-1998

COUNTRY	USFDINO	TOTSALE	RTLOCAL	RTUS	ROTHTOT	RTAFFIL	RTNAFF	INTAX1	INTAX	TAXIT
Argentina	198.47	7.82	26.6	38.88	15.54	2.94	62.54	7.47	1.8	10.57
Brazil	477.67	31.32	32.52	54.17	7.14	7.45	79.24	16.95	3.45	2.35
Chile	124.53	3.24	30.9	46.81	22.29	6.75	70.96	15.19	2.36	9.62
Colombia	144.93	5.11	25.99	46.22	8.58	4.72	67.6	31.77	4.04	13.16
Ecuador	64.4	0.78	11.52	38.88	8.38	12.21	46.97	53.89	2.16	14.61
Egypt	64.33	1.8	0.33	20.1	13.53	1.65	31.98	18.2	9.14	12.7
Hong Kong	413.07	19.22	24.2	39.07	36.73	21.18	42.09	15.8	1.18	1
India	91.13	0.89	26.51	31.48	3.03	2.35	61.87	18.16	4.81	25.3
Indonesia	148.8	7.29	13.38	27.72	49.52	24.77	16.33	54.65	23.91	4.91
Jamaica	37.8	0.98	16.11	28.5	20.92	21.35	22.04	39.48	1.83	6.44
Korea Rep.	157.07	3.44	16.07	45.24	4.7	14.43	46.89	29.46	3.03	10.15
Malaysia	151.13	8.61	26.79	22.61	15.81	28.19	22.13	34.34	2.73	15.72
Mexico	694.67	26.43	30.84	36.47	3.25	27.28	41.72	30.28	3.25	5.23
Nigeria	55.2	3.1	39.31	20.72	4.86	57.34	7.35	46.19	32.16	15.9
Panama	129.2	1.71	3.59	12.3	21.29	3.76	14.05	19	1.56	10.22
Peru	62.07	1.65	15.32	23.75	13.14	2.19	32.98	15.3	6.84	14.16
Philippines	133.73	4.03	30.79	36.65	12.39	12.55	54.88	28.82	3.52	24.82
Singapore	332.13	34.04	20.44	29.89	34.56	24.21	26.11	25.77	0.57	2.24
South Africa	148.2	4.32	32.17	54.66	7	1.81	90.88	51.31	3.54	3.73
Thailand	138.47	6.83	32.9	11.75	6.98	9.97	43.44	25.24	2.29	18.16
Trinidad-Tobago	31.93	0.74	2.09	4.48	6.85	0.03	7.63	43.96	13.6	8.12
Venezuela	238.33	3.99	33.55	43.95	2.4	2.11	81.56	49.85	3.08	11.21

Note: TOTSALE= Total Sales Value of Affiliates (billions of dollars), USFDINO = Number of U.S. FDI firms in a host country, RLOCAL= Ratio of local sales to total sales of the affiliates, RUS= Ratio of total sales back to U.S. to total sales, ROTH= Ratio of sales to other markets to total sale, RAFFILI= Ratio of sales to affiliate firms to total sale, RNAFFILI= Ratio of sales to non-affiliates to total sale, INTAX1 = Ratio of income, profit and capital gain tax to total tax revenue, INTAX = Ratio of foreign income tax paid to total income earned, ITT= Ratio of tax on International trade to total tax revenue. RLOCAL + RUS + ROTH should add up to 100%, similarly RAFFILI + RNAFFIL should be 100%, but due to censoring, the sum is less than 100% in most cases.

Table II.2a. Estimation results of GARCH (p, q) to generate variances for the inflation rate for sample of developing countries

Country	Autoregresive process	Kurtosis of residual	GARCH model	Coefficients of GARCH			
				α_1	α_2	α_3	θ
ARGENTINA	AR (4)	58.68	GARCH (q=1)	1.29* (1.72)			
BRAZIL	AR (2)	48.70	GARCH (q=1)	1.76* (1.65)			
CHILE	AR (12)	10.84	GARCH (q=1, p=1)	0.89*** (3.76)			0.29*** (2.78)
COLOMBIA	AR (12)	4.44	GARCH (q=1, p=1)	0.12* (1.84)			0.87*** (12.58)
ECUADOR	AR (12)	6.99	GARCH (q=1)	1.34*** (4.55)			
EGYPT	AR (12)	8.12	GARCH (q=1)	0.53*** (2.87)			
HONG KONG	AR (12)	11.75	GARCH (q=1, p=1)	0.84*** (3.50)			0.46*** (5.12)
INDIA	AR (12)	5.50	GARCH (q=1, p=1)	0.15*** (2.32)			0.81*** (8.67)
INDONESIA	AR (12)	22.07	GARCH (q=1)	0.99*** (4.93)			
JAMAICA	AR (12)	16.05	GARCH (q=1, p=1)	0.81*** (4.13)			0.11 (1.03)
KOREA	AR (12)	5.14	GARCH (q=1, p=1)	0.05 (0.79)			0.77*** (2.55)
MALAYSIA	AR (12)	5.53	GARCH (q=1, p=1)	0.27** (2.15)			0.48* (1.94)
MEXICO	AR (12)	11.64	GARCH (q=1, p=1)	1.18*** (3.78)			0.31*** (3.4)
NETHERLAND AN.	AR (12)	9.57	GARCH (q=(2))		0.19** (2.12)		
NIGERIA	AR (12)	9.67	GARCH (q=(3))			0.89*** (3.68)	
PANAMA	AR (12)	4.89	GARCH (q=(3), p=1)			0.024 (0.50)	0.86*** (2.65)
PERU	AR (12)	82.68	GARCH (q=1)	3.44* (1.65)			
PHILIPPINES	AR (12)	11.66	GARCH (q=1)	1.03*** (5.75)			
SINGAPORE	AR (12)	4.02	GARCH (q=1)	0.25** (2.22)			
SOUTH AFRICA	AR (12)	4.79	GARCH (q=2, p=1)	0.38*** (2.67)			0.02*** (2.83)
THAILAND	AR (12)	4.25	GARCH (q=1, p=1)	0.0001 (0.0001)			0.02*** (2.89)
TRINIDAD TOB.	AR (12)	4.69	GARCH (q=1)	0.49*** (2.91)			
VENEZUELA	AR (12)	28.74	GARCH (q=1)	1.17*** (4.94)			

*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 obtain stationary series. Autoregressive (AR) processes of each series are 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. Values in parentheses are t-ratios.

Table II.2b. Estimation results of GARCH (p, q) to generate variances for the real exchange rate for sample of developing countries

	Autoregressive process	Kurtosis of residual	GARCH model	Coefficients of GARCH			
				α_1	α_2	α_4	θ
ARGENTINA	AR(12)	38.22	GARCH (q=1, p=1)	0.58*** (2.64)			0.46*** (3.55)
BRAZIL	AR(9)	33.81	GARCH (q=1, p=1)	0.85* (1.66)			0.06 (0.45)
CHILE	AR(1)	11.13	GARCH (q=1, p=1)	0.19** (2.22)			0.67*** (6.22)
COLOMBIA	AR(12)	25.94	GARCH (q=1)	3.91*** (3.44)			
ECUADOR	AR(5)	74.76	GARCH (q=1)	1.13 (1.40)			
EGYPT	AR(12)	44.65	GARCH (q=1, p=1)	2.92*** (8.2)			0.09 (1.62)
HONG KONG	AR(12)	21.43	GARCH (q=1, p=1)	0.48*** (2.71)			0.51*** (3.75)
INDIA	AR(9)	42.51	GARCH (q=(3))			2.92*** (9.99)	
INDONESIA	AR(9)	40.82	GARCH (q=1)	1.22 (1.20)			
JAMAICA	AR(9)	22.52	GARCH (q=1)	1.56*** (6.21)			
KOREA	AR(12)	57.25	GARCH (q=1)	1.8*** (7.6)			
MALAYSIA	AR(12)	35.86	GARCH (q=1, p=1)	0.87*** (4.29)			0.27*** (3.17)
MEXICO	AR(12)	26.59	GARCH (q=1)	1.96*** (5.5)			
NETHERLAND AN.	AR(12)	8.14	GARCH (q=(2), p=1)		0.31** (2.49)		0.33* (1.83)
NIGERIA	AR(12)	46.11	GARCH (q=1, p=1)	0.001 (0.05)			0.02 (0.01)
PANAMA	AR(2)	4.25	GARCH (q=2)	0.09 (1.3)	0.19* (1.77)		
PERU	AR(3)	72.55	GARCH (q=1)	0.43 (1.07)			
PHILIPPINES	AR(8)	19.55	GARCH (q=1, p=1)	2.05*** (4.79)			0.08* (1.86)
SINGAPORE	AR(12)	9.32	GARCH (q=1)	0.64*** (3.85)			
SOUTH AFRICA	AR(12)	11.78	GARCH (q=1, p=1)	0.87*** (4.18)			0.35*** (4.48)
THAILAND	AR(5)	29.67	GARCH (q=1)	0.77*** (3.37)			
TRINIDAD TOB.	AR(12)	64.90	GARCH (q=1, p=1)	1.63** (2.48)			0.28*** (2.58)
VENEZUELA	AR(12)	51.12	GARCH (q=1)	0.21 (0.75)			

*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 obtain stationary series. Autoregressive (AR) processes of each series are 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.

Table II.3. Determinants of U.S. multinational firms Affiliates' total sales (production) of U.S. Multinational firms in developing countries (TOTSALE): Panel-heteroscedasticity corrected GLS

	Coefficient	t-ratio
MIGA (Multilateral Investment Guarantee Agency)	-0.573	-1.107
BTXT (Bilateral tax treaty)	-0.578	-1.088
REFORM (Economic reform)	0.759	1.448
DASIA (Asia dummy)	-3.561**	-2.056
DAFRICA (Africa Dummy)	-4.777**	-2.661
GDPPC (Host GDP per capita)	16.585**	3.628
RGFC (Gross Fixed capital formation)	-0.00194	-0.16
LITERA (Literacy rate)	-0.148***	-4.26
LABOR (Economically active labor force)	-0.178***	-4.262
TELEM (Telephone main line per 1000 people)	-0.005**	-2.026
DISTANCE (Distance from host to U.S.)	0.002***	3.935
INTAX (Corporate income tax)	0.084***	2.67
TRADETAX (International trade tax as % of total tax	0.001	0.549
RER (Real Exchange Rate)	0.001	0.909
VRER (Variance of real exchange rate)	-0.143***	-3.547
VRER2 (Square of variance of real exchange rate)	0.001**	2.951
VINF (Variance of inflation rate)	0.001	1.033
VINF2 (Square of variance of inflation rate)	-0.0001	-0.822
POLI (Political instability index)	0.530	0.946
POLI2 (Square of political instability index)	-0.036	-0.487
NOUSFDI (Number of U.S. multinational firms)	0.035***	10.535
USGDPC (US GDP per capita)	0.053***	4.077
NTRADUS (Bilateral trade of host with U.S.)	0.001***	2.916
NTRADE (Total trade of host country)	-0.007**	-2.830
TOTOTH	-0.001	-0.131
Constant	-7.408**	-2.251
Log Likelihood	-812.59	
Wald χ^2 (25)	628.68***	

Note: GLS is generalized least square corrected for panel-heteroscedastic error structure.
*** P<1%, **P<5%, *P < 10%

Table II.4. Determinants of sales of U.S. multinational firm Affiliates in the host and home country markets

	Sales in host country market (RTLOCAL)				Sales back to source country market (RTUS)			
	GLS		Tobit Random		GLS		Tobit Random	
Variables	Coeff.	t-ratio	Coeff.	t-ratio	Coeff.	t-ratio	Coeff.	t-ratio
MIGA (Multilateral Investment Guarantee Agency)	-3.926	-1.129	0.465	0.076	3.905	0.915	6.040	0.866
BTXT (Bilateral tax treaty)	-0.288	-0.073	-7.637	-1.259	-2.143	-0.452	-8.001	-1.143
REFORM (Economic reform)	-0.796	-0.233	-3.792	-0.674	-6.291	-1.406	-4.836	-0.756
DASIA (Asia Dummy)	-5.634	-0.566	2.822	0.174	-10.491	-1.044	-8.513	-0.454
DAFRICA (Africa Dummy)	16.184	1.272	33.562*	1.729	44.731***	3.212	72.968***	3.239
GDPPC (Host GDP per capita)	-56.47***	-3.697	-114.9***	-4.111	-46.67**	-2.925	-87.89**	-2.689
RGFC (Gross Fixed capital formation)	-0.093	-1.165	-0.083	-0.575	0.008	0.087	-0.190	-1.152
LITERA (Literacy rate)	1.054***	4.177	1.51***	3.749	1.331***	4.388	2.18***	4.670
LABOR (Economically active labor force)	1.096***	2.983	1.468**	2.930	1.543***	3.755	2.407***	4.144
TELEM (Telephone main line per 1000 people)	0.016	0.963	0.006	0.207	0.010	0.469	-0.003	-0.091
DISTANCE (Distance from host to U.S.)	0.001	0.879	0.001	0.482	0.001	0.439	0.001	0.107
INTAX (Corporate income tax)	0.027	1.189	0.005	0.143	-0.036	-1.490	-0.058	-1.368
TRADETAX (International trade tax as % of total tax	-0.07***	-3.540	-0.076**	-2.410	-0.029	-1.372	-0.037	-1.035
RER (Real Exchange Rate)	-0.003	-1.796	-0.004	-1.184	0.003	1.373	0.007	1.656
VRER (Variance of real exchange rate)	0.541*	1.722	0.730	1.409	0.816*	1.733	1.746***	3.042
VRER2 (Square of variance of real exchange rate)	-0.002	-1.518	-0.002	-1.167	-0.003	-1.413	-0.006**	-2.637
VINF (Variance of inflation rate)	-0.002	-0.655	-0.009	-1.099	-0.008**	-2.544	-0.015**	-2.303
VINF2 (Square of variance of inflation rate)	0.001	0.506	0.001	1.063	-0.001**	2.506	0.001**	2.300
POLI (Political instability index)	-2.180	-0.496	-2.774	-0.393	15.57**	2.842	21.72**	2.722
POLI2 (Square of political instability index)	0.347	0.639	0.573	0.632	-2.607***	-3.796	-3.39***	-3.283
NOUSFDI (Number of U.S. multinational firms)	0.021	1.540	0.059**	2.569	0.035**	2.348	0.027	1.017
USGDPC (US GDP per capita)	-0.495***	-6.283	-0.797***	-5.397	0.411***	4.568	0.37**	2.180
NTRADE (Total trade of host country)	-0.045**	-2.958	-0.055*	-1.852	-0.027	-1.414	-0.104***	-3.090
NTRADUS (Bilateral trade of host with U.S.)	-0.001	-1.434	-0.001	-1.422	-0.001*	-1.730	-0.001	-1.150
Total Sale to Other countries	0.064	0.942	0.270*	1.751	0.431***	4.868	0.785***	4.397
Constant	66.146**	2.526	98.87**	2.397	-208.7***	-6.856	-282.6***	-5.950
Log Likelihood	-1467.1		-1187.7		-1525.64		-1216.1	
Wald χ^2 (25)	182.31***		121.3***		201.71***		113.3***	

Note: GLS is generalized least square corrected for panel-heteroscedastic error structure. Tobit random effect is an estimation that accounts for both country effects and the censored values. *** P<1%, **P<5%, *P < 10%

Table II.5. Determinants of sales of U.S. multination firm Affiliates to other affiliates and non-affiliates in the host and source country markets

	Sales to Other Affiliate firms (RTAFFIL)				Sales to Non-affiliates persons (RTNAFF)			
	GLS		Tobit Random		GLS		Tobit Random	
Variables	Coeff.	t-ratio	Coeff.	t-ratio	Coeff.	t-ratio	Coeff.	t-ratio
MIGA (Multilateral Investment Guarantee Agency)	2.332*	1.877	0.813	0.388	-3.730	-1.025	0.562	0.101
BTXT (Bilateral tax treaty)	-2.147	-1.371	1.684	0.710	3.376	1.090	-4.486	-0.639
REFORM (Economic reform)	2.294*	1.886	3.447*	1.806	-5.278	-1.405	-3.015	-0.470
DASIA (Asia Dummy)	13.722***	3.263	13.399**	2.360	-37.633***	-4.257	-24.186	-1.116
DAFRICA (Africa Dummy)	-1.251	-0.266	-18.315**	-2.619	51.93***	5.561	65.26**	2.596
GDPPC (Host GDP per capita)	-6.064	-0.848	-3.112	-0.300	-75.98***	-5.068	-102.17**	-2.715
RGFC (Gross Fixed capital formation)	0.032	0.458	0.017	0.355	-0.059	-0.733	-0.060	-0.457
LITERA (Literacy rate)	-0.396***	-3.596	-1.308***	-8.590	2.431***	10.876	2.629***	5.169
LABOR (Economically active labor force)	-0.730***	-5.602	-1.397***	-7.874	2.802***	6.992	3.384***	5.060
TELEM (Telephone main line per 1000 people)	0.001	0.072	0.004	0.414	0.016	1.040	0.018	0.741
DISTANCE (Distance from host to U.S.)	-0.001	-0.564	0.001	0.933	0.002***	3.002	0.001	0.659
INTAX (Corporate income tax)	0.49***	4.03	0.643***	4.12	-0.899***	-4.08	-1.32***	-3.13
TRADETAX (International trade tax as % oftotal tax	-0.009	-1.373	-0.032**	-2.898	-0.048**	-2.681	-0.067**	-2.256
RER (Real Exchange Rate)	0.001	1.297	-0.003**	-2.392	0.003	1.462	0.001	0.127
VRER (Variance of real exchange rate)	-0.24*	-1.974	-0.515**	-2.737	1.645***	4.154	1.21*	1.886
VRER2 (Square of variance of real exchange rate)	0.001	1.449	0.002**	2.473	-0.006***	-3.423	-0.004	-1.539
VINF (Variance of inflation rate)	0.001	0.225	-0.003	-1.334	-0.011***	-4.651	-0.013**	-2.541
VINF2 (Square of variance of inflation rate)	-0.001	-0.223	0.001	1.287	0.001***	4.375	0.001**	2.555
POLI (Political instability index)	-0.025	-0.016	4.076	1.515	12.09***	3.144	7.217	1.050
POLI2 (Square of political instability index)	0.046	0.206	-0.639	-1.825	-1.975***	-3.939	-1.282	-1.385
NOUSFDI (Number of U.S. multinational firms)	0.006	1.491	0.011	1.456	0.052***	3.992	0.061**	2.255
USGDPC (US GDP per capita)	-0.072**	-2.341	0.094*	1.795	-0.126	-1.586	-0.294**	-2.051
NTRADE (Total trade of host country)	-0.016**	-2.222	0.004	0.390	-0.039**	-2.414	-0.039	-1.249
NTRADUS (Bilateral trade of host with U.S.)	0.001***	3.293	0.001	0.403	-0.001***	-3.632	-0.001*	-1.827
TOTOTH	0.159***	4.009	0.212***	4.100	0.119	1.451	0.451***	3.232
Constant	54.666***	5.902	85.505***	5.902	-141.09***	-6.425	-119.45**	-2.686
Log Likelihood	-1139.3		-1063.4		-1475.64		-1352.8	
Wald χ^2 (25)	482***		357.6***		816.3***		78.6***	

Note: GLS is generalized least square corrected for panel-heteroscedastic error structure. Tobit random effect is an estimation that accounts for both country effects and censored values. *** P<1%, **P<5%, *P < 10%

Table II.6. Determinants of sales of U.S. multinational firm affiliates to other affiliates and non-affiliates in the host country market

	Sales to Local Affiliate firms (RLOAFF)				Sales to Local Non-affiliate person (RLONAF)			
	GLS		Tobit Random		GLS		Tobit Random	
Variable	Coeff.	t-ratio	Coeff.	t-ratio	Coeff.	t-ratio	Coeff.	t-ratio
MIGA (Multilateral Investment Guarantee Agency)	0.218	0.224	5.577**	2.509	-5.125*	-1.660	-7.224	-1.41
BTXT (Bilateral tax treaty)	-0.340	-0.276	-2.976	-1.220	1.322	0.416	2.352	0.45
REFORM (Economic reform)	1.565	1.500	-1.448	-0.612	-1.683	-0.523	-8.846*	-1.89
DASIA (Asia Dummy)	4.647	1.422	19.238***	3.054	-10.271	-1.147	-15.561	-1.14
DAFRICA (Africa Dummy)	-4.292	-1.085	23.302***	3.238	22.162**	2.055	27.329*	1.68
GDPPC (Host GDP per capita)	6.522	1.086	17.225	1.593	-62.89***	-4.644	-111.2***	-4.75
RGFC (Gross Fixed capital formation)	-0.022	-0.736	0.081	1.494	-0.044	-0.748	-0.112	-0.92
LITERA (Literacy rate)	-0.222**	-2.684	0.285*	1.664	1.136***	4.878	1.79***	5.31
LABOR (Economically active labor force)	-0.369***	-4.145	0.609**	2.749	1.19***	3.475	1.687***	3.97
TELEM (Telephone main line per 1000 people)	0.003	0.784	0.024**	2.444	-0.007	-0.490	-0.008	-0.37
DISTANCE (Distance from host to U.S.)	0.001	0.409	-0.001**	-2.411	0.001	1.276	0.002	1.33
INTAX (Corporate income tax)	-0.33	-0.31	-0.049	-0.294	-0.5***	-2.8	-1.89***	-4.7
TRADETAX (International trade tax as % of total tax	-0.005	-1.069	-0.009	-0.777	-0.053**	-2.952	-0.06**	-2.31
RER (Real Exchange Rate)	0.001	0.886	0.001	0.944	-0.001	-0.288	0.001	0.46
VRER (Variance of real exchange rate)	-0.183*	-1.910	-1.302***	-5.802	0.668**	2.249	1.374***	3.17
VRER2 (Square of variance of real exchange rate)	0.001	1.496	0.005***	5.512	-0.002*	-1.947	-0.005**	-2.79
VINF (Variance of inflation rate)	-0.001	-1.129	-0.005	-1.343	-0.002	-0.735	-0.008	-1.15
VINF2 (Square of variance of inflation rate)	0.001	0.996	0.001	1.293	0.001	0.536	0.001	1.09
POLI (Political instability index)	-1.032	-0.824	0.176	0.060	-2.696	-0.678	0.173	0.02
POLI2 (Square of political instability index)	0.176	0.982	0.036	0.096	0.161	0.337	-0.115	-0.14
NOUSFDI (Number of U.S. multinational firms)	0.006	1.581	0.025***	3.009	0.026*	1.943	0.049**	2.58
USGDPC (US GDP per capita)	0.058**	2.232	-0.016	-0.287	-0.566***	-7.835	-0.858***	-6.94
NTRADE (Total trade of host country)	-0.004	-0.893	0.036**	2.887	-0.034**	-2.526	-0.058**	-2.31
NTRADUS (Bilateral trade of host with U.S.)	0.001**	2.372	0.001**	2.814	-0.001**	-2.776	-0.001**	-2.87
TOTOTH	0.043	1.471	0.224***	3.908	0.024	0.382	0.204	1.57
Constant	3.378	0.447	-39.19**	-2.322	83.52***	3.480	98.66**	2.84
Log Likelihood	-1041.9		-978.1		-1434.2		-1150.9	
Wald χ^2 (25)	152.45***		165.5***		218.3***		220***	

Note: GLS is generalized least square corrected for panel-heteroscedastic error structure. Tobit random effect is an estimation that accounts for both country effects and censored values. *** P<1%, **P<5%, *P < 10%

Table II.7. Determinants of sales U.S. multinational firm affiliates to other affiliates and non-affiliates in the source country market

	Sales to Parent firms in source country (RTPAR)				Sales to Non-affiliate persons in the source country (RTUSNAF)			
	GLS		Tobit Random		GLS		Tobit Random	
Variables	Coeff.	t-ratio	Coeff.	t-ratio	Coeff.	t-ratio	Coeff.	t-ratio
MIGA (Multilateral Investment Guarantee Agency)	1.416	1.485	-4.013*	-1.708	2.829	0.753	6.357	1.005
BTXT (Bilateral tax treaty)	-0.900	-0.851	-1.727	-0.605	-2.253	-0.571	-4.452	-0.699
REFORM (Economic reform)	-0.497	-0.548	-1.550	-0.575	-2.056	-0.498	2.491	0.428
DASIA (Asia Dummy)	7.872**	2.607	6.918	0.694	-20.021**	-2.090	-21.312	-1.247
DAFRICA (Africa Dummy)	1.964	0.573	-2.865	-0.231	46.15***	3.795	66.41***	3.253
GDPPC (Host GDP per capita)	-9.41*	-1.85	-47.6**	-2.596	-21.971	-1.455	-45.419	-1.544
RGFC (Gross Fixed capital formation)	0.061	1.228	-0.064	-1.244	0.025	0.439	-0.093	-0.625
LITERA (Literacy rate)	-0.053	-0.715	-0.296	-1.132	1.326***	5.000	2.096***	4.936
LABOR (Economically active labor force)	-0.232**	-2.553	-0.546*	-1.745	1.843***	4.948	2.63***	4.999
TELEM (Telephone main line per 1000 people)	-0.001	-0.310	-0.022	-2.271	0.029	1.646	0.039	1.369
DISTANCE (Distance from host to U.S.)	-0.001	-0.863	-0.001	-0.031	0.001	1.562	0.001	0.796
INTAX (Corporate income tax as % of total tax)	0.29***	3.67	0.63***	4.63	-0.05**	-2.237	-0.46*	-1.89
TRADETAX (International trade tax as % of total tax	0.002	0.370	-0.028**	-2.235	-0.044**	-2.261	-0.042	-1.288
RER (Real Exchange Rate)	0.001	0.659	0.001	0.030	0.004*	1.872	0.006	1.508
VRER (Variance of real exchange rate)	-0.027	-0.312	0.441*	1.775	0.826*	1.908	1.718***	3.351
VRER2 (Square of variance of real exchange rate)	0.001	0.175	-0.002*	-1.671	-0.003	-1.564	-0.006**	-2.925
VINF (Variance of inflation rate)	0.001	0.022	-0.001	-0.492	-0.008**	-2.496	-0.014**	-2.521
VINF2 (Square of variance of inflation rate)	-0.001	-0.059	0.001	0.540	0.001**	2.449	0.001**	2.517
POLI (Political instability index)	0.319	0.282	4.378	1.606	10.49**	2.081	18.51**	2.575
POLI2 (Square of political instability index)	-0.037	-0.225	-0.621*	-1.725	-2.103***	-3.386	-3.094***	-3.327
NOUSFDI (Number of U.S. multinational firms)	0.005	1.247	0.010	0.858	0.025	1.673	0.026	1.091
USGDPC (US GDP per capita)	-0.080***	-3.407	-0.040	-0.568	0.531	6.353	0.532***	3.437
NTRADE (Total trade of host country)	-0.013**	-2.684	-0.038**	-2.960	-0.003*	-0.168	-0.048	-1.607
NTRADUS (Bilateral trade of host with U.S.)	-0.001	-0.442	-0.001**	-2.037	-0.001	-0.820	-0.001	-1.000
TOTOTH	0.079***	3.193	0.262***	4.552	0.247***	3.186	0.568***	3.505
Constant	28.91***	4.339	43.071	2.335	-241.507	-8.876	-336.2***	-7.728
Log Likelihood	-1038.3		-938.3		-1496.3		-1223.9	
Wald χ^2 (25)	118.08***		89.7***		336.6***		160.6***	

Note: GLS is generalized least square corrected for panel-heteroscedastic error structure. Tobit random effect is an estimation that accounts for both country effects and censored values. *** P<1%, **P<5%, *P < 10%

Table II.8. Determinants of imports of U.S. multinational firm affiliates from parent firms (TIMPFP)

	GLS		Tobit Random Eeffect	
	Coefficient	t-ratio	Coefficient	t-ratio
MIGA (Multilateral Investment Guarantee Agency)	-0.335	-0.540	-3.212**	-2.628
BTXT (Bilateral tax treaty)	-0.624	-0.999	2.618**	1.972
REFORM (Economic reform)	1.244**	2.051	3.044**	2.508
DASIA (Asia Dummy)	4.218**	2.128	11.23***	3.169
DAFRICA (Africa Dummy)	4.492*	1.914	-2.688	-0.651
GDPPC (Host GDP per capita)	22.974***	6.297	3.489	0.528
RGFC (Gross Fixed capital formation)	0.070***	4.007	0.076**	2.560
LITERA (Literacy rate)	0.110**	2.602	-0.214***	-2.508
LABOR (Economically active labor force)	-0.054	-1.013	-0.624***	-5.797
TELEM (Telephone main line per 1000 people)	0.006*	1.875	0.018***	3.257
DISTANCE (Distance from host to U.S.)	-0.001	-1.191	-0.001	-0.174
INTAX (Corporate income tax as % of total tax)	-0.099***	-2.89	-0.11	-1.29
TRADETAX (International trade tax as % of total tax	-0.005	-1.411	0.014**	2.043
RER (Real Exchange Rate)	-0.001	-0.990	0.001	0.351
VRER (Variance of real exchange rate)	-0.047	-1.038	-0.012	-0.100
VRER2 (Square of variance of real exchange rate)	0.001	1.000	-0.001	-0.131
VINF (Variance of inflation rate)	0.001**	2.209	-0.001	-0.681
VINF2 (Square of variance of inflation rate)	-0.001**	-2.058	0.001	0.416
POLI (Political instability index)	1.536**	2.443	1.825	1.289
POLI2 (Square of political instability index)	-0.148**	-1.991	-0.225	-1.242
NOUSFDI (Number of U.S. multinational firms)	0.027***	7.898	0.069***	11.178
USGDPC (US GDP per capita)	0.006	0.348	0.101***	3.335
NTRADE (Total trade of host country)	-0.018***	-5.433	-0.008	-1.302
NTRADUS (Bilateral trade of host with U.S.)	-0.001***	-4.354	-0.001	-7.670
TOTOTH	0.017	0.951	0.004	0.139
Constant	-9.731**	-2.557	-18.22**	-2.200
Log Likelihood	-897.1		-1125.6	
Wald χ^2 (25)	756.9***		531.5***	

Note: GLS is generalized least square corrected for panel-heteroscedastic error structure. Tobit random effect is an estimation that accounts for both country effects and censored values. *** P<1%, **P<5%, *P < 10%

Table II.9. Determinants of Intra-firm trade balance of parents of U.S. Multinational firms (TRADBA): Panel-heteroscedasticity corrected GLS

	Coefficient	t-ratio
MIGA (Multilateral Investment Guarantee Agency)	5.505	0.068
BTXT (Bilateral tax treaty)	94.951	1.213
REFORM (Economic reform)	-120.459	-1.501
DASIA (Asia Dummy)	609.47**	2.195
DAFRICA (Africa Dummy)	1402.72***	4.518
GDPPC (Host GDP per capita)	-1887.651**	-2.649
RGFC (Gross Fixed capital formation)	-0.050	-0.036
LITERA (Literacy rate)	37.908***	6.467
LABOR (Economically active labor force)	33.784***	5.724
TELEM (Telephone main line per 1000 people)	-0.071	-0.205
DISTANCE (Distance from host to U.S.)	-0.100***	-4.003
INTAX (Corporate income tax as % of total tax)	-19.59***	-3.55
TRADETAX (International trade tax as % of total tax	0.178	0.437
RER (Real Exchange Rate)	0.028	0.636
VRER (Variance of real exchange rate)	28.33***	3.666
VRER2 (Square of variance of real exchange rate)	-0.090**	-2.680
VINF (Variance of inflation rate)	0.152*	1.934
VINF2 (Square of variance of inflation rate)	-0.001*	-1.726
POLI (Political instability index)	-13.754	-0.148
POLI2 (Square of political instability index)	-6.250	-0.522
NOUSFDI (Number of U.S. multinational firms)	0.344	0.714
USGDPC (US GDP per capita)	0.156	0.078
NTRADE (Total trade of host country)	0.288	0.811
NTRADUS (Bilateral trade of host with U.S.)	-0.027***	-4.501
TOTOTH	-1.582	-0.822
Constant	-2228.69***	-4.419
Log Likelihood	-2507.7	
Wald χ^2 (25)	165.9***	

Note: GLS is generalized least square corrected for panel-heteroscedastic error structure. *** P<1%, **P<5%, *P < 10%

Figure II.1. The Distribution of Total Sales of U.S. Affiliate firms: 1998

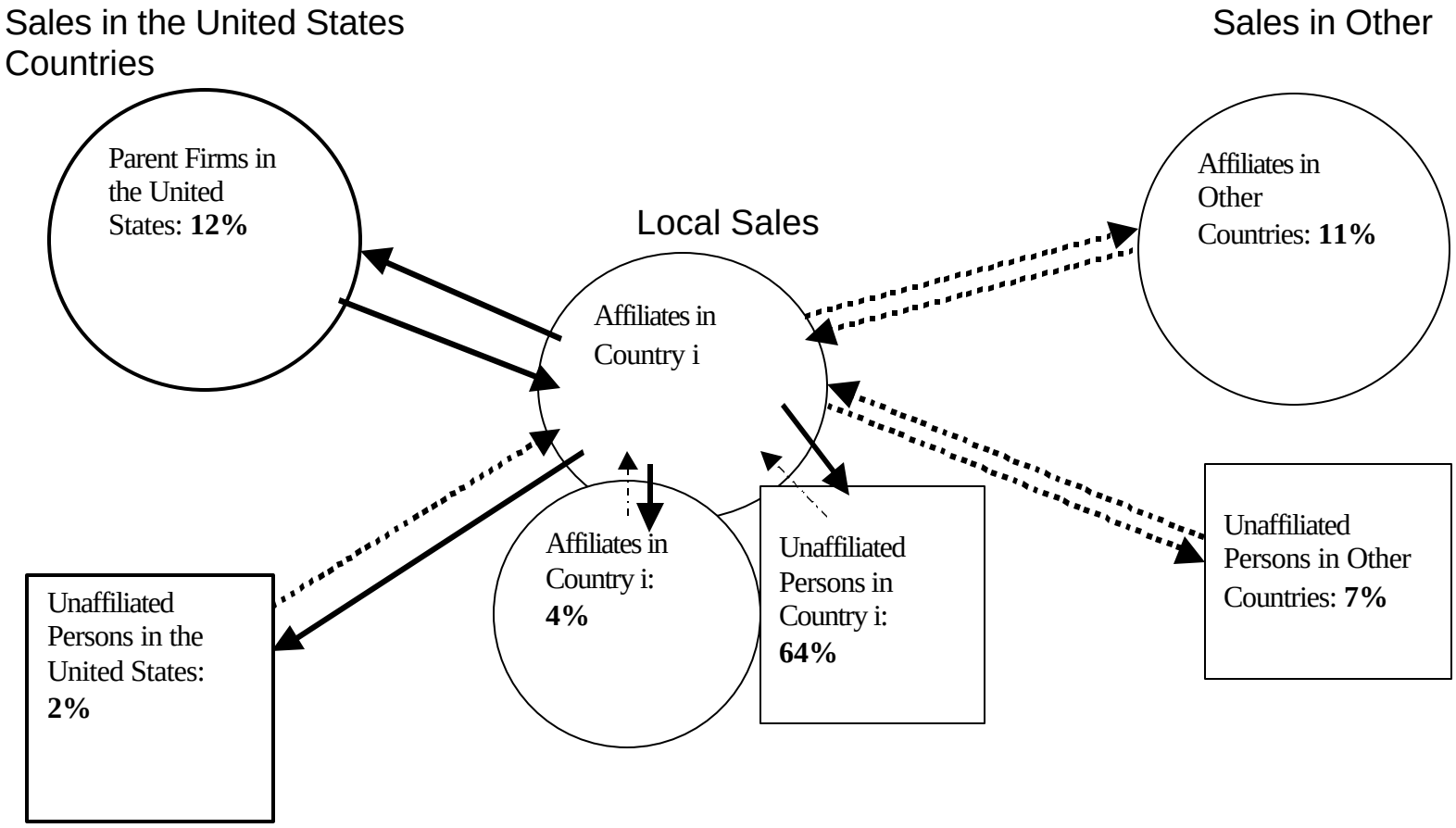

Figure II. 2. Total Affiliates' Sales of U.S. Multinationals by Host Country

CHAPTER III. FOREIGN DIRECT INVESTMENT, HOST COUNTRY PRODUCTIVITY AND EXPORT: THE CASE OF U.S. AND JAPANESE MULTINATIONAL AFFILIATES

I. INTRODUCTION

There are both benefits and costs associated with FDI flow to developing countries. The net welfare effect is the concern of most host country governments. The net effect depends on factors attributable to the characteristics of a host country and a foreign firm. Some of these factors are host country's capacity to tap the benefits from foreign firms, host country policy, the nature and motivation of affiliate firms' business practices, and the comparative advantages of a host country. The benefits expected from FDI are not readily available because host country characteristics as well as trade and investment policies of host countries contribute in realizing the potential benefits expected from FDI.

Previous studies capture the welfare effects of FDI on a host country by its impact on tax revenue (Lai, 2001). Some other studies consider only one of the components of welfare separately for case of one country (Djankov and Hoekman (1998) for Czech, Egger and Pfaffermayr (1999) for Austria, Liu and et. al. (2001) for China and Aitken and Harrison (1999) for Venzuela). To arrive at conclusive results, one should consider the different components of welfare for a larger sample of host countries. The purpose of this paper is to assess the impact of FDI on host country's productivity and export through positive externalities of marketing skills, infrastructure setup, and local workers training to penetrate international markets. In this paper, to empirically estimate the welfare effects of FDI two indicators that proxy the impacts of FDI on local firms are considered, which are labor productivity (and value added) and the volume of total

exports. In addition to total FDI from all source countries, the role of U.S. and Japanese FDI firms in terms of promoting productivity and export capability of firms in sample developing countries is addressed in this paper. In each case, disaggregated flow of FDI by major industrial groups is considered for analysis.

The impact of FDI on host countries' welfare is often divided into two categories, direct and indirect impacts. The direct benefits are relatively easy to quantify and include tax revenue contribution, generation of foreign currency (if export-oriented), and creation of employment opportunities[29]. The spillover effect is one of the indirect effects that complicate the computation of welfare impacts, as it is difficult to quantify some aspects, such as benefit through economies of scale. The positive spillover effects are benefits generated through the transfer of technology, managerial and marketing skills, and the network effect of marketing (through reduced costs of marketing to penetrate foreign markets following the footings of the affiliate firms' exports). It can also be argued that the presence of foreign firms helps to expand infrastructure facilities, which makes it easier and profitable for local firms to crowd-in.

The negative spillover effects occur with competition over limited resources and limited skilled manpower, and either due to strategic motives by the affiliates of MNCs or the high technological gap between local and foreign firms. There are also other costs associated with inflow of FDI such as restrictive business practices by foreign firms (i.e. intra-firm trade, transfer pricing, and profit repatriation) and forgone tax in the case of tax incentives. The net welfare effects also differ by the nature of FDI (amount and forms of

[29] The employment benefit is often ignored on the basis that there is no actual employment creation, but foreign firms compete with local firms over the existing employed labor; this is particularly true for skilled labor in the case of developed countries. However, foreign firms often target the unskilled cheap labor, which is in elastic supply in developing countries.

entry), motives behind internal transactions, and host country government policies. Theoretical and empirical findings are not conclusive on the net welfare effects of FDI, especially for the case of developing countries.

The results of the study show that total FDI flows resulted in negative spillover effects on productivity, but facilitate exports of a host country. Total FDI flow from the U.S. has negative spillover effects on both productivity and export. U.S. manufacturing FDI and the number of U.S. firms increases the value added and export of host countries. FDI flows from Japan have no significant impact on productivity and export, but most Japanese FDI firms that invested in different sub-sectors resulted in lower value added in a host country. On the other hand, productivity is enhanced by foreign portfolio investment, availability of skilled manpower, capital intensity of industries and the number of bilateral investment treaties signed by host countries. Official development assistance and official aid have a negative and significant effect on host country productivity, value added and export.

The next section presents a review of the theoretical and empirical literature on the welfare impact of FDI. The third section discusses the theoretical foundation and econometric specification of the model. The fourth section presents estimation techniques, and the last section provides conclusions.

II. LITERATURE REVIEW

Recently, one of the priorities of policy makers in developing countries is to provide attractive incentives to compete for foreign direct investment (FDI). In economies where domestic private investment is very low and where foreign capital is

crucial to increase production/productivity and transfer technology, policy makers provide different forms of incentives to attract FDI (Aggarawal, 1987). Most countries provide tax holidays, while others do not impost local content requirement. Still others ease export and performance requirements (Bende-Nadende, 2002). It is also well documented that to tap the expected benefits from FDI, there is a need for a minimum threshold level of absorptive capacity. These include human and physical capital, and suitable policies to allow host countries to capture the benefits from FDI (Reis, 2001; Richardson, 1998; Dunning and Narual, 1996).

It is believed that efficiency-seeking FDI firms tend to be located in countries with an elastic supply of skilled labor and sound technological and physical infrastructure (Gary, 1997). Low-income host countries with limited human and physical capital and poor infrastructure cannot compete to attract such efficiency-seeking firms. Resource seeking, export-oriented, and to some extent local market targeting FDI firms are common types of FDI in developing countries. The efficiency and welfare benefits of these forms of FDI are questionable from the host country's viewpoint. Domestic investors are also concerned about the shift in entrepreneurship and the crowding-out effects of foreign investment on domestic firms (Caves, 1997). The other impact of FDI, as indicated by similar studies, is the widening wage and income inequalities that result from the inflow of FDI in developing countries, which raise income distribution issues (Figini and Gorg, 1999; Tsai, 1995).

Previous studies test the roles of aggregate foreign capital flow on employment, productivity and technology transfer (Larudee and Koechin, 1999; de Mello, 1999; Aitken and Harrison, 1999). The impact of FDI on a domestic firm's productivity is

crucial for the host countries, as domestic infant industries are expected to learn from foreign firms (Markusen and Venables, 1999). Host country governments compare expected benefits with costs in the forms of forgone tax revenue due to financial incentives, repatriated profits and the crowding-out effects of foreign firms, given the absorptive capacity of the country (Hanson, 2001).

FDI, like any other forms of capital inflow, is expected to increase the capital stock of developing countries to help mitigate scarcity of capital and improve productivity of domestic factors of production. Unlike portfolio and official development aid, FDI helps transfer not only capital but also management skills, and infrastructure economies of scale advantages to local firms (Blomstorm and Kokko, 1998). FDI is also thought of as a composite bundle of capital stocks, skills and technology (de Mello, 1997). Some of these benefits[30] are imperfectly tradable in the world market and can be acquired only through FDI inflow. In his survey article, de Mello (1997) points out that with greater value-added content of FDI-related production and productivity spillovers associated with FDI, FDI leads to increasing returns in domestic production. On the other hand two recent studies argue that the gains from FDI in a host country depend on corporate transparency (Moday and Sadka, 2002) and the size of the share of home market served by foreign firms (Bhattacharjea, 2002).

Policies adopted by the host country governments also matters in tapping the benefits of foreign investment. For instance, restrictive domestic content requirements raise efficiency concerns. The foreign investors' response is also different depending on whether they target the local market or neighboring markets as host country governments

[30] The benefits from technology spillover are improved productivity, employment and gain in consumer surplus through increased production, infrastructure development, managerial skill, and economies of scale that facilitate trade.

provide different incentives to different forms of entry. Host countries often face trade-offs in choosing policy with respect to FDI. Khawar (1997) and Agosin and Mayer (2000) indicated trade-offs between government objectives by crowding out domestic firms, at least in the short run. Tax/subsidy incentives lower tax revenue; domestic content and local ownership requirements bind inflow of foreign capital, and trade-offs between the short-term losses by domestic firms include crowding-out effects and long-term employment gains from inflow of FDI (Khawar, 1997). The net effect of these policy measures and the response of FDI on host country welfare are not conclusive in the case of developing countries.

Affiliates of MNCs, however, need more than the policy of the host country governments. Often, they demand bilateral and multilateral agreements to ensure their benefits, to avoid double taxation and to ensure security. To this effect, developing countries sign bilateral investment treaties (BIT) with both developed and other developing countries to improve protection, guarantee benefits for both sides and avoid double taxation (UNCTAD, 2000). Membership in a multilateral investment guarantee agency (MIGA) is also seen as an advantage to guarantee benefits and provide some security for investment (Baker, 1999). From the point of view of developing countries, the signing of the BIT and membership in MIGA attracts FDI along with development objectives to enhance the welfare of their society. However, there are some conflicts of interest in signing the agreements and the net effect of them on the overall host country's welfare is not clear. The role of BIT and MIGA in securing benefits and enhancing welfare is also worth considering.

It is also well documented that the welfare effects of FDI depend on the level of development and trade policy of a host country (Harris and Schmitt, 2001), the level of entry[31] by FDI[32] (Richardson, 1998), specific incentive policies by the host country's governments (Hanson, 2001; Barros and Carbral, 2000; Fumagalli, 1999), absorptive capacity of host countries (Borenztein, 1998), and minimum level of technology (Bende-Nabende, 2002). However, most theoretical works focus on the welfare impact of FDI through tax competition among host country governments (Lai, 2001) and host country size (Haufler and Wooton, 1999).

The problem often faced in the analysis of the welfare impact of FDI is how to define the welfare of a host country. Khawer (1997) and Harris and Schimitt (2001) define welfare of a host country as national income, which is the sum of all forms of factor incomes, while Teng (2001) uses the sum of consumer and producer surplus to account for the welfare effect of FDI. To fully account for the welfare effect, one should include both direct and indirect effects. Empirically, these effects can be measured through three channels [improved productivity, penetration of foreign market (export) and the domestic fixed capital formation (crowd-in/out effects)] used as a proxy for both direct and indirect effects of FDI inflow on host country welfare.

Previous empirical studies considered each of these channels of welfare impacts separately. For instance, the impact of FDI on local firms' productivity is addressed in Djankov and Hoekman (1998) for Czech, Egger and Pfaffermayr (1999) for Austria, Liu and et. al. (2001) for China, Konings (1999) for emerging economies, and Aitken and

[31] Forms of entry by MNCs (FDI, licensing, joint venture) are also found to affect national welfare differently as host countries follow different policies with respect to each forms of entry (Moran, 2000; Teng, 2001). However, in this paper, no distinction is made.

[32] This is measured by ownership share of foreign firms in a host country, full ownership (FDI), joint venture, subsidiary or branch.

Harrison (1999) for Venzuela. The only empirical study on the role of FDI to help penetrate foreign market for exports is by Aitken, Hanson and Harrison (1997) for the case of Mexican manufacturing firms. Studies by Lipsey (1999) and Eaton and Tamura (1996) also presented the trends in export behavior of East Asian firms following the entry of U.S. and Japanese MNCs. Agosin and Mayer (2000) presented evidence for the crowding-out effects of MNCs for the case of developing countries. This paper will reconsider the two channels of productivity and export through which FDI affects host country welfare for the cases of U.S. and Japanese FDI in developing countries.

The results of previous studies are mixed. Djankov and Hoekman (1998) and Aitken and Harrison (1999) found a positive impact of foreign firms on local firms productivity. A study by Aitken, Hanson and Harrison (1997) also showed a positive externality from foreign firms, which enhances the export prospects of local firms. Egger and Pfaffermayr (1999) also showed that foreign firms induce labor-augmenting productivity and also highlight that job creation is overestimated. On the other hand, a study by Konings (1999) found negative spillover effects to domestic firms for the case of Poland. The purpose of this study is to fill the empirical gap by using sample developing countries and disaggregated data by industrial groups.

III. MODEL AND ECONOMETRIC SPECIFICATION

3.1. Model

Hanson (2001) defines the welfare effects of a host country that has received FDI as the sum of factor incomes and net subsidy provided by the host country to attract FDI.

As indicated by Hanson, let the revenue function of a local firm be given by:

$$r^i = r^i(y_i, Y_i, \ddot{e}_i(Y^d)) \qquad (1)$$

where r^i is the revenue function, y_i is output of the local firm, Y_i is output of the rival foreign firm, Y^d is the domestic output of the foreign firm, and λ_i captures the spillover effects from a foreign firm's domestic production to domestic industry. Also let w and z represent wages to labor (L) and the rate of return to capital (K) respectively, and a_i and b_i represent the per-unit labor and capital costs to produce a unit of output. Let s represent the rate of subsidy provided by a host country government.

Welfare is given by the sum of factor incomes net of subsidy:

$$\omega = wL + zK + \sum_{i}^{n} \left[r^i - (a_i + b_i) y_i \right] - sY_i \qquad (2)$$

welfare is affected by spillover effects through the local firm revenue function at the rate of λ_i. The spillover effects enter the welfare function through r^i . In this case, the spillover effects can be in the form of positive externality to help improve productivity and help penetrate the international market. The presence of foreign firms also implies positive externalities in the forms of infrastructure and the training of local workers, which benefit the host country by crowding in local firms. On the other hand, the crowding-out effects come through competition over limited resources and a market share that raises the unit costs (a_i and b_i) to drive local firms out of the market. Hence, the three channels of spillover effects can be captured by the welfare function.

However, both the theoretical and empirical results of previous studies depend upon the specific assumptions of the definition of welfare, sample countries used, and control variables used in the analysis. Further empirical work is needed to see the

robustness of previous empirical works by considering welfare effects of FDI from different source countries, and different industries to a large sample of host countries.

To account for the two channels through which the presence of FDI in developing countries affect the welfare, host countries' productivity, value added and export are used as a proxy through which foreign firm's spillover effects are manifested. FDI from all source countries, the U.S., and Japan are considered in the estimation of productivity, value added and export equations. The control variables are the traditional growth and productivity determinants as well as regional, national and industrial group specific factors.

3.2. Econometric specification

The study by de Mello (1999) specified the basic augmented production function from which estimation equations are derived as

$$Y = A\ddot{O}(L,K,F,\grave{U}) \qquad (3)$$

Where Y is output, K is capital, L is labor, A captures the efficiency of production, $\boldsymbol{W}$is a vector of control variables, and F denotes FDI flows. This production function can be extended to other host country benefits as well including the export contribution of foreign firms to help local firms to penetrate international markets. Let Y_{ijt} (P_{ijt}, E_{ijt}) represents the two channels through which FDI affects the welfare of host countries. P_{ijt} measures host country productivity, and E_{ijt} stands for host country export. P is defined

as total factor productivity, which is given by the industry level total value added[33] per labor employed in each industry.

The general form of the estimated model is as given below:

$$Y_{ijt} = X_{ijt}\beta + \alpha_i + \delta_j + U_{ijt} \qquad where\ i = 1,.....,N\ and\ t = 1,.....T \qquad (4)$$

The assumptions of this model are that X_{ijt} is 1x k vector of time varying regressors, α_i denotes the unobservable country specific effect, and δ_j denotes the unobservable industry specific factors. U_{ijt} denotes the remainder disturbance and is i.i.d. N $(0, \sigma_e^2)$. α_i's and δ_j 's can be fixed or random.

In the above specification, the overall error term is assumed to have the usual Gauess-Markove's assumptions. But in the context of panel data where the sample is drawn from heterogeneous countries, the assumptions may not hold. In practice, panel (group-wise) heteroscedasticity is assumed in the model and panel-corrected estimation procedure is used to estimate the model (Back and Katz, 1995). Such model can take the following form:

$$Y_{ijt} = X_{jit}\beta + \delta_j + U_{ijt}$$
$$\text{where } i = 1,.....,N;\ j = 1,.....K \text{ and } t = 1,.....T \quad \text{and } U_{ijt} \sim N(0, \sigma_i^2) \qquad (5)$$

In this case, the country specific effect and the remainder disturbance are lumped together as overall error terms and panel-heteroscedasticity is introduced in the error term. Industry specific effects are controlled by dummy variables, since it is suspected that industry specific factors correlate with the other regressors. In this paper, as the test for homoscedasticity fails even after accounting for the country effects, panel-

[33] Value added is computed as total output net of intermediate inputs, which is purchased input by each firm from other firms.

heteroscedasticity corrected model is estimated and it explains the data better than the usual fixed or random effect models.

The explanatory variables can be represented in a vector form as:

$$X_{ijt} = [FDI_{it} \quad CAPITAL_{ijt} \quad LABOR_{it} \quad POLICY_{it} \quad OCAPITAL_{it} \quad EMPL_{ijt}]$$

where *i* stands for country, *j* for industry and *t* for time. Some of the explanatory variables have only country and time dimensions. The definitions of individual dependent variables are provided in the Appendix. FDI measures components of U.S. FDI flows[34] and Japanese FDI flows to host countries as well as total FDI flows to host countries from all sources countries. Together with the total FDI, it is believed that other forms of capital flow in the form of official aid and official development assistance help to improve the welfare of a host country. OCAPITAL measures other forms of capital other than FDI, such as portfolio (bond and equity) investment, and official development assistance and aid. CAPITAL refers to industry level fixed capital formation. EMPL measures industry specific employment level. LABOR measures two variables, the economically active labor force in the host country and the indicator of skilled manpower. For the case of export and value added, industry level employment is also used to control for industry level employment.

POLICY refers to two variables, which include a dummy variable for the periods of membership in Multilateral Investment Guarantee Agency (MIGA) and the number of Bilateral Investment Treaties (BIT) signed during each period. These agreements provide a kind of protection for foreign investors over future policy or government change. Other control variables include the number of firms in an industry, telephone main lines per

[34] This includes disaggregated FDI flow of the U.S. by major industrial groups.

1000 people as a proxy for infrastructure, GDP per capita and the indicator of political uncertainty.

The expected signs for FDI and OCAPITAL are positive, as most developing countries are capital-scarce and have relatively more unskilled labor. Capital intensity of an industry (CAPITAL) is also expected to have a significant positive impact on productivity and export of host country industries. Policy and labor, especially the availability of skilled labor force, are also expected to increase productivity and export of local firms. LABOR and POLICY are expected to have a positive impact as argued by the proponents of FDI in order to promote the development of host countries through technology transfer in all models considered.

IV. ESTIMATION AND RESULTS

4.1. Estimation and Data

The data for this study is drawn from the World Bank Trade and Production and the World Bank World Development Indicators CD-ROMs for a sample of developing countries. The selection of countries is based on availability of both productivity as well as U.S. and Japanese FDI data. The World Bank Trade and Production CD-ROM provides detailed trade and production data by country and by industrial group from 1979-1999. FDI data for the U.S. is obtained from the Bureau of Economic Analysis. For Japanese FDI, data is obtained from the Japanese Ministry of Finance. The U.S. and Japanese FDI data sets are available from 1987-1998. This limits the sample period used in this study. Some countries have incomplete observations on productivity and capital by industrial group, which makes the panel unbalanced. Major macro-economic variables

are the same during a given year for an industrial group in a host country. Sample host countries are taken from Africa, Asia, and Latin America. For the detailed list of variables used in estimation see description of the data in the Appendix.

Table 1 presents mean values of some of the variables used in the estimation of productivity, value added and export values. Countries like Chile, Hong Kong, Korea Republic, Peru, Singapore and Venezuela have shown productivity level (value added per employee) of 3000 and above over the period of analysis: 1989-1998. Share of export to total output is also one indicator of country's openness and export competitiveness in the international market. Over the period considered, Hong Kong, Singapore, Sri Lanka and Indonesia top the list of countries with large export share of total output. In terms of number of affiliates in each country, U.S. and Japanese multinational firms seem to target countries with high productivity. However, in terms of values of U.S. and Japanese multinational affiliates investments, firms do not seem to follow productivity of host countries.

Together with FDI flow from all source countries to developing countries, disaggregated U.S. and Japanese FDI by major industrial groups is used to explain the two welfare indicators of a host country. U.S. and Japanese FDI data is further disaggregated into manufacturing and non-manufacturing industrial groups. From manufacturing and non-manufacturing industrial groups, dominant sectors are picked to see their effects on welfare. From manufacturing, food producing, and from non-manufacturing, trade and service sub-sectors are selected. In addition to total FDI value, the number of foreign firms in a host country is also used to see if the values and numbers of FDI result in different conclusions. Finally, source countries' exports (as opposed to

FDI) are also tested for their roles in affecting a host country's productivity and exports to the rest of the world.

Given the panel nature of the data, panel data technique, which takes into account country-specific effects, will be used for estimation allowing for heteroscedastictiy[35]. To see the robustness of the results, estimation is made controlling for industry-specific factors. First, industry dummies are created for 27 of the 28 industrial groups. Then these dummies are used in estimating panel-heteroscedasticity corrected GLS model. It is believed that industry specific factors correlate with other regressors that determine productivity at industry level. Thus, instead of assuming the industry specific effects as random, dummy variables are created. In addition, regional dummy variables for the two regions, Africa and Asia, are also incorporated in the estimation, taking Latin America as a base.

Equation 5 is estimated for each FDI variable, taking into account the dummy variables and other control variables. First, total FDI from all sources countries is used as the explanatory variable, including the control variables, under three alternatives estimations- controlling for country effects, industry effects and both country and industry effects. A similar procedure is followed for the case of total FDI from U.S. and Japan, manufacturing, non-manufacturing, food, trade and service sub-sectors.

Most variables are transformed by taking ratios to account for the size of the host country. For instance, total FDI as well as U.S. and Japanese FDI variables are divided by the GDP of host countries. Similarly, other forms of capital, such as bond and equity

[35] Heteroscedasticity is tested for the pooled data both with and without country dummies, in both cases, the error structure of the data turns out to be heteoscedastic.

portfolios, as well as official development assistance are also divided by host country GDP. The economically active labor force is also taken as a ratio to total population.

This study is different from other similar studies in three ways. First, the two components of determinants of welfare are used for analysis using disaggregated data by industrial groups. Second, the estimation is made to see the effects of the major capital-exporting countries, U.S. and Japan, for the purposes of comparison. Sample countries are taken from three regions, which represent developing economies to draw lessons for the respective regions.

4.2. Results and Discussion

The results of this study show that the total FDI inflow to developing countries lowers productivity and value added in the host countries. The same is true for the case of U.S. FDI. None of the FDI that goes to different sub-sectors in a host country facilitates improvements in productivity or value added. This result proves that the expected spillover effect from FDI is not materialized in the cases of sample developing countries. Estimation results of the determinants of host countries' productivity, value added and total exports, including total FDI from all source countries, are shown in Tables 2-4. The difference between the three tables in the appendix is the variables used to account for the specific effects in the model. In the three cases, the impacts of the control variables are more or less the same. This is true even when one uses U.S. and Japanese FDI variables and their components. Since the impact of the control variables are similar in almost all cases, only the coefficients of U.S. and Japanese FDI and their components are reported (Tables 5-7) under the three alternative estimation approaches.

Some control variables have significant effects on productivity, value added and exports (Table 4). The results show that productivity improvement is observed in those countries which sign BITs, have more skilled manpower, have larger GDP per capita, and have more inflows of portfolio investment (both in bonds and equity). The capital intensity of industrial groups also improves the productivity of a host country as expected. Surprisingly, total FDI and official development assistance and aid lower the productivity of the host country.

Similar results are observed for value added, the exception being that the total labor force (as opposed to skilled labor force) and employment at the industry level increase the value added. Most other variables have similar impacts as in the productivity model.

The results for the total host country's exports are different in that total FDI increases exports from host countries, unlike its impact on productivity and value added. The change in the sign of total FDI in the export equation proves that FDI inflow in developing countries targets the export sector or tends to export products so that local firms follow suit and take advantage of the infrastructure and marketing skills of foreign firms. The employment level at each industry, total labor force and skilled manpower also increase the exports of host countries. This result is expected, as most developing countries have comparative advantage in labor-intensive products to compete in the international market.

The impacts of U.S. and Japanese total FDI as well as their major components on productivity, value added and total export are reported in Tables 5-7. None of the U.S. and Japanese FDI variables have any positive impact on the productivity of the host

countries. Rather, most U.S. FDI components impede productivity enhancement. For the U.S., total FDI, non-manufacturing FDI, food processing FDI, and trade and service FDI have negative and significant impacts on productivity. For the case of Japan, it is only manufacturing FDI that has a similar effect. The remaining FDI components of Japan have negative signs, though insignificant. The result of the negative spillover effect is in line with the findings of Konings (1999) for the case of Poland. The exports of Japan to the host countries improve productivity, even though the reverse is true for the case of U.S. export (Table 7). The result implied that, in the case of Japan, servicing local market through export, not through FDI, is beneficial for a host country to improve productivity.

The impacts on value added are slightly different. Most variables turn out to be significant with the negative signs similar to those in the productivity model. One exception is that the U.S. manufacturing FDI has a positive and significant impact on the value added. The number of U.S. FDI firms also increases value added in the host country (Table 6). U.S. exports to host countries, unlike Japanese exports, increase value added in host countries. Hence, only U.S. manufacturing FDI firms and U.S. exports improve net total production in the sample developing countries.

In the export equation, most variables are insignificant but have negative signs. Exports are enhanced by the presence of U.S. manufacturing FDI. The presence of a greater number of U.S. FDI firms also improves total exports, despite the negative sign on the total U.S. FDI firms. U.S. non-manufacturing FDI also lowers host countries' exports. Exports of U.S. to host countries increase exports by host countries to the rest of the world. This result seems to support the idea that exports by U.S. firms target

neighboring markets and host country firms benefit from U.S. export to the rest of the world. Japanese exports to host countries have no effect on exports by host countries.

V. CONCLUSIONS

Both theoretical and empirical studies focus on the determinants of FDI flow in general and the roles of host and home country characteristics and policies towards FDI, in particular. Recently, most developing country governments have raised concerns as to the contributions of the presence of foreign firms on the welfare of an economic agent in their economies. There are few empirical works that address the roles of FDI on the welfare of host countries, and most previous studies analyze only part of the welfare components, particularly the productivity effects of FDI. Only one study addresses the roles of FDI through the export market penetration (Aitken, et. al., 1997). Most studies conduct their research in the context of one country, the results of which may not necessarily be generalized to other economies. However, to understand the full welfare effects of FDI, the roles through different channels, which affect economic agents in each host country, should be addressed.

The role that FDI plays in affecting host country productivity, value added and exports is analyzed in this study. The flows of total FDI from all source countries as well as FDI from the U.S. and Japan over the period 1989-1998 to sample developing countries are considered. Trade and production data by industrial groups and disaggregated U.S. and Japanese FDI data is used to address the issues in this paper.

The results of the study show that total FDI flows resulted in a negative spillover effect on productivity, but facilitate exports of a host country. Total FDI flows

from the U.S. have negative spillover effects on both productivity and export. U.S. manufacturing FDI and the number of U.S. firms increases the value added and export of host countries. FDI flows from Japan have no significant impact on productivity and export, but most Japanese FDI firms that invested in different sub-sectors resulted in lower value added in a host country. On the other hand, productivity is enhanced by foreign portfolio investment, availability of skilled manpower, capital intensity of industries and the number of bilateral investment treaties signed by host countries. Official development assistance and official aid have negative and significant effects on host country productivity, value added and export.

Host country governments should look into the bilateral and multilateral investment agreements to secure the benefits from foreign firms. Also, for the success of technology transfer, the compatibility and suitability of the technologies that foreign firms import into a host country should be studied carefully to benefit from inflow of foreign capital and technology.

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APPENDIX: DATA

The variables used in this paper are in annual frequency. The main source of data for the U.S. FDI is the 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 and Table 1. Selected data for foreign affiliates in all countries in which investment was reported). Data for Japanese FDI is obtained from the Japanese Ministry of Finance website (http://www.mof.go.jp/english/e1c008.htm). Trade and production data by industrial groups is obtained from the World Bank Trade and Production CD-ROM. All other variables except bilateral trade, BIT, and membership in MIGA are taken fom the CD-ROMs of World Development Indicators and International Financial Statistics of International Monetary Fund. Data on bilateral trade (exports and imports) is taken from the Direction of Trade Statistical Yearbook; BIT and membership in MIGA information 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]. Political instability index is taken from the Freedom House Annual Survey 1970-2000. The following is a list of variables used in the regression analysis.

List of Variables

1. Output Value by country and by industry group **(VLOUTP)**
2. Value Added by country and by industry group **(VLVADD)**
3. Number of Establishment by country and by industry group **(VIFIRMS)**
4. Number of employees or persons engaged by country and by industry group **(VLLABOR)**
5. Gross fixed capital formation by country and by industry group **(VIFCAPF)**
6. Total export by country and by industry group **(EXPTOTAL)**
7. Total Foreign direct investment, net **(TFDI)**
8. U.S. Foreign direct investment by country overtime **(USFDI)**
9. U.S. Foreign Direct Investment in Manufacturing, total **(USFDIMT)**
10. U.S. Foreign Direct Investment in Food Manufacturing **(USFDIF)**
11. U.S. Foreign Direct Investment in Trade and Service **(USFDITS)**
12. U.S. Foreign Direct Investment in Non-manufacturing, total **(USFDINMT)**
13. Japanese Foreign Direct Investment **(JPFDI)**
14. Japanese Foreign Direct Investment in Manufacturing, total **(JPFDIMT)**
15. Japanese Foreign Direct Investment in Food Manufacturing **(JPFDIF)**
16. Japanese Foreign Direct Investment in Non-manufacturing, total **(JPFDINMT)**
17. Japanese Foreign Direct Investment in Trade and Services **(USFDISR)**
18. Number of US Foreign Direct Investment firms **(USFDINO)**
19. Number of Japanese Foreign Direct Investment firms **(JPFDINO)**
20. Export of US to host countries **(USEXPO)**
21. Japanese Export to host countries **(JPEXPO)**
22. Number of Bilateral Investment Treaties signed during each year by country **(BIT)**
23. Membership in Multilateral Investment Guarantee Agency, dummy **(MIGA)**
24. Political instability indicator taken from Freedom House Annual Survey **(POLI)**
25. Gross Domestic Product per capita **(GDPPC)**

26. Labor force, total by country overtime **(LAB)**

27. Official development assistance and official aid **(ODAOAD)**

28. Population, total **(POP)**

29. Portfolio investment, bonds **(PIB)**

30. Portfolio investment, equity **(PIE)**

31. Telephone mainlines (per 1,000 people) **(TELEM)**

Table III.1. Mean of some of the variables used in the productivity, export and value added models: 1989-1998

COUNTRY	PRODL	LVLVADD	REXPTOT	USFDINO	JPFDINO	RUSFDI	RJPFDI	NFDI
Bangladesh	1.03	9.71	0.38	2.5	3.35	0.67	11.6	0.01
Bolivia	2.24	8.86	0.28	9.28	0	0.17	1	0.96
Cameroon	2.54	9.42	0.32	8.73	0	0.31	0.9	-0.05
Chile	3.54	12.26	0.18	130.14	6.57	0.05	13.69	3.31
Colombia	2.85	12.23	0.19	139.4	1	0.22	2.67	1.44
Ecuador	2.34	10.05	0.13	63.61	0.54	0.21	1.36	1.92
Egypt	1.67	11.56	0.11	63.88	0.56	0.24	0.45	1.87
Ethiopia	1.54	9.01	0.10	1.89	0	0	1	0.35

Hong Kong	3.23	12.08	12.72	421.33	145.56	0.25	140.75	-
India	1.16	12.95	0.33	78.33	9.44	0.33	0.58	0.17
Indonesia	1.75	12.62	0.76	145.54	113.64	0.22	8.71	1.19
Kenya	1.25	9.81	0.24	23.82	0.2	0.02	0.8	0.15
Korea, Rep.	3.81	14.84	0.26	167.65	34.62	0.19	11.33	0.38
Malaysia	2.7	12.33	0.64	150.18	84.13	0.23	130.78	5.29
Mexico	2.97	13.02	0.30	608	7.2	0.42	5.99	1.52
Morocco	2.35	11.31	0.26	17.52	0	0.12	1	0.85
Pakistan	1.96	11.01	0.35	22.99	0.67	0.66	2.34	0.48
Panama	2.72	9.29	0.17	126.21	146.31	1.44	2587.16	3.33
Peru	3.05	11.77	0.08	58.55	0.58	0.44	0.83	1.17
Philippine	2.19	11.95	0.38	127.15	51.3	0.24	51.56	1.59
Singapore	3.61	12.22	2.29	351.39	89.11	0.28	204.01	10.61
South Africa	2.83	13.28	0.87	104	0	0.01	1	0.21
Sri Lanka	1.32	9.84	1.34	5.09	5.35	0.11	14.91	0.88
Trinidad a	2.62	9.36	0.43	27.41	0.19	0.35	1.18	5.55
Uruguay	2.97	10.82	0.20	26.14	2	0.06	2.04	0.36
Venezuela	3.02	12.36	0.14	219	3.2	0.22	9.74	1.26

Note: PRODL= Value added per number of employees, VADD= Value added by industrial group, EXPTO= Ratio of total export to total output by industrial group, USFDINO = Number of U.S. FDI in a host country, JPFDINO = Number of Japanese FDI in a host country, RUSFDI=Ratio of Total U.S. Foreign Direct Investment (FDI) to GDP, RJPFDI=Ratio of Total Japanese FDI to GDP, NFDI= Ratio of Total FDI to GDP

Table III.2. Determinants of productivity, value added and total export of host countries, FDI from all countries controlling for country specific effects: Panel-heteroscedasticity corrected GLS

Variable	Labor productivity	Value added	Total Export
Capital Intensity	0.023***	0.014***	-0.002
	(24.19)	(10.65)	(-1.27)
Number of workers	-	0.001***	0.001***
		(23.22)	(3.57)
Number of Firms	-0.01***	0.001	-0.001
	(-8.75)	(0.65)	(-1.51)
African Dummy	-0.187**	0.74***	1.058***
	(-2.84)	(6.88)	(7.53)
Asian Dummy	-0.657***	0.52***	0.8***
	(-16.24)	(7.89)	(10.34)
Bilateral Investment Treaty	0.027***	0.071***	0.012

	(4.35)	(6.85)	(1.00)
Multilateral Investment Guarantee agency	-0.13***	-0.256***	-0.14**
	(-4.25)	(-4.71)	(-2.22)
GDP per capita	0.001***	0.001***	-0.001
	(13.6)	(18.55)	(-1.27)
Total FDI	-0.011*	-0.119***	0.141***
	(-1.74)	(-9.41)	(10.97)
Labor force	0.387	0.817	4.54***
	(0.701)	(0.921)	(4.24)
Skilled labor force	0.004***	0.001	0.027***
	(3.84)	(0.486)	(11.0)
Bond Portfolio Investment	4.36**	4.22	-11.61***
	(2.25)	(1.234)	(-3.17)
Equity portfolio Investment	10.29***	19.46***	4.24
	(5.57)	(6.19)	(1.29)
Official Development Assistance and Aid	-1.887***	-14.76***	-7.98***
	(-4.35)	(-18.28)	(-6.29)
Infrastructure	0.003***	-0.014***	0.001
	(-5.403)	(-12.07)	(0.33)
Political Instability	0.136***	0.299***	0.46***
	(3.45)	(4.37)	(6.14)
Political Instability square	-0.011**	-0.028***	-0.05***
	(-2.26)	(-3.19)	(-5.11)
Constant	1.318***	9.47***	-7.50***
	(5.18)	(24.31)	(-16.42)
Wald test	4999***	8099***	823***
Number of observations	4462	4462	4333
Number of countries	22	22	22
Number of Industrial groups	28	28	28

*p<10%, **p<5%, ***p< 1% . Numbers in parentheses are t-ratios

Table III.3. Determinants of productivity, value added and total export of host countries, FDI from all countries controlling for industry specific effects: Panel-heteroscedasticity corrected GLS

Variable	Labor productivity	Value added	Total Export
Capital Intensity	0.027***	0.017***	-0.003
	(19.55)	(8.12)	(-1.39)
Number of Workers	-	0.001***	0.001***
		(21.76)	(3.76)
Number of Firms	-0.001***	-0.001	-0.001
	(-5.66)	(-0.58)	(-1.59)
African Dummy	-0.175***	0.77***	1.29***
	(-3.98)	(7.81)	(10.96)
Asian Dummy	-0.64***	0.57***	1.02***
	(-21.87)	(8.82)	(13.25)
Bilateral Investment Treaty	0.019***	0.095***	-0.003

	(4.07)	(9.07)	(-0.26)
Multilateral Investment Guarantee agency	-0.094***	-0.23***	0.066
	(-4.17)	(-4.5)	(1.09)
GDP per capita	0.001***	0.001***	-0.001*
	(16.6)	(20.24)	(-1.66)
Total FDI	-0.02***	-0.12***	0.14***
	(-4.16)	(-10.22)	(10.04)
Labor force	-0.923**	1.36	3.29***
	(-2.41)	(1.58)	(3.38)
Skilled labor force	0.005**	-0.001	0.03***
	(7.05)	(-1.29)	(16.15)
Bond Portfolio Investment	5.61***	16.37***	-15.63***
	(3.62)	(4.82)	(-3.83)
Equity portfolio Investment	11.71***	17.15***	3.13
	(7.96)	(5.27)	(0.81)
Official Development Assistance and Aid	-2.08***	-14.69***	-8.63***
	(-7.05)	(-22.17)	(-10.19)
Infrastructure	-0.003***	-0.02***	0.001
	(-6.12)	(-14.17)	(0.81)
Political Instability	0.13***	0.47***	0.38***
	(4.65)	(7.29)	(4.89)
Political Instability square	-0.01**	-0.05***	-0.04***
	(-2.77)	(-7.05)	(-4.44)
Constant	1.69***	9.16***	-7.35***
	(9.68)	(23.57)	(-16.67)
Wald test	7380***	6530***	1129***
Number of observations	4462	4462	4333
Number of countries	22	22	22
Number of Industrial groups	28	28	28

*p<10%, **p<5%, ***p< 1% . Numbers in parentheses are t-ratios

Table III.4. Determinants of productivity, value added and total export of host countries, FDI from all countries controlling for country and industry specific effects: Panel-heteroscedasticity corrected GLS

Variable	Labor productivity	Value added	Total Export
Capital Intensity	0.003***	0.002	-0.003**
	(5.58)	(1.41)	(-2.09)
Number of Workers	-	0.001***	0.001**
		(20.79)	(2.73)
Number of Firms	-0.001***	-0.001*	-0.001***
	(-4.77)	(-1.68)	(-2.95)
African Dummy	-0.006	0.668***	1.02***
	(-0.15)	(8.09)	(8.99)
Asian Dummy	-0.55***	0.64***	0.86***
	(-22.04)	(13.04)	(13.66)
Bilateral Investment Treaty	0.03***	0.08***	0.013

	(7.7)	(9.88)	(1.3)
Multilateral Investment Guarantee Agency	-0.058***	-0.27***	-0.17***
	(-2.9)	(-6.78)	(-3.26)
GDP per capita	0.001***	0.001***	-0.001*
	(20.98)	(26.03)	(-1.85)
Total FDI	-0.02***	-0.13***	0.13***
	(4.43)	(-12.89)	(12.1)
Labor force	-1.32***	1.63**	3.88***
	(-3.42)	(2.32)	(4.12)
Skilled labor force	0.006***	-0.002	0.03***
	(8.16)	(-1.36)	(13.29)
Bond Portfolio Investment	2.12*	4.77*	-8.01**
	(1.85)	(1.75)	(-2.7)
Equity portfolio Investment	9.02***	23.19***	3.78
	(8.23)	(9.28)	(1.55)
Official Development Assistance and Aid	-1.67***	-17.05***	-8.67***
	(-5.49)	(-24.16)	(-8.22)
Infrastructure	-0.002***	-0.015***	0.001
	(-6.28)	(-16.67)	(1.09)
Political Instability	0.09***	0.27***	0.55***
	(3.83)	(5.28)	(7.94)
Political Instability square	-0.007**	-0.024***	-0.055***
	(-2.29)	(-3.73)	(-6.37)
Constant	1.85***	11.02***	-6.95***
	(10.26)	(36.9)	(-16.27)
Wald test	18523***	14171***	3739***
Number of observations	4462	4462	4333
Number of countries	22	22	22
Number of Industrial groups	28	28	28

*p<10%, **p<5%, ***p< 1% . Numbers in parentheses are t-ratios

Table III.5. Role of U.S. and Japanese FDI on Host countries productivity, value added and total export, controlling for country specific effects: Panel-heteroscedasticity corrected GLS

Variable	Labor productivity	Value added	Total Export
US FDI	-0.077**	-0.337***	-0.324**
	(-2.68)	(-6.58)	(-5.25)
Japanese FDI	-0.001	-0.001***	0.001
	(-0.61)	(-10.46)	(0.551)
Number of U.S. FDI	-0.001***	0.003***	0.002***
	(-3.62)	(13.42)	(6.36)
Number of Japanese FDI	-0.001	-0.003***	0.001
	(-0.68)	(-4.52)	(1.39)
US FDI: Manufacturing	0.019	1.06***	0.31**
	(0.255)	(8.21)	(2.39)

Japanese FDI: Manufacturing	-0.11	-0.42***	0.026
	(-1.38)	(-3.44)	(0.19)
US FDI: Non-manufacturing	-1.15**	-1.34***	-0.23*
	(-2.41)	(-12.07)	(-1.89)
Japanese FDI: Non-manufacturing	0.003	-0.62***	0.002
	(0.04)	(-5.51)	(0.019)
US FDI: Food processing	-0.034	-0.05	-0.04
	(-0.713)	(-0.663)	(-0.48)
Japanese FDI: Food processing	-0.07	-0.25***	-0.032
	(-1.35)	(-2.85)	(-0.35)
US FDI: Trade & service	-0.06	-0.218*	0.04
	(-0.99)	(-1.92)	(0.3)
Japanese FDI: Trade & service	-0.04	-0.11	-0.04
	(-0.62)	(-1.03)	(-0.37)
US export to host countries	0.0001	0.0001***	0.0001**
	(1.1)	(7.45)	(2.58)
Japanese Export to host countries	-0.0001	-0.0001***	0.0001
	(-0.189)	(-7.15)	(0.13)

*p<10%, **p<5%, ***p< 1% . Numbers in parentheses are t-ratios

Table III.6. Role of U.S. and Japanese FDI on Host countries productivity, value added and total export, controlling for industry specific effects: Panel-heteroscedasticity corrected GLS

Variable	Labor productivity	Value added	Total Export
US FDI	-0.087***	-0.51***	-0.32***
	(-3.915)	(-10.66)	(-5.24)
Japanese FDI	0.001	-0.001***	0.001
	(0.925)	(-10.38)	(1.43)
Number of U.S. FDI	-0.001***	0.004***	0.002***
	(-3.19)	(15.53)	(4.96)
Number of Japanese FDI	0.001	-0.003***	0.001
	(0.944)	(-7.75)	(0.96)
US FDI: Manufacturing	-0.08	1.04***	0.22*
	(-1.62)	(9.66)	(1.93)
Japanese FDI: Manufacturing	-0.067	-0.403***	0.014

	(-1.26)	(-3.53)	(0.12)
US FDI: Non-manufacturing	-0.14***	-1.51***	0.036
	(-3.11)	(-17.14)	(0.35)
Japanese FDI: Non-manufacturing	-0.007	-0.63***	-0.13
	(-0.16)	(-6.63)	(-1.25)
US FDI: Food processing	-0.028	-0.177**	-0.002
	(-0.87)	(-2.506)	(-0.04)
Japanese FDI: Food processing	-0.11***	-0.32***	0.006
	(-3.01)	(-3.95)	(0.076)
US FDI: Trade & service	-0.04	-0.48***	0.12
	(-0.95)	(-5.19)	(1.25)
Japanese FDI: Trade & service sector	-0.04	-0.04	-0.13
	(-0.92)	(-0.49)	(-1.37)
US export to host countries	-0.0001	0.001***	0.0001***
	(-0.74)	(7.09)	(3.46)
Japanese Export to host countries	0.0001	-0.0001***	-0.0001
	(1.21)	(-7.51)	(-1.13)

*p<10%, **p<5%, ***p< 1% . Numbers in parentheses are t-ratios

Table III.7. Role of U.S. and Japanese FDI on Host countries productivity, value added and total export, controlling for both country and industry specific effects: Panel heteroscedasticity corrected GLS

Variable	Labor productivity	Value added	Total Export
US FDI	-0.13***	-0.38***	-0.29***
	(-7.22)	(-9.7)	(-5.6)
Japanese FDI	0.001	-0.001***	0.001
	(1.47)	(-13.07)	(0.63)
Number of U.S. FDI	-0.001***	0.003***	0.002***
	(-5.57)	(16.86)	(9.26)
Number of Japanese FDI	0.001	-0.003***	0.002**
	(0.96)	(-5.34)	(2.11)
US FDI: Manufacturing	-0.058	0.92***	0.31**
	(-1.26)	(9.94)	(2.57)
Japanese FDI: Manufacturing	-0.08*	-0.38***	0.08

	(-1.82)	(-4.36)	(0.69)
US FDI: Non-manufacturing	-0.14***	-1.25***	-0.208**
	(-3.52)	(-14.8)	(-1.97)
Japanese FDI: Non-manufacturing	0.004	-0.72***	-0.002
	(0.09)	(-8.59)	(-0.017)
US FDI: Food processing	-0.062	-0.59	-0.016
	(-2.05)	(-0.95)	(-0.24)
Japanese FDI: Food processing	-0.033	-0.13**	-0.019
	(-1.08)	(-2.11)	(-0.28)
US FDI: Trade & service	-0.13***	-0.19**	0.066
	(-3.33)	(-2.28)	(0.645)
Japanese FDI: Trade & service	-0.019	-0.04	-0.062
	(-0.51)	(-0.48)	(-0.677)
US export to host countries	-0.001**	0.0001***	0.0001**
	(-2.79)	(2.94)	(2.13)
Japanese Export to host countries	0.0001**	-0.0001***	0.001
	(2.1)	(-4.86)	(0.533)

*p<10%, **p<5%, ***p< 1% . Numbers in parentheses are t-ratios