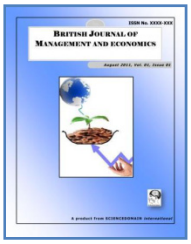

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Host Country Degree of Rurality and the Location Choice of Multinational Enterprises: A Panel Model Analysis

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Research Article

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ABSTRACT

In this paper, we build up the literature by introducing host-country degree of rurality as a factor influencing Multinational Enterprises' (MNEs) location choice measured by foreign direct investment (FDI) inflows. Based on 1999-2007 panel data of 172 countries, we show that host-country degree of rurality has a negative relationship with the location choice of multinationals. The effect is more profound in low-income host countries than in high-income host countries. We also confirm that the control variables, such as host-country market size, trade openness, labor costs, and labor skills are positively related to FDI inflows while interest rates and expected currency depreciation are negatively related. Moreover, results of pair-wise Granger causality tests show FDI has a feedback relationship with per capital GDP and exchange rate movements. Impulse response test results render key insights into FDI linkages and associated policy implications.

Keywords: Multinational enterprises' location choice; FDI; degree of rurality; granger causality; fixed effects model; panel data; impulse response;

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1. INTRODUCTION

Rural areas lag behind their urban counterparts in facilities and services that are considered essential for economic efficiency, global connectivity, and economic diversification. Generally, rural areas also claim a larger share of the poor. To alleviate these problems, rural development programs seek to attract external investment to complement the primary sector (such as investment in the fertilizer and hybrid seed industries) as well as to promote the development of other sectors. Both developed and developing countries actively seek investment from overseas as part of their rural economic development strategies. However, the link between a location's degree of rurality and the location choice of multinational enterprises has not been formally investigated in the literature. We attempt to fill this gap.

Many developing countries remain agrarian with more than 60% of population and 90% of land mass in rural areas (UNCTAD, 2008). Foreign direct investment (FDI) inflows to both agrarian and developed economies have increased dramatically over the past two decades. FDI has the potential to stimulate economic growth through job creation, provision of needed capital for investment, and knowledge spillovers. Governments in developing as well as developed countries are promoting the attractiveness of their rural areas as a potential hub embracing future FDI inflows by launching a number of programs aimed at overcoming the physical and institutional infrastructure problems faced by rural areas.[1] A large body of literature has been developed in recent years examining the impact of macro-level factors on FDI inflows. However, despite the importance of FDI in rural economic development strategies and the active efforts of rural communities to attract foreign investors, the literature has failed thus far to formally test the link between the location decisions of multinational firms and the degree of rurality of a location. In this paper, we introduce the degree of rurality as one of the key factors influencing the location decision of multinational enterprises (MNEs).

Using a 1999-2007 panel data model, we assess the link between country-level FDI inflows and degree of rurality controlling for market size, trade openness, labor costs, interest rates, labor skills, exchange rate movements, and FDI agglomeration effects. Moreover, we conduct pairwise Granger causality tests to assess a feedback relationship between latter variables and FDI inflows. Finally, we estimate impulse response functions to examine the dynamic response of FDI inflows to a one-time shock in each of the independent variables.

Our contributions to the literature are threefold. First, the main finding that the degree of rurality of the hosting country plays a significant negative role in attracting FDI inflows complements the literature of FDI determinants. As far as we know, this paper is the first examining the relation between the degree of rurality and multinational enterprises' location decision. Second, the existing literature identifies many factors as determinants of FDI inflows, yet studies fail to examine the direction of causality linkages between FDI inflows and the latter variables. Our study sheds light on these linkages and highlights a feedback relationship between FDI inflows and two variables of the model, GDP per capita and exchange-rate movements. Finally, the existing empirical literature mostly ignores the dynamic response of FDI inflows to shocks in the other variables.

[1]For example, the Indian government on Jan 11, 2011, said Indian villages were "ripe" for profitable ventures, especially in areas of infrastructure development and services.

In this paper, we shed light on the dynamic response of FDI to a one-time shock in the independent variables. More important, results also present pivotal policy implications related to FDI rural development and economic growth linkages.

2. A BRIEF LITERATURE REVIEW

The literature has identified several variables as the determinants of FDI inflows. Early neoclassical theories place return to capital at the forefront of motives for FDI location choice (for example, Mundell, 1957). Since then, studies have identified several other factors motivating the location choice of MNEs. Dunning (1993) summarizes that multinational enterprises allocate foreign direct investment to reduce production costs, establish new markets, improve operation efficiency, and allocate strategic assets. More recent studies identify variables such as market size, interest rates, labor costs and skills, trade openness, and exchange rates as factors driving the location choice of MNEs.

Many studies find a significant and positive relationship between market size and FDI inflows (Lankes and Venables, 1996; Resmini, 2000; Nunes et al., 2006, and Sahoo, 2006), but Holland and Pain (1998) fail to confirm the latter results. The relationship between interest rates and FDI inflows is addressed by studies. Previous studies show that low interest rates are associated with a stable macroeconomic condition, thereby attract FDI inflows.[2] Furthermore, Interest rates attract FDI inflows because they indicate aggressive monetary policy and better economic growth perspectives.[3] The literature also associates interest rates as a cost of investment; MNEs that finance investments by borrowing from host-country financial institutions are expected to increase investment when interest rates are low (Barrell and Pain, 1996). Empirical evidence on the relationship between labor cost and FDI inflows are mostly mixed. While Lankes and Venables (1996) and Nunes et al. (2006) find that wage rates are negatively associated with FDI inflows, Kumar (1994) and Sahoo (2006) show that high wages determine FDI inflows positively.

In terms of labor skills, Carr et al. (2001) examine a panel dataset of bilateral country-level U.S. outbound and inbound affiliate sales from 1986 to 1994 and find evidence for both horizontal and vertical motivations for FDI consistent with the knowledge-capital model. Yeaple (2003) shows that location choice based on skills depends on whether the MNE is from a skill-intensive or skill-scarce sector, the former favoring skill-abundant host countries. The association between trade openness and FDI has been examined by Lankes and Venables (1996), Belderbos (1997), Blonigen (2002) and others.

In general, trade openness is expected to stimulate vertical FDI and dampen horizontal FDI. With regard to exchange-rate movements, earlier theories of FDI reject a significant correlation between FDI inflows and exchange-rate movements. For example, Mundell (l968) and McCulloch (1989) argue that when the MNEs' home country currency appreciates, the cost of assets in foreign countries as well as the nominal return in terms of home-country currency fall, leaving the rate of return unchanged. Other studies, Froot and Stein (1991) and Klein and Rosengren (1994), show that exchange rate movements influence FDI inflows. Froot and Stein (1991) argue that an appreciation of the source

[2]Dasgupta, D. and Ratha, D. (2000). The role of short-term debt in recent crises, unpublished results.
[3]Nonnenberg , M. J. B. and Mendonça , M. J. C. D. (2004). The determinants of direct foreign investment in developing countries, unpublished results.

country's currency will make investment abroad more attractive and raise FDI inflows into the host country. Moreover, others such as Moshirian and Pham (1999) theorize that an appreciation of the source country's currency can influence MNEs to reduce their repatriated income and increase their reinvestment in the host countries.

Each of the above studies, however, fails to consider the degree of rurality of the host country as one of the key factors influencing FDI inflows. In this paper, we contribute to the literature by adding the degree of rurality in the FDI model. The primary sector is the traditional economic base of rural areas, but sustained economic growth and development require a more diversified economy. In addition, practically every country has rural areas that it seeks to develop more; as a result, there is keen competition among countries to attract FDI. We believe that success depends on the degree of rurality as well. Our study tests the impact of the degree of rurality on FDI inflows.

3. EMPIRICAL MODEL SPECIFICATION

(i) Degree of Rurality: Rural areas lack adequate physical, financial, and other infrastructures that provide agglomeration effects and generally exhibit slower economic growth (Partridge and Rickman, 2008). Even for the United States, a highly developed industrialized country, compared to urban areas, rural areas tend to have lower per capita income, higher poverty rates, and lagging educational levels and that most rural areas are struggling for economic vitality.[4] In contrast, urban areas possess a more efficient sharing of local infrastructure and facilities, a variety of input suppliers, and a large pool of workers with similar skills, all of which are critical for a widespread adoption of new technologies and business practices (Puga, 2010). Thus, naturally, the degree of rurality of an economy affects the location choice of multinational firms. We therefore hypothesize that host countries that exhibit a high degree of rurality receive a lower amount of FDI inflows. We use the level of FDI inflows as a measure of MNE location choice and the percent of people living in rural areas (as defined by national governments) as a proxy for degree of rurality in our analysis.[5]

We test the impact of rurality on FDI inflows, controlling for other relevant variables: market size, growth rate of market size, trade openness, cost of labor, cost of borrowing, labor skill, exchange rate movements, and degree of FDI agglomeration.[6] This relationship is specified in a general functional form as

$$F = f(gdp\_pc, gdp\_rate, opennes, wage, irate, skill, exrate, rurality, agglom) \quad (1)$$

[4]Waldrof, B. S. (2007). The effects of rurality and industrial specialization on income growth: U.S. counties 2000 to 2003, Purdue University, U.S.A., unpublished results.

[5]The source for this data is World Bank, World Development Indicators Database. http://www.worldbank.org.

[6]FDI inflows in host countries are used as a measure of the location choice of multinational firms. Data on FDI are collected from the International Monetary Fund (IMF), International Financial Statistics database.

where

F = Host country level of FDI, a proxy for the location choice of MNEs.

gdp_pc = host-country market size measured by real per capita GDP

gdp_rate = host-country growth in market size measured by real per capita GDP growth

opennes = host-country trade openness measured by the sum of exports and imports divided by GDP

wage = labor cost in host-country proxied by hourly labor cost in the manufacturing sector

irate = host-country interest rates measured by lending rates

exrate = expected rate of depreciation of the host-country currency against the U.S. Dollar

skill = host-country level of skill measured by completion of tertiary education in all programs

rurality = host-country degree of rurality proxied by the proportion of the population living in rural areas

agglom = FDI agglomeration measured by previous level of FDI.

The partial derivative of FDI inflows, F, with respect to the degree of rurality of the host country is given by: $\frac{\partial F}{\partial rurality} < 0$.

(ii) Market Size: The hypothesis is that a larger and growing host-country market attracts market-seeking FDI activities. Furthermore, a large market and thus demand may allow large-scale production with scale effects, which enhances production (or service) efficiency, making the location more attractive. In this study, we use host country per capita real GDP and growth rate of real GDP as measures of market size. We expect the partial derivatives of both variables with respect to FDI to be positive, i.e., $\frac{\partial F}{\partial gdp\_pc} > 0$ and $\frac{\partial F}{\partial gdp\_rate} > 0$.[7]

(iii) Trade Openness*:* The literature posits that the relationship between FDI and trade openness, signifying a low trade cost, depends on the type of FDI. It

[7]Data are collected from Penn World Table 6.3. gdp_pc equals real GDP per capita (Constant Prices: Laspeyres, rgdpl in Penn World Table), and gdp_rate equals growth rate of real GDP per capita (chain, grgdpch in Penn World Table). Center for International Comparisons of Production, Income and Prices (CIC): http://pwt.econ.upenn.edu/php_site/pwt63

suggests that multinationals enter a foreign market through exports in the absence of trade costs such as tariffs and transportation costs but will enter a foreign market through outward FDI if trade costs are high, duplicating a source country plant in a foreign country. This posits a negative relationship between horizontal FDI and trade openness:: $\frac{\partial F}{\partial opennes} < 0$. On the other hand, much of FDI entails a large amount of trade: for example, export-oriented FDI involves exports to third countries and back to the source country, and it also involves trade in intermediate and capital goods. Hence, as pointed out in Lankes and Venables (1996), Holland and Pain (1998), Sahoo (2006), and elsewhere, trade openness would stimulate vertical FDI: the partial derivative of FDI inflows with respect to trade openness is $\frac{\partial F}{\partial opennes} > 0$. In our study, we let the empirical data determine the sign associated with trade openness. We use the sum of imports and exports divided by GDP as a measure of trade openness.[8]

(iv) Labor Cost: The literature thus far has failed to provide a clear link between wage rates and FDI inflows. Traditional FDI theory suggests that labor-cost differential between the parent and host countries provides a motive for FDI flows whereby lower-wage countries attract more FDI inflows. However, empirical studies have also exhibited a positive relationship between the two variables, suggesting that high wage rates may reflect skill intensity or productivity (Wei and Liu, 2001). In this paper, we follow the traditional theory and hypothesize that high wages dampen FDI inflows: $\frac{\partial F}{\partial wage} < 0$. We use country-level manufacturing labor cost as a measure of wages.[9]

(v) Labor Skill: Theoretically, MNEs with relative skill abundance have the competitive advantage to operate in skill-scarce host countries, implying that FDI flows from high-skill countries to lower-skill countries. Nonetheless, casual observations exhibit that a large proportion of FDI flows from skill-abundant countries to other skill-abundant countries rather than to skill-scarce countries. Also, as Yeaple (2003) and others point out multinational enterprises in skill-intensive sectors favor skilled-labor-abundant host countries; and those in low-skill-intensive sectors prefer to invest in skill-scarce countries. Hence, the literature fails to exhibit a conclusive relationship labor skill and FDI inflows. We

[8]Data on trade openness are obtained from Penn World Table 6.3, Openness in Constant (2005) Prices (openc in Penn World Table). Center for International Comparisons of Production, Income and Prices (CIC): http://pwt.econ.upenn.edu/php_site/pwt63

[9]Data are obtained from the International Labor Organization, LABORSTA database. The data is reported by country on a monthly, weekly, or hourly basis in local currency units. We converted the data to hourly basis in U.S. Dollar terms.

hypothesize that, on balance, higher host country level of skills raises FDI inflows making the partial derivative positive: $\frac{\partial F}{\partial skill} > 0$.[10]

(vi) Cost of Capital: As mentioned above, lower rates of interest often serve as a proxy for economic stability and economic growth potential, inducing thereby a larger level of FDI inflows. In addition, it is not uncommon for MNEs to borrow funds for investment from host-country financial institutions, making low-interest-rate host countries the location choice of multinational activities. On the contrary, the factor endowments theory predicts that FDI flows from capital-abundant countries characterized by lower interest rates to capital-scarce host countries that exhibit higher rates of interest, making the sign of the parameter associated with interest rates ambiguous. However, we hypothesize that the fact that multinationals rely heavily on funds raised in host countries and prefer to operate in financially stable economies makes the impact of high interest rates on FDI negative. Hence, the partial derivative of FDI inflows with respect to interest rate should be negative: $\frac{\partial(F)}{\partial(irate)} < 0$. We use host-country lending rates as a measure of interest rates.[11]

(vii) Exchange Rates: Consistent with Barrell and Pain (l996), Froot and Stein (1991) Grubert and Mutti (1991), Swenson (1994), and others, we anticipate a significant relationship between FDI inflows and exchange-rate movements. While the impact of a depreciating host-country currency on investment returns expropriated in terms of the source country currency is negative, its impact on acquiring productive assets in the host economy is positive. However, it is hard to imagine that MNEs would be induced to invest in an economy whose currency is falling in value and anticipated to continue doing so, since it might signal weak macroeconomic conditions. Hence, we hypothesize that a negative relationship exists between a host-country currency that is expected to depreciate and FDI inflows: $\frac{\partial F}{\partial exrate} < 0$.[12]

[10]We use total tertiary graduates in all programs at the country level as a measure of skill. The data is gathered from UNESCO Database at http://stats.uis.unesco.org/unesco.

[11]Data on lending rate are collected from the International Monetary Fund, International Financial Statistics database.

[12]In our model, we use the bilateral host-country currency against the U.S. dollar as the measure of exchange rates. Where E is expressed as $\frac{national\ currency}{U.S.\ Dollar}$, we measure the rate of appreciation of the host currency as $\frac{E^e - E}{E}$, where E^e is the expected one-period-ahead exchange rate, and E is the current rate of exchange. In our model, we use the actual one-period-ahead exchange rate as a proxy for the expected rate of exchange rate. Data on the exchange rate are collected from Penn World Table 6.3. Center for International

(viii) FDI Agglomeration: A casual observation of FDI activities indicates that multinational enterprises tend to choose locations characterized by a large level of previous FDI activities. Firms are more likely to benefit from external economies of scale and network effects if they operate in areas with a large cluster of other firms. We hypothesize that FDI agglomeration increases FDI inflows: $\frac{\partial F}{\partial agglom} > 0$. [13]

To summarize, we estimate the specific natural log version of Equation (1) by

$$\log(F_{it}) = a_0 + a_1.\log(msize_{it}) + a_2.\log(opennes_{it}) + a_3.\log(wage_{it}) + a_4.irate_{it}$$

$$+ a_5.\log(skill_{it}) + a_6.\log(exrate_{it}) + +a_7.rurality_{it} + a_8.\log(agglom) + u_{it} \quad (1)$$

where the subscripts *i* and *t* represent cross-section and period, u is the error term, and $\ln$ stands for natural log. We discuss the data and methodology used to estimate Equation (2) in the following section.

4. DATA AND METHODOLOGY

We estimate Equation (2) for three different sets of sample host countries using 1999 to 2007 panel data: 61 higher-income host countries, 111 lower-income host countries, and 172 combined higher- and lower-income host countries. A least square method is applied to a model of the form:

$$F_{it} = \alpha + \gamma_i + X_{it}^{'}\beta_t + \varepsilon_{it} \quad (2)$$

where F is the dependent variable (FDI inflows), $X_{it}^{'}$ is a vector of regressors, ε_{it} are the error terms for *i* = 1,2,…, n cross-sections over *t* = 1,2,…, T periods. α, β, and γ_i represent the overall constant term, the vector of coefficients associated with the regressors, and the cross-section effects, respectively. The slope coefficients, β, are assumed to be common to all individual cross-sections and periods. The random effects specifications assume that the cross-section and period random effects are uncorrelated with the residuals, ε_{it}. The choice between random and fixed effects is determined applying the Hausman test. The tests in each case reject the assumption that the random effects are uncorrelated with the explanatory variables; thus, our empirical model relies on cross-section fixed effects specification. The results are presented in Tables 1 to 3.

We use the Granger causality test to determine if the dependent variable and each of the regressors can provide statistically significant information about the future values of each.

Comparisons of Production, Income and Prices (CIC): http://pwt.econ.upenn.edu/php_site/pwt63

[13]Data on FDI are collected from the International Monetary Fund, International Financial Statistics database.

Granger causality between the dependent variable and each of the independent variables is examined by estimating the following pair of equations:

$$F_t = a_0 + \sum_{k=1}^{m} a_k F_{t-k} + \sum_{j=1}^{m} b_j X_{t-j} + u_t \quad (3)$$

$$X_t = c_0 + \sum_{k=1}^{m} c_k X_{t-k} + \sum_{j=1}^{m} d_j F_{t-j} + v_t \quad (4)$$

where F is FDI, X is any of the variables specified on the right side of Equation (2), and *u* and *v* are the disturbance terms, assumed to be uncorrelated with each other. This test is performed using the combined sample of higher- and lower-income host countries. Table 4 exhibits the estimation results.

We also examine the impulse response function of FDI inflows to one-time shocks in each of the regressors specified in Equation (2). The impulse responses can provide useful hints as to how FDI inflows react to policy target shocks such as exchange rate and interest rate shocks. The impulse-response functions are estimated using the following vector autoregressive model:

$$Z_t = \delta_1 Z_{t-1} + \delta_2 Z_{t-2} + ... + \delta_p Z_{t-p} + \varphi_t \quad (5)$$

where Z represents the vector of the variables exhibited in Equation (2), the δs are the parameters of the model, and the φs are the stochastic error terms (impulses). Chart 1 exhibits the estimated impulse-response functions.

5. ESTIMATION RESULTS

As stated above, Tables 1 to 3 report the coefficient estimates for the combined sample of higher- and lower-income host countries, the sample of higher-income host countries, and the sample of lower-income countries, respectively. In each table, the first two columns show the estimation results with per capita real GDP as the measure of market size, while columns 3 and 4 are estimated using real GDP per capita growth rate as the measure of market size. Furthermore, the results in columns 3 and 5 of each table are estimated with the degree rurality variable, while the results in the remaining two columns are estimated omitting it from the model. The estimated coefficients in columns 2 and 4 of each table are fairly close in statistical significance and sign to those in columns 3 and 5 (including the rurality variable); hence we will discuss our findings based on the results exhibited in columns 3 and 5 of each table. Our discussion starts with the results in Table 1, the results for the combined higher- and lower-income host countries.

5.1 Parameter Estimates for the Combined Higher- and Lower-Income Host Countries

The results in Table 1 show that GDP per capita rather than the rate of growth of GDP is a determining factor in the location choice of multinational firms. The estimated coefficient of per capital GDP is statistically significant at the 5% level. suggesting that market size has a

positive relationship with FDI inflows. Our results support Barrell and Pain (1996), Janicki and Wunnava (2004), Pantelidis and Kyrkilis (2003), and Mody and Krinsha (1998) but fail to confirm Kimino et al. (2007). The estimated coefficient is 0.28, suggesting that a 1% rise in GDP per capita is associated with a 0.28% rise in FDI inflows.

Trade openness shows a positive and robust relationship with FDI inflows; columns 3 and 5 suggest that a 1% rise in trade openness is associated with a 0.60% to 0.63% rise in FDI inflows. This result is consistent with vertical FDI hypothesis but inconsistent with horizontal FDI hypothesis. Theoretically, trade openness stimulates vertical FDI but allows exports to substitute for horizontal FDI.

Table 1. Combined Higher- and Lower-Income Host Countries ,Dependent Variable FDI Inflows (Panel Least Square Method)

Parameter Estimates				
Exogenous Variables	**Market Size = gdp per capita**	**Market Size = gdp per capita**	**Market Size = gdp per capita growth**	**Market Size = gdp per capita growth**
c	-3.801	0.07	-0.589	2.54
	(3.34)***	(0.05)	(0.98)	(2.84)***
log(gdp_pc)	0.433	0.28		
	(3.20)***	(2.00)**	---	---
gdp_rate			0.005	0.00
	---	---	(1.17)	(1.08)
log(opennes)	0.645	0.60	0.720	0.63
	(5.27)***	(4.96)***	(5.93)***	(5.25)***
log(wage)	0.143	0.10	0.188	0.12
	(2.51)**	(1.66)*	(3.32)***	(2.03)**
irate	-0.005	0.001	-0.005	0.001
	(3.00)***	(2.93)***	(3.27)***	(2.88)***
log(skill)	0.103	0.10	0.097	0.10
	(2.26)**	(2.13)**	(2.10)**	(2.00)**
log(exrate)	-0.295	-0.38	-0.29	-0.39
	(4.86)***	(5.97)***	(4.68)***	(6.07)***
rurality		-0.05		-0.06
	---	(3.94)***	---	(4.66)***
log(agglom)	0.615	0.60	0.65	0.62
	(23.70)***	(23.59)***	(27.8)***	(26.55)***
Adjusted R-Squared	0.99	0.99	0.99	0.99
Durbin Watson	1.65	1.69	1.69	1.72
Number of Observations	513	513	513	513
Periods included	8	8	8	8
Cross-Sections included	68	68	68	68

The numbers in parentheses are t-statistics.
****, **, * respectively indicate statistical significance at the 1%, 5%, and 10% level.*

The estimated wage coefficient ranges between 0.10 and 0.12 (see columns 3 and 5 in Table 1) with statistical significance of 10% and 5%, respectively. The positive coefficient is inconsistent with the factor endowments theory, which predicts a negative relationship

between the two variables, but consistent with the empirical results of Wei and Liu (2001) and others, who argue that higher wage rates reflect higher productivity, thereby attracting FDI.

Columns 3 and 5 in Table 1 show that the estimated coefficient of interest rates (a proxy for the cost of borrowing in the host country) is negative and statistically significant at the 1% level. The estimated coefficient of -0.001 suggests that a 1% rise in a host country's interest rates causes FDI inflows to fall by 0.001%. The negative coefficient is inconsistent with the factor endowments theory, which posits that capital flows to capital-scarce countries that exhibit higher rates of interest. The evidence in this paper hints that multilateral firms finance their investment by borrowing from host-country financial institutions. In addition, this result suggests that host countries can use interest rates as an effective FDI policy tool.

Our findings show a positive relationship between FDI inflows and labor skills. The estimated coefficient is 0.10 (significant at the 5% level), indicating that host-country labor skill is positively associated with FDI inflows and that multinationals favor locations endowed with skilled labor. The results hint that investments in education and training, which result in enhanced labor skill, may increase FDI inflows.

Table 1 shows that the estimated parameters associated with the host-country expected currency depreciation range between -0.38 and -0.39 (see columns 3 and 5, respectively), and each is statistically significant at the 1% level. It suggests that a 1% rise in the expected depreciation lowers FDI inflows by approximately 0.38% to 0.39%. The negative coefficient is consistent with the profit-translation effect of exchange rate movements. The evidence confirms previous empirical findings that show a statistically significant link between exchange-rate movements and FDI inflows. The robust relationship between the two variables also indicates that exchange rates can be effective policy instruments.

The estimated coefficient of the degree of rurality ranges between -0.05 and -0.06 (see Table 1, columns 3 and 5), both statistically significant at the 1% level. Hence, although the magnitude of the coefficient is not large, the results show a highly significant and robust (to specification variation) relationship between FDI inflows and the degree of rurality of a host country suggesting that rurality is in general a turnoff to multinationals. The results imply that host countries who wish to stimulate FDI activities need to develop effective rural development projects to reduce problems associated with degree of rurality.

Last, FDI agglomeration, measured by previous level of FDI inflows, appears to induce further FDI inflows. The estimated coefficient of FDI agglomeration ranges between 0.60 and 0.62 and is statistically significant at the 1% level of significance.

5.2 Parameters Estimate for the Higher-Income Host Countries

Table 2 reports the estimated coefficients based on a sample of higher-income host countries. Only some of the coefficients in Table 2 are statistically significant. The coefficients that are statistically significant and robust (to specification) are those associated with market size measured by per capital GDP, labor skill, exchange rate, and FDI agglomeration. The impact of the degree of rurality is still negative, although the level of significance is not robust to specification (the coefficient in column 3 is statistically insignificant, while that in column 5 is significant).

For the higher-income host countries, FDI inflows are not significantly associated with the host's GDP growth rate, trade openness, wages, and interest rates. FDI flows mainly from higher-income countries to other similarly higher-income countries; thus, interest rates and wages are not expected to play a significant role in the location choice of firms investing in this type of host country. The results indicate that market size, labor skill, and FDI agglomeration impose a positive impact on FDI inflows, while expected host-country currency depreciation has a negative impact. The estimated parameters associated with market size, labor skill, and FDI agglomeration are 0.84, between 0.19 and 0.26, and between 0.62 and 0.67, respectively, while that associated with expected exchange-rate depreciation is in the range of -0.51 to -0.52 (see Table 2, columns 3 and 5). Indicating a negative relationship between FDI inflows and degree of rurality, column 5 in Table 2 shows that the coefficient of the degree of rurality is -0.05 (statistically significant at the 5% level).

Table 2. Higher-Income Host Countries, Dependent Variable FDI Inflow (Panel Least Squares Method)

Parameter Estimates				
Exogenous Variables	**Market Size = gdp per capita**	**Market Size = gdp per capita**	**Market Size = gdp per capita growth**	**Market Size = gdp per capita growth**
c	-8.010	-5.93	-0.436	2.11
	(3.89)***	(2.39)**	(0.35)	(1.28)
log(gdp_pc)	0.898	0.84	---	---
	(4.34)***	(3.98)***		
gdp_rate	---	---	0.007	0.01
			(1.09)	(1.29)
log(opennes)	0.122	0.09	0.352	0.28
	(0.57)	(0.45)	(1.63)	(1.28)
log(wage)	-0.021	-0.04	0.135	0.09
	(0.29)	(0.51)	(2.07)**	(1.35)
irate	-0.005	-0.01	-0.007	-0.01
	(0.91)	(1.01)	(0.98)	(1.02)
log(skill)	0.287	0.26	0.228	0.19
	(3.15)***	(2.79)***	(2.39)**	(1.93)**
	-0.479	-0.51	-0.467	-0.52
log(exrate)	(4.23)***	(4.44)***	(3.90)***	(4.32)***
	---	-0.03	---	-0.05
rurality		(1.50)		(2.32)**
	0.629	0.62	0.680	0.67
log(agglom)	(13.06)***	(12.97)***	(13.83)***	(13.65)***
Adjusted R-Squared	0.99	0.99	0.99	0.99
Durbin Watson	1.85	1.87	1.81	1.84
Number of Observations	222	222	222	222
Periods Included	8	8	8	8
Cross-Sections Included	36	36	36	36

The numbers in parentheses are t-statistics.
****, **, * respectively indicate statistical significance at the 1%, 5%, and 10% level.*

5.3 Parameter Estimates for Lower-Income Host Countries

Table 3 reports the regression results for the sample set of lower-income host countries. In contrast to the results shown in Table 2, the estimated coefficient of market size (measured by real GDP per capita and GDP growth rates) is not statistically significant, suggesting market-seeking motives play a lesser role for this group of countries. Again, contrary to the evidence for higher-income host countries, trade openness has a statistically significant and robust relationship with FDI inflows for the lower-income host countries. The estimated coefficient indicates that a 1% rise in the degree of trade openness is associated with 1.25% to 1.375% higher FDI inflows (see Table 3, columns 3 and 5). The wage coefficient is not statistically significant, suggesting that lower wage is not a significant FDI motive.

Table 3. Lower-Income Host Countries, Dependent Variable FDI Inflow (Panel Least Squares Method)

Parameter Estimates				
Exogenous Variables	**Market Size = gdp per capita**	**Market Size = gdp per capita**	**Market Size = gdp per capita growth**	**Market Size = gdp per capita growth**
c	1.389	5.92	-1.158	5.88
	(1.13)	(3.59)***	(0.95)	(3.55)***
log(gdp_pc)	0.000	0.00	---	---
	(1.36)	(1.32)		
gdp_rate	---	---	-0.003	-0.01
			(0.34)	(0.88)
log(opennes)	1.318	1.25	1.375	1.33
	(5.38)***	(5.39)***	(5.47)***	(5.61)***
log(wage)	0.016	-0.07	0.070	-0.03
	(0.12)	(0.53)	(0.56)	(0.25)
irate	-0.009	-0.01	-0.011	-0.01
	(2.48)**	(2.03)**	(2.83)**	(2.45)**
log(skill)	0.046	0.04	0.050	0.04
	(0.68)	(0.55)	(0.72)	(0.60)
	-0.908	-1.01	-0.969	-1.10
log(exrate)	(4.09)***	(4.78)***	(4.31)***	(5.11)***
	---	-0.08	---	-0.08
rurality		(3.87)***		(3.98)***
	0.458	0.42	0.491	0.45
log(agglom)	(8.94)***	(8.59)***	(10.76)***	(10.26)***
Adjusted R-Squared	0.98	0.99	0.98	0.99
Durbin Watson	1.5	1.54	1.6	1.65
Number of Observations	162	162	162	162
Periods Included	8	8	8	8
Cross-Sections Included	32	32	32	32

The numbers in parenthesis are t-statistics.
****, **, * respectively indicate statistical significance at the 1%, 5%, and 10% level.*

The estimated coefficient of interest rates is -0.01, statistically significant at the 1% level, indicating that a 1% rise in the host-country interest rate is associated with 0.01% lower FDI inflows. It also hints that multinationals borrow funds from host countries for the purpose of financing FDI activities. The estimated coefficient associated with the expected rate of host-country currency depreciation ranges between -1.10 and -0.91, statistically significant at the 1% level (see Table 3, columns 3 and 5). The size of estimated coefficient for the lower-income host countries is lower than that shown for the higher-income group in Table 2, suggesting that FDI inflows in lower-income host countries are more sensitive to exchange-rate movements than those going to higher-income host countries.

The results in Table 3 show that the estimated coefficient of rurality is statistically significant and also robust to specification. The size of the coefficient associated with the degree of rurality is -0.08, suggesting that a 1% rise in the degree of rurality is associated with 0.08% lower FDI inflows.

Table 4. Pairwise Granger-Causality Tests (Sample l999-2007)

	Lag 1	**Lag 2**	**Lag 3**
Null Hypothesis:	**F-Statistic**	**F-Statistic**	**F-Statistic**
log(gdp_pc) does not Granger-cause log(FDI).	6.91***	2.59*	1.92
log(FDI) does not Granger-cause log(gdp_pc).	11.67***	3.60***	0.09
	(886)	(772)	(658)
log(opennes) does not Granger-cause log(FDI).	0.94	1.51	3.12***
log(FDI) does not Granger-cause log(opennes).	0.34	0.91	2.40
	(886)	(772)	(658)
log(wage) does not Granger-cause log(FDI).	2.40	0.80	0.37
log(FDI) does not Granger-cause log(wage).	2.42	0.86	0.86
	(693)	(605)	(517)
irate does not Granger-cause log(FDI).	0.16	1.04	3.34***
log(FDI) does not Granger-cause irate.	1.59	0.47	1.15
	(721)	(623)	(527)
log(skill) does not Granger-cause log(FDI).	6.55***	1.92	0.45
log(FDI) does not Granger-cause log(skill).	0.02	0.01	0.13
	(709)	(618)	(527)
rurality does not Granger-cause log(FDI).	0.96	1.30	2.63**
log(FDI) does not Granger-cause rurality.	2.54	0.21	1.38
	(886)	(772)	(658)
log(ex_rate) does not Granger-cause log(FDI).	3.08***	5.84***	1.64
log(FDI) does not Granger-cause log(ex_rate).	5.34***	2.24	4.68***
	(886)	(772)	(658)

The sample: combined higher- and lower-income host countries.
The numbers in parentheses indicate the number of observations.
****, **, * respectively indicate statistical significance at the 1%, 5%, and 10% level.*

The results estimated using the aggregate sample (Table 1) show that, with the exception of the GDP growth rate, each of the coefficients associated with market size, trade openness, wages, labor skill, interest rates, exchange rates, degree of rurality, and FDI agglomeration is statistically significant. The results based on the higher-income host countries suggest that market size, labor skill, exchange rates, rurality (though not robust), and FDI agglomeration have a statistically significant relationship with the location choice of multinationals. For the lower-income host countries, trade openness, interest rates, exchange rates, degree of rurality, and FDI agglomeration have a statistically significant relationship with the location choice of multinationals. In summary, the empirical evidence shows that the variables explaining the theoretical model of FDI vary based on the sample set examined.

5.4 Results of Pairwise Granger Causality Tests

Table 4 shows F-statistics for Granger-causality tests for three different lag lengths. The results suggest a feedback relationship between GDP per capita and FDI (at varying lag lengths), suggesting that FDI inflows and per capita GDP reinforce each other, and that as conventionally expected FDI contributes to GDP growth. A feedback relationship is also exhibited between exchange-rate movements and FDI inflows, suggesting the two variables impact each other. Also shown in Table 4 is a one-way Granger causality running from trade openness, interest rates, and degree of rurality to FDI inflows with a lag of three years and a one -way causal link running from labor skill to FDI inflows with a lag of one year.

5.5 Impulse-Response Estimates

We assess the impulse response of FDI inflows to a one-time shock in each of the independent variables for the combined sample of higher- and lower-income countries. The estimation results of the impulse response of FDI inflows to a one-time shock in each of the other variables are presented in Chart 1. The vertical axis shows the change in FDI (in millions of U.S. Dollars with plus/minus two standard error bands) due to a one time shock (i.e., one standard deviation shock) in the given variable (shown respectively on each graph). The horizontal axis shows response time (in years).

A one-time positive shock in trade openness, labor skill, and GDP per capital, respectively, has a muted impact on FDI inflows for the first five years; after the fifth year, FDI steadily rises for the remaining period. The impulse response of FDI to a one-time shock in expected exchange-rate depreciation is close to zero for the first four years and falls steadily after the fourth year. Shocks in wage rates and interest rates induce a small dynamic response in FDI inflows: the impulse response of FDI to one-time shock in the wage rate and also in interest rates is close to zero during each of the periods examined. The impulse response of FDI to a shock in rurality is also close to zero, but this is partly because the degree of rurality is a characteristic of the individual cross-sections that is slow to change with time.

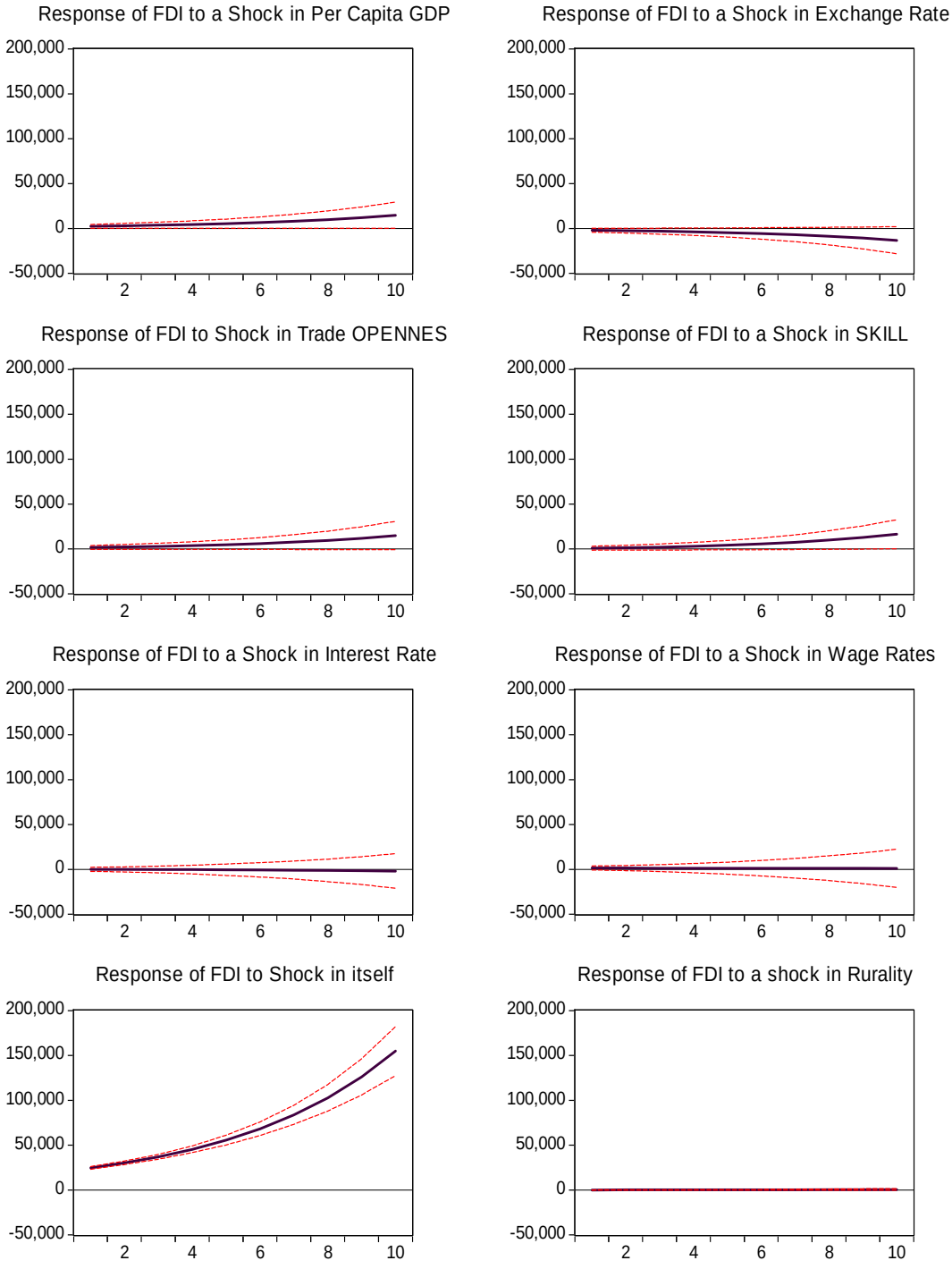

Chart 1. Response to Cholesky One Standard Deviation Innovation ± 2 Standard Errors

6. SUMMARY AND CONCLUSIONS

We hypothesize that a high degree of rurality in an economy leads to fewer FDI inflows, because rural areas lack efficient infrastructure, skilled labor force, a variety of input suppliers, and other factors that are critical for the adoption of technologies and business practices. Using 1999 to 2007 panel data for 172 host countries, we find evidence supporting our hypothesis. Furthermore, the negative impact of the degree of rurality on FDI inflows is more profound for lower-income host countries than for higher-income host countries. The findings provide important policy implications. First, countries may be able to increase the level of FDI inflows by enhancing synergies that facilitate efficient business activities; this calls for rural development projects such as rural-urban and international connectivity, adequate labor skill, and other infrastructure. At the bare minimum, rural development programs should ensure the supply of electric power, telecommunications, water and solid waste systems, reliable highway systems, and quality education and training programs in rural areas.

Furthermore, consistent with existing empirical literature, our results, based on the sample of combined higher- and lower income host-countries, show that large market size, high degree of trade openness, lower labor costs, higher labor skill, lower cost of capital, expected appreciation of hosting countries' currencies, and FDI agglomeration tend to attract more FDI inflows.

For the higher-income host countries, the statistically significant variables consist of market size, labor skill, expected exchange rate movements, and FDI agglomeration; the level of significance of the rurality coefficient is not robust to specification. The relationship between labor skill and FDI inflows is positive—multinationals favor skill-endowed locations—suggesting that policies designed to enhance skill and productivity may attract FDI inflows. For the sample of higher-income countries, wages and cost of borrowing do not appear to play an important role in the location decisions of multinationals.

For the lower-income host countries, trade openness, exchange rates, and cost of capital play a significant role in attracting FDI inflows; the impacts of market size, labor costs, and labor skills are not statistically significant. These results suggest that lower-income host countries may use low interest rates, trade openness, and exchange rate policies to attract FDI inflows.

Results of causality tests suggest that FDI inflows have a feedback relationship with GDP per capita and exchange-rate movements; they also show a one-way Granger-causal link running from trade openness, interest rates, labor skill, and degree of rurality to FDI inflows under alternative lags. These results hint that FDI inflows and economic growth as well as FDI inflows and exchange-rate movements reinforce each other. The impulse response of FDI inflows to a one-time shock in most of the variables of the model is delayed by at least four years. For example, the impulse response of FDI to a one-time exchange-rate movement is close to zero for the first four years, after which FDI falls steadily. The impulse response of FDI to a one-time shock in labor cost, interest rates, and degree of rurality appears to be low.

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