# Bilateral Investment Treaties and Foreign Direct Investment 


#### Abstract

Byung S. Min, Sudesh Mujumdar, and Jong C. Rhim* This paper investigates the relationship between bilateral investment treaties (BITs) and foreign direct investment (FDI) inflows using random coefficient panel models, and accounting for the regime shift that occurred with the 1997 Asian Financial Crisis. The estimation results reveal that BITs have a strong positive impact on FDI inflows for the pre1997 era. However, the strength of this positive impact diminishes as more BITs are concluded, implying that each additional BIT yields a relatively smaller FDI-payoff. No statistically significant impact of BITs on FDI inflows is found for the period following the Asian Financial Crisis, implying a decline in their relative importance in attracting FDI. Further, BITs do not have a stronger impact on FDI inflows for developing countries in comparison to developed countries.


## I. Introduction

Bilateral Investment Treaties (BITs) have a fairly long history that can be traced to the 1960s. Over time, these treaties become have gained in popularity (Tobin and RoseAckerman, 2006; Neumayer and Spess, 2005), supplying the impetus for theoretical and empirical examinations of their impact on foreign direct investment (FDI).

Theoretical forays into the link between a Bilateral Investment Treaty (BIT) and FDI have revealed that FDI can experience a boost provided that the ratification of the BIT yields a credible guarantee by the host economy of a certain standard of treatment of foreign investment (Dolzer and Stevens, 1995). Given that FDI often involves a sunk-type fixed investment, the host economy (with a short-sighted government) may have the incentive to maximize the welfare in a way that is detrimental to foreign investors. This fundamental holdup or dynamic inconsistency problem (Tirole, 1988; Neumayer and Spess, 2005; Tornell, 1991; Staiger and Tabellini, 1987) can be largely alleviated through a BIT.

Ceteris paribus, it could thus be maintained that the larger the number of BITs that a country has ratified, the weaker the above-mentioned problems and hence the stronger their impact on FDI. Of course, just how strong this impact is, is an empirical question. In this regard, the evidence is mixed. Some studies, such as Min (2007), Salacuse and Sullivan (2005), Neumayer and Spess (2005), and Tobin and Rose-Ackerman (2006), find a positive, statistically significant effect of the number of BITs on FDI, whereas others such as Hallward-Driemeier (2003) find no statistically significant relationship.

The objective of this paper is to shed further light on this relationship by undertaking a more sophisticated empirical examination. The empirical efforts thus far have failed to allow for the intercepts and slopes of the BIT variable that vary from country to country. Figure 1 demonstrates there is considerable variability between the intercepts and slopes for different

[^0]Figure 1: Scatterplot of Intercepts and Slopes for all Countries with at Least Five Observations of FDI for 1985-2001.

countries in our dataset. The minimum and maximum values of the intercepts (slopes) are -$13.6(-0.71)$ and 12.4 (3.95) respectively, and their respective mean values are $3.2(0.30)$. Further, the correlation between intercepts and slopes is -0.47 over the period 1985-2001. The estimation model we employ (random coefficient panel model) allows the intercept and slope coefficient on the BIT variable to vary from country to country.

Further, we embed a linear mixed-effects model in a multi-level model that allows us to quantify the (co)variability of subject-specific intercepts and slopes ${ }^{1}$ and to assess the importance of cross-level effects and address problems of heterogeneity with samples of repeated measurements (Raudenbush and Bryk, 2002; Frees, 2004). The next section makes explicit this approach.

## II. Model

A linear mixed-effects panel model includes both fixed effects and random effects components and therefore provides a flexible version of a linear random coefficient model. The model we employ is described in this manner:

$$
\begin{equation*}
F D I_{\_} \text {flows }_{i t}=\mathbf{x}_{i t}^{\prime} \boldsymbol{\beta}+\zeta_{0 i}+\zeta_{1 i} z_{i t}+\varepsilon_{i t} \tag{1}
\end{equation*}
$$

where the dependent variable is FDI inflows to a country $i$ in year $t$. The $\mathbf{x}_{i t}$ is a vector of covariates including constants except for the $z_{i t}$ (i.e. BIT) variable, and $\boldsymbol{\beta}$ is a vector of subject-invariant coefficients including regression intercept. $\zeta_{0 i}$ and $\zeta_{1 i}$ which are subject-

[^1]specific random intercept and coefficients, respectively. The $\varepsilon_{i t}$ are time and subject-specific idiosyncratic residuals. Therefore, the equation represents a mixed linear effect: The first part of the RHS in (1) captures fixed effects components, and the second part captures random effects components.

Now, $\quad E\left(F D I_{-}\right.$flows $\left._{i t} / \mathbf{x}_{i t}, \zeta_{0 i}, \zeta_{1 i}\right)=\left(\beta_{0}+\zeta_{0 i}\right)+\left(\boldsymbol{\beta}_{-0}+\zeta_{1 i}\right) \mathbf{x}_{i t} \quad$ where $\quad \boldsymbol{\beta}_{-0} \quad$ contains parameters (excluding the intercept) whose estimates yield the subject-specific line. The location and slope of this line depends on the sign of $\zeta_{0 i}$. $\zeta_{1 i}$ which determines the deviation from the line indicated by the fixed effect component.

Following standard practice (Wooldridge, 2002; Cameron and Trivedi, 2005), the random intercept and slope are assumed to have a bivariate normal distribution with zero mean and covariance matrix: ${ }^{2}$

$$
\boldsymbol{\Psi} \equiv \operatorname{cov}\left(\zeta_{0 i}, \zeta_{1 i}\right)=\left[\begin{array}{ll}
\psi_{00} & \psi_{01}  \tag{2}\\
\psi_{01} & \psi_{11}
\end{array}\right] .
$$

where $\psi_{00}$ and $\psi_{11}$ are variances of $\zeta_{0 i}$ and $\zeta_{1 i}$ respectively. The $\psi_{01}$ refers to covariance between these two stochastic parameters. Furthermore, $\zeta_{0 i}$ and $\zeta_{1 i}$ are assumed to be uncorrelated across subjects (countries) and uncorrelated for idiosyncratic errors.

The model in (1) can determine whether a regressor (i.e. BIT in our case) has a different effect on the dependent variable when the subjects are from different groups in the sample. Neumayer (2005) argues that the reasons for the conclusion of a BIT can differ between developing and developed countries. If this argument is valid, the variance of the random component (intercept and coefficient) can be reduced by using a two-stage model formulation. In this case, the level-1 model is this:

$$
\begin{equation*}
F D I_{-} \text {flows }_{i t}=\mathbf{x}_{i t}^{\prime} \boldsymbol{\beta}+\xi_{0 i}+\xi_{1 i} z_{i t}+\varepsilon_{i t} \tag{3}
\end{equation*}
$$

The level-2 model shows the relationship between the random intercept, random coefficient, and the latent variable ( $D_{i}$ ).

$$
\begin{align*}
& \xi_{0 i}=\delta_{01}+\delta_{02} D_{i}+\zeta_{0 i}  \tag{4}\\
& \xi_{1 i}=\delta_{11}+\delta_{12} D_{i}+\zeta_{1 i} \tag{5}
\end{align*}
$$

where $D_{i}$ is a binary variable differentiating developing and developed countries. Substituting $(4,5)$ into $(3)$, we obtain the reduced form:

$$
\begin{equation*}
\text { FDI_ }_{-} \text {flows }_{i t}=\mathbf{x}_{i t}^{\prime} \boldsymbol{\beta}_{-0}+\beta_{0}+\delta_{01}+\zeta_{0 i}+\left(\zeta_{1 i}+\delta_{11}\right) z_{i t}+\delta_{02} D_{i}+\delta_{12} D_{i} \cdot z_{i t}+\varepsilon_{i t} \tag{6}
\end{equation*}
$$

[^2]where $D_{i} \cdot z_{i t}$ is a cross-level interaction between the level-1 variable $z$ (i.e. BIT) and the level-2 variable $D_{i}$ (i.e. indicator variable for developing countries). It captures the difference between the marginal change in response variables (i.e. FDI inflows) per unit of bilateral investment treaty (i.e. case), between developing and developed countries.

## III. Description of Data

The total number of BITs with OECD countries increased from 74 in 1970 to 1,044 in 2001 largely due to newly ratified BITs from the late 1980s (see Tobin and Rose-Ackerman, 2006 for a history of BITs). The number of BITs concluded varies from country to country, ranging from 0 to 19 . Over the period under consideration, the annual average number of BITs is 3.2. Our dataset is a subset of the data employed in Neumayer and Spess (2005) which represents an unbalanced panel for 207 countries covering the period 1960-2001. Our dataset excludes 21 countries where no FDI flows are observed. Furthermore, based on the Chow test results, we consider only data spanning 1985 to 2001.

The set of explanatory variables in our estimation model includes a Political Constraint Index (+), initially developed by Henisz (2000) to capture the degree of political risk in a way that shows the ability of political institutions to make credible commitments to an existing policy regime; inflation, to capture the stability of macroeconomic conditions (+); natural logarithm of GDP per capita, as a proxy for productivity $(+)$; natural logarithm of population to control for the total size of the market ( + ); and a natural resources variable, where the expected sign of the coefficient is positive $(+$ ) (Asiedu, 2006). In addition, the estimation model includes a number of indicator variables to capture the impact of WTO membership; Free Trade Agreements with the US, EU, and Japan; and developing country status. Table 1 presents descriptive statistics.

## IV. Estimation Results

Figure 2 gives indication of a structural break in FDI flows and BITs around the year 1997 (the onset of the Asian Financial Crisis). This is confirmed by Chow tests with a statistical significance of less than 1 percent. For estimation purposes, we thus partition our data into two sets: one, spanning the period 1985 to 1996 and another spanning the period: 1997 to 2001.

## A. Random-Intercept Models

Table 2 shows estimation results from random-intercept models for the period 1985-1996. All estimated coefficients on the BIT variable are positive and statistically significant (at conventional levels) regardless of model specification, implying a significant, positive effect of BITs on FDI inflows. The negative signs of the coefficients on the $\mathrm{BIT}^{2}$ imply a diminishing strength of the positive effect of BITs on FDI inflows, although the estimates of these coefficients are not statistically significant at conventional levels.

In order to investigate the indirect effects of a BIT via investment risk, we include an interaction variable between BIT and the Investment Risk variable (Models 2, 4, 5, 6). This interaction variable is found not be significant.

Further, we find that Political Constraint, productivity (measured by GDP per capita), and the size of market (measured by logarithm of population) are important determinants of FDI inflows during 1985-1996.

We repeat the estimation using data after 1996 when there was a regime shift in parameters. These results (Table 3) are significantly different from those in Table 2. The sign

Table 1: Summary Statistics of Variables (1985-2001)

| Variable |  | Mean | Std. <br> Dev. | Min | Max | Observations |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Ln (FDI in constant value of US\$ 1996) | overall | 4.36 | 3.02 | -4.69 | 12.59 | $\mathrm{N}=2947$ |
|  | between |  | 2.53 | -0.84 | 11.19 | $\mathrm{n}=186$ |
|  | within |  | 1.59 | -5.32 | 9.60 | $\mathrm{T}-\mathrm{bar}=15.84$ |
| BITs (Bilateral Investment Treaties) | overall | 3.19 | 4.33 | 0 | 19 | $\mathrm{N}=3162$ |
|  | between |  | 3.44 | 0 | 16.58 | $\mathrm{n}=186$ |
|  | within |  | 2.64 | -10.50 | 13.96 | $\mathrm{T}=17$ |
| Political Constraint | overall | 0.21 | 0.21 | 0 | 0.72 | $\mathrm{N}=2874$ |
|  | between |  | 0.18 | 0 | 0.70 | $\mathrm{n}=181$ |
|  | within |  | 0.11 | -0.29 | 0.70 | T-bar $=15.87$ |
| Inflation | overall | 84.17 | 757.85 | -31.91 | 26762.02 | $\mathrm{N}=2837$ |
|  | between |  | 273.89 | -0.58 | 2227.71 | $\mathrm{n}=183$ |
|  | within |  | 706.38 | -2117.72 | 24618.49 | $\mathrm{T}-\mathrm{bar}=15.50$ |
| Ln (GDP per capita) | overall | 8.36 | 1.07 | 5.63 | 10.40 | $\mathrm{N}=2314$ |
|  | between |  | 1.07 | 6.14 | 10.23 | $\mathrm{n}=164$ |
|  | within |  | 0.13 | 7.81 | 9.10 | $\mathrm{T}-\mathrm{bar}=14.10$ |
| Natural Resource | overall | 4.92 | 10.20 | 0 | 82 | $\mathrm{N}=2772$ |
|  | between |  | 10.17 | 0 | 44.83 | $\mathrm{n}=180$ |
|  | within |  | 3.60 | -24.60 | 47.87 | T-bar $=15.4$ |
| Ln (Population) | overall | 15.47 | 1.95 | 10.46 | 20.98 | $\mathrm{N}=3113$ |
|  | between |  | 2.01 | 10.51 | 20.88 | $\mathrm{n}=186$ |
|  | within |  | 0.10 | 15.07 | 15.83 | T-bar $=16.73$ |
| Investment Risk | overall | 6.81 | 2.43 | 0.66 | 12 | $\mathrm{N}=1629$ |
|  | between |  | 1.25 | 3.47 | 11.31 | $\mathrm{n}=105$ |
|  | within |  | 2.20 | 0.83 | 13.48 | $\mathrm{T}-\mathrm{bar}=15.51$ |
| Dummy for WTO membership | overall | 0.60 | 0.48 | 0 | 1 | $\mathrm{N}=3162$ |
|  | between |  | 0.43 | 0 | 1 | $\mathrm{n}=186$ |
|  | within |  | 0.22 | -0.33 | 1.48 | $\mathrm{T}=17$ |
| Dummy for Bilateral Trade Agreement with US, EU and Japan | overall | 0.07 | 0.26 | 0 | 2 | $\mathrm{N}=3162$ |
|  | between |  | 0.22 | 0 | 1.11 | $\mathrm{n}=186$ |
|  | within |  | 0.14 | -0.51 | 1.72 | $\mathrm{T}=17$ |

Note: Between and within refer to between countries (i.e. cross-section with n observations) and within clusters (i.e. time-series with sample period T) respectively. Overall refers to the pooled data with N observations. The Political Constraint Index is designed to show the extent to which political actors are constrained in their choice of future policies by the existence of other political actors with veto power who will have to consent to policy choices (Henisz, 2000). Scores range from 0 (executive's perfect discretionary power to change policies) to 1 (little discretionary power). Investment risk, measured by the composition of government unity, legislative strength, and popular support with equal weights, ranges from 0 (high risk) to 12 (low risk) (Neumayer and Spess, 2005).

Figure 2: Bilateral Investment Treaties (Accumulated and New Conclusions) and FDI Inflows for 207 Countries from 1985 to 2001.


Notes: FDI is measured in 1990 constant US dollars. BIT here indicates bilateral investment treaties with OECD countries. Data compiled from Neumayer and Speiss (2005).
of the estimated coefficient on the BIT variable is negative, but the estimates are not significant at conventional levels for all models except model 3 where the estimated coefficient is weakly significant (at the $10 \%$ level). The $\mathrm{BIT}^{2}$ and interaction variables are also not significant. However, productivity and the size of market remain significant ${ }^{3}$.

## B. Random-Coefficient Models

Tables 4 and 5 show estimation results based on a random-coefficient form of (1). We find that all coefficient estimates on the BIT variable have positive signs and are statistically significant (regardless of the model specifications) for data spanning 1985 to 1996. These results are thus similar to those obtained from using the random-intercept model. In contrast to the random-intercept model, however, we find significant, decreasing marginal effects of BITs on FDI flows, and significant estimates of the coefficient on the interaction variable between BIT and Investment Risk (for models 4, 5 and 6). As with the estimation results using the random-intercept model, Political Constraint, productivity, and size of market remain significant.

We note that the estimated standard deviation of idiosyncratic errors $(\sqrt{\theta})$ in the randomcoefficient model is somewhat lower than in the random-intercept model (Table 2-A). However, the standard deviation of random-intercept $\left(\sqrt{\psi_{00}}\right)$ remains high and is large compared to random-slope $\left(\sqrt{\psi_{11}}\right)$. We will investigate this further in the following section.

[^3]The estimation of random-coefficient models after the 1997 Asian crisis again show negative signs on the estimates of the coefficient on the BIT variable. Note that the number of BITs concluded in the post-1996 era dropped significantly compared to the pre-1997 era. These negative signs are possible if MNEs reduced their foreign investment because they interpreted this reduction in the number of BIT conclusions as a sign of a deteriorating investment environment (Min, 2007). Besides the estimated coefficient on the BIT in model 3 which is weakly significant (at the 10 precent level), none of the other corresponding estimates from the other models are significant.

Table 2: Estimation of Random-Intercept Models for 1985-1996

| Variable | modell | model2 | model3 | model4 | model5 | model6 |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| BIT $\mathrm{BIT}^{2}$ | $\begin{aligned} & 0.162^{* * *} \\ & (0.017) \end{aligned}$ | $\begin{aligned} & 0.149 * * * \\ & (0.044) \end{aligned}$ | $\begin{aligned} & 0.206^{* * *} \\ & (0.042) \\ & -0.003 \\ & (0.003) \end{aligned}$ | $\begin{aligned} & 0.206 * * * \\ & (0.058) \\ & -0.005 \\ & (0.003) \end{aligned}$ | $\begin{aligned} & 0.200 * * * \\ & (0.058) \\ & -0.004 \\ & (0.003) \end{aligned}$ | $\begin{aligned} & 0.197 * * * \\ & (0.058) \\ & -0.004 \\ & (0.003) \end{aligned}$ |
| BIT*Investment Risk |  | $\begin{aligned} & 0.006 \\ & (0.006) \end{aligned}$ |  | $\begin{aligned} & 0.008 \\ & (0.006) \end{aligned}$ | $\begin{aligned} & 0.007 \\ & (0.006) \end{aligned}$ | $\begin{aligned} & 0.007 \\ & (0.006) \end{aligned}$ |
| Political Constraint | $\begin{aligned} & 1.749 * * * \\ & (0.304) \\ & 0.000 \end{aligned}$ | $\begin{aligned} & 2.27 * * * \\ & (0.380) \\ & 0.000 \end{aligned}$ | $\begin{aligned} & 1.769 * * * \\ & (0.305) \\ & 0.001 \end{aligned}$ | $\begin{aligned} & 2.288 * * * \\ & (0.380) \\ & 0.000 \end{aligned}$ | $\begin{aligned} & 2.233^{* * *} \\ & (0.382) \\ & 0.000 \end{aligned}$ | $\begin{aligned} & 2.245^{* * *} \\ & (0.383) \\ & 0.001 \end{aligned}$ |
| Ln (GDP per capita) | $\begin{aligned} & 1.365^{* * *} \\ & (0.105) \\ & 0.001 \end{aligned}$ | $\begin{aligned} & 0.778 * * * \\ & (0.165) \\ & 0.012 \end{aligned}$ | $\begin{aligned} & 1.383^{* * *} \\ & (0.106) \\ & 0.001 \end{aligned}$ | $\begin{aligned} & 0.811 * * * \\ & (0.168) \\ & 0.011 \end{aligned}$ | $\begin{aligned} & 0.816 * * * \\ & (0.167) \\ & 0.012 \end{aligned}$ | $\begin{aligned} & 0.822 * * * \\ & (0.167) \\ & 0.012 \end{aligned}$ |
| Natural Resource | $\begin{aligned} & (0.009) \\ & 0.645^{* * *} \end{aligned}$ | $\begin{aligned} & (0.010) \\ & 0.65 * * * \end{aligned}$ | $\begin{aligned} & (0.009) \\ & 0.647^{* * *} \end{aligned}$ | $\begin{aligned} & (0.010) \\ & 0.658^{* * *} \end{aligned}$ | $\begin{aligned} & (0.010) \\ & 0.652 * * * \end{aligned}$ | $\begin{aligned} & (0.010) \\ & 0.651^{* * *} \end{aligned}$ |
| Ln (Population) <br> Dummy for WTO <br> Membership <br> Dummy for Trade <br> Agreement | (0.060) | (0.098) | (0.060) | (0.099) | $\begin{aligned} & (0.098) \\ & 0.243 \\ & (0.187) \end{aligned}$ | $\begin{aligned} & (0.098) \\ & 0.239 \\ & (0.187) \\ & -0.148 \\ & (0.367) \end{aligned}$ |
| Constant | $\begin{aligned} & -17.87 * * * \\ & (1.308) \end{aligned}$ | $\begin{aligned} & -13.77 * * * \\ & (2.148) \end{aligned}$ | $\begin{aligned} & -18.10^{* * *} \\ & (1.329) \end{aligned}$ | $\begin{aligned} & -14.24^{* * *} \\ & (2.180) \end{aligned}$ | $\begin{aligned} & -14.33^{* * *} \\ & (2.168) \end{aligned}$ | $\begin{aligned} & -14.36^{* * *} \\ & (2.160) \end{aligned}$ |
| Random Part |  |  |  |  |  |  |
| $\begin{aligned} & \sqrt{\psi_{00}} \\ & \sqrt{\theta} \end{aligned}$ | $\begin{aligned} & 1.29 \\ & (0.09) \\ & 1.36 \\ & (0.03) \end{aligned}$ | $\begin{aligned} & 1.22 \\ & (0.11) \\ & 1.41 \\ & (0.04) \end{aligned}$ | $\begin{aligned} & 1.30 \\ & (0.09) \\ & 1.34 \\ & (0.03) \end{aligned}$ | $\begin{aligned} & 1.22 \\ & (0.11) \\ & 1.41 \\ & (0.04) \end{aligned}$ | $\begin{aligned} & 1.22 \\ & (0.11) \\ & 1.41 \\ & (0.04) \end{aligned}$ | $\begin{aligned} & 1.21 \\ & (0.11) \\ & 1.41 \\ & (0.03) \end{aligned}$ |
| $\hat{\rho}$ | 0.47 | 0.43 | 0.47 | 0.43 | 0.43 | 0.42 |
| Number of Obs. | 1528 | 886 | 1528 | 886 | 886 | 886 |
| Log likelihood | -2808.4 | -1650.7 | -2807.7 | -1649.6 | -1648.8 | -1648.7 |

Note: $\hat{\psi}_{00}$ is variance of stochastic intercept. The $\theta$ and $\hat{\rho}$ are the variances of idiosyncratic errors and intraclass (within-country) correlation respectively. Note that $\hat{\rho}=\hat{\psi}_{00} /\left(\hat{\psi}_{00}+\hat{\theta}\right)$. Asterisks ***, **, * represent significance at 1 percent, 5 percent, and 10 percent levels respectively. Numbers in parentheses are standard errors.

Table 3: Estimation of Random-Intercept Models for 1997-2001

| Variable | model1 | model2 | model3 | model4 | model5 | model6 |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| BIT | $\begin{aligned} & -0.020 \\ & (0.022) \end{aligned}$ | $\begin{aligned} & -0.034 \\ & (0.060) \end{aligned}$ | $\begin{aligned} & -0.124^{*} \\ & (0.069) \end{aligned}$ | $\begin{aligned} & -0.087 \\ & (0.104) \end{aligned}$ | $\begin{aligned} & -0.087 \\ & (0.104) \end{aligned}$ | $\begin{aligned} & -0.084 \\ & (0.104) \end{aligned}$ |
| $\mathrm{BIT}^{2}$ |  | $\begin{aligned} & 0.005 \\ & (0.005) \end{aligned}$ |  | $\begin{aligned} & 0.005 \\ & (0.005) \end{aligned}$ | $\begin{aligned} & 0.005 \\ & (0.005) \end{aligned}$ | $\begin{aligned} & 0.005 \\ & (0.005) \end{aligned}$ |
| BIT*Investment Risk |  |  | $\begin{aligned} & 0.006 \\ & (0.004) \end{aligned}$ | $\begin{aligned} & 0.003 \\ & (0.005) \end{aligned}$ | $\begin{aligned} & 0.003 \\ & (0.005) \end{aligned}$ | $\begin{aligned} & 0.002 \\ & (0.005) \end{aligned}$ |
| Political Constraint | $\begin{aligned} & 0.425 \\ & (0.434) \end{aligned}$ | $\begin{aligned} & 0.575 \\ & (0.471) \end{aligned}$ | $\begin{aligned} & 0.428 \\ & (0.433) \end{aligned}$ | $\begin{aligned} & 0.575 \\ & (0.471) \end{aligned}$ | $\begin{aligned} & 0.571 \\ & (0.473) \end{aligned}$ | $\begin{aligned} & 0.583 \\ & (0.473) \end{aligned}$ |
| Inflation | $\begin{aligned} & -0.001 \\ & (0.001) \end{aligned}$ | $\begin{aligned} & -0.001 \\ & (0.001) \end{aligned}$ | $\begin{aligned} & -0.001 \\ & (0.001) \end{aligned}$ | $\begin{aligned} & -0.001 \\ & (0.001) \end{aligned}$ | $\begin{aligned} & -0.001 \\ & (0.001) \end{aligned}$ | $\begin{aligned} & -0.001 \\ & (0.001) \end{aligned}$ |
| Ln (GDP per capita) | $\begin{aligned} & 1.663^{* * *} \\ & (0.119) \end{aligned}$ | $\begin{aligned} & 1.300^{* * *} \\ & (0.209) \end{aligned}$ | $\begin{aligned} & 1.596 * * * \\ & (0.126) \end{aligned}$ | $\begin{aligned} & 1.294 * * * \\ & (0.209) \end{aligned}$ | $\begin{aligned} & 1.294 * * * \\ & (0.209) \end{aligned}$ | $\begin{aligned} & 1.279 * * * \\ & (0.210) \end{aligned}$ |
| Natural Resource | $\begin{aligned} & 0.013 \\ & (0.01) \end{aligned}$ | $\begin{aligned} & 0.02 * * \\ & (0.01) \end{aligned}$ | $\begin{aligned} & 0.014 \\ & (0.01) \end{aligned}$ | $\begin{aligned} & 0.02 * * \\ & (0.01) \end{aligned}$ | $\begin{aligned} & 0.02 * * \\ & (0.01) \end{aligned}$ | $\begin{aligned} & 0.02 * * \\ & (0.01) \end{aligned}$ |
| Ln (Population) | $\begin{aligned} & 0.751^{* * *} \\ & (0.071) \end{aligned}$ | $\begin{aligned} & 0.613 * * * \\ & (0.116) \end{aligned}$ | $\begin{aligned} & 0.744 * * * \\ & (0.071) \end{aligned}$ | $\begin{aligned} & 0.614 * * * \\ & (0.116) \end{aligned}$ | $\begin{aligned} & 0.614 * * * \\ & (0.116) \end{aligned}$ | $\begin{aligned} & 0.621^{* * *} \\ & (0.116) \end{aligned}$ |
| Dummy for WTO <br> Membership |  |  |  |  | $\begin{aligned} & 0.024 \\ & (0.28) \end{aligned}$ | $\begin{aligned} & 0.012 \\ & (0.28) \end{aligned}$ |
| Dummy for Trade Agreement |  |  |  |  |  | $\begin{aligned} & 0.189 \\ & (0.279) \end{aligned}$ |
| Constant <br> Random Part | $\begin{aligned} & -20.3^{* * *} \\ & (1.542) \end{aligned}$ | $\begin{aligned} & -15.4^{* * *} \\ & (2.707) \end{aligned}$ | $\begin{aligned} & -19.4^{* * *} \\ & (1.628) \end{aligned}$ | $\begin{aligned} & -15.2 * * * \\ & (2.722) \end{aligned}$ | $\begin{aligned} & -15.2^{* * *} \\ & (2.738) \end{aligned}$ | $\begin{aligned} & -15.2^{* * *} \\ & (2.733) \end{aligned}$ |
| $\sqrt{\psi_{00}}$ | $\begin{aligned} & 1.39 \\ & (0.09) \end{aligned}$ | $\begin{aligned} & 1.39 \\ & (0.12) \end{aligned}$ | $\begin{aligned} & 1.38 \\ & (0.09) \end{aligned}$ | $\begin{aligned} & 1.39 \\ & (0.12) \end{aligned}$ | $\begin{aligned} & 1.38 \\ & (0.12) \end{aligned}$ | $\begin{aligned} & 1.39 \\ & (0.12) \end{aligned}$ |
| $\sqrt{\theta}$ | $\begin{aligned} & 0.90 \\ & (0.03) \end{aligned}$ | $\begin{aligned} & 0.84 \\ & (0.03) \end{aligned}$ | $\begin{aligned} & 0.89 \\ & (0.03) \end{aligned}$ | $\begin{aligned} & 0.84 \\ & (0.03) \end{aligned}$ | $\begin{aligned} & 0.84 \\ & (0.03) \end{aligned}$ | $\begin{aligned} & 0.83 \\ & (0.03) \end{aligned}$ |
| $\hat{\rho}$ | 0.71 | 0.73 | 0.71 | 0.73 | 0.73 | 0.74 |
| Number of obs. | 667 | 412 | 667 | 412 | 412 | 412 |
| Log likelihood | -1049.1 | -626.9 | -1047.8 | -626.7 | -626.7 | -626.4 |

Note: $\hat{\psi}_{00}$ is variance of stochastic intercept. The $\theta$ and $\hat{\rho}$ are variances of idiosyncratic errors and intra-class (within-country) correlation respectively. Note that $\hat{\rho}=\hat{\psi}_{11} /\left(\hat{\psi}_{11}+\hat{\theta}\right)$ where $\hat{\psi}_{11}$ is variance of stochastic slope Asterisks ${ }^{* * *},{ }^{* *},{ }^{*}$ represent significance at the 1 percent, 5 percent, and 10 percent levels respectively. Numbers in parentheses are standard errors.

Table 4: Estimation of Random-Coefficient Models for 1985-1996

| Variable | modell | model2 | model3 | model4 | model5 | model6 |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| BIT | $\begin{aligned} & 0.146^{* * *} \\ & (0.020) \end{aligned}$ | $\begin{aligned} & 0.130 * * * \\ & (0.046) \end{aligned}$ | $\begin{aligned} & 0.208^{* * *} \\ & (0.044) \end{aligned}$ | $\begin{aligned} & 0.206 * * * \\ & (0.061) \end{aligned}$ | $\begin{aligned} & 0.200^{* * *} \\ & (0.061) \end{aligned}$ | $\begin{aligned} & 0.192 * * * \\ & (0.061) \end{aligned}$ |
| BIT ${ }^{\text {2 }}$ |  |  | $\begin{aligned} & -0.005^{*} \\ & (0.003) \end{aligned}$ | $\begin{aligned} & -0.007 * * \\ & (0.003) \end{aligned}$ | $\begin{aligned} & -0.007 * \\ & (0.003) \end{aligned}$ | $\begin{aligned} & -0.006 * \\ & (0.003) \end{aligned}$ |
| BIT*Investment Risk |  | $\begin{aligned} & 0.008 \\ & (0.006) \end{aligned}$ |  | $\begin{aligned} & 0.01^{*} \\ & (0.006) \end{aligned}$ | $\begin{aligned} & 0.01^{*} \\ & (0.006) \end{aligned}$ | $\begin{aligned} & 0.01^{*} \\ & (0.006) \end{aligned}$ |
| Political Constraint | $\begin{aligned} & 1.762 * * * \\ & (0.307) \end{aligned}$ | $\begin{aligned} & 2.283 * * * \\ & (0.383) \end{aligned}$ | $\begin{aligned} & 1.755^{* * *} \\ & (0.306) \end{aligned}$ | $\begin{aligned} & 2.224^{* * *} \\ & (0.380) \end{aligned}$ | $\begin{aligned} & 2.177 * * * \\ & (0.384) \end{aligned}$ | $\begin{aligned} & 2.152 * * * \\ & (0.383) \end{aligned}$ |
| Inflation | $\begin{aligned} & 0.000 \\ & (0.001) \end{aligned}$ | $\begin{aligned} & 0.000 \\ & (0.001) \end{aligned}$ | $\begin{aligned} & 0.000 \\ & (0.001) \end{aligned}$ | $\begin{aligned} & 0.000 \\ & (0.001) \end{aligned}$ | $\begin{aligned} & 0.000 \\ & (0.001) \end{aligned}$ | $\begin{aligned} & 0.000 \\ & (0.001) \end{aligned}$ |
| Ln (GDP per capita) | $\begin{aligned} & 1.351 * * * \\ & (0.106) \end{aligned}$ | $\begin{aligned} & 0.799 * * * \\ & (0.168) \end{aligned}$ | $\begin{aligned} & 1.374^{* * *} \\ & (0.108) \end{aligned}$ | $\begin{aligned} & 0.841^{* * *} \\ & (0.171) \end{aligned}$ | $\begin{aligned} & 0.848^{* * *} \\ & (0.171) \end{aligned}$ | $\begin{aligned} & 0.855^{* * *} \\ & (0.170) \end{aligned}$ |
| Natural Resource | $\begin{aligned} & 0.002 \\ & (0.009) \end{aligned}$ | $\begin{aligned} & 0.011 \\ & (0.010) \end{aligned}$ | $\begin{aligned} & 0.001 \\ & (0.009) \end{aligned}$ | $\begin{aligned} & 0.010 \\ & (0.011) \end{aligned}$ | $\begin{aligned} & 0.011 \\ & (0.011) \end{aligned}$ | $\begin{aligned} & 0.011 \\ & (0.011) \end{aligned}$ |
| Ln(Population) | $\begin{aligned} & 0.658 * * * \\ & (0.061) \end{aligned}$ | $\begin{aligned} & 0.672 * * * \\ & (0.099) \end{aligned}$ | $\begin{aligned} & 0.666^{* * *} \\ & (0.062) \end{aligned}$ | $\begin{aligned} & 0.701^{* * *} \\ & (0.099) \end{aligned}$ | $\begin{aligned} & 0.693^{* * *} \\ & (0.099) \end{aligned}$ | $\begin{aligned} & 0.703 * * * \\ & (0.098) \end{aligned}$ |
| Dummy for WTO Membership |  |  |  |  | $\begin{aligned} & 0.240 \\ & (0.191) \end{aligned}$ | $\begin{aligned} & 0.229 \\ & (0.190) \end{aligned}$ |
| Dummy for Trade Agreement |  |  |  |  |  | $\begin{aligned} & -0.300 \\ & (0.361) \end{aligned}$ |
| Constant <br> Random Part | $\begin{aligned} & -17.9^{* * *} \\ & (1.337) \end{aligned}$ | $\begin{aligned} & -14.2^{* * *} \\ & (2.192) \end{aligned}$ | $\begin{aligned} & -18.3^{* * *} \\ & (1.371) \end{aligned}$ | $\begin{aligned} & -15.2 * * * \\ & (2.240) \end{aligned}$ | $\begin{aligned} & -15.2 * * * \\ & (2.235) \end{aligned}$ | $\begin{aligned} & -15.4^{* * *} \\ & (2.220) \end{aligned}$ |
| $\sqrt{\psi_{00}}$ | $\begin{aligned} & 1.40 \\ & (0.11) \end{aligned}$ | $\begin{aligned} & 1.35 \\ & (0.16) \end{aligned}$ | $\begin{aligned} & 1.43 \\ & (0.11) \end{aligned}$ | $\begin{aligned} & 1.42 \\ & (0.17) \end{aligned}$ | $\begin{aligned} & 1.40 \\ & (0.17) \end{aligned}$ | $\begin{aligned} & 1.42 \\ & (0.18) \end{aligned}$ |
| $\sqrt{\psi_{11}}$ | $\begin{aligned} & 0.08 \\ & (0.03) \end{aligned}$ | $\begin{aligned} & 0.07 \\ & (0.03) \end{aligned}$ | $\begin{aligned} & 0.08 \\ & (0.02) \end{aligned}$ | $\begin{aligned} & 0.07 \\ & (0.02) \end{aligned}$ | $\begin{aligned} & 0.08 \\ & (0.03) \end{aligned}$ | $\begin{aligned} & 0.07 \\ & (0.02) \end{aligned}$ |
| $\rho_{01}$ | $\begin{aligned} & -0.59 \\ & (0.18) \end{aligned}$ | $\begin{aligned} & -0.59 \\ & (0.31) \end{aligned}$ | $\begin{aligned} & -0.66 \\ & (0.18) \end{aligned}$ | $\begin{aligned} & -0.73 \\ & (0.27) \end{aligned}$ | $\begin{aligned} & -0.70 \\ & (0.27) \end{aligned}$ | $\begin{aligned} & -0.78 \\ & (0.27) \end{aligned}$ |
| $\sqrt{\theta}$ | $\begin{aligned} & 1.35 \\ & (0.03) \end{aligned}$ | $\begin{aligned} & 1.40 \\ & (0.04) \end{aligned}$ | $\begin{aligned} & 1.35 \\ & (0.03) \end{aligned}$ | $\begin{aligned} & 1.39 \\ & (0.04) \end{aligned}$ | $\begin{aligned} & 1.39 \\ & (0.04) \end{aligned}$ | $\begin{aligned} & 1.40 \\ & (0.04) \end{aligned}$ |
| Statistics | 1528 | 886 | 1528 | 886 | 886 | 886 |
| Log likelihood | -2804.0 | -1648.4 | -2802.8 | -1646.5 | -1645.7 | -1645.4 |

Note: $\theta$ is variance of idiosyncratic errors. The $\hat{\psi}_{00}$ and $\hat{\psi}_{11}$ are variances of the stochastic intercept and the stochastic slope, respectively. The $\hat{\rho}_{01}$ represents the correlation between intercept and slope. Asterisks ***, **, * represent significance at the 1 percent, 5 percent, and 10 percent levels respectively. Numbers in parentheses are standard errors.

Table 5: Estimation of Random-Coefficient Models for 1997-2001

| Variable | model1 | model2 | model3 | model4 | model5 | model6 |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| BIT | $\begin{aligned} & -0.021 \\ & (0.022) \end{aligned}$ | $\begin{aligned} & -0.034 \\ & (0.059) \end{aligned}$ | $\begin{aligned} & -0.126^{*} \\ & (0.069) \end{aligned}$ | $\begin{aligned} & -0.106 \\ & (0.109) \end{aligned}$ | $\begin{aligned} & -0.084 \\ & (0.113) \end{aligned}$ | $\begin{aligned} & -0.088 \\ & (0.114) \end{aligned}$ |
| $\mathrm{BIT}^{\wedge} 2$ |  |  | $\begin{aligned} & 0.007 \\ & (0.004) \end{aligned}$ | $\begin{aligned} & 0.004 \\ & (0.005) \end{aligned}$ | $\begin{aligned} & 0.003 \\ & (0.005) \end{aligned}$ | $\begin{aligned} & 0.002 \\ & (0.005) \end{aligned}$ |
| BIT*Investment Risk |  | $\begin{aligned} & 0.005 \\ & (0.005) \end{aligned}$ |  | $\begin{aligned} & 0.005 \\ & (0.005) \end{aligned}$ | $\begin{aligned} & 0.005 \\ & (0.005) \end{aligned}$ | $\begin{aligned} & 0.005 \\ & (0.005) \end{aligned}$ |
| Political Constraint | $\begin{aligned} & 0.417 \\ & (0.437) \end{aligned}$ | $\begin{aligned} & 0.574 \\ & (0.471) \end{aligned}$ | $\begin{aligned} & 0.436 \\ & (0.435) \end{aligned}$ | $\begin{aligned} & 0.575 \\ & (0.472) \end{aligned}$ | $\begin{aligned} & 0.592 \\ & (0.473) \end{aligned}$ | $\begin{aligned} & 0.600 \\ & (0.475) \end{aligned}$ |
| Inflation | $\begin{aligned} & -0.001 \\ & (0.001) \end{aligned}$ | $\begin{aligned} & -0.001 \\ & (0.001) \end{aligned}$ | $\begin{aligned} & -0.001 \\ & (0.001) \end{aligned}$ | $\begin{aligned} & -0.001 \\ & (0.001) \end{aligned}$ | $\begin{aligned} & -0.001 \\ & (0.001) \end{aligned}$ | $\begin{aligned} & -0.001 \\ & (0.001) \end{aligned}$ |
| Ln(GDP per capita) | $\begin{aligned} & 1.664^{* * *} \\ & (0.119) \end{aligned}$ | $\begin{aligned} & 1.303 * * * \\ & (0.211) \end{aligned}$ | $\begin{aligned} & 1.593^{* * *} \\ & (0.128) \end{aligned}$ | $\begin{aligned} & 1.297 * * * \\ & (0.214) \end{aligned}$ | $\begin{aligned} & 1.273 * * * \\ & (0.208) \end{aligned}$ | $\begin{aligned} & 1.267 * * * \\ & (0.215) \end{aligned}$ |
| Natural Resource | $\begin{aligned} & 0.013 \\ & (0.01) \end{aligned}$ | $\begin{aligned} & 0.02 \\ & (0.01) \end{aligned}$ | $\begin{aligned} & 0.014 \\ & (0.01) \end{aligned}$ | $\begin{aligned} & 0.021^{* *} \\ & (0.01) \end{aligned}$ | $\begin{aligned} & 0.02 * * \\ & (0.01) \end{aligned}$ | $\begin{aligned} & 0.02 * * \\ & (0.01) \end{aligned}$ |
| Ln (Population) | $\begin{aligned} & 0.752 * * * \\ & (0.071) \end{aligned}$ | $\begin{aligned} & 0.610 * * * \\ & (0.115) \end{aligned}$ | $\begin{aligned} & 0.743 * * * \\ & (0.072) \end{aligned}$ | $\begin{aligned} & 0.609^{* * *} \\ & (0.115) \end{aligned}$ | $\begin{aligned} & 0.616 * * * \\ & (0.113) \end{aligned}$ | $\begin{aligned} & 0.615^{* * *} \\ & (0.116) \end{aligned}$ |
| Dummy for WTO Membership |  |  |  |  | $\begin{aligned} & 0.022 \\ & (0.285) \end{aligned}$ | $\begin{aligned} & 0.009 \\ & (0.284) \end{aligned}$ |
| Dummy for FTA Agreement |  |  |  |  |  | $\begin{aligned} & 0.194 \\ & (0.281) \end{aligned}$ |
| Constant Random part | $\begin{aligned} & -20.3 * * * \\ & (1.541) \end{aligned}$ | $\begin{aligned} & -15.3^{* * *} \\ & (2.716) \end{aligned}$ | $\begin{aligned} & -19.4^{* * *} \\ & (1.663) \end{aligned}$ | $\begin{aligned} & -15.1^{* * *} \\ & (2.746) \end{aligned}$ | $\begin{aligned} & -15.1 * * * \\ & (2.708) \end{aligned}$ | $\begin{aligned} & -15.0^{* * *} \\ & (2.764) \end{aligned}$ |
| $\sqrt{\psi_{00}}$ | $\begin{aligned} & 1.37 \\ & (0.38) \end{aligned}$ | $\begin{aligned} & 1.44 \\ & (0.21) \end{aligned}$ | $\begin{aligned} & 1.40 \\ & (0.40) \end{aligned}$ | $\begin{aligned} & 1.49 \\ & (0.68) \end{aligned}$ | $\begin{aligned} & 1.55 \\ & (0.70) \end{aligned}$ | $\begin{aligned} & 1.53 \\ & (0.72) \end{aligned}$ |
| $\sqrt{\psi_{11}}$ | $\begin{aligned} & 0.01 \\ & (0.00) \end{aligned}$ | $\begin{aligned} & 0.01 \\ & (0.02) \end{aligned}$ | $\begin{aligned} & 0.01 \\ & (0.02) \end{aligned}$ | $\begin{aligned} & 0.01 \\ & (0.00) \end{aligned}$ | $\begin{aligned} & 0.10 \\ & (0.04) \end{aligned}$ | $\begin{aligned} & 0.08 \\ & (0.00) \end{aligned}$ |
| $\rho_{01}$ | $\begin{aligned} & -0.73 \\ & (0.02) \end{aligned}$ | $\begin{aligned} & -0.99 \\ & \text { (n.a.) } \end{aligned}$ | $\begin{aligned} & -1.0 \\ & (0.03) \end{aligned}$ | $\begin{aligned} & -1.0 \\ & \text { (n.a.) } \end{aligned}$ | $\begin{aligned} & -0.56 \\ & (0.05) \end{aligned}$ | $\begin{aligned} & -0.52 \\ & (0.04) \end{aligned}$ |
| $\sqrt{\theta}$ | $\begin{aligned} & 0.88 \\ & (0.05) \end{aligned}$ | $\begin{aligned} & 0.84 \\ & (0.03) \end{aligned}$ | $\begin{aligned} & 0.89 \\ & (0.05) \end{aligned}$ | $\begin{aligned} & 0.84 \\ & (0.06) \end{aligned}$ | $\begin{aligned} & 0.83 \\ & (0.06) \end{aligned}$ | $\begin{aligned} & 0.84 \\ & (0.06) \end{aligned}$ |
| Statistics Number of obs. | 667 | 412 | 667 | 412 | 412 | 412 |
| Log likelihood | -1049.0 | -626.8 | -1047.8 | -626.5 | -627.4 | -626.8 |

Note: Instead of MLE, which was used in our other estimations, Model 1 was estimated using Rabe-Hesketh et al.'s (2004) generalised linear latent and mixed model (GLLMM) program because MLE failed to converge. This GLLMM is basically a two-stage model formulation. A spherical integration rule of degree 15 combined with adaptive quadrature was used to cut the estimation time.
The $\theta$ represents the variance of idiosyncratic errors. The $\hat{\psi}_{00}$ and $\hat{\psi}_{11}$ are variances of stochastic intercept and stochastic slope respectively. The $\hat{\rho}_{01}$ represents the correlation between intercept and slope. Asterisks ${ }^{* * *}$, **, * represent significance at the 1 percent, 5 percent, and 10 percent levels respectively. Numbers in parentheses are standard errors.

Table 6: Estimation of Cross-Level Interaction for 1985-1996

| Variable | model1 | model2 | model3 | model4 | model5 | model6 |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| BIT | $\begin{aligned} & 0.103 \\ & (0.088) \end{aligned}$ | $\begin{aligned} & 0.143 \\ & (0.091) \\ & -0.005 \end{aligned}$ | $\begin{aligned} & 0.146^{*} \\ & (0.090) \\ & -0.005^{*} \end{aligned}$ | $\begin{aligned} & 0.188 * * \\ & (0.087) \end{aligned}$ | $\begin{aligned} & 0.140 \\ & (0.090) \\ & -0.005 \end{aligned}$ | $\begin{aligned} & 0.239 * * * \\ & (0.088) \\ & -0.004 \end{aligned}$ |
| $\mathrm{BIT}^{2}$ |  | (0.003) | (0.003) |  | (0.003) | (0.003) |
| Dummy for Developing Country (LDC) | $\begin{aligned} & -1.44^{* * *} \\ & (0.424) \end{aligned}$ | $\begin{aligned} & -1.44 * * * \\ & (0.422) \end{aligned}$ | $\begin{aligned} & -1.47 * * * \\ & (0.430) \end{aligned}$ |  | $\begin{aligned} & -1.42^{* * *} \\ & (0.432) \end{aligned}$ |  |
| LDC*BIT | $\begin{aligned} & 0.073 \\ & (0.091) \\ & 1.660^{* * *} \end{aligned}$ | $\begin{aligned} & 0.091 \\ & (0.092) \\ & 1.662^{* * *} \end{aligned}$ | $\begin{aligned} & 0.096 \\ & (0.092) \\ & 1.654^{* * *} \end{aligned}$ | $\begin{aligned} & -0.046 \\ & (0.088) \\ & 1.798^{* * *} \end{aligned}$ | $\begin{aligned} & 0.098 \\ & (0.092) \\ & 1.618^{* * *} \end{aligned}$ | $\begin{aligned} & -0.041 \\ & (0.086) \\ & 1.758^{* * *} \end{aligned}$ |
| Political Constraint | $\begin{aligned} & (0.307) \\ & 0.000 \end{aligned}$ | $\begin{aligned} & (0.305) \\ & 0.000 \end{aligned}$ | $\begin{aligned} & (0.306) \\ & 0.000 \end{aligned}$ | $\begin{aligned} & (0.306) \\ & 0.000 \end{aligned}$ | $\begin{aligned} & (0.308) \\ & 0.000 \end{aligned}$ | $\begin{aligned} & (0.306) \\ & 0.000 \end{aligned}$ |
| Inflation <br> Ln (GDP per capita) | $\begin{aligned} & (0.001) \\ & 1.056 * * * \\ & (0.136) \end{aligned}$ | $\begin{aligned} & (0.001) \\ & 1.076^{* * *} \\ & (0.137) \end{aligned}$ | $\begin{aligned} & (0.001) \\ & 1.083 * * * \\ & (0.138) \end{aligned}$ | $\begin{aligned} & (0.001) \\ & 1.328^{* * *} \\ & (0.108) \end{aligned}$ | $\begin{aligned} & (0.001) \\ & 1.081 * * * \\ & (0.138) \end{aligned}$ | $\begin{aligned} & (0.001) \\ & 1.366^{* * *} \\ & (0.111) \end{aligned}$ |
| Natural Resource Ln (Population) | $\begin{aligned} & (0.009) \\ & 0.603 * * * \\ & (0.062) \end{aligned}$ | $\begin{aligned} & 0.613 * * * * \\ & (0.062) \end{aligned}$ | $\begin{aligned} & (0.009) \\ & 0.608 * * * \\ & (0.063) \end{aligned}$ | $\begin{aligned} & 0.662 * * * * \\ & (0.061) \end{aligned}$ | $\begin{aligned} & (0.009) \\ & 0.601^{* * *} \\ & (0.063) \end{aligned}$ | $\begin{aligned} & (0.009) \\ & 0.669^{* * *} \\ & (0.061) \end{aligned}$ |
| Dummy for WTO <br> Membership <br> Dummy for FTA <br> Agreement |  |  |  |  | $\begin{aligned} & 0.166 \\ & (0.146) \end{aligned}$ | $\begin{aligned} & -0.407 \\ & (0.319) \end{aligned}$ |
| Constant | $\begin{aligned} & -13.5 * * * \\ & (1.832) \end{aligned}$ | $\begin{aligned} & -13.8^{* * *} \\ & (1.832) \end{aligned}$ | $\begin{aligned} & -13.8^{* * *} \\ & (1.857) \end{aligned}$ | $\begin{aligned} & -17.8^{* * *} \\ & (1.335) \end{aligned}$ | $\begin{aligned} & -13.9 * * * \\ & (1.856) \end{aligned}$ | $\begin{aligned} & -18.2 * * * \\ & (1.370) \end{aligned}$ |
| Random part $\sqrt{\psi_{00}}$ | $\begin{aligned} & 1.35 \\ & (0.11) \end{aligned}$ | $\begin{aligned} & 1.38 \\ & (0.11) \end{aligned}$ | $\begin{aligned} & 1.38 \\ & (0.11) \end{aligned}$ | $\begin{aligned} & 1.39 \\ & (0.11) \end{aligned}$ | $\begin{aligned} & 1.38 \\ & (0.11) \end{aligned}$ | $\begin{aligned} & 1.43 \\ & (0.11) \end{aligned}$ |
| $\sqrt{\psi_{11}}$ | $\begin{aligned} & 0.07 \\ & (0.03) \end{aligned}$ | $\begin{aligned} & 0.06 \\ & (0.02) \end{aligned}$ | $\begin{aligned} & 0.07 \\ & (0.02) \end{aligned}$ | $\begin{aligned} & 0.08 \\ & (0.03) \end{aligned}$ | $\begin{aligned} & 0.07 \\ & (0.02) \end{aligned}$ | $\begin{aligned} & 0.08 \\ & (0.02) \end{aligned}$ |
| $\rho_{01}$ | $\begin{aligned} & -0.60 \\ & (0.23) \end{aligned}$ | $\begin{aligned} & -0.64 \\ & (0.23) \end{aligned}$ | $\begin{aligned} & -0.66 \\ & (0.22) \end{aligned}$ | $\begin{aligned} & -0.59 \\ & (0.20) \end{aligned}$ | $\begin{aligned} & -0.66 \\ & (0.21) \end{aligned}$ | $\begin{aligned} & -0.73 \\ & (0.17) \end{aligned}$ |
| $\sqrt{\theta}$ | $\begin{aligned} & 1.35 \\ & (0.03) \end{aligned}$ | $\begin{aligned} & 1.35 \\ & (0.03) \end{aligned}$ | $\begin{aligned} & 1.34 \\ & (0.03) \end{aligned}$ | $\begin{aligned} & 1.35 \\ & (0.03) \end{aligned}$ | $\begin{aligned} & 1.35 \\ & (0.03) \end{aligned}$ | $\begin{aligned} & 1.35 \\ & (0.03) \end{aligned}$ |
| Statistics <br> Number of obs. Log likelihood | $\begin{aligned} & 1528 \\ & -2798.4 \end{aligned}$ | $\begin{aligned} & 1536 \\ & -2815.9 \end{aligned}$ | $\begin{aligned} & 1528 \\ & -2797.1 \end{aligned}$ | $\begin{aligned} & 1536 \\ & -2822.4 \end{aligned}$ | $\begin{aligned} & 1528 \\ & -2796.4 \end{aligned}$ | $\begin{aligned} & 1528 \\ & -2802.0 \end{aligned}$ |

Note: $\theta$ is variance of idiosyncratic errors. The $\hat{\psi}_{00}$ and $\hat{\psi}_{11}$ are variance of stochastic intercept and stochastic slope, respectively. The $\hat{\rho}_{01}$ represents the correlation between intercept and slope. Asterisks ${ }^{* * *}$, **, * represent significance at the 1 percent, 5 percent, and 10 percent levels respectively. Numbers in parentheses are standard errors.

## C. Cross-Level Interaction

The large estimated random-intercept standard deviation, $\sqrt{\psi_{00}}$, (mentioned in the previous section), could have occurred because the random-intercept model employed did not allow for any systematic difference between developing and developed countries. In order to
test this claim, we use a cross-level interaction model. Here, we include an indicator variable, $D_{i}$, for developing countries in the fixed part of the random-coefficient model. Now, we find that both the standard deviation $\left(\sqrt{\psi_{00}}\right)$ and idiosyncratic error $(\sqrt{\theta})$ drop somewhat, lending modest support for our claim.

The estimated coefficient on the BIT variable remains positive across all models but is statistically significant in only 3 of the 6 models considered. The $\mathrm{BIT}^{2}$ variable is significant at the 10 percent level only in model 3, implying that the speed of increase in the BIT variable was not well captured by the cross-level interaction model.

The indicator variable for a developing country is statistically significant regardless of the model specification. The negative signs may be reflecting the fact that FDI flows among developed countries have been dominant. However, the signs of the estimated cross-level interaction variable (LDC_BIT) vary depending on the model specification. Furthermore, none of these estimated coefficients are significant. This is somewhat surprising because it runs counter to the conventional belief that the BIT effect will be greater in LDCs than in developed countries.

We conduct the above exercise for the post 1996-era and find results similar to those obtained using the random-coefficient model for the same sample period (these results are available on request).

## V. Summary and Conclusions

This paper examines the relationship between BITs and FDI inflows through a relatively more sophisticated methodological lens - the random-coefficient model with the following results.

Firstly, BITs are found to have a positive effect on FDI inflows. However, the statistical significance of the estimated coefficient on the BIT variable varies depending on the estimation model and the sample period. The estimated coefficient on the BIT variable, given the control of direct investment risk indicated by Political Constraint (and Investment Risk), is positive and statistically significant at conventional levels, regardless of model specifications, before the 1997 crisis. However, the estimated coefficient on the BIT variable is not significant across all specifications; and in some cases, it has the unexpected sign for the period following the Asian Financial crisis. The Asian Financial crisis resulted in a sharp drop in BITs which in turn may have signalled a less attractive investment environment - this may account for the reduced positive effect of BITs on FDI inflows.

Secondly, the relationship between conclusions of BITs and FDI inflows can be captured by a concave curve, indicating that the rate of increase of the effect of BITs on FDI inflows decreases. Thus from a policy perspective, it is worthwhile to know that each subsequent BIT is likely to yield a relatively smaller payoff.

Finally, in contrast to conventional wisdom, developing countries do not enjoy a significantly larger impact of BITs on FDI inflows vis-à-vis developed countries. It may be worthwhile for future research to uncover, carefully, the reasons behind this.

## References

Asiedu, E., (2006), "Foreign direct investment in Africa: The role of natural resources, market sizes, government policies, institutions and political stability", World Economy, 29(1): 63-77.

Cameron, C.A., and Trivedi, P.K., (2005), Microeconometrics: Methods and applications,Cambridge University Press, Cambridge.
Dolzer, R., and Stevens, M., (1995), Bilateral Investment Treaties, The Hague: MartinusNijhoff Publishers.
Frees, E.W., (2004), Longitudinal and Panel Data: Analysis and Application in the SocialSciences, Cambridge University Press: Cambridge.
Hallward-Driemeier, M., (2003), Do bilateral investment treaties attract FDI? Only a bit...,and they could bite, Washington, D.C.: World Bank, World Bank Policy Research Paper WPS 3121.
Henisz, W.J., (2000), "The institutional environment for economic growth, Economics and Politics, 12(1):1-31.
Neumayer, E., and Spess, L., (2005), "Do bilateral investment treaties increase foreign directinvestment to developing countries", World Development, 33(10):1567-1585.
Neumayer, E., (2005), "Self-interest, foreign need and good governance: Are bilateralinvestment treaty program similar to aid allocation?", mimeo, London School of Economics and Political Science.
Rabe-Hesketh, S., Skrondal, A., and Pickles, A., (2004), GLLAMM Manual. Technical Report 160, University of California Berkeley, Division of Biostatistics. http://www.bepress.com/ucbbiostat/paper160/
Raudenbush, S.W., and A.S. Bryk, (2002), Hierarchical Linear Models: Applications and DataAnalysis Methods, Second ed. Sage, London
Salacuse, J.W., and Sullivan, N.P., (2005), "Do BITs really work? An evaluation of bilateralinvestment treaties and their grand bargain", Harvard International Law Journal, 46:67-130.
Staiger, R.W., and Tabellini, G., (1987), "Discretionary trade policy and excessive protection",American Economic Review, 77:823-37.
Tirole, J., 1988, The Theory of Industrial Organisation, MIT Press, Cambridge, MA.
Tobin, J. and Rose-Ackerman, S., (2006), "Bilateral investment treaties: Do they stimulateforeign direct investment?", Yale Law School Center for Law, mimeo.
Tornell, A., (1991), "Time inconsistency of protectionist programs", Quarterly Journal of Economics, 106:963-74.
Wooldridge,J.M., (2002), Econometric Analysis of Cross Section and Panel Data, Cambridge, MA, MIT Press.


[^0]:    The authors are grateful to two anonymous referees for their helpful comments and suggestions.
    *Byung S. Min is a Senior Lecturer at the School of International Business and Asian Studies, Griffith University, Australia.
    Sudesh Mujumdar is an Associate Professor of Economics at the University of Southern Indiana, IN, USA.
    Jong C. Rhim is a Professor of Finance at the University of Southern Indiana, IN, USA.

[^1]:    ${ }^{1}$ Using dummy variables is an alternative option for estimating country-specific intercepts, with the interactions between these dummy variables and the BIT variable providing estimates of country-specific slopes. However, this can entail more than 100 coefficients. In addition, if the countries are viewed as a (random) sample from a population of countries, we are not interested in the individual coefficients; rather, we are seeking to quantify the (co)variability of the intercepts and slopes.

[^2]:    ${ }^{2}$ Interpreting the covariance matrix is a complex task because individual elements in the matrix depend not only on the scale of the dependent variable but also on the scale of the independent variable.

[^3]:    ${ }^{3}$ Standard deviations of random intercepts, measured by $\sqrt{\psi_{00}}$, are about 7-12 percent higher than corresponding standard deviations using data before 1997, further supporting the use of a random coefficient model.

