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QUALITY OF INSTITUTIONS AND FOREIGN DIRECT INVESTMENT IN DEVELOPING COUNTRIES: CAUSALITY TESTS FOR CROSS-COUNTRY PANELS

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Abstract. This paper analyzes the short-run and long-run dynamics between quality of institutions and foreign direct investment (FDI) in the sample of 62 developing countries covering the period 1984-2003. Panel cointegration test and FM OLS (Fully Modified OLS) estimators are used to test for cointegration. For short-run dynamics, we estimate error correction model using fixed effect OLS and system GMM estimators. Institutional quality and FDI are found to have bi-directional cointegrating relationship in the long-run. However, there is no evidence in favor of short-run causality between two variables.
JEL *Classification:* C23, F23, O17

Keywords: Quality of Institutions, Foreign Direct Investment, Cointegration, Short-run causality; Developing countries.

1. Introduction

The institutional quality of a host country received growing attention in the recent literature as one of key determinants in location decision of foreign firms. Institutional variables such as the legal and political systems are thought to be crucial to curb the risk of opportunism in foreign direct investment (FDI) since they provide the structure for exchange that determines the cost of transacting and the cost of transformation. (North, 1990) Less corruption, a fair, predictable and an efficient bureaucracy may help attract FDI (Campos and Kinoshita, 2003).

Despite some studies that found no significant impact of institutions on inward FDI, (Hines, 1995) still a majority of papers on this topic provide evidence in support of a positive effect of role of institutions in entry decision by multinational enterprises (MNE). Campos and Kinoshita (2003) show that quality of institutions is one of main determinants of FDI inflows to transition countries. Using Japanese firm level data, Kang (2004) also finds that an institutional environment favorable to MNEs leads to a higher level of ownership of local companies. Wei (2000) examines a bilateral panel FDI data and provides the evidence that corruption in a host country negatively affects inward FDI. With a different view, Hellman et. al (2002) suggests that FDI might provide a negative feedback to the host country by magnifying the problems of the state capture and procurement kickbacks in a highly corrupt environment.

These results emphasize the role of institutional quality on attracting FDI. However, positive relationship between institutions and FDI does not automatically imply a true causal relationship. Critics can refer to the fact that there are a number of econometric problems with this approach because variables measured in the level form have common trends and measurement errors. Moreover, these statistical problems may be compounded by endogeneity problems if reverse causality is present. (Zhang and Fan, 2001) However, the use of variables measured in differences, capturing only the short-term impact, can lead to the misspecification of the final model since it ignores any long-term relationship. Engle and Granger (1987) suggested a clever way to reconcile this problem by proposing the two-step estimation of error correction model (ECM). This approach is useful in investigating both cointegration and a short-run Granger causality.

None of the former studies have explicitly examined the causality between FDI and the quality of institutions. In addition, most of the work is concentrated on the effect of corruption rather than institutions in a broader sense. Campos and Kinoshita (2003) used GMM dynamic panel estimator to support the presence of positive effect of institutions on FDI, but they did not consider the integration and cointegration properties of the data. It is uncertain whether their results represent a true structural long-run equilibrium relationship or a spurious one. (Christopoulos and Tsionas, 2004).

Causality is an important issue. Although both foreign technology (transferred primarily by FDI) and good institutions are regarded as the main two requirements of economic growth (Hausmann and Rodrik, 2003), the relationship between these variables has not been studied adequately. Our study of the causal relationships can facilitate explanation of the way these factors interact to foster economic growth, even though the growth is not the main issue in the present chapter.

The purpose of this paper is to investigate both the long-run cointegrating relationship and short run dynamics between FDI and the quality of institutions. Cointegration refers to a linear combination of nonstationary variables implying that their stochastic trends must be linked as a long-run equilibrium. Short-run dynamics enable us to test the direction of short-run causality. This paper uses the bivariate error correction model (ECM) approach to apply a series of econometric tests to a panel of 62 developing countries observed over the period 1984–2003. To the best of our knowledge, this is the first study that applies the error correction model to examine the causality between FDI and institutional quality in developing countries.

The remainder of our paper is organized as follows. The econometric model and empirical approach are introduced in section 2. Section 3 explains the data. Section 4 reports the empirical results and section 5 concludes.

2. The model and econometric technique

To investigate the causal relationship between FDI and institutional quality, we use the following autoregressive-distributed lag model (ADL)

$$y_{i,t} = \beta_0 + \beta_1 y_{i,t-1} + \beta_2 y_{i,t-2} + \beta_3 x_{i,t} + \beta_4 x_{i,t-1} + \beta_5 x_{t-2} + \psi_t + \varepsilon_i + u_{i,t}\,, \quad (1)$$

where $i = 1, \ldots 62$, $t = 1, \ldots 20$,

$y_{i,t}$ is either the log of inward FDI stock ($FDI_{i,t}$) or institutional quality ($Inst_{i,t}$) of country i in year i, ψ_t is the period-specific parameter capturing aggregate global shocks (assuming somewhat unrealistically, that the sensitivities of $y_{i,t}$ to the shocks are identical for all countries), ε_i is an unobserved country-specific effect and $u_{i,t}$ is a stochastic error term. When the dependent variable is quality of institutions, ψ_t is dropped, since institutional variables are usually persistent and may not be significantly affected by worldwide macroeconomic shock. The lag length of two is chosen according to the AIC (Akaike Information Criteria) and BIC (Bayesian Information Criteria) model selection criteria.

2.1. Testing for Unit Root

Before we examine the existence of cointegration, we must verify that FDI and $Inst$ are integrated of order one, or $I(1)$ in levels. We use panel unit root test of Im et. al, (1995) for both level and first-differenced variables. The use of panel-based tests is necessary because the power of country-by-country time-series unit root tests may be quite low given the sample size and time span of the data. (Christopoulos and Tsionas, 2004).

However, the drawback of IPS test is that their basic models are developed under the assumption of $T \to \infty$, which can mislead asymptotic results for panels where T is relatively small as in our case. Hadri and Larsson (2005) propose the tests for panel data under the assumption of limit theory that T is fixed and the number of groups N is allowed to go infinity. This makes the test to be more applicable to panels with large number of cross-section relative to short period of time and improves the finite sample properties. We follow their method and derive the panel statistic as an alternative to IPS panel unit root test.

2.2. Testing for cointegration and estimating the long run relationship

As a precondition for causality test, we need to check cointegrating properties of variables. A panel cointegration test developed by Pedroni (1999a) is conducted in this paper. For a small sample size, the test based on the group ADF-statistic is the most powerful, followed by the test based on the panel v-statistic. Thus, we will adopt group ADF-statistic as criteria of accepting or rejecting the null.

Following the cointegration tests, we apply the fully modified OLS (FMOLS) method to estimate the long run relationship. It is well known that despite its super-consistency, OLS estimation yields asymptotically biased results, because the nonstationary regressors are endogenously determined in the I (1) case. (Christopoulos and Tsionas, 2004) On the other hand, FMOLS produces asymptotically unbiased estimator as the statistic is constructed so as to make corrections for endogeneity and serial correlations to the OLS estimator $\beta_{i,t}$.

2.3. Error Correction Model

Short run dynamics are important issue as well as long run cointegrating relationship. Having established the presence of a structural long-run relationship, we proceed to estimate both long run and short run causalities between variables in a single error correction equation. The test is made on the basis of Engle-Granger two-step methodology (1987). Since ADL model does not make a distinction between long run and short run effects, the basic model represented by equation (1) is linearly transformed into error correction model such as

$$\begin{aligned}\Delta y_{i,t} &= \beta_0 + (\beta_1 - 1)\Delta y_{i,t-1} + \beta_3 \Delta x_{i,t} + \\ &(\beta_3 + \beta_4)\Delta x_{i,t-1} + \lambda(y_{i,t-2} - \phi x_{i,t-2}) + \\ &\psi_t + \varepsilon_i + u_{i,t}.\end{aligned} \tag{2}$$

The first three non-constant terms capture short-run dynamics while the error-correction term represents deviations from the long-run equilibrium. Error correction term is obtained by saving residuals of separate estimation of long run equilibrium. The second step is to estimate equation (2). The parameter λ can be interpreted as the speed of adjustment since its coefficient represents the rate at which short-run dynamics of FDI (or $Inst$) converge to the long run equilibrium relationship. Apparently, λ must be significantly different from zero if the variables are cointegrated.

To check the robustness of the model, we implement the system GMM method using ECM proposed by Yasar et al. (2004). The general way to deal with dynamic panel data is to apply first-differenced GMM estimators using the levels of the series lagged two periods or more as instrumental variables. However, when the number of time series observations is small, as in our case, the first differenced GMM may behave quite poorly because lagged levels of the variables are only weak instruments for subsequent first-differences. (Bond et al., 2001) This problem may be alleviated by introducing the system GMM estimator suggested by Arellano and Bover (1995) and Blundell and Bond (1998). Under the additional assumption that first-differences are not correlated with country-specific effects, the basic idea of system GMM is to combine both equations in first-differences, taking the lagged level variables as instruments, with equations in levels with lagged first-differences as instruments. To illustrate, considering a simple AR(1) model,

$$\begin{aligned} y_{i,t} &= \alpha y_{i,t-1} + \beta x_{i,t} + \eta_i + \nu_{i,t}, \\ |\alpha| &< 1 \ \text{ for } \ i = 1,\dots,N \ \text{ and } \ t = 2,\dots T, \end{aligned} \tag{3}$$

where $x_{i,t}$ is correlated with η_i and endogenous so as to satisfy $E[x_{i,t}\nu_{i,s}] \neq 0$ for $i = 1,\dots,N$ and $s \leq t$. Then two moments conditions for system GMM are

$$E[x_{i,t-s}\Delta\nu_{i,t}] = 0 \ \text{ for } \ t = 3,\dots,T,\ i = 1,\dots,N \ \text{ and } \ s \geq 2, \tag{4}$$

$$E[\Delta x_{i,t-s}\nu_{i,t}] = 0 \ \text{ for } \ t = 1,\dots,T,\ i = 1,\dots,N. \tag{5}$$

To establish the validity of instrumental variables, specification tests are conducted. The first specification test is Sargan test of which the null is that there is no correlation between instruments and errors. The failure to reject the null can be viewed as evidence in favor of using valid instruments. The null hypothesis of the second test is that the errors are not serially correlated in first-differenced equation. By construction, the differenced error term may be first-order serially correlated even if the original error term is not. (Carkovic and Levine, 2002) Thus, if the null of no serial correlation of AR(2) model cannot be rejected, it can be viewed as evidence supporting the validity of instruments used.

3. Data

The data used in this paper represents a balanced panel of 62 developing countries between 1984 and 2003. Due to the unavailability of sufficiently long time series data, most transition economies are not included. The FDI variable is per capita inward FDI stock in millions of U.S. dollars. The data source is the UNCTAD (United Nations Conference on Trade and Development) statistical database. The institutional quality data is provided by ICRG (International Country Risk Guide) researchers dataset. Three subcomponents of institutional quality include corruption, law and order, and bureaucracy quality. The assessment of these components is based on the subjective analysis of the available information. For measurement of corruption, potential and actual corruption in the form of nepotism, excessive patronage, secret party funding is also considered as well as financial corruption such as bribe. (ICRD, 2005) Law and order are assessment of strength and impartiality of the legal system and the popular observance of the law. Bureaucracy quality stands for strength and expertise to govern without drastic changes in policy or interruptions in government services.

Since we look into the bivariate causality rather than treating each subcomponent as different variables, we use the average of the normalized three components as a proxy for quality of institutions. The range of normalized point is from zero to one, where higher score implies better institutions. By the nature of this construction, these variables are bounded above and below by random number, which makes it impossible for the series to be nonstationary. Thus, we transform the index using inverse logit function to allow it to vary without limit.

4. Empirical Results

4.1. Time-series properties

In this section, we present our empirical results Table 1. IPS panel unit root tests without trend reported in Table 2 support the presence of a unit root in both FDI and institutional quality across countries, as well as stationarity of their first differences. As seen in the table, the inclusion of trend does not change the results for both FDI and quality of institutions.

Table 1. Summary Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
FDI	1240	2.4409	1.335	–2.279	7.492
Institutions	1240	–0.1546	0.822	–3.135	2.39

Notes: FDI is log of FDI stock per capita.

Table 2. IPS Panel unit root tests

Variables	Trend		No Trend	
	Levels	First differences	Levels	First differences
FDI	**–2.12**	–3.906***	**–1.043**	–3.774***
Institutions	**–1.536**	–3.537***	**–1.390**	–3.477***

Notes: Boldface values denote sampling evidence in favor of unit roots. *** represents rejection of the null of unit roots at the 1 % level of significance.

Hadri and Larsson panel unit root results are reported in Table 3. Both FDI and index of institutional quality turn out to have unit root and their differenced series are stationary. Trend is not included to test for differenced series as the trend term disappears when the original series is differenced. Thus, we conclude in favor of the presence of panel unit root and stationarity of the first differences; I (1, 1).

Table 3. Hadri and Larsson Panel Stationarity tests (Lag=2)

Variables	Trend	No Trend	
	Levels	Levels	First differences
FDI	**11.155*** **	**21.83*** **	1.87
Institutions	**10.927*** **	**14.217 *** **	1.85

Notes: Boldface values denote sampling evidence in favor of unit roots. *** represents rejection of the null of stationarity at the 1 % level of significance.

4.2. Cointegration and long run elasticity

As a next step, the results on panel cointegration tests support the view that there is cointegration between FDI stock and quality of institutions (not posted). From our result, ADF group statistics, the most powerful statistics for data with short period, is –2.847, are in agreement with the presence of cointegration.

From panel FMOLS test shown in Table 4, the coefficient of institutions is 0.15 with t-statistic of 3.73. FDI stock has negative (–0.04) but marginally significant effect (1.85) on institutions at 10 % level. This result is still consistent with the presence of cointegration, but reversed sign of institutional effect needs to be questioned. We reinvestigate this issue using the test result from error correction model in the next section.

4.3. Error Correction Model

Table 5 presents results of two-step fixed effect OLS estimation for panel error correction model. When current change of FDI is taken as dependent variable, the one-step estimator posted on the bottom row shows that long-run elasticity is positive and significant between FDI and institutional quality. Also, the coefficient of error correction term is negative and statistically significant. We see the similar result for equation of differenced institutional quality. The long-

Table 4. Individual FMOLS results

	FDI		Institutional Quality	
	Coefficient	t-statistic	Coefficient	t-statistic
Algeria	–0.60	(–1.12)	–0.40	(–3.09)
Angola	–2.13	(–0.62)	–0.13	(–2.16)
Argentina	1.85	(1.86)	0.02	(0.16)
Bahrain	–0.08	(–0.09)	0.01	(0.05)
Bangladesh	0.25	(1.25)	0.39	(0.65)
Bolivia	0.60	(4.13)	0.87	(3.49)
Brazil	–0.74	(–2.78)	–0.31	(–0.91)
Chile	1.20	(4.87)	0.60	(4.26)
China	0.15	(0.13)	0.12	(0.95)
Colombia	–1.36	(–6.21)	–0.54	(–6.98)
Costa Rica	–0.50	(–2.05)	–0.82	(–4.66)
Cote d'Ivoire	–0.72	(–5.41)	–1.11	(–6.69)
Dominican Rep.	–0.23	(–0.35)	–0.30	(–2.00)
Ecuador	–2.56	(–3.08)	–0.21	(–3.56)
El Salvador	0.58	(2.35)	0.49	(1.43)
Ghana	–0.38	(–0.82)	–0.04	(–0.12)
Guatemala	–0.05	(–0.60)	–1.20	(–0.78)
Guinea	5.27	(9.23)	0.14	(8.80)
Haiti	–0.13	(–1.43)	–0.63	(–0.54)
Honduras	1.73	(10.55)	0.46	(11.85)
Hong Kong	–0.18	(–0.63)	–0.33	(–0.77)
India	1.72	(1.86)	0.16	(1.99)
Indonesia	–0.09	(–1.06)	–1.19	(–0.82)
Iran	0.11	(0.73)	–0.02	(–0.05)
Jamaica	0.24	(0.55)	0.18	(0.59)
Jordan	–0.21	(–0.57)	–0.19	–0.44)
Kenya	–0.10	(–0.87)	–0.04	(–0.03)
Kuwait	0.98	(1.35)	0.20	(1.79)
Lebanon	0.30	(0.64)	0.04	(0.15)
Liberia	0.07	(0.13)	0.08	(0.29)
Malawi	0.68	(2.17)	0.33	(1.33)
Malaysia	–0.08	(–0.18)	–0.20	(–0.62)
Mali	1.87	(2.29)	0.12	(1.24)
Mexico	–0.50	(–0.55)	–0.07	(–0.58)
Nicaragua	–4.54	(–2.07)	0.04	(0.80)
Nigeria	0.19	(0.56)	0.62	(1.67)
Pakistan	1.46	(3.32)	0.41	(5.18)
Panama	0.26	(2.56)	1.32	(1.53)
Paraguay	0.14	(1.10)	0.67	(0.62)
Peru	1.48	(6.17)	0.48	(5.01)
Philippines	0.20	(2.13)	1.54	(1.82)
Saudi Arabia	1.24	(2.32)	0.30	(2.47)
Senegal	–1.10	(–0.59)	–0.11	(–2.01)
Singapore	0.43	(2.02)	0.42	(1.03)

South Africa	–0.67	(–8.78)	–1.31	(–9.98)
Korea	–0.16	(–0.49)	–0.41	(–0.83)
Sri Lanka	0.43	(2.86)	1.05	(2.48)
Sudan	1.03	(0.54)	0.03	(0.48)
Syria	0.84	(2.15)	0.29	(1.80)
Taiwan	–0.65	(–4.49)	–0.79	(–3.38)
Tanzania	0.56	(0.47)	–0.30	(–1.42)
Thailand	–0.24	(–0.46)	–0.19	(–1.49)
Togo	–0.95	(–1.65)	0.28	(3.25)
Trinidad and Tobago	1.60	(3.32)	–3.07	(–1.52)
Tunisia	–0.02	(–0.53)	–0.06	(–0.08)
Turkey	0.06	(0.43)	0.06	(0.32)
UAE	–0.10	(–0.18)	0.28	(4.96)
Uganda	2.10	(4.58)	–0.28	(–1.77)
Uruguay	–0.74	(–1.00)	–0.35	(–3.21)
Venezuela	–0.98	(–1.88)	0.60	(3.20)
Zambia	0.61	(2.27)	–0.35	(–1.29)
Zimbabwe	0.02	(0.05)	–0.35	(–1.29)
Panel FMOLS	**0.15**	**(3.73)**	**–0.04**	**(1.85)**

Notes: t-values are in parentheses.

Table 5. Panel Error Correction Model (Two Step Fixed Effect OLS)

Explanatory variables	Dependent variables	
	ΔFDI_t	$\Delta Inst_t$
$\Delta Inst_t$	0.005 (0.865)	
$\Delta Inst_{t-1}$	0.006 (0.839)	0.073 (0.012)
ΔFDI_t		0.008 (0.749)
ΔFDI_{t-1}	–0.116 (0.000)	–0.012 (0.637)
$FDI_{t-2} - \phi Inst_{t-2}$	–0.153 (0.000)	
$Inst_{t-2} - \phi FDI_{t-2}$		–0.157 (0.000)
Constant	0.111 (0.000)	–0.036 (0.155)
Number of Observation	1116	1116
R-Squared	0.06	0.19
Long run Elasticities	0.329 (0.000)	0.2 (0.000)

Notes: Time-dummies are included for equation of change of FDI. *P*-values are in parentheses.

run elasticity has a significant and positive sign. Error correction term shows that short-term change of quality of institutions responds to the deviation from long-run equilibrium. These results confirm the evidence of cointegrating relationship between two variables. As to short-run dynamics, lagged FDI in first difference is negative and significantly related to contemporaneous change of FDI. However, there is no evidence of short-term causality from institutional quality. Both current change of institutional variable and lagged one affect differenced FDI positively, but the effect is statistically insignificant. When the dependent variable is differenced quality of institutions, lagged change of its own values have positive and significant effect on current change. Differenced contemporaneous FDI positively affects change of institutions, while lagged FDI in first difference enters negatively. The coefficients of both variables are insignificant. To sum up, Table 5 supports the presence of long-run bi-directional cointegration while it shows no evidence in favor of short-term causality between FDI and quality of institutions. As those coefficients are quite close between the two models, we do not report the instrumental variable model.

For robustness check, system GMM procedure is implemented. The results are reported in Table 6. The first stage estimation on cointegration is implemented using system GMM, instead of OLS, to control for endogeneity of nonstationary variables. The ECM estimation result shows that there are positive and significant long run elasticities between the two variables. Also, negative and significant coefficients of error correction term imply that short run dynamics responds to the deviation from long run equilibrium and eventually results in convergence to the equilibrium. From negative and significant coefficients of error correction term, the existence of long-run causality between institutions and FDI seems evident. Again, this finding confirms the presence of a positive cointegrating relationship.

Table 6. Panel Error Correction Model (Two Step System GMM)

Explanatory variables	Dependent variables	
	ΔFDI_t	$\Delta Inst_t$
$\Delta Inst_t$	0.443 (0.52)	
$\Delta Inst_{t-1}$	–0.14 (0.819)	0.346 (0.000)
ΔFDI_t		–0.014 (0.773)
ΔFDI_{t-1}	–0.045 (0.392)	–0.062 (0.208)
$FDI_{t-2} - \phi Inst_{t-2}$	–0.05 (0.000)	
$Inst_{t-2} - \phi FDI_{t-2}$		–0.069 (0.000)
Constant	0.029 (0.379)	0.008 (0.277)
Number of Observation	1116	1116
Sargan Test	0.435	0.219
AR (1) in first differences	0.000	0.000
AR (2) in first differences	0.577	0.40
Long run Elasticities	0.31 (0.000)	0.295 (0.000)

Notes: Time-dummies are included for equation of change of FDI. *P*-values are in parentheses.

5. Conclusions

There seems to be consensus on the argument that quality of institutions of host country is one of the major factors in attracting foreign direct investment. What is less known is the two-way causality between FDI and quality of institutions. In this paper, we examine causal relationships between foreign direct investment and institutions. An error correction model is estimated using fixed effect regression followed by unit root test and cointegration test. Our empirical findings suggest that there is a long run relationship between two variables and the causality is bi-directional. However, there is no clear evidence in favor of short-run causality between institutional quality and FDI.

These results suggest that previous literature should be more cautious in placing too much emphasis on the view that policies aimed at establishing high standards of institutions as a prerequisite would lead to more inward FDI in developing countries, since the effect may not be apparent in the short period. Rather, the policy should aim at long-term improvement of institutional quality. Also the role of FDI inflow should not be overlooked because it can lead to permanent changes in institutions.

For future work, we can explore role of other determinants such as productivity or infrastructure of host country in FDI decision or institutional quality in multivariate framework, while we focused only on bivariate causality in this paper. Besides, more work could be done to take account of possible structural break for both variables. Particularly for FDI, this problem was well documented in UNCTAD (2005). As recording practices differ across countries and they change over time, FDI time series data have structural breaks, though it is unlikely that a common regime change occurs to all countries. It could be a potential obstacle to yield more reliable unit root test result.

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