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Escobari, Diego and Vacaflores, Diego

The University of Texas – Pan American, Texas State University

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Diego Escobari* Diego E. Vacaflores**

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Abstract

This paper sets to analyze the dynamic feedback between Foreign Direct Investment (FDI) and economic growth—larger FDI promotes higher GDP, while higher GDP can be achieved with higher levels of FDI. We use panels and a sample of 19 Latin American countries to estimate a dynamic FDI and a dynamic GDP equation that jointly characterize the evolution of both variables. We find that the dynamics of GDP and FDI are mostly driven by the expectations. Shocks of GDP or FDI were found to play no role affecting the dynamics.

Keywords: Foreign Direct Investment, Economic Growth, Rational Expectations

JEL Classifications: F36, F43, O11, O47, O54

* Contact: Department of Economics and Finance, University of Texas – Pan American, Edinburg, Texas 78541 Email: escobarida@utpa.edu
** Contact: Department of Finance and Economics, Texas State University, San Marcos, Texas 78666 Email: dv13@txstate.edu

1. Introduction

The importance of foreign direct investment (FDI) for growth and development has been extensively documented. Previous work has emphasized on the potential of FDI to increase the volume and the efficiency of FDI, its technological diffusion and the improvements in human capital and productivity that results from higher levels of competition. FDI is also linked with more efficient management and productive methods. These capital flows are immensely important to developing countries, which are capital constrained and lack the access to technology and foreign markets that Multinational Corporations (MNCs) have. Because of its importance, there exists intense competition, in terms of incentives (i.e. tax incentives and subsidies), between host countries to attract more FDI.

FDI is especially important for Latin American countries, which have experienced a significant increase in these capital inflows since the 1990s. Despite the recent economic crisis, the amount of FDI flowing into Latin America and the Caribbean has quickly recovered and returned to its 2007 level, standing at around US$ 115 billion per year (10 percent of world flows), maintaining its upward trend for the decade with approximately 50 percent more funds flowing into the region than in 2000. This renewed interest in the region comes from the relatively strong economic performance of most countries in the region, but it is also heavily concentrated in the best performers (i.e. Brazil, Mexico, and Chile). A significant part of this recent FDI is driven by the need for primary commodities in fast growing emerging countries like China, leading to new investments to extract raw materials (food and metals) and hydrocarbons, but another significant part of investment is geared to satisfy domestic markets, as the growth in incomes has outpaced those of other regions.

This paper extends the existing literature by studying the role of expectations in the dynamic interaction between FDI and economic growth. Our approach is similar to previous studies that acknowledge that FDI and economic growth are jointly determined. This is important because the estimation of FDI or growth equations need to account for potential endogeneity. Moreover, static models are miss-specified because by ignoring dynamics they force agents to behave myopically (i.e., foreign investors do not take into account expectations about growth). Our dynamic specifications not only control for endogeneity, but also postulate that such endogeneity is not constrained to contemporaneous relationships, but is potentially related to previous realization of FDI and growth. The intuition to motivate our approach is straightforward; countries with higher economic growth are able to attract more FDI. Hence, previous levels of growth affect current FDI. In addition, previous FDI as predicted by neoclassical growth models also affects current economic growth. This means that FDI and economic growth are jointly determined and current values are the results of previous dynamics of both variables. What is more, economic agents (e.g., tax payers, foreign investors, local consumers) are allowed to behave dynamically and form expectation about the future paths of our endogenous variables.

To capture the joint dynamics between FDI and economic growth we follow the feedback mechanism described in Bun and Kiviet (2006). More importantly, we employ a two-step approach to filter the dynamics to decompose each of the two variables into expected values and shocks. Then, rather than just estimating how FDI affects economic growth we differentiate between the effects of expected FDI and FDI shocks on growth. The estimation employs the dynamic panel methods described in Arellano and Bond (1991) and Blundell and Bond (1998). These estimators acknowledge that GDP growth and FDI are jointly determined while considering that previous dynamics of both are important as well. Using our panel of 19 Latin American countries from 1990 through 2011, our results show that the dynamics of FDI and growth are mostly driven by expectations – shocks of either FDI or growth have no statistically significant effect on the dynamics of these two variables. Specifically, a one percent increase in FDI flowing into Latin American countries increases the contemporaneous GDP per capita by 0.08 percent, and a one percent increase in GDP per capita in the host country increases the inflow of FDI by 2.3 percent.

Because most of the policies geared to improve the performance of a given country are implemented taking into consideration the determinants of productivity (i.e., education, taxation, trade, and the quality of the institutions), the use of current and past information becomes of upmost relevance. This supports our approach of looking at the relationship between FDI and economic growth in a dynamic context. Dynamics are important at the Multinational Corporation level as well because investment decision are determined based on forecasts of the economic conditions that are expected to prevail for investment to be profitable (if the emphasis is in satisfying the domestic market) or for production initiatives to be sustainable (if the emphasis is in the world market). Forecasts, which are consistent with rational expectations and our estimation methods, are based in materialized behavior. Realization of these projections are necessary for the sustainability of governmental policies and investment decisions, so fluctuations in the main determinants that can alter predetermined trends should be taken into consideration. Expectations change over time and take into account all previous information. Unexpected fluctuations – shocks – can force governments and MNCs to re-evaluate their policies (strategies) and may impact FDI and growth in a different way than expected fluctuations. Given the nature of fluctuations (which comprise expected fluctuations and shocks), it thus become imperative to measure the relevance of how new information (shocks) carries and may have a differentiated effect than expected fluctuations on the enactment of policymakers in governments in host countries.

Most of the previous economic literature on FDI has been devoted to determine the existence of growth enhancing links, measured by improvements in GDP per capita growth rates. Theoretical models provide the framework for a positive relationship between FDI and economic growth, and most empirical studies corroborate this notion with the use of different econometric techniques and samples. This positive effect on growth requires some degree of complementary with domestic investment, infrastructure, and human capital, at least in the short run (see e.g., De Mello, 1999; Borensztein *et al.*, 1998; Alfaro *et al.*, 2004; Damijan *et al.*, 2003; UNCTAD, 1999).

Another branch of the literature has concentrated in the determinants that lead to increases in FDI (Tsai, 1994; Delbecque *et al.*, 2007; Olney, 2011; Mogab *et al.*, 2012). FDI is an instrument that allows firms to transfer capital, technology, and organizational skills from one country to another, and stresses the differences in the cost and quality of productive factors in different countries, looking to take advantage of economies of scale in production. MNCs are usually more inclined to penetrate foreign markets through FDI when trade costs are high, firm-level scale economies are high, plant-level scale economies are low, and when the host-country's market size is large. They also respond to the economic performance of the host country, the existing stock of FDI, the quality of infrastructure, the tax burden, labor market rigidity, and the level of industrialization of the receiving economy. Theory predicts that firms will penetrate foreign markets through vertical FDI when factor-costs differences between countries are large and through horizontal FDI when countries are similar in terms of markets size and factor cost.

One contentious point that arises from the specifications that aim at establishing the relationship between FDI and economic growth is the potential joint endogeneity of these variables. This has led to statistical testing to disentangle the directional causality, which has proven complicated because tests and solid arguments suggests both, that higher levels of FDI will fuel higher rates of growth and that higher rates of economic growth will generate higher levels of FDI flowing into the country. Our approach is closest to Choe (2003) who jointly estimates equations for growth and FDI using a panel VAR. He shows that there exists a strong positive association between FDI inflows and economic growth – FDI Granger-causes growth, and vice versa. Our approach uses internal instruments to control for the potential endogeneity of growth and FDI. While a VAR approach only allows estimating the effects of shocks on dynamics, our two-step approach using dynamic panels allows us to estimate the effects of shocks and expected changes on the dynamics of both variables.

FDI studies in Latin American countries include Bengoa and Sanchez-Robles (2003) who show that economic freedom increases capital inflows, and Campos and Kinoshita (2008) who find that financial liberalization and institutions are important. Montero (2008) presents an overview of the determinants of FDI while Blanco (2012) finds no evidence that FDI is spatially autocorrelated, but surrounding market potential has a positive effect on FDI. Ruiz and Pozo (2008) study the exchange-rate uncertainty effects on FDI. Beyond Latin America, Li and Liu (2005) use a sample of 84 countries over the period 1970-99 to find that the interaction of human capital and FDI exerts a strong positive effect on economic growth on developing countries. The paper is structured as follows. Section 2 presents the data. The motivation and estimation strategies of the FDI and economic growth equations are presented in Section 3. Section 4 reports and discusses the results. Section 5 concludes.

2. Data

The data for this study comes primarily from the World Bank's World Development Indicators (WDI), and is complemented with data from the Inter-American Development Bank's LA&C Macro Economic Watch database for the terms of trade index, data from Freedom in the World for data on political rights, and data from Barro and Lee's Educational Attainment Dataset for our measure of educational attainment (extrapolated for yearly frequency). The sample used is composed of 19 Latin American countries and encompasses the period 1990-2011, with yearly observations. The sample excludes countries that are too small, have special governmental controls, or lack adequate data. The countries in the sample are: Argentina, Bolivia, Brazil, Chile, Colombia, Costa Rica, Dominican Republic, Ecuador, El Salvador, Guatemala, Haiti, Honduras, México, Nicaragua, Panama, Paraguay, Perú, Uruguay, and Venezuela.

[Table 1, here]

Table 1 presents descriptive statistics (in five-year averages) of the variables used in the analysis. As it can be observed, both the real GDP growth rate and FDI have experienced and increase throughout the period, but stagnated between the 1995-99 and the 2000-04 periods, with the dispersion of GDP per capita increasing in the last period while the dispersion of FDI actually decreasing in that same period. The population growth rate in the region has continuously declined and the educational level (measured by the average number of years of secondary schooling) has steadily increased, ending up with an increase of approximately 40 percent relative to the 1990-94 time period – although it is becoming more dispersed. We also see that the share of investment as a proportion of GDP has remained pretty stable during the first three time periods, but it has experience a 5 percent decline in the most recent period – relative to the initial time period. As far as the openness of these economies is concerned, the data shows that Latin American economies are increasingly engaged in international trade – as measured by total trade as a percentage of GDP – and are experiencing a significant improvement in their terms of trade, although the variation amongst countries has increased through time for our last measure. The behavior of the cost of capital shows a similar picture in terms of fluctuations, with both the domestic real interest rate and the foreign lending rate first increasing and then declining steadily. The measure of political stability used in the study shows a stable pattern, with a small improvement in the 1995-99 time period, but the measure proxying for infrastructure (number of telephone lines per 100 people) shows a continuous improvement throughout the period considered. It should also be noted that there is significant variation among countries in all our measures (reflected in the standard deviation).

3. Empirical Strategy

3.1. The Dynamic Growth Equation

The empirical strategy to characterize the dynamic feedback between FDI and economic growth follows Bun and Kiviet (2006). This involves the specification of one dynamic equation for each of these variables. We first specify the dynamic growth equation in a similar fashion than most of the economic growth literature. We augment Islam (1995)'s growth equation to include FDI in the following way:

$$y_{it} = \alpha_0 y_{i,t-1} + \alpha_1 \mathrm{fdi}_{it} + \alpha_2 n_{it} + \alpha_3 s_{it} + \alpha_4 h_{it} + X\delta + \mu_i + \varepsilon_{it} \quad (1)$$

where y_{it} is the logarithm of per capita GPD of country i at time t, fdi_{it} is the logarithm of FDI, n_{it} is the population growth rate, s_{it} is the ratio of gross capital formation to GDP (ratio of domestic investment to real GDP), and h_{it} is human capital (measured as the average number of years of secondary schooling). The variables in the matrix X are controls commonly included in the growth cross-country studies: a measure of trade (i.e., the ratio of trade to GDP), a terms-of-trade index, and a variable to capture political rights. μ_i captures the time-invariant country-specific effects, while ε_{it} denotes the remaining disturbance term.

The correct specification and the assumption on the contemporaneous correlation between fdi_{it} and ε_{it} are crucial to obtain consistent estimates of the main coefficient of interest, the effect of fdi on y. For example, even though we are not directly interested on the coefficient of the lagged dependent variable, including the autoregressive term allows for the existence of dynamics in the underlying process. This will take into account the possibility that correlation between economic growth and foreign direct investment arises merely from a dynamic common driving force. Because it is easy to argue that foreign investors' decision today is affected by previous levels of per capita GDP, we will consider fdi_{it} to be endogenous in a panel data sense. That is, assuming that the error terms ε_{it} are serially uncorrelated, fdi_{it} is modeled as endogenous if we allow it to be correlated with contemporaneous and previous shocks, but it must not be correlated with future shocks,

$$\left.\begin{array}{ll} E(\mathrm{fdi}_{it}\varepsilon_{is}) \neq 0, & s < t \\ E(\mathrm{fdi}_{it}\varepsilon_{is}) = 0, & s \geq t \end{array}\right\} \text{ for all } i. \quad (2)$$

Notice that this is more flexible than the traditional treatment of endogeneity using Instrumental Variables (IV), and two (or three) stage least squares, where only contemporaneous correlation is allowed and dynamics are ruled out by construction. The error term ε_{it} corresponds to the random part of the GDP per capita that cannot be predicted based on previous variables. The assumption of serially uncorrelated disturbances means that previous unexpected changes in the GDP per capita cannot be used to predict future unexpected changes.[1] This specification still allows governments to take into consideration their forecast in terms of future FDI inflows in order to enact and implement policy that can affect GDP growth.

3.2. The Dynamic FDI Equation

The specification of the FDI equation is also standard in the economic literature. Specifically, following Li and Liu (2005) we have:

$$\mathrm{fdi}_{it} = \beta_0 \mathrm{fdi}_{i,t-1} + \beta_1 y_{it} + \beta_2 n_{it} + \beta_3 h_{it} + \beta_4 \mathrm{Trade}_{it} + Z\gamma + \nu_i + \xi_{it}, \quad (3)$$

[1] This assumption will be tested as part of the estimation procedure.

where Trade_{it} is the ratio of trade to GDP. The rest of the variables are the same as in Equation (1), while the matrix Z follows Li and Liu (2005) and contains controls such as the terms of trade index, a measure of political rights, real interest rate, the London Interbank offered rate, and a proxy for infrastructure (i.e., telephone lines per 100 people). The time-invariant country-specific effect is captured by ν_i, and ξ_{it} is the random error term that is independent from all random variables introduced so far.

With serially uncorrelated disturbances, y_{it} will be modeled as endogenous. That is, the estimation strategy allows y_{it} to be correlated with previous and contemporaneous shocks ξ_{it}, but y_{it} has to be uncorrelated with future shocks,

$$\left.\begin{array}{ll} E(y_{it}\xi_{is}) \neq 0, & s < t \\ E(y_{it}\xi_{is}) = 0, & s \geq t \end{array}\right\} \text{ for all } i. \tag{4}$$

Modeling y_{it} as endogenous does not prevent economic agents from forming forward looking perspectives. We allow foreign investors (MNCs) to have their own beliefs about future values of the GDP per capita. That is, we retain the ability to use forecasts of GDP growth in the determination of the investment strategies to be pursued by MNCs.

3.3. Estimation Methodology

To allow for the dynamic feedback between y_{it} and fdi_{it} and to obtain consistent estimates of the coefficients of interest, α_1 in Equation (1) and β_1 in Equation (3), we will use two dynamic panel data estimators; one is the difference GMM estimator proposed by Holtz-Eakin *et al.* (1988) and Arellano and Bond (1991), and the other one is the system GMM estimator proposed by Blundell and Bond (1998). The first estimator works by taking first differences to eliminate the unobserved time-invariant country-specific characteristic (i.e., ε_{it} or ξ_{it}). Then a vector of instruments M is needed to construct moments $E(\Delta\varepsilon_{it}M)$ for the estimation of the GDP equation, and a vector of instruments H for moments $E(\Delta\xi_{it}H)$ in the estimation of the FDI equation. Under serially uncorrelated ε_{it} and under equations (2), fdi_{it} and its lags are valid instruments for $\Delta\mathrm{fdi}_{it}$ in the GDP equation in first differences. Likewise, with no first order serial correlation in ξ_{it}, y_{it} and its lags are valid instruments for Δy_{it} in the first-differenced FDI equation.

The system GMM estimator is used because Blundell and Bond (1998) pointed out a statistical shortcoming with the difference GMM estimator. If y_{it} and fdi_{it} are persistent over time then these variables and its lags will be weak instruments for the equations in first differences. Therefore we will also report the system GMM estimates as proposed by Blundell and Bond. The idea is to combine the equation in first differences and the equation in levels. The additional moment conditions for the GDP equation in levels are $E[(\mu_i + \varepsilon_{it})W] = 0$ and for the FDI equation in levels are $E[(\nu_i + \xi_{it})P] = 0$. Hence, we need the additional sets of instruments W and P. Blundell and Bond propose using $\Delta\mathrm{fdi}_{it}$, Δy_{it}, and its lags as instruments.

3.4. Expectations and Shocks

Notice that we can write Equations (1) and (3) to break down the dynamics of y_{it} and the dynamics of fdi_{it} in two different components:

$$y_{it} = E\left[y_{it} | y_{i,t-1}, \mathrm{fdi}_{it}, n_{it}, s_{it}, h_{it}, X, \alpha, \delta, \mu_i\right] + \varepsilon_{it}, \tag{5}$$

$$\mathrm{fdi}_{it} = E\left[\mathrm{fdi}_{it} | \mathrm{fdi}_{i,t-1}, y_{it}, n_{it}, h_{it}, \mathrm{Trade}_{it}, Z, \beta, \gamma, \nu_i\right] + \xi_{it}. \tag{6}$$

The first component on the right-hand side of each of the equations is the expected or anticipated part of y_{it} or fdi_{it}, respectively. Hence ε_{it} and ξ_{it} represent the unanticipated (shocks) components. The evolution of the expected components is consistent with rational expectation models, where agents form their expectations based on Equations (1) and (3).

Once the coefficients of the GDP and FDI equations are estimated, we can also estimate the expected components by just simply computing the fitted values of the estimated equations. Moreover, the shocks can be obtained as the regression residuals. That is, $E[y_{it}] = \widehat{y_{it}}$ and $E[\mathrm{fdi}_{it}] = \widehat{\mathrm{fdi}_{it}}$, and the estimated shocks are $\widehat{\varepsilon_{it}} = y_{it} - E[y_{it}]$ and $\widehat{\xi_{it}} = \mathrm{fdi}_{it} - E[\mathrm{fdi}_{it}]$. This is useful because we can replace y_{it} and fdi_{it} in Equations (1) and (3) with their two additively separable expected and unexpected component to estimate the marginal effects,

$$y_{it} = \alpha_0 y_{i,t-1} + \alpha_E E[\mathrm{fdi}_{it}] + \alpha_S\{\mathrm{fdi}_{it} - E[\mathrm{fdi}_{it}]\} + \alpha_2 n_{it} + \alpha_3 s_{it} + \alpha_4 h_{it} + X\delta + \mu_i + \varepsilon_{it}$$

$$\mathrm{fdi}_{it} = \beta_0 \mathrm{fdi}_{i,t-1} + \beta_E E[y_{it}] + \beta_S\{y_{it} - E[y_{it}]\} + \beta_2 n_{it} + \beta_3 h_{it} + \beta_4 \mathrm{Trade}_{it} + Z\gamma + \nu_i + \xi_{it}. \tag{7}$$

(8)

The hypotheses of interest is then not only to see if the marginal effects are significant, but also test if the marginal effect of the expected component is the same as the marginal effects of a shock (i.e., H_0: $\alpha_E = \alpha_S$ and H_0: $\beta_E = \beta_S$). This set up thus allows us to examine the response that our measure of interest will have for a given change in the expected component but also from the unexpected component. In other words, economic actors – and the government – will take into consideration past and current realization of FDI to determine their actions, and thus the behavior of GDP. This will be reflected in the effect of the expected component of FDI on GDP per capita. Furthermore, the specification also allows for economic actors to react to unexpected fluctuations in FDI in the determination of their behavior, and thus on GDP per capita. This will be measured by the coefficient of the unexpected component. Of course, the same logic applies to the FDI specification, where we analyze the influence of the expected and unexpected components of GDP per capita on FDI inflows.

The estimation of Equations (7) and (8) uses the same methods as before. The two components of y_{it} and fdi_{it} will be treated as potentially endogenous — correlated with contemporaneous and previous shocks. In this two-step approach the expected and unexpected components used in the second step are generated regressors that come from the first step. Including only the shocks or only the expected components would yield incorrect standard errors. Equations (7) and (8) follow model 4 in Pagan (1984) and accounts for the estimation error in the first step by including both components — the expected and the shock — in the estimation of the second-step.

The key identification assumption in the first-step estimation is that there is no serial correlation in the error terms. We test for the validity of this assumption during the discussion of the results. This is important for the interpretation of the shocks in the second step. No serial correlation means that the current error term cannot be predicted based on previous error terms or previous values of the GDP, FDI or the other variables in the model. Then testing whether the resulting error term in the first step has no serial correlation is in fact a test of whether the unexpected component used in the second step is indeed a shock.

4. Results

4.1. The Growth Equation

Table 2 reports the results from the estimation of Equation (1). For comparison purposes the first two columns treat fdi_{it} as a strictly exogenous regressor. The benefit in the Within specification in the second column is that it additionally controls for any observed or unobserved time-invariant country-specific characteristics. Consistent with the Monte Carlo simulations in Blundell *et al.* (2000), the estimate of the autoregressive term in the first column appears upwards-biased while the Within appears downwards-biased. Moreover, also consistent with Blundell *et al.* (2000), the estimate of the coefficient on fdi_{it} appears negatively biased in the Pooled OLS specification and to a lesser extent in the Within specification.

[Table 2, here]

Columns (3) and (4) treat fdi_{it} as endogenous. Moreover, the autoregressive term, the ratio of capital gross formation to GDP (s_{it}), and our measure of human capital (h_{it}) are treated as potentially endogenous as well. The population growth (n_{it}) and the controls variables in X are treated as exogenous. The validity of these two specifications is tested with three specification tests. First, a second-order serial correlation test on the differenced error term is used to assess whether the assumption of no first-order serial correlation is met. The large p-values in both columns show strong support for a valid specification. Second, to test the overall validity of the instrument list we use the Sargan test of over-identifying restrictions. The results in both specifications show strong evidence to reject the null hypothesis that instrument list is not correlated with the residuals.[2] Finally, to test for the validity of the additional instrument list in the system GMM specification we use the difference Sargan test. The p-value in the last column validates these additional instruments.[3]

The main coefficient of interest — the marginal effect of fdi_{it} on y_{it} — has a positive sign that is robust across all specifications. In our preferred specification — column 4 — the magnitude of the coefficient indicates that a one percent increase in Foreign Direct Investment increases the contemporaneous GDP per capita by 0.08 percent. This effect is statistically significant at at least 10%

[2] In the difference GMM the instruments for $y_{i,t-1}$ are the second through the fourth lags. The instruments for fdi_{it}, s_{it}, and h_{it} are its second and third lags. Because the rest of the variables are treated as exogenous, we instrument for them in the moment conditions with Δn_{it}, and ΔX.

[3] The additional instruments used in the levels equation for the system GMM specification are $\Delta y_{i,t-1}$, $\Delta \text{fdi}_{i,t-1}$, $\Delta s_{i,t-1}$, and $\Delta h_{i,t-1}$.

level. When comparing the magnitude of the coefficient across columns, we see that the effect is larger after controlling for the potential endogeneity of fdi_{it}. The fact that the coefficients across specifications are different is evidence that controlling for endogeneity is key to obtain consistent estimates of the marginal effect.

4.2. The FDI Equation

The estimates of the FDI equation are reported in Table 3. The first two columns assume that y_{it} is strictly exogenous, while columns three and four relax this assumption. Furthermore, the specifications from columns two through four control for country-specific characteristics. The biases of the Pooled OLS and the Within specification are consistent with the known biases found in Blundell *et al.* (2000); the coefficient of the autoregressive term appears to be upwards-biased in the Pooled OLS, while the estimates on y_{it} appear to be downwards-biased in the first two columns.

[Table 3, here]

The GMM specifications in the third and fourth columns model y_{it} as potentially endogenous. Moreover, $\mathrm{fdi}_{i,t-1}$, h_{it}, and Trade_{it} are treated as endogenous as well. The population growth rate (n_{it}) and the set of controls in the matrix Z are all modeled as exogenous. All three specification tests for the GMM estimators strongly support the validity of the no-serial-correlation assumption and the instrument lists.[4] Our main coefficient of interest is the marginal effect of y_{it} on fdi_{it}. The estimate in the last column suggests a positive and highly statistically significant effect: a one percent increase in GDP per capita increases FDI by 2.3%.

4.3. Expectations

We now turn to analyze how the expected and the unexpected components of FDI affect GDP per capita, and how the expected and the unexpected components of GDP per capita affect FDI. The results of the estimation of equations (7) and (8) are presented in Tables 4 and 5, respectively. The

[4] In the difference equations the instruments for $\mathrm{fdi}_{i,t-1}$ are its second, third, and fourth lags. For y_{it}, h_{it}, and Trade_{it}, the instruments are its second and third lags. For the strictly exogenous variables n_{it}, and the matrix Z, the instruments are simply Δn_{it}, and ΔZ. In the levels equations the additional instruments are $\Delta\mathrm{fdi}_{i,t-1}$, $\Delta y_{i,t-1}$, $\Delta s_{i,t-1}$, and $\Delta\mathrm{Trade}_{i,t-1}$.

measures for expected fdi_{it} and the fdi_{it} shock employed in Table 4 are obtained from the estimates in the fourth column of Table 3. Moreover, these measures of $\text{expected } y_{it}$ and y_{it} shock used in Table 5 come from the estimates in the system GMM specification of Table 2. All specifications in both tables pass the three specification tests. The robustness checks in the GDP equation includes one at the time the variables in X, while the robustness results for the FDI equation has different specifications for the matrix of controls Z.

[Table 4, here]

The results in Table 4 show that only the expected component of fdi_{it} has an statistically significant effect on GDP. Across all columns of the table the marginal effects are statistically significant at least at the one percent1% confidence level. The interpretation of the coefficient in the last column indicates that a one percent increase in expected FDI increases the GDP per capita of the host country by 0.25 percent. However, an increase in the FDI that comes as a surprise does not have any effect on per capita GDP. Furthermore, the bottom part of the table reports the p-values of the null hypothesis that the marginal effect of the expected FDI is equal to the marginal effect of an FDI shock (i.e., $H_0: \alpha_E = \alpha_S$). Across all specifications we reject the null.

[Table 5, here]

The results for Equation 8 (presented in Table 5) appear to show a similar pattern; the expected component of y_{it} has an impact on FDI, but there is no statistically significant effect of the FDI shocks. Moreover, the null hypothesis that the marginal effects of the expected components and the shock is the same is rejected in most of the specifications, but not all. When controlling for political rights, the real interest rate, the interbank rate, or infrastructure, the results hold. Overall the estimates from these two tables are clear: the dynamic between these two variables is channeled through expectations. The shock on any of these variables has no statistically significant effect on the system.[5]

[5] Escobari (2012) uses a similar two-step procedure to estimate a dynamic supply and a dynamic demand for a perishable product. He finds that in the supply side the dynamics are dominated by the shocks. See also Escobari and Mollick (2013) for the role of unexpected government expenditures on output growth.

5. Conclusion

Most of the economic literature on FDI examines the impact that these type of inflows can have on the economic performance of the host country, and while the most recent studies control for the endogenous relationship between FDI and GDP per capita (i.e. Islam, 1995; Li and Liu, 2005; Bengoa and Sanchez-Robles, 2003; and Choe, 2003), their empirical specifications does not allow to assess differentiated effects of expectations and shocks. This paper sets to analyze the importance of expectations in the dynamic feedback between FDI and per capita GDP by incorporating the expected and unexpected components in the estimation of the GDP per capita and FDI equations. The results show that there is an important dynamic feedback between GDP per capita and FDI, where contemporaneous values are jointly determined based on the previous sequence of both variables and the controls. On the one hand higher levels of FDI promote higher levels of GDP per capita, while on the other hand higher levels of GDP per capita in the host country serves to attract higher levels of FDI. Our estimation approach specifically allows for this dynamic interaction where economic agents can behave dynamically and form expectations about the future path of both variables.

To analyze the role of expectations we use a two step approach where in the first step we estimate two equations that characterize the dynamics of both variables. We then use the estimates of this first step to break down the evolution of GDP per capita and FDI into their expected and unexpected components. In the second step we allow for a differentiated marginal effect of the expectations and the shocks of each of the variables on the other. The results show strong evidence that the dynamic feedback between these two variables is almost entirely driven by expectations, with the unexpected component lacking any influence. Shocks on any of the two variables do not have a statistically significant effect on the dynamics.

These results are important in the implementation of growth enhancing policies in the host countries and specific investment strategies by MNCs because they indicate that information on the expected component of GDP per capita and FDI are sufficient to form reliable forecast in which to base future actions. In other words, economic actors – and the government (MNCs) – should continue to take into consideration past and current realization of FDI (GDP per capita) to determine their actions, and thus the behavior of GDP per capita (FDI). Indeed, the lack of statistical significance on the unexpected components suggests that these unexpected fluctuations are muted, and thus can safely be ignored.

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Table 1. Means and Standard Deviations

VARIABLES	(1990-4)	(1995-9)	(2000-4)	(2005-10)
y_{it}	7.656	7.901	7.813	8.162
	(0.781)	(0.782)	(0.746)	(0.792)
Expected y_{it}	7.706	7.907	7.857	8.089
	(0.619)	(0.711)	(0.688)	(0.702)
y_{it} shock	0.014	-0.011	-0.038	0.039
	(0.160)	(0.212)	(0.186)	(0.172)
fdi_{it}	5.322	6.530	6.536	7.263
	(1.900)	(1.991)	(1.948)	(1.775)
Expected fdi_{it}	5.552	6.458	6.515	7.296
	(2.241)	(2.635)	(2.886)	(3.149)
fdi_{it} shock	-0.278	0.095	0.002	0.075
	(1.922)	(2.043)	(2.026)	(2.344)
n_{it}	1.995	1.767	1.516	1.367
	(0.465)	(0.500)	(0.576)	(0.516)
h_{it}	1.729	1.915	2.123	2.401
	(0.603)	(0.626)	(0.639)	(0.688)
s_{it}	0.192	0.188	0.193	0.180
	(0.061)	(0.057)	(0.041)	(0.053)
Trade_{it}	0.578	0.608	0.650	0.719
	(0.370)	(0.353)	(0.289)	(0.305)
Terms of Trade Index $_{it}$	101.343	109.016	107.977	122.531
	(20.172)	(27.243)	(26.648)	(51.166)
r_{it}	10.613	18.236	13.984	8.564
	(24.742)	(16.916)	(15.393)	(10.147)
Interbank r_{it}	5.667	5.856	3.279	2.984
	(1.688)	(.241)	(1.981)	(1.782)
Political Rights_{it}	2.621	2.736	2.568	2.511
	(1.338)	(1.338)	(1.285)	(1.138)
$\text{Infrastructure}_{it}$	6.207	9.758	12.924	15.133
	(4.108)	(6.291)	(7.884)	(8.171)

Note: Standard Deviations in parentheses.

Table 2. GDP Equation

	(1)	(2)	(3)	(4)
	OLS		GMM	
VARIABLES	Pooled	Within	Difference	System
$y_{i,t-1}$	0.931***	0.680***	0.350***	0.715***
	(0.0258)	(0.0438)	(0.0875)	(0.136)
fdi_{it}	0.0177***	0.0486***	0.119***	0.0839*
	(0.00550)	(0.0149)	(0.0262)	(0.0452)
n_{it}	-0.00526	0.0977	0.780***	0.125
	(0.0151)	(0.0908)	(0.228)	(0.212)
s_{it}	-0.223	-0.671*	-2.177**	-0.292
	(0.140)	(0.322)	(0.889)	(0.710)
h_{it}	0.00292	0.124**	0.773***	0.0721
	(0.00873)	(0.0585)	(0.229)	(0.139)
Trade_{it}	0.000201	0.000135	0.000657	-7.29e-05
	(0.000240)	(0.000637)	(0.00150)	(0.00139)
Trade Index_{it}	0.000603*	0.00170***	0.00152**	0.000656
	(0.000342)	(0.000277)	(0.000746)	(0.000955)
$\text{Political Rights}_{it}$	-0.0143	-0.0161	-0.0195	-0.0163
	(0.0109)	(0.0120)	(0.0222)	(0.0342)
Serial correlation [a]			-0.189	-0.0306
Serial correlation (p-value) [a]			0.850	0.976
Sargan [b]			9.727	14.45
Sargan (p-value) [b]			1	1
Difference Sargan (p-value) [c]				1

Notes: The dependent variable is y_{it}. Figures in parentheses for the OLS specifications are White heteroskedasticity-consistent estimates of the asymptotic standard errors. For the GMM specifications are the Windmeijer finite-sample corrected standard errors of the GMM two-step estimates. * significant at 10%; ** significant at 5%; ** significant at 1%. [a] The null hypothesis is that the errors in the first-difference regression exhibit no second-order serial correlation (valid specification). [b] The null hypothesis is that the instruments are not correlated with the residuals (valid specification). [c] The null hypothesis is that the additional instruments used in the levels equation are not correlated with the residuals (valid specification).

Table 3. FDI Equation

	(1)	(2)	(3)	(4)
	OLS		GMM	
VARIABLES	Pooled	Within	Difference	System
$\text{fdi}_{i,t-1}$	0.829***	0.435***	0.0302	0.259
	(0.0561)	(0.0679)	(0.145)	(0.282)
y_{it}	0.253**	1.001***	2.513***	2.308***
	(0.101)	(0.201)	(0.576)	(0.653)
n_{it}	0.0185	-0.468*	-1.510	-0.0558
	(0.0789)	(0.263)	(1.302)	(1.236)
h_{it}	0.125	-0.133	-2.216**	-1.655*
	(0.0995)	(0.248)	(1.009)	(0.964)
Trade_{it}	-0.00287**	0.00715	-0.00178	-0.00404
	(0.00141)	(0.00490)	(0.00502)	(0.00874)
$\text{Political Rights}_{it}$	-0.0254	-0.122	-0.128	-0.0651
	(0.0358)	(0.0813)	(0.118)	(0.124)
r_{it}	-0.00706	-0.00558	-0.00267	-0.00559
	(0.00512)	(0.00335)	(0.00299)	(0.00421)
Interbank r_{it}	0.0297*	0.0365*	0.0195	-0.00523
	(0.0153)	(0.0183)	(0.0175)	(0.0362)
$\text{Infrastructure}_{it}$	-0.00688	0.0122	0.101	0.142
	(0.00430)	(0.0158)	(0.103)	(0.123)
Serial correlation [a]			-1.277	-0.580
Serial correlation (p-value) [a]			0.201	0.562
Sargan [b]			10.09	9.420
Sargan (p-value) [b]			1	1
Difference Sargan (p-value) [c]				1

Notes: The dependent variable is fdi_{it}. See notes on Table 2.

Table 4. System GMM Estimation of the GDP Equation with Expectations and Shocks.

VARIABLES	(1)	(2)	(3)	(4)	(5)
$y_{i,t-1}$	0.185	0.147	0.433***	0.178	0.168
	(0.123)	(0.141)	(0.0894)	(0.142)	(0.133)
Expected fdi_{it}	0.254***	0.262***	0.160***	0.251***	0.253***
	(0.0460)	(0.0493)	(0.0296)	(0.0487)	(0.0468)
fdi_{it} shock	0.0326	0.0307	0.0308	0.0424	0.0264
	(0.0229)	(0.0231)	(0.0381)	(0.0268)	(0.0290)
n_{it}	0.697***	0.685***	0.246**	0.678***	0.741***
	(0.198)	(0.227)	(0.122)	(0.226)	(0.254)
s_{it}	-0.868**	-0.991**	-0.413	-0.699*	-0.731
	(0.379)	(0.448)	(0.429)	(0.384)	(0.543)
h_{it}	0.534***	0.536***	0.302**	0.508***	0.552***
	(0.135)	(0.161)	(0.128)	(0.168)	(0.193)
Trade_{it}		0.000805			0.000462
		(0.00108)			(0.000972)
Trade Index $_{it}$			0.000210		0.000524
			(0.000640)		(0.000628)
Political Rights_{it}				-0.0120	-0.000438
				(0.0151)	(0.0335)
H_0: $\alpha_E = \alpha_S$ (p-value) [d]	1.47e-07	5.99e-08	3.54e-05	9.22e-06	2.17e-09
Serial correlation [a]	0.113	0.0394	-0.180	0.0246	0.178
Serial correlation (p-value) [a]	0.910	0.969	0.857	0.980	0.859
Sargan [b]	8.659	8.485	14.48	7.865	9.356
Sargan (p-value) [b]	1	1	1	1	1
Difference Sargan (p-value) [c]	1	1	1	1	1

Notes: The dependent variable is y_{it}. [d] The null hypothesis is that the coefficient on the expected component is the same as the coefficient on the shock. See notes on Table 2. Expected fdi_{it} and fdi_{it} shock are obtained from the last column of Table 3.

Table 5. System GMM Estimation of the FDI Equation with Expectations and Shocks

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)
$\text{fdi}_{i,t-1}$	0.344***	0.335***	0.286**	0.292***	0.383***	-0.0379
	(0.108)	(0.110)	(0.136)	(0.113)	(0.141)	(0.294)
Expected y_{it}	2.291***	2.377***	2.247***	2.572***	2.285***	2.731***
	(0.602)	(0.619)	(0.628)	(0.651)	(0.606)	(0.995)
y_{it} shock	1.410	1.436	-0.252	0.856	1.482	-0.448
	(0.927)	(0.932)	(0.620)	(0.749)	(0.938)	(0.713)
n_{it}	-1.744**	-1.748**	-1.121	-1.829**	-1.989**	2.255
	(0.737)	(0.739)	(0.834)	(0.743)	(0.895)	(2.167)
h_{it}	-1.519*	-1.493*	-0.927	-1.876**	-1.469*	-0.432
	(0.798)	(0.803)	(0.731)	(0.839)	(0.803)	(1.212)
Trade_{it}	-0.00191	-0.00279	-0.00343	0.00360	-0.00171	0.00103
	(0.00590)	(0.00607)	(0.00421)	(0.00639)	(0.00588)	(0.00726)
$\text{Political Rights}_{it}$		0.0493				-0.222
		(0.0935)				(0.422)
r_{it}			-0.0137***			-0.0109**
			(0.00229)			(0.00468)
Interbank r_{it}				0.0154		-0.0142
				(0.0167)		(0.0328)
$\text{Infrastructure}_{it}$					-0.0322	0.223
					(0.0647)	(0.170)
$H_0: \beta_E = \beta_S$ (p-value) [d]	0.347	0.320	0.000480	0.0327	0.404	0.0101
Serial correlation [a]	-0.429	-0.266	-1.369	-0.273	-0.250	-0.404
Serial correlation (p-value) [a]	0.668	0.790	0.171	0.785	0.803	0.686
Sargan [b]	10.99	10.61	14.56	10.15	10.75	11.26
Sargan (p-value) [b]	1	1	1	1	1	1
Difference Sargan (p-value) [c]	1	1	1	1	1	1

Notes: The dependent variable is fdi_{it}. [d] The null hypothesis is that the coefficient on the expected component is the same as the coefficient on the shock. See notes on Table 2. Expected y_{it} and y_{it} shock are obtained from the last column of Table 2.