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# **Does foreign aid really attract foreign investors? New evidence from panel cointegration**

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## **Abstract:**

This paper examines whether foreign aid contributes to attracting foreign direct investment (FDI) in aid receiving countries. Using both homogeneous and heterogeneous panel cointegration techniques, I find that the effect of foreign aid on FDI is negative. This is in contrast to previous studies that usually found a positive association between aid and FDI.

Keywords: foreign direct investment, foreign aid, panel cointegration

JEL classification: C23, D31, F21, F35

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## 1. Introduction

An often cited OECD report encouraged the international community to improve “the synergies between FDI flows and official development assistance” (OECD, 2002, p. 30). In fact, the existing literature suggests that, under certain circumstances, government-funded development aid can be used as an effective means to ease access to privately financed FDI for developing countries. In this paper, I challenge this widespread belief: in the long-run, positive effects seem to vanish; I find a *negative* effect of foreign aid on FDI.

From a theoretical perspective, the sign of the effect of aid on FDI is not clear a priori. On the one hand, aid could be negatively associated with FDI by distorting individual incentives, by diverting resources from productive activities to unproductive rent-seeking (e.g., Economides et al., 2008), and by crowding-out FDI (Beladi and Oladi, 2006). On the other hand, aid may for example raise the productivity of capital when used to finance complementary factors of production (Selaya and Sunesen, 2012).

This latter channel is well established in the empirical literature: aid seems to be effective in attracting foreign investors when it goes to specific sectors, especially infrastructure (Kapfer et al., 2007; Kimura and Todo, 2010) and education (Donaubauer et al., 2013). In the most prominent study on this issue, Harms and Lutz (2006) find positive effects of aid per se in countries where the regulatory burden on firms is high. Karakaplan et al. (2005) and Selaya and Sunesen (2012) find evidence for a significantly positive, albeit small, impact of aid. Yasin (2005) detects beneficial effects of bilateral aid on FDI in sub-Saharan Africa. For the same region, Asiedu et al. (2009) conclude that aid actually discourages foreign investors.

Although virtually all studies concur that aid and FDI are positively correlated, it could well be that it may take some time until negative effects can be observed. I therefore re-examine the aid-FDI nexus using long-run estimators and extend the existing literature in several dimensions.

First, I use a large panel dataset covering 63 developing countries over 43 years. This enables me to draw upon much more information than previous studies. Second, I employ panel cointegration techniques to solve problems that existing studies have often failed to deal with adequately, such as omitted variables, endogeneity bias, and non-stationarity. Third, I explicitly address heterogeneity concerns that arise from cross-sectional pooling in standard panel regressions: when the slope coefficients differ across countries the measured *average* impact from aid on FDI might be misleading. To explore this issue further, I provide estimates for each of the 63 countries. To preview the results: I find that (i), on average, there is a *negative* effect of aid on FDI, and (ii) there is considerable cross-country heterogeneity in the effects of aid on FDI.

## 2. Empirical analysis

### 2.1 Empirical specification and data

To examine the impact of aid on FDI, I follow common practice in panel cointegration studies and consider a bivariate equation

$$\left( \frac{FDI}{GDP} \right)_{it} = \alpha_i + \delta_i t + \beta \left( \frac{Aid}{GDP} \right)_{it} + e_{it}, \quad (1)$$

where *FDI* stands for net FDI inflows while *Aid* represents foreign aid. Both variables enter the equation as shares of GDP. I also account for country-specific fixed effects,  $\alpha_i$ , and country-specific trends,  $\delta_i t$ . As the principal interest is on the long-run impact (measured by the  $\beta$ -coefficient), it is not essential to be concerned about the variable lags through which aid impacts FDI; the short-run effects and adjustments to the long-run equilibrium are accommodated by the error term.

Data on FDI inflows are from UNCTAD,<sup>1</sup> data on aid from the OECD,<sup>2</sup> and GDP data from the World Development Indicators. To account for cross-sectional dependence due to common time effects, I use cross-sectionally demeaned data. All developing countries with complete time series data over the period 1970-2012 are included. This procedure yields a sample of 63 countries with 2709 observations.

### 2.2 Panel unit roots and cointegration tests

A crucial assumption concerning Eq. (1) is that aid and FDI share similar stochastic trends. Empirically, this implies that both variables must be integrated (of the same order), and cointegrated. The parameter estimates of a regression consisting of cointegrated variables are superconsistent, meaning that they converge faster to the true values than it is usually the case (at a rate  $T$  rather than  $\sqrt{T}$ ). This also holds if the (stationary) error term is correlated with one of the

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<sup>1</sup> Available at: <http://unctadstat.unctad.org>.

<sup>2</sup> Available at: <http://www.oecd.org/dac/stats>.

regressors. Thus, an implication of detecting cointegration is that the estimates are not biased by omitted stationary variables. Omitting a non-stationary variable would produce non-stationary residuals, and thus lead to a failure to detect cointegration. Consequently, an important characteristic of a cointegrating relationship is that no further controls have to be included to produce unbiased estimates. If, in contrast, aid and FDI are not cointegrated, then the error term  $e_{it}$  is non-stationary, and Eq. (1) would be a spurious regression. From this, it follows that the first step is to test for the stationarity of both variables. If the series are non-stationary, the second step is to test for a cointegrating relationship. If such a relationship is found, the third step is to estimate Eq. (1) using an appropriate panel cointegration estimator.

Table 1 reports the results of the panel unit root test of Im et al. (2003) (IPS) and the ADF Fisher panel unit root test proposed by Maddala and Wu (1999). Both tests fail to reject the null of non-stationarity. As the unit root hypothesis is rejected for the first differences, it can be concluded that all series are integrated of order one. To test for cointegration, I use the panel and group ADF and PP  $t$ -tests suggested by Pedroni (1999). These tests allow for heterogeneous intercepts and trend coefficients across countries. Additionally, I employ the cointegration tests developed by Kao (1999), where four within-dimension-based DF test statistics and one within-dimension-based ADF statistic are used. Table 2 reports the results. All tests reject the null of no cointegration, indicating that aid and FDI are indeed cointegrated.

### **2.3 Long-run relationship**

To estimate the long-run impact of aid on FDI, I first use a Fully Modified OLS (FMOLS) estimator, which employs a non-parametric correction to eliminate potential endogeneity biases. Foreign investors might lobby their governments to increase aid. Aid could also be given as a compensation for reduced FDI flows to overcome financial distress during economic crises. In

both cases, causation may run from FDI to aid.<sup>3</sup> First, I follow Kao and Chiang (2001) and perform FMOLS on the pooled sample. The results are presented in the first column of Table 3. The estimated coefficient is highly significant and *negative*. More precisely, the point estimate for the *Aid* coefficient implies that an increase in the aid-to-GDP ratio by one percentage point decreases the FDI-to-GDP ratio by 0.142 percentage points on average. To evaluate the robustness of this finding, I also report the results of a dynamic OLS (DOLS) estimation. To account for possible serial correlation and endogeneity, Eq. (1) is augmented with leads, lags and current values of the first-differenced *Aid* variable:

$$\left(\frac{FDI}{GDP}\right)_{it} = \alpha_i + \delta_i t + \beta \left(\frac{Aid}{GDP}\right)_{it} + \sum_{j=-p}^p \Phi_{ij} \Delta \left(\frac{Aid}{GDP}\right)_{it-j} + \varepsilon_{it}, \quad (2)$$

where  $\Phi_{ij}$  are coefficients of lead and lag differences. From the second column of Table 3 it can be seen that the DOLS results are largely in agreement with the FMOLS results. Although the magnitude of the coefficient is somewhat smaller, it is again negative and highly significant.

A potential problem with the estimates presented so far is the assumption of a homogeneous long-run coefficient across countries. Hence, I use between-dimension, group-mean panel estimators suggested by Pedroni (2001). These estimators allow for heterogeneous slope coefficients and involve estimating separate FMOLS and DOLS regressions for each country.

The long-run impact can be computed by averaging the resulting slope coefficients,  $\hat{\beta} = N^{-1} \sum_{i=1}^N \hat{\beta}_i$ .

The corresponding  $t$ -statistic is calculated as  $t_{\hat{\beta}} = N^{-1/2} \sum_{i=1}^N t_{\hat{\beta}_i}$ . As can be seen in columns three and

four of Table 3, the significant and negative impact of aid on FDI carries over. I thus conclude that my findings are robust to different estimation techniques. However, the use of mean-group

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<sup>3</sup> In principle, endogeneity concerns could be addressed with appropriate instruments. However, finding valid instruments for aid is rather difficult (Clemens et al., 2012).

estimators implies smaller coefficients compared to the within-dimension estimates, suggesting that the effect of aid on FDI is not homogeneous across countries.

## **2.4 Individual country results**

To examine the degree of heterogeneity, I plot the DOLS estimates of the *Aid* coefficient for each country in Figure 1. Accordingly, there are large differences between countries that are not captured in standard panel regressions: the coefficients range from -1.418 in Malaysia to 1.290 in Panama. Though, it is unclear which factors determine the sign and magnitude of the long-run effect in each country. Since it is likely that in individual cases the reasons for this are manifold and complex, an attempt to find an appropriate explication would go beyond the scope of this paper. However, it can be seen that negative effects (e.g. through rent-seeking) of aid seem to have hindered access to FDI in the past in many Asian economies. In contrast, sub-Saharan African countries dominate the group where positive effects (e.g. through the financing of complementary factors of production) prevail. This mechanism can certainly be expected in the latter region, as it substantially lags behind other regions in terms of infrastructure and/or education.

## **3. Conclusion**

I analyzed the relationship between aid and FDI in a large sample of developing countries using panel cointegration techniques. My results suggest that, in the long-run and on average, aid and FDI are negatively correlated. Thus, rent-seeking or crowding-out effects seem to dominate other potentially FDI-attracting effects of aid. I conclude from this that policymakers should not pin their hopes too much on positive synergies between aid and FDI.

## References

- Asiedu, E., Jin, Y., & Nandwa, B. (2009). Does foreign aid mitigate the adverse effect of expropriation risk on foreign direct investment? *Journal of International Economics*, 78(2), 268-275.
- Beladi, H., & Oladi, R. (2006). Does foreign aid impede foreign investment? *Frontiers of Economics and Globalization*, 1, 55-63.
- Clemens, M. A., Radelet, S., Bhavnani, R. R., & Bazzi, S. (2012). Counting chickens when they hatch: Timing and the effects of aid on growth\*. *The Economic Journal*, 122(561), 590-617.
- Donaubauer, J., Herzer, D., & Nunnenkamp, P. (2013). Does aid for education attract foreign investors? *European Journal of Development Research*, forthcoming.
- Economides, G., Kalyvitis, S., & Philippopoulos, A. (2008). Does foreign aid distort incentives and hurt growth? Theory and evidence from 75 aid-recipient countries. *Public Choice*, 134(3-4), 463-488.
- Harms, P., & Lutz, M. (2006). Aid, governance and private foreign investment: some puzzling findings for the 1990s\*. *The Economic Journal*, 116(513), 773-790.
- Im, K. S., Pesaran, M. H., & Shin, Y. (2003). Testing for unit roots in heterogeneous panels. *Journal of Econometrics*, 115(1), 53-74.
- Kao, C. (1999). Spurious regression and residual-based tests for cointegration in panel data. *Journal of Econometrics*, 90(1), 1-44.
- Kao, C., & Chiang, M.-H. (2001). On the estimation and inference of a cointegrated regression in panel data. *Advances in Econometrics*, 15, 179-222.
- Kapfer, S., Nielsen, R., & Nielson, D. (2007). *If you build it, will they come? Foreign aid's effects on foreign direct investment*. unpublished.
- Karakaplan, U., Neyapti, B., & Sayek, S. (2005). *Aid and foreign direct investment: international evidence*. Working Papers, Turkish Economic Association.
- Kimura, H., & Todo, Y. (2010). Is foreign aid a vanguard of foreign direct investment? A gravity-equation approach. *World Development*, 38(4), 482-497.
- Maddala, G. S., & Wu, S. (1999). A comparative study of unit root tests with panel data and a new simple test. *Oxford Bulletin of Economics and Statistics*, 61(S1), 631-652.

- OECD. (2002). *Foreign direct investment for development: Maximising benefits, minimising costs*. report, OECD.
- Pedroni, P. (1999). Critical values for cointegration tests in heterogeneous panels with multiple regressors. *Oxford Bulletin of Economics and Statistics*, 61(S1), 653-670.
- Pedroni, P. (2001). Purchasing power parity tests in cointegrated panels. *Review of Economics and Statistics*, 83(4), 727-731.
- Selaya, P., & Sunesen, E. R. (2012). Does foreign aid increase foreign direct investment? *World Development*, 40(11), 2155-2176.
- Yasin, M. (2005). Official development assistance and foreign direct investment flows to Sub-Saharan Africa. *African Development Review*, 17(1), 23-40.

**Table 1** Panel unit root tests

Variables	Deterministic terms	IPS statistics	ADF Fisher statistics
Levels			
$(FDI/GDP)_{it}$	Constant, trend	-0.37	128.57
$(Aid/GDP)_{it}$	Constant, trend	1.37	80.77
First differences			
$\Delta (FDI/GDP)_{it}$	Constant	-17.41**	557.84**
$\Delta (Aid/GDP)_{it}$	Constant	-13.75**	429.38**

Notes: Four lags were selected to adjust for autocorrelation.

\*\* Indicate significance at the 1% level.

**Table 2** Panel cointegration tests

Pedroni (1999)	
Panel PP $t$ -statistic	-29.29**
Panel ADF $t$ -statistic	-30.45**
Group PP $t$ -statistic	-22.79**
Group ADF $t$ -statistic	-20.54**
Kao (1999)	
$DF_{\rho}$ statistic	-64.24**
$DF_t$ statistic	-28.91**
ADF $t$ -statistic	-9.85**
$DF_{\rho}^*$ statistic	-6.69**
$DF_t^*$ statistic	-9.77**

Notes: The number of lags is based on the Schwarz information criterion with a maximum number of four.

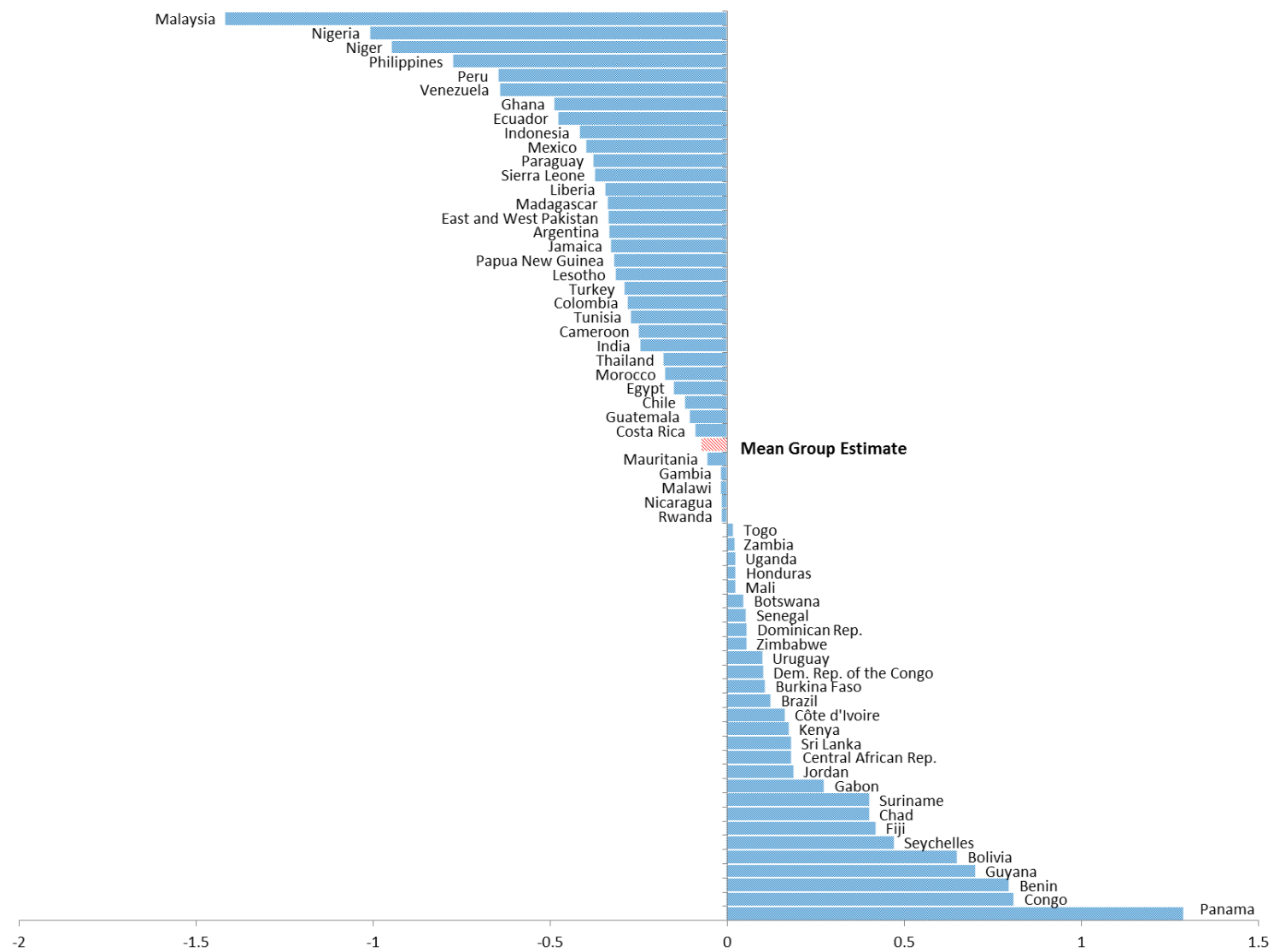
\*\* Indicate a rejection of the null of no cointegration at the 1% significance level.

**Table 3** Estimates of the long-run effect of aid on FDI

Within-dimension estimator		Mean-group estimator	
Kao and Chiang (2001)		Pedroni (2001)	
FMOLS	DOLS	FMOLS	DOLS
-0.142*	-0.098**	-0.078**	-0.074*
(7.01)	(3.62)	(3.06)	(2.20)

*Notes:* *t*-statistics are in parenthesis. The DOLS regressions were estimated with one lead and one lag.

\*(\*\*) Indicate significance at the 5% (1%) level.



**Figure 1** Individual country DOLS estimates