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Foreign direct investment and economic growth: A real relationship or wishful thinking?☆

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ABSTRACT

Several theories have been advanced on the beneficial effect of foreign direct investment (FDI) on economic growth. However, mixed empirical findings have resulted in a long-standing debate. This study explores the global FDI–growth relationship through an 'informed' econometric analysis predicated on substantial guidance obtained from a detailed investigation of 880 estimates reported in 108 published studies. With model uncertainties alleviated and the core specification benchmarked against the aforementioned assessment, our econometric analysis, utilising a global sample of 140 countries in the period 1970 to 2009, conclusively documents that FDI positively affects economic growth. Moreover, we find that this association holds globally as strongly as in the developing world. Further, it is regional variation rather than within-country variation, and contemporaneous FDI rather than past FDI, which matters for growth. Finally, appropriate absorptive capacity indicators for positive growth are identified to be trade openness and financial development rather than schooling.

1. Introduction

Developing countries are generally unable to exploit the benefits from their abundant natural resources due to inadequate human and physical capital and technological knowhow. Many of these countries are also typically constrained by weak protection of property rights, corruption, and severe civil, political and economic instability. Such setbacks hinder their capital accumulation and become obstacles to using already existing resources. Consequently, international sources of growth such as development aid assistance, loans, portfolio flows, and foreign direct investment (FDI), become highly pursued items on their economic agenda. Compared to other sources of international capital, FDI arguably offers significant advantages, principally because it provides the host country with a relatively more stable flow of funds, helps augment productive capacity, and increases employment and trade. It is also argued that FDI generates positive knowledge externalities through labour training and skill acquisition, helps transfer technology and organisational knowhow, introduces new production processes, creates backward and forward linkages across sectors, and provides domestic firms with much-desired access to foreign markets. The host country, in return, offers foreign firms new and relatively unexploited markets, cheap labour, and natural resources.

Globally, FDI has grown from about 0.5% of the world's GDP in 1970 to over 3% in 2008. The World Bank (2010) reports that the overall share of developing countries in global FDI inflows was 37% in 2010, representing more than a three-fold increase since 2000. Thus, the growth effects of FDI and the channels through which these effects operate are of great importance to understand.

Despite a significant body of theoretical and empirical research exploring these connections, extant empirical literature does not offer a clear picture on the central issue of whether FDI has globally any effect on growth. A thorough review of the literature conducted in this study reveals 108 empirical studies using data from around the globe and reporting 880 regression estimates of the effects of FDI on growth. Curiously, the distribution of these estimates is such that 43% are positive and statistically significant, 26% are positive and statistically insignificant, 17% are negative and statistically significant, and 14% are negative and statistically insignificant. That is, fewer than half of the studies have found a positive and statistically significant effect, and nearly one-third report a negative effect of FDI on growth. Further, 40% find a statistically insignificant effect. This mixed distribution could suggest that the theoretical predictions about the beneficial role of FDI for the host country might be very optimistic, and thus, they do not receive full support from the data. Thus, it appears that the theories related to issues such as spillovers, technology diffusion, labour training and skill acquisition, might be merely 'wishful' thinking, rather than pointing towards the 'real' effects of FDI on growth.

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The core of objective of this paper is to present a more informed exploration of FDI–growth relationship by using a two-step approach. The first step conducts a detailed analysis of 880 reported FDI–growth estimates from 108 published studies. This investigation is useful for two reasons. First, covering almost the entire population of published estimates, it permits a better understanding of the research process by providing formal evidence on the manner in which findings vary with respect to factors such as the choice of dependent and independent variables, sample composition, time span, and methodology. This procedure, also known as meta-regression analysis (MRA), has been adopted by a growing number of papers to shed light on several important issues (e.g., Card and Krueger, 1995; Disdier and Head, 2008; Doucouliagos and Ulubasoglu, 2008; Görg and Strobl, 2001; Havranek and Irsova, 2011; Irsova and Havranek, 2013). Second, with accumulated evidence considered in its entirety, variations exhibited by numerous models accounted for, and the effects of sampling error netted out, an econometric specification that can serve as a highly useful benchmark for empirical analysis using cross-country data becomes possible.

Not surprisingly, the first step yields substantially rich information on the sources of different findings on the global FDI–growth relationship and how, in turn, uncertainties related to empirical formulation can be alleviated to obtain a more reliable picture on the said link. Therefore, in the second step, we conduct an econometric investigation of the FDI–growth relationship using data from a sample 140 countries around the world over the period 1970 to 2009, and find new and important results which shed light on the global FDI–growth connection. Our approach contrasts with not only those studies that adopt a simple qualitative assessment of previous findings to formulate their econometric specification, but also many MRA-based studies that do not convey their results to a formal framework for an informed econometric analysis.

Taken together, our analysis documents conclusively that voluntary exchanges reflected in FDI do generate economic growth. Moreover, we find five new and important results on the global FDI–growth linkage. First, the FDI–growth relationship exhibits stronger within-region variation than within-country variation. While this does not mean that there is no within-country variation, a region, as a larger unit, might host sufficiently different types of FDI that in turn demonstrate greater ability to produce growth. Single countries might host a more narrow range or more specific types of FDI that have comparatively lower ability to generate growth. Second, the FDI–growth association holds globally as strongly as in the developing world. This is important because theoretical arguments generally point to the benefits of FDI only for developing countries. Third, absorptive capacity is important, but our evidence suggests that crucial absorptive capacity variables are trade openness and financial development. The latter is consistent with Alfaro et al. (2004). Also, the absorptive capacity effects work non-linearly in that FDI enhances growth up to a certain level of financial development and trade openness, and the effect tapers off at very high levels of the latter two. Conversely, schooling does not emerge strongly as an absorptive capacity variable as was argued in the previous literature. Fourth, it is current FDI, rather than past (i.e., lagged) FDI that matters for growth. This might be because FDI's effect is encapsulated in other parts of the economy over time such that the effect is observed only contemporaneously. Lastly, government size and inflation play important roles in the manner in which FDI affects growth.

Before proceeding, it is worthwhile to emphasize that Iwasaki and Tokunaga (2014) comes closest to our study. Using 119 published estimates from 23 studies on the transition economies of Central and Eastern Europe and former Soviet Union, Iwasaki and Tokunaga find a non-zero effect of FDI on economic growth. We differ from their study in three major respects. First, we cover the whole world, and use 880 estimates from 108 published studies. Second, we convey our meta-analysis findings to primary data. In particular, we cross-check our MRA findings with cross-country global data, as well as conduct econometric investigation using the benchmark specification suggested by the MRA. Third, given our global focus, our results convey a very different set of findings.

2. A brief review of the theoretical and empirical literature

The aforementioned varied distribution of FDI–growth estimates parallels diverse questions on the connection between FDI and growth. In what follows, we provide a critical overview of the theoretical and empirical literature to shed light on the background of the divergent findings in prior work. The very range of questions that arises demonstrates that it is not entirely surprising to obtain mixed results.

Razin and Sadka (2007) classify the literature on FDI into two broad categories: (i) micro-level studies exploring, with reference to international trade and industrial organisation theories, the market power of foreign firms, firm-specific production and cost advantages, and (ii) macro-finance studies that generally focus on the long-term growth effects of FDI with respect to growth theories.

2.1. Positive effects of FDI on growth

In neoclassical models, long-term growth can only result from exogenously driven technological progress and/or labour force growth. Hence, FDI can only affect economic growth if it enhances technological progress. The mere injection of capital stock would lead to long-term level effects, yet only transitional growth. In endogenous growth theories, FDI contributes to growth directly through higher capital stock and newer technology, and indirectly through improving human capital, infrastructure, institutions, and spillovers. Positive externalities can take the form of managerial skills, organisational knowhow, and labour training. FDI can also assist the host economy with gaining access to world markets. Empirical studies finding a positive effect of FDI on growth include De Gregorio (1992), Zhang (2001), and Baldwin et al. (2005).[1]

Although the theoretical predictions are clear, a number of puzzling facts also exist. While the effect of FDI on growth would depend inversely on the technological gap between the investor and the host country (motivated by the neoclassical prediction that capital would flow across countries in search of higher marginal returns), one paradox is that, until recently, approximately three-quarters of global FDI activity took place among developed nations (Razin and Sadka, 2007). Thus, one wonders what the data can deliver in the context of the North–South relationship.

Numerous other questions abound. For example, FDI is often a specific investment into a specific sector.[2] Hence, for FDI-driven technology transfers and spillovers to be able to create economy-wide growth, a multiplier effect should be initiated across sectors. Does FDI reach the other parts of the economy? What if foreign firms operate in isolated enclaves? Does FDI bring *the* latest technology, or simply more of the existing high technology? Where do foreign firms stand in the host economy relative to leading domestic firms? How do foreign firms manage the domestic labour—by training or by firing?[3] What roles do country-specific factors play in these activities?[4]

These are well-known questions that scrutinise the growth-generating role of FDI in the host country. Divergent effects seem normal if models using cross-country data do not carefully model the factors conducive to growth, including the type of inflows, domestic economic conditions, timing of the effects, and regulatory framework.

[1] Baldwin et al. (2005) use industry-level data from seven OECD countries.

[2] One reason for the FDI surge in developing nations is the foreign acquisition of domestic firms in privatisation programmes that generally target specific industries (e.g., the sale of telecommunication firms).

[3] It is well known that privatised firms (or those acquired by foreign firms) dispose of some labour initially.

[4] In fact, a number of studies have found heterogeneous FDI–growth effects across countries (e.g., de Mello, 1999; Nair-Reichert and Weinhold, 2001), even within developing countries. See also Durham (2004).

2.2. Adverse effects

Negative coefficients have also been estimated for FDI in the growth models (e.g., Carkovic and Levine, 2005).[5] This leads to the question: how does FDI cost growth? One channel could be through the distortions in the domestic economy. Easterly (1993) notes that policies in the form of preferential tax treatments and other concessions can distort domestic incentives. If foreign firms obtain significant benefits from host governments, the distortions caused could have large negative effects on growth. Further, Borensztein et al. (1998) argue that if FDI enters a country to overcome trade barriers, it might result in an FDI inflow that does not respond to higher efficiency, but only to profit opportunities created by distorted incentives. Balasubramanyam et al. (1996) argue that the mere infusion of human capital and new technology into a distortion-ridden economy may neither lift the economy to a higher plane nor alter the slope of the production function. It might, instead, merely serve to redistribute income in favour of the new agents of production. Sadik and Bolbol (2001) argue that FDI is not economically justifiable in some Arab countries due to distorted incentives in defence and petrochemical contracts. These considerations suggest a potential for net negative effects to accrue from FDI.

It is also argued that FDI might crowd out domestic investment by diverting scarce resources away from other productive sectors. However, a number of studies also argue (or cite the argument) that FDI facilitates domestic investment. Borensztein et al. (1998) find that this crowding out effect is not robust. De Mello (1999) finds that the substitutability between capital stocks embodying old (domestic) and new (FDI-related) technology is higher in advanced economies than developing economies.

Government size could be another channel for adverse growth effects. Governments might need to invest in infrastructure to attract FDI; this might increase foreign debt and the distortionary tax burden, serving as another example of crowding out. All these suggest a role for domestic investment and government size in growth models.

2.3. Conditional effects: absorptive capacity

A number of findings suggest that developing and developed countries respond to FDI differently in growth generation (e.g., Durham, 2004). Thus, several authors have argued that the effects of FDI on growth are *conditional* upon the existence of other factors. For example, Borensztein et al. (1998) and Blomstrom et al. (2000) highlight the need for an adequate stock of human capital for host countries to close technology gaps. Further, the beneficial effect of FDI is enhanced in an environment characterised by an open-trade and investment regime and macroeconomic stability (Balasubramanyam et al., 1996). In addition, Alfaro et al. (2004) find that developed financial markets are an important determinant of the extent to which FDI affects growth. Moreover, infrastructure such as telephone lines, paved roads and electricity are suggested as absorptive capacity variables. Hence, the direct effect of FDI on growth can be zero (or negative), while FDI interacted with human capital, or with financial-market development or trade, might have a positive effect on growth.[6] Therefore, the implications for emerging markets are mixed because poorer countries are less likely to possess the necessary initial absorptive characteristics.

However, it is important to note that absorptive capacity is also a determinant of FDI. Think of it this way: would foreign firms invest in a country with high inflation, low openness, weak infrastructure, and poor human capital? Rational investors would consider these factors before undertaking investment in the host country.[7] Thus, if absorptive capacity was not controlled for in a growth regression, FDI would be capturing its effects.

Combining these factors suggests that FDI can potentially affect economic growth through any of four channels: (i) a *direct* (but transitional) *effect* on growth, just like other factor inputs; (ii) *indirectly* through stimulating the accumulation of other inputs; (iii) *interactively* through its effect on the marginal product of other inputs; and (iv) *negatively*, consistent with distortion and crowding out theories.

3. Empirical analysis of the existing FDI–growth estimates

The diverse *theoretical* issues raised above demonstrate the need for a systematic assessment of the FDI–growth relationship. However, it is worth noting three further *empirical* points that reinforce this need. The first question is: can all the 'nice' theoretical effects of FDI (e.g., positive externalities, productivity gains, transfer of managerial and organisational knowhow, and backward and forward linkages) can be detected with cross-country data? At first glance, these effects seem more relevant at the microeconomic rather than the macroeconomic level of analysis. However, this presumption is testable. If it is true, the mean FDI–growth effect in the cross-country data should be zero.

The second question is on the nature of the FDI–growth relationship. Does the reduced form relationship between FDI and growth – as employed by most studies – convey the entire story? Given that FDI is said to mobilise several factors that could be growth generating or growth dampening, it is not clear from reduced form specifications the channels through which FDI exerts its effects on growth, and how contrasting effects amount to an aggregate effect. Also, in a cross-country model that does not control FDI-determining factors, FDI is likely to capture institutional, macroeconomic and infrastructural factors, rather than operations of foreign firms. Moreover, there might also be some periods, regions, and countries across which FDI has a varying relation with growth. Thus, the variation in evidence might be due to variation in the real, underlying effects of FDI and growth.

The third question is statistical: sampling error. While statistical significance is an important dimension in assessing the results from an individual model, it is, in general, inadequate when considering the results from numerous studies.[8] Given that *all* studies are plagued by sampling error, it is necessary to consider the precision of the reported estimates and to construct confidence intervals. Focusing on the individual estimates and their associated t-statistics would suggest erroneously that FDI has no effect on growth.

3.1. Approach to MRA

As the standardised measure of the effect of FDI on growth, we use the partial correlation between FDI and economic growth. Consider the basic econometric model: $growth = \alpha + \delta FDI + \beta_1 x + u$, where x is a vector of controls, and u is the residuals. Direct FDI effectiveness is given by $\partial growth/\partial FDI = \delta > 0$. We convert various estimates of δ into partial correlations, r. However, an important issue is that when the

[5] Note that a negative coefficient is generally estimated when FDI is interacted with some absorptive capacity variable in the model (the negative sign generally belongs to the non-interacted FDI variable). We elaborate on this in the next section; nevertheless, a negative estimate points to a detrimental effect.

[6] World Bank (2001) argues that countries with low absorptive capacities such as Morocco, Uruguay, and Venezuela failed to reap spillovers, while Malaysia and Taiwan fared well due to better capacities.

[7] An FDI and absorptive capacity interactive variable in a growth regression – often estimated to be positive – would be capturing the effects that reflect the decision of a foreign firm based on a prior assessment of the absorptive capacity of the host country, and its subsequent operations. The non-interactive FDI variable should then capture the effects that do not rest on, or are independent of, the absorptive capacity (assessment). A negative or insignificant sign for this variable probably reflects that these are either 'bad' investments, or investments that are oriented towards using cheap labour and repatriating profits back to country of the investor, rather than accessing the host market for the long term, and making no contribution to growth.

[8] For example, Papanek (1973), Mosley et al. (1987), Durham (2004), Alfaro et al. (2004), and Wang et al. (2004) together report 68 FDI–growth estimates. The partial correlations reported in these papers range from −0.68 to +0.77, with an average correlation of +0.06. Likewise, the associated t-statistics also vary, including values close to zero. It is tempting to conclude from these studies that FDI does not affect growth.

basic growth model includes both FDI and its interactions (e.g., an absorptive capacity variable), the calculation of the partial correlation for the *total* FDI effect is not possible.[9] The implication of this limitation for our approach is that we are able to provide the average FDI–growth estimate only from studies that do not use an interaction term for FDI (94 of 108 studies). To understand the depth of this limitation we compare the average partial correlation from only studies using interaction terms, as well as those from all studies.

To find the unconditional mean FDI–growth effect, partial correlations between FDI and growth are regressed on a constant: $r_{ij} = \beta_0 + v_{ij}$ where r_{ij} is the ith FDI–growth partial correlation reported in the jth study and v_{ij} is the random error. In computing this average effect, we also construct *weighted* averages, which assign greater weight to estimates that are deemed to be of higher quality. We use precision – the inverse of the standard error of a partial correlation – as weights. Precision is an objective measure of quality and is the standard approach in meta-analysis (Hunter and Schmidt, 2004) and is known to produce optimal weights. The findings hold when we re-estimate the model using degrees of freedom as weights. The approach described above assumes that r varies randomly around a central effect, β_0, which is the mean FDI–growth effect, after allowing for random sampling error. To identify the variables that cause heterogeneity in the primary models, we utilise a vector (Z) of moderator variables which include indicators that capture modelling, data, and estimation differences, as well as time and regional dummies: $r_{ij} = \gamma_0 + \gamma Z_{ij} + v_{ij}$ (Stanley, 2001; Stanley and Jarrell, 1989). Z also includes binary indicators on whether model i in study j utilises a certain FDI interaction term. The implication of the aforementioned inability to calculate the full partial correlation is that those binary indicators in the MRA will detect how the linear FDI term is affected in a regression model following the inclusion of an FDI interaction.

To identify the empirical studies to include in the MRA, an exhaustive and comprehensive search was conducted.[10] This intensive search revealed 108 comparable published papers in English that offer regression-based estimates of the FDI-economic growth association using cross-country data.[11] The reference list of studies included in the MRA is provided in Appendix A. To ensure data accuracy, the estimates and the study characteristics were independently checked by several coders.

Fig. 1 illustrates the FDI–growth relationship with a funnel plot, tracing the association between partial correlations and the precision measure. Mimicking the varied distribution mentioned in the Introduction, the funnel plot highlights a large variation in the reported estimates.

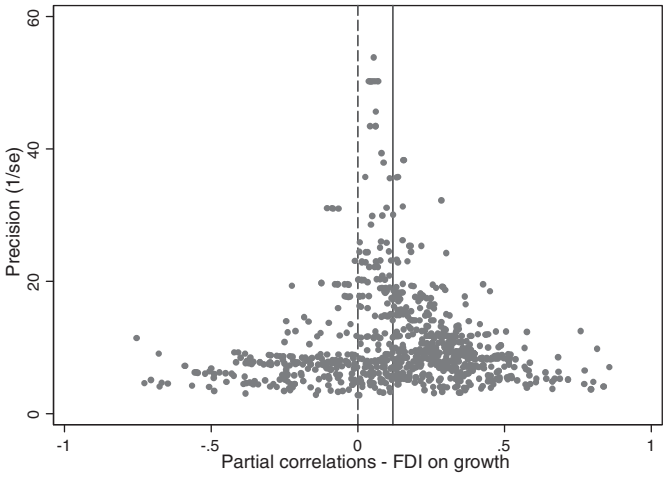

Fig. 1. Funnel plot of partial correlations of FDI on economic growth (n = 880). Note: The dashed line indicates the position of a zero effect. The vertical continuous line indicates the value of the precision weighted average partial correlation (+0.12).

3.2. Mean FDI–growth partial correlation

Table 1 reports the average effect sizes. Column 1, using all estimates, reports average effect size as +0.15 and +0.12. Column 2 focuses only on studies without FDI interactions and reports an analogous size effect. Focusing on average partial correlation of the linear FDI variable from studies that use FDI interactions, column 3 reports +0.25 as average effect size. Column 4 excludes the top and bottom 5% estimates of the entire sample, column 5 is restricted to studies controlling for endogeneity, while column 6 focuses on estimates derived from models using data from only developing countries. Finally, column 7 considers only studies that have been published after the year 2000, given significant heterogeneity among prior studies. In row 1, all estimates are assigned an equal weight, while precision is assigned as weight in row 2. The unweighted average is larger than the precision-weighted average, though the confidence intervals of both averages overlap significantly. All columns report average effect size between +0.10 and +0.17.[12] None of the 95% confidence intervals include zero and they are rather tight.[13]

Although it is not possible from these estimates to make a universal conclusion about the FDI–growth effect size, given the aforementioned limitation relating to partial correlations, it appears that the positive growth effect of FDI is robust to different partitions of the data. It must be noted that, contrary to theoretical predictions that FDI from North to South would be more growth enhancing, the analysis restricted only to developing countries does not yield a significantly different effect size. The size of the effect is small but it is still of some economic significance.

3.3. Heterogeneity: real world factors, modelling, estimation, and data

We consider a large list of moderator variables to capture heterogeneity due to real world factors, as well as the modelling, data, and estimation differences. Appendix B presents the definitions and sample means of these variables.

Here we report the results of a general-to-specific modelling strategy, where we commence with all potential explanatory variables and

[9] The multiple partial correlation for FDI, a device to capture the partial correlation of the *total* effect, can only be computed for a model when FDI and its interactions are entered in the regression in alternate times, information that is not provided by studies. See Cowden (1952) for details.

[10] Numerous search engines were accessed, including Econlit, Google Scholar. Keyword searches included 'foreign direct investment', 'FDI', 'growth', 'economic growth', 'GDP', 'international capital flows', 'international transfers', and 'national performance'. In addition to search engines, exhaustive manual searches were also conducted. This involved investigating any references listed in empirical, theoretical, and review studies. The search for papers was terminated in June 2009.

[11] Studies reporting the effect of FDI on growth at plant/firm level, or for specific industries, are excluded. A very small number of estimates were eliminated because they were extreme outliers, probably due to reporting/typing errors in the original published studies.

[12] All standard errors are adjusted for the clustering of estimates within studies. This is to address the data dependence, which arises due to clustering of observations within a study (Everitt et al., 2001; Hox, 2002). If the estimates are reported by a different author, or if the same author uses a different set of samples, the corresponding estimates are considered statistically independent (Hunter and Schmidt, 2004).

[13] A potentially important problem here is the publication selection bias (Card and Krueger, 1995; Stanley, 2001), which could inflate the meta-average. This bias can be detected by conducting the Funnel Asymmetry Test and Precision Effect Test, which involves estimating $r_{ij} = \beta_0 + \beta_{se} SE_{ij} + \varepsilon_{ij}$ and $r_{ij} = \beta_0 + \beta_2 SE^2_{ij} + \upsilon_{ij}$, respectively (Stanley and Doucouliagos, 2012). Although these tests could only test the bias related to the non-interacted FDI term in the primary FDI-growth regression, they nevertheless indicate a mild selectivity for the positive effect of FDI on growth. Correcting for this bias, the meta-averages are still positive and statistically significant and fairly close to the basic MRA results reported in Table 1.

Table 1
Average partial correlations of FDI on economic growth.

Statistic	All estimates (1)	Only studies without FDI interactions (2)	Only studies with FDI interactions (3)	Excluding top and bottom 5% estimates (4)	Only estimates controlling for endogeneity (5)	Only estimates using data for developing countries (6)	Only estimates from papers published after 2000 (7)
Un-weighted, β_0	0.15 (0.10 to 0.20)	0.12 (0.06 to 0.18)	0.25 (0.20 to 0.31)	0.16 (0.12 to 0.19)	0.19 (0.10 to 0.27)	0.15 (0.09 to 0.22)	0.17 (0.10 to 0.24)
Weighted by precision, β_0	0.12 (0.09 to 0.15)	0.10 (0.07 to 0.13)	0.20 (0.22 to 0.28)	0.12 (0.09 to 0.15)	0.16 (0.09 to 0.22)	0.12 (0.09 to 0.15)	0.12 (0.08 to 0.16)
Number of studies	108	94	14	102	31	77	69
Number of estimates	880	695	185	790	150	543	492
Total sample size	149,990	102,061	47,929	146,366	23,877	81,018	109,512

Note: Each cell reports the key estimate from separate regressions from Eq. (1). Row 1 does not use weights. Row 2 uses precision (the inverse of the estimate's standard error) as weights. All cells use cluster-adjusted standard errors. Figures in brackets are 95% confidence intervals.

sequentially remove any variable that was not statistically significant at the 10% level, using Wald tests to validate all excluded variables.[14] The constant term is β_0, which is estimated to be 0.11 in column 1 of Table 2.

3.3.1. Time

Of the seven time dummies, 1940s, 1950s, 1960s, 1970s, 1980s, 1990s and 2000s, indicating whether studies use data from those decades, the 1940s is used as the benchmark. Table 2 finds that models using data from the 1980s produce larger FDI–growth effects, which might be due to increased globalisation, liberalisation and integration efforts. The 2000s captures weaker effects. The latter result is conditional in that the 15 studies have used data from only the 2000–2002 period. Surprisingly, the seven-fold increase in global FDI in the 1990s did not produce a higher FDI–growth effect. This evidence suggests that the FDI–growth link is stronger in some periods than others.

3.3.2. Region[15]

The ten regional dummies constructed are *Africa*, *Australasia*, *East Asia*, *Central and Eastern European Countries* (*CEECs*), *Latin America*, *the Middle East*, *North America*, *South-East Asia*, *South Asia*, and *Western Europe*, each indicating whether the sample contains countries from the relevant region. North America is used as the benchmark. Column 1 of Table 2 indicates that three regions emerge as important. *Western Europe* has a positive coefficient, suggesting that models estimated using data that include Western European countries find statistically stronger FDI–growth effects. In contrast, both the Middle East and South-East Asia have negative coefficients, meaning that the FDI–growth relationship is weaker in those regions than it is in North America. The results also find that the FDI–growth experience seems to be much smaller in South-East Asia than it is in the rest of Asia. Finally, the results imply that East Asia and Latin America are significantly no different from North America in benefiting from FDI.

3.3.3. Measurement

Five dummy variables capture the differences in FDI measurement: *Gross FDI*, *Growth Rate of FDI*, *Lagged FDI*, and *Net FDI*.[16] The *FDI/GDP* ratio is the most common measure and is used as the benchmark. We also control for *Growth Rate of GDP Per Capita* (versus *Growth Rate of GDP*). *Lagged FDI* is especially important here. If FDI is an autoregressive process, whether contemporaneous or lagged FDI is employed in modelling should not matter. However, there are reasons to believe that it is lagged FDI, rather than contemporaneous FDI, that should affect growth because all the suggested channels are more likely to work with some time lag (e.g., Durham, 2004).

Table 2 demonstrates that FDI measured with a lag results in smaller effects. Given the coefficient of −0.12 on *Lagged FDI* and that of β_0 in Table 2 being +0.11, FDI in the past has almost zero direct effect on contemporaneous growth. This can occur if over time, FDI's effect is encapsulated in other parts of the economy. This result resonates with Durham (2004), who finds different results with contemporaneous and lagged FDI.[17]

3.3.4. Estimation

The dummy variables *2SLS*, *3SLS*, *GLS*, *GMM*, and *SUR* capture the estimator differences that might matter for the FDI–growth relationship. OLS is the benchmark. Reverse causality or omitted variables are likely to induce endogeneity between FDI and economic growth, so it is important to assess how 2SLS, 3SLS and GMM results might be different than OLS. Also, some of the estimators are used in combination with *Fixed Effects*, *Random Effects*, *Granger Causality*, *VAR*, and *ECM*. Nair-Reichert and Weinhold (2001) suggest a strong presence of country fixed effects in the FDI–growth relationship. A number of studies employ time-series techniques, such as Granger Causality and panel co-integration (e.g., Zhang, 2001), suggesting different directions of causality between FDI and growth (income per capita in the case of co-integration) and other contingent factors such as the trade regime (de Mello, 1999).

Strikingly, Table 2 shows that none of the estimation methods make a difference to the FDI–growth effect compared to OLS.[18] The finding that addressing endogeneity in a model did not yield, on average, a different result than OLS in the literature is very surprising, given our strong priors on reverse causality. The explanation could be that there is either no endogeneity between FDI and growth, such that taking a measure does not correct any bias, or that the literature uses poor instruments, such that the correction was, on balance, not achieved. In general, it is evident that instrumental variables employed in the literature do not fully comply with exclusion restrictions to ensure a

[14] The full set of estimation results is available upon request.

[15] Unfortunately, some studies do not provide this information. They merely identify their samples as developing countries. This leads to a loss of observations in our MRA.

[16] *Gross* and *Net FDI* are measured as the dollar value of investments. *Lagged FDI* refers to lagged variables regardless of the type of FDI measurement, which is controlled with other dummies. Therefore, it indicates a space in the timing only.

[17] In addition, the use of *Net FDI* in dollar value results in larger FDI–growth effects. Measuring growth on a *per capita* basis versus overall GDP also results in larger effects.

[18] The estimation methods were also classified into the following three broad groups: *Individual*, *Instrumental*, and *System Estimation*. *Individual* denotes estimates whereby individual-country heterogeneity is captured via fixed effects or random effects models. *Instrumental* denotes estimates based on instrumental variables (2SLS, 3SLS, and GMM), while *System* estimation refers to studies that estimate a system of equations. No differences in results emerge.

Table 2
Meta-regression analysis of the effects of FDI on growth.

Moderator variable	All studies (1)	Sensitivity analysis				
		All studies, un-weighted (2)	Top & bottom 5% removed (3)	Excluding single country studies (4)	Developing countries only (5)	Convergence & investment only (6)
Constant	0.11	0.16	0.14	0.10	0.13	0.25
	(1.92)*	(2.59)**	(2.86)***	(1.74)*	(2.00)**	(2.79)***
Sample size (×100)	−0.006	−0.008	−0.006	−0.005	−0.007	−0.004
	(−5.77)***	(−3.18)***	(−5.63)***	(−3.95)***	(−2.86)***	(−2.45)**
Lagged FDI	−0.12	−0.09	−0.11	−0.13	−0.07	−0.04
	(4.20)***	(−1.97)*	(−4.43)***	(−4.37)***	(−2.23)**	(−0.85)
Net FDI	0.18	0.17	0.10	0.20	0.10	–
	(2.14)**	(1.89)*	(1.95)*	(2.21)**	(1.68)*	
Growth of per capita output	0.07	0.06	0.07	0.08	0.07	−0.01
	(3.26)***	(1.37)	(3.71)***	(3.16)***	(2.63)**	(−0.18)
Single country	−0.07	−0.07	−0.08	–	−0.05	−0.06
	(−2.36)**	(−1.71)*	(−3.26)***		(−1.32)	(−1.30)
Western Europe	0.06	0.08	0.06	0.06	–	0.06
	(2.42)**	(1.85)*	(2.53)**	(2.39)**		(1.70)*
Middle East	−0.10	−0.13	−0.09	−0.10	−0.08	−0.13
	(−3.92)***	(−3.92)***	(−3.73)***	(−3.78)***	(−2.66)**	(−2.56)**
South-East Asia	−0.06	−0.07	−0.06	−0.05	−0.07	−0.07
	(−3.14)***	(−2.29)**	(−3.25)***	(−2.26)**	(−1.82)*	(−2.67)**
1981–1990	0.14	0.12	−0.05	0.14	0.12	0.11
	(2.77)***	(2.85)***	(−1.41)	(2.80)***	(2.02)**	(1.59)
2001–2005	−0.11	−0.21	−0.13	−0.09	−0.20	−0.25
	(−2.83)**	(−3.29)***	(−3.27)***	(−2.31)**	(−4.01)***	(−4.36)***
FDI × financial market	0.18	0.02	0.17	0.04	0.16	0.16
	(3.59)***	(0.26)	(3.38)***	(0.62)	(3.20)***	(2.93)***
FDI × trade	0.11	0.06	0.09	0.10	0.27	0.04
	(4.40)***	(1.32)	(2.84)***	(4.36)***	(4.01)***	(0.87)
Government	0.07	0.05	0.06	0.06	0.05	0.05
	(3.21)***	(1.60)	(3.20)***	(3.01)***	(1.91)*	(2.14)**
Financial market	−0.13	0.04	−0.12	0.03	−0.12	−0.09
	(−2.79)***	(0.55)	(−2.75)***	(0.40)	(−2.78)***	(−1.74)*
Inflation	−0.04	−0.06	−0.04	−0.04	0.03	0.01
	(−2.45)**	(−2.19)**	(−2.29)**	(−2.00)**	(0.82)	(0.24)
Foreign aid	−0.08	−0.08	−0.09	−0.09	−0.11	−0.10
	(−2.39)**	(−1.57)	(−2.89)***	(−2.51)**	(−2.45)**	(−1.47)
Secondary schooling	−0.08	−0.05	−0.08	−0.08	−0.06	−0.12
	(−2.93)***	(−1.11)	(−3.35)***	(−2.78)***	(−1.31)	(−2.90)***
Adj. R-squared	0.56	0.24	0.63	0.59	0.58	0.60
Number of estimates	838	839	754	711	540	318
Number of studies	103	103	97	75	77	39

Notes: *, **, *** denote statistical significance at the 10%, 5% and 1% levels, respectively. t-statistics reported in brackets using cluster adjusted standard errors. Precision is used to weigh each estimate, except in column 2. Country composition of the sample used was not specified in five studies, hence, these studies could not be included in the MRA. Output suppressed: only general-to-specific modelling results are presented with this table.

reasonable correction in endogeneity.[19] Thus, it is not entirely unexpected that our MRA cannot detect any significant difference between estimates that 'address' endogeneity and those that do not. The close average partial correlations in columns 1 and 5 in Table 1 reinforce this finding.

Analogously, controlling for other factors, neither panel fixed nor random effects estimators yield a divergent effect compared to (pooled) OLS. This is contrary to the strong individual heterogeneity suggested in the literature. However, this MRA finding does not mean that each economy has the same production function or follows the same growth process, rather it merely suggests that FDI does not exhibit significantly different variations in contributing economic growth across countries.

3.3.5. Data

The data differences are captured by *Single*, *Panel*, and *Length Average*, with *Cross-sectional* used as the benchmark. While some panel datasets consist of annual time series, others average the annual data, such as five-yearly averages. *Length Average* measures the number of years of annual data that are used to average the data. The growth literature presumes that cross-sectional data capture long-term effects, panel data capture medium-term (transition) effects, and annual data capture short-term effects.

Neither the use of panel data compared to cross-sectional nor the length of the period over which growth is averaged is significant in Table 2. However, the coefficient on *Single* is negative, which means that models investigating the FDI–growth effects with single-country data report, on average, smaller effects than those that use a cross-section of countries. The major feature of *Single*-country models is that they exploit only the time dimension of the data. Thus, if the presumption of cross-sectional data referring to long-term effects and time-series data referring to short-term effects is true, FDI is likely to affect growth more strongly in the long-term. Alternatively, a *Single*-country

[19] One might consider partial correlation as a measure of statistical strength of the relationship in question as reflected by the t-statistics of coefficient estimates. Considering that 2SLS is, by construction, less efficient than OLS, normally a valid instrumentation in the presence of endogeneity should indicate a lower *statistical* association between FDI and growth. In the absence of endogeneity, no correction is necessary, and a valid instrumentation is likely to approximate the OLS (i.e., true) relationship. Invalid instrumentation in the presence of endogeneity can result in the OLS estimate, and even in a *zero* statistical association in the absence of endogeneity. Efficiency of other instrument-based methods with respect to OLS (e.g., GMM), can vary depending on the number of moment conditions exploited, but the previous reasoning is also likely to hold with those methods. Therefore, one would presumably expect a lower statistical link between FDI and growth if the endogeneity problem were appropriately addressed. Note that the focus here is on the *statistical* association, not on differing magnitudes of the IV/OLS coefficient estimates, which depend not only on the discussion above, but also the direction of bias in the FDI–growth relationship.

model might reflect FDI types, motives, and other market characteristics that are too narrow to generate any significant growth.

It is worth emphasizing that in the results above that relate to single-country models, the absence of individual country heterogeneity in panel data models, as well as significant variations found of regions, are consistent with the interpretation that being larger economic units, regions are more conducive to higher growth from FDI inflows.

3.3.6. Explanatory variables

To explore the specification differences, 20 dummy variables are constructed: convergence; share of government consumption in GDP; share of investment in GDP; labour input; share of trade in GDP; financial-market development; inflation; economic freedom; democracy; political instability; foreign aid; literacy rate; average years of schooling; primary schooling, secondary schooling, higher education; FDI interacted with financial-market development; FDI interacted with years of schooling; FDI interacted with secondary schooling; and FDI interacted with trade.

The results indicate a statistically significant and positive coefficient for both *FDI* × *Financial Market* and *FDI* × *Trade*, with the implication that the partial correlation of the linear (i.e., non-interactive) FDI term is significantly higher when FDI is interacted with financial markets and trade in the respective model. This result implies that FDI's effect on growth works not only linearly, but also through its interaction with conditioning variables. Put differently, without any interaction term the model assumes that the linear FDI variable captures the total FDI effect, in which case FDI's variation in the specification, direct and joint with other variables, is not clearly teased out, leading to greater imprecision in the estimate of the linear FDI term.[20]

Controlling for the size of government results in larger effects for FDI, while controlling for financial markets, inflation, foreign aid, and secondary schooling results in robustly smaller effects. We follow Doucouliagos and Ulubasoglu (2008) in interpreting these findings. If the size of government is negatively (positively) related to growth, FDI is positively (negatively) related to larger governments. It is generally agreed that larger governments are negatively associated with growth. Thus, the MRA result implies that a higher role of FDI in the economy is associated with larger governments.[21] In contrast, models that control for financial markets report smaller FDI–growth effects. This result implies that if financial markets are positively (negatively) related to growth, FDI is positively (negatively) related to financial markets. Likewise, if inflation is positively (negatively) related to growth, the MRA suggests that FDI is positively (negatively) related to inflation. Similarly, the MRA predicts that FDI is associated with greater secondary schooling (absorptive capacity), and higher levels of foreign aid.

Importantly, domestic investment is not estimated to be significant in the MRA. This result is consistent with the fragile evidence between FDI and domestic investment (Alfaro et al., 2004; Borensztein et al., 1998), despite the arguments that FDI might crowd out the latter. Openness (the share of trade in GDP) is also statistically insignificant. The MRA does not predict a strong direct association between openness levels and FDI. It suggests that trade is a significant absorptive capacity variable for FDI.

3.3.7. Robustness

Our preferred estimates are those in column 1 of Table 2, while columns 2 to 5 are presented for sensitivity analysis of the MRA results. Column 2 presents the results when all estimates are given an equal weight (assumed to be of equal quality). Column 3 removes the top and bottom 5% of partial correlations. Not surprisingly, by removing larger observations, the fit of the model improves (the adjusted R-squared rises from 0.56 to 0.63). Column 4 uses all studies except those that use data for a single country, leaving cross-sectional and panel data studies. From developing countries' perspective, the most appropriate sample for analysis is FDI from industrial countries into developing countries. Hence, in column 5 of Table 2, the dataset is restricted to those estimates that only include FDI into developing countries. Column 6 of Table 2 restricts the data specifically to those estimates that controlled for both domestic capital and convergence.

These robustness checks also confirm the statistical significance of FDI–growth effect. The constant term (β_0) with an estimated value of 0.11 is similar to the result in column 1 of Table 1. This average abstracts from heterogeneity and is derived without controlling for the effects of specification. With the average partial correlation between FDI and growth, the result in Table 2 suggests that the multivariate MRA captures all the overall FDI–growth effect found earlier, and further, deviations from this effect can be attributed to other factors, with the attached coefficients indicating the extent of such effects at work. Importantly, column 4 of Table 2 demonstrates that the *FDI* × *Financial Market* result disappears when models estimated using data from *Single* countries are excluded from the MRA. Given that single-country models exploit only the time dimension of the data; this finding might suggest that the FDI-financial markets' interaction matters for growth more strongly over time.[22] Overall, this finding suggests that the interaction between *FDI* × *Financial Market* matters for growth, but the effect is likely to work under some nuanced circumstances.

Two important differences emerge when only the estimates from developing countries are used. First, the coefficient on *Lagged FDI* is smaller. Second, the coefficient on *FDI* × *Trade* is significantly larger (0.27 compared to 0.11). Models estimated using data from developing countries, which ignore this interaction, find a lower partial correlation for the linear FDI term. The marginal contribution of this term to growth is greater when FDI is interacted with trade in the sample of developing countries. Conversely, *Lagged FDI* is insignificantly different from contemporaneous FDI when convergence and domestic investment are controlled jointly in the FDI–growth models.

4. Econometric analysis and results

This section aims to cross-check the MRA findings with a global dataset that covers nearly 140 countries over the period 1970 to 2009. The principal objective here is to explore whether econometric evidence is consistent with the MRA evidence in terms of the direction of effects. A *one-to-one* match between the magnitudes of partial correlations indicated by the MRA and econometric analysis might not be possible given a number of issues that cannot be modelled with the MRA.

4.1. Benchmark specification

The MRA results above suggest that panel dataset exhibits no difference compared to cross-sectional dataset, and estimator type does not matter relative to (pooled) OLS. Time and regional variations are important. Thus, our benchmark empirical formulation is a pooled OLS estimation of five-year averaged panel data where period-specific and region-specific effects are controlled. FDI/GDP and real GDP growth

[20] The increased partial correlation of the linear FDI term after controlling for FDI's interactions in the regression can be due to either the reduced regression error variance (i.e., lower uncertainty in the model), or the increased sum of squares for FDI, such that the variation related to FDI's direct effect is 'cleaned' once its joint variation with conditional variables is considered. In both cases, this result signals the relevance of FDI's interaction effect in the model.

[21] The effect of FDI when government is not included in a growth model is +0.11, rising to +0.18 when government is included in the model. This implies that there is an indirect effect of FDI and government on growth: FDI is associated with larger governments, which in turn reduces growth.

[22] It seems plausible to assume that an insignificant *FDI* × *Financial Market* interaction in the primary regression is likely to lead to no change in the partial correlation of the linear FDI term. Thus, the total FDI effect is likely will be captured by the linear FDI term.

per capita are FDI and economic growth measures, respectively. We estimate the variants of:

$$Y_{it} = \delta_0 + \delta_1 FDI_{it} + \gamma_1 A_{it} + \gamma_2 FDI_{it} \times A_{it} + \theta X_{it} + \eta_i + \tau_t + \varepsilon_{it}. \quad (1)$$

where, for country i and time period t, Y is growth in real GDP per capita, FDI is the share of FDI in GDP, **A** is a vector of absorptive capacity variables including financial development and trade openness, **X** is a vector of other controls, η is a vector of 10 regional dummies, τ denotes time period dummies and ε is the error term. Data descriptions and sources provided are in Appendix C.

It must be noted that this model would capture the *within-region variation* in the FDI–growth association consistent with the MRA finding that regional variation matters more for the relationship. The model might not reflect the best growth process that a country might follow, but the MRA suggests that the FDI–growth relationship is more likely to emerge significant if the unit of analysis is regions, rather than countries.[23] As for the estimation method, it is unclear whether the OLS estimation would provide the causal link between FDI and growth given our strong priors on endogeneity of FDI. We address this issue through a dynamic panel estimation below following the pooled OLS analysis.

Column 1 of Table 3a reports the result of the most basic model with FDI as the only explanatory variable, estimated using 807 observations from 181 countries for the period 1970–1999.[24] Strikingly, the partial correlation between FDI and growth is found to be 0.11, which is exactly the same as β_0 as reported in column 1 of Table 2. The estimated coefficient suggests that, on average, a 1% increase in FDI/GDP in a country is associated with 0.23% higher growth compared to another country in the same region. Column 2 of Table 3a presents the results with predicted benchmark specification that includes all the significant explanatory variables found in the MRA.[25, 26] The partial correlation of the linear FDI term is estimated to be 0.15, while its coefficient is 0.46, significant at 1%. *FDI* × *Financial Market* has an insignificant coefficient and *FDI* × *Trade* has a negative coefficient significant at 5%.

The subsequent columns make a series of perturbations to column 2 of Table 3a and demonstrate the manner in which the FDI–growth relationship varies, with a focus on benchmark partial correlation of 0.15. Column 3 of Table 3a excludes *Financial Market* and column 4 removes *FDI* × *Financial Market* as well. Consistent with the MRA finding in column 4 of Table 2, these do not yield a different result for linear FDI. Excluding *FDI* × *Trade* in column 5 of Table 3a reduces the partial correlation of linear FDI to 0.10, which is another finding consistent with the MRA. The coefficient for the linear FDI term is reduced from 0.46 to 0.30, significant at 5%. This reduction in the coefficient is anticipated because removing an interaction with a negative effect would assign that effect, at least partly, to the remaining non-interactive FDI term, reducing its coefficient size. Nevertheless, the negative sign of *FDI* × *Trade* is surprising, and thus, will be explored below. Continuing with the perturbations, excluding government size, inflation, and secondary schooling in columns 6, 7 and 8, respectively, yields FDI–growth partial correlations of 0.13, 0.16, and 0.15. Coefficient of the linear FDI term varies between 0.41 and 0.52, being significant at the 1% level. The direction of the changes in partial correlation in columns 6 and 7 is also consistent with MRA, while removal of schooling does not produce a different partial correlation. Column 9 runs the regression with observations for which lagged FDI is available, while column 10 actually uses lagged FDI instead of contemporaneous FDI. With the latter, the partial correlation of the linear FDI term decreases to 0.08 and its coefficient reduces from 0.36 to 0.25, with the significance level decreasing from 1% to 10%. Again, this result concurs with the MRA finding. Finally, column 11 adds the 2000–2004 period to the sample, and the linear FDI term is estimated with a partial correlation of 0.10. This reduction in the effect is also predicted by the MRA. The estimated coefficient is 0.36, which is significant at 1%.

Table 3b excludes different groups of countries from the sample. Restricting the focus to developing countries only, column 1 yields a partial correlation of 0.17. Compared to the partial correlation of 0.15 in column 2 of Table 3a, this is not a major difference for the effect of linear FDI, a result predicted by the MRA. Column 2 removes *FDI* × *Trade* in the sample of developing countries, while column 3 uses lagged FDI in the same sample. Reductions in partial correlations are precisely what are predicted by column 4 of Table 2. Columns 4 to 10 of Table 3b remove regions in the world one by one. Increased partial correlation upon the removal of Middle East is in line with the MRA finding, though contrary to prediction, removal of Europe and South-East Asia does not create a great difference. An important result, which is not detected with the MRA is the reduced partial correlation (0.11) when Africa is excluded from the sample. Finally, removal of other regions does not make a major difference in the results, which is again in line with the MRA results.

Overall, these findings largely confirm the direction of the effect between linear FDI and growth predicted by the MRA, though magnitudes of changes in partial correlations are somewhat smaller. The latter is not surprising because all the predictions of MRA (such as *Single*) cannot be fitted. With all these findings, we surmise that the benchmark specification proposed by the MRA can greatly alleviate model uncertainties.

4.2. Extending the benchmark model

We now extend the benchmark specification to fit better more recent data to the cross-country FDI–growth relationship. The most important extension is the modelling of non-linearity pertaining to the interaction effects of FDI with financial markets and trade openness, which is motivated by the negative, though generally insignificant, coefficients of *FDI* × *Financial Market* and *FDI* × *Trade* in Table 3a. Retaining the 1970–1999 sample for comparability, estimated coefficients in column 1 of Table 4 point to the presence of non-linearity in the form of inverted-U effect for FDI and financial-market interaction and a U-shaped interaction for FDI and trade openness. Although some interactions fall short of being significant at conventional levels, estimated coefficients imply that FDI contributes more to growth at higher levels of financial development, but this effect weakens at very high levels of the latter. In contrast, FDI contributes negatively to economic growth at low levels of trade openness, but this effect tapers off at higher levels of openness. The linear FDI term in the model is strongly significant at 1%.

Subsequent columns of Table 4 check the sensitivity of these findings. Column 2 includes log initial income and investment in the specification. Columns 3 and 4 estimate the models in columns 1 and 2, respectively, with the extended 1970–2009 sample. Using this sample and the full model in column 4, column 5 clusters the standard errors at the region level. Column 6 removes FDI disinvestments, and finally, column 7 'prunes' the outliers in financial development and trade-openness variables. It is clear that these outliers adversely influence the statistical significance of the non-linear interaction terms such that their removal makes all concerned point estimates strongly significant at 1% to 5%. Hence, with several measures taken, MRA predictions accounted for, and the latest data covered, column 7 can be considered as the 'gold standard' FDI–growth model, and therefore, its coefficients can be used for numerical implications.

[23] Equation (1) is a regional production function or a regional growth process (except it does not include physical investment at present).

[24] The period ends for now in 1999 to mimic the time span of the majority of studies in the MRA sample.

[25] Foreign aid is excluded here because it results in a huge sample loss, but its inclusion otherwise does not change the main thrust of the results.

[26] Data availability on right-hand side reduces the sample to 630 and the number of countries to 136 here. However, in another striking (unreported) piece of evidence, the basic specification as in column 1, using this particular sample yields the same partial correlation of 0.11 as when 181 countries were utilised.

Table 3
Cross-checking MRA.

a

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
	Dependent variable: growth of real GDP per capita										
FDI	0.227***	0.456***	0.410***	0.408***	0.296**	0.408***	0.517***	0.456***	0.364***		0.359***
	(3.140)	(3.716)	(3.671)	(3.606)	(2.531)	(3.235)	(4.076)	(3.710)	(3.191)		(2.862)
Fin. dev.		0.00248		−0.00170	0.00354	0.000278	0.00546	0.00263	−0.00125	−0.00220	−0.00204
		(0.437)		(−0.326)	(0.606)	(0.0484)	(0.924)	(0.475)	(−0.235)	(−0.426)	(−0.386)
FDI ∗ fin. dev.		−0.00223			−0.00328**	−0.00193	−0.00252	−0.00223	−0.00112		−0.00212*
		(−1.503)			(−2.380)	(−1.221)	(−1.609)	(−1.502)	(−0.971)		(−1.743)
Trade open.		0.0109***	0.0122***	0.0122***	0.00702**	0.00863**	0.0129***	0.0110***	0.0131***	0.0122***	0.0109***
		(2.624)	(3.203)	(3.202)	(2.201)	(2.270)	(3.028)	(2.629)	(3.098)	(2.974)	(2.885)
FDI ∗ trade open.		−0.00139**	−0.00202***	−0.00200***		−0.00119*	−0.00163**	−0.00139**	−0.00138**		−0.000912*
		(−2.044)	(−3.208)	(−3.130)		(−1.778)	(−2.319)	(−2.044)	(−2.202)		(−1.652)
Gov't size		−0.0519**	−0.0458*	−0.0446*	−0.0449*		−0.0643**	−0.0518**	−0.0615**	−0.0551**	−0.0342
		(−2.033)	(−1.831)	(−1.755)	(−1.811)		(−2.403)	(−2.038)	(−2.450)	(−2.205)	(−1.017)
Inflation		−0.00194***	−0.00196***	−0.00197***	−0.00198***	−0.00200***		−0.00194***	−0.00155***	−0.00159***	−0.00213***
		(−6.577)	(−6.569)	(−6.542)	(−6.593)	(−6.585)		(−6.536)	(−9.288)	(−10.13)	(−5.091)
Sec. schooling		0.00161	−0.000711	0.000761	0.00387	0.00110	−0.00301		0.0203	0.0235	0.0133
		(0.0923)	(−0.0425)	(0.0436)	(0.220)	(0.0630)	(−0.160)		(1.381)	(1.573)	(0.887)
Lagged FDI										0.246*	
										(1.760)	
Lagged FDI ∗ fin. dev.										−0.00145	
										(−0.953)	
Lagged FDI ∗ trade open.										−0.000747	
										(−1.026)	
Constant	3.364***	2.736***	3.738***	3.823***	3.749***	2.150**	2.781***	3.757***	2.358***	2.819***	2.740***
	(7.155)	(3.000)	(4.878)	(4.676)	(4.418)	(2.360)	(2.969)	(4.691)	(2.759)	(3.616)	(3.500)
No. of observations	807	630	631	631	630	630	630	630	513	513	768
Adj. R-squared	0.227	0.308	0.304	0.305	0.304	0.303	0.270	0.308	0.267	0.255	0.256
No. of countries	181	136	136	136	136	136	136	136	133	133	140
FDI part. corr. (linear term)	0.11	0.15	0.15	0.14	0.10	0.13	0.16	0.15	0.14	0.08	0.10
Sample period	1970–99	1970–99	1970–99	1970–99	1970–99	1970–99	1970–99	1970–99	1970–99	1970–99	1970–2004

Robust t-statistics in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. Five-year averaged panel.

b

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	Dependent variable: growth of real GDP per capita									
FDI	0.475***	0.388***		0.478***	0.570***	0.509***	0.358**	0.438***	0.418***	0.405***
	(3.612)	(2.779)		(3.614)	(4.485)	(3.293)	(2.273)	(3.314)	(3.469)	(3.571)
Fin. dev.	0.0207	0.0237*	0.0170	0.00434	0.00520	0.000598	−0.00433	−0.000149	0.00802	−0.000127
	(1.610)	(1.926)	(1.482)	(0.527)	(0.923)	(0.101)	(−0.681)	(−0.0255)	(1.268)	(−0.0244)
FDI ∗ fin. dev.	−0.00418	−0.00517**		−0.00176	−0.00292*	−0.00171	−0.00351**	−0.00120	−0.00212	−0.00140
	(−1.457)	(−2.162)		(−0.696)	(−1.827)	(−1.039)	(−2.277)	(−0.749)	(−1.429)	(−1.120)
Trade open.	0.00584	0.00299	0.00607	0.00743	0.0135***	0.00943**	0.00352	0.0124**	0.0137***	0.0134***
	(1.018)	(0.686)	(1.202)	(1.403)	(3.221)	(2.055)	(0.828)	(2.578)	(3.134)	(3.260)
FDI ∗ trade open.	−0.000848			−0.00134*	−0.00176***	−0.00191*	−0.000122	−0.00179**	−0.00130*	−0.00153**
	(−1.015)			(−1.674)	(−2.592)	(−1.828)	(−0.209)	(−2.197)	(−1.882)	(−2.372)
Gov't size	−0.0510	−0.0476	−0.0478	−0.0432	−0.0733***	−0.0476*	−0.0211	−0.0379	−0.0633**	−0.0627**
	(−1.600)	(−1.517)	(−1.579)	(−1.461)	(−2.895)	(−1.817)	(−0.586)	(−1.323)	(−2.451)	(−2.550)
Inflation	−0.00192***	−0.00194***	−0.00162***	−0.00196***	−0.00189***	−0.00193***	−0.00248***	−0.00241***	−0.00188***	−0.00149***
	(−6.380)	(−6.374)	(−10.10)	(−6.479)	(−6.390)	(−6.598)	(−3.918)	(−3.024)	(−6.640)	(−7.551)
Sec. schooling	0.00741	0.0101	0.0373	0.0140	0.00581	0.00592	−0.0174	−0.00116	−0.00570	0.0182
	(0.269)	(0.367)	(1.618)	(0.584)	(0.327)	(0.336)	(−0.926)	(−0.0636)	(−0.323)	(1.303)
Lagged FDI			0.289**							
			(2.027)							
Lagged FDI ∗ fin. dev.			−0.00570*							
			(−1.774)							
Lagged FDI ∗ trade open.			0.000426							
			(0.447)							
Constant	1.042	1.254	−0.0619	2.996***	2.546***	3.647***	4.221***	3.657***	3.611***	3.607***
	(0.876)	(1.061)	(−0.0600)	(2.947)	(2.676)	(4.251)	(3.894)	(4.013)	(4.152)	(4.415)
No. of observations	476	476	384	522	584	598	440	501	612	591
Adj. R-squared	0.300	0.298	0.260	0.290	0.352	0.295	0.349	0.325	0.309	0.263
No. of countries	109	109	106	107	127	128	99	112	131	115
FDI part. corr. (linear term)	0.17	0.13	0.11	0.16	0.19	0.14	0.11	0.15	0.14	0.15
Sample excludes	Developed	Developed	Developed	Europe	Middle East	S. East Asia	Africa	LAC	East Asia	CEEC

Robust t-statistics in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. Time period: 1970–1999. Five-year averaged panel.

Table 4
MRA-informed econometric analysis — pooled OLS.

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Dependent variable: growth of real GDP per capita						
FDI	0.475**	0.437**	0.487***	0.387***	0.387***	0.382**	0.758***
	(2.452)	(2.317)	(2.951)	(2.649)	(3.846)	(2.971)	(4.740)
Fin. dev.	0.0361***	0.0260*	0.0236**	0.0166	0.0166**	0.0212**	0.0181***
	(2.704)	(1.922)	(2.149)	(1.484)	(2.334)	(2.417)	(3.551)
Fin. dev. sq.	−0.0003***	−0.0002***	−0.0002***	−0.0002***	−0.0002***	−0.0002***	−0.0002***
	(−3.388)	(−2.625)	(−3.880)	(−3.037)	(−3.782)	(−3.849)	(−7.856)
FDI ∗ fin. dev.	0.00159	0.00399	−0.00152	−0.000138	−0.000138	−0.000504	−0.00135*
	(0.484)	(1.112)	(−0.872)	(−0.0801)	(−0.0667)	(−0.219)	(−1.785)
FDI ∗ fin. dev. sq.	−3.07e−05	−3.99e−05**	7.21e−06	2.02e−06	2.02e−06	5.00e−06	9.72e−06***
	(−1.624)	(−1.985)	(0.842)	(0.238)	(0.251)	(0.543)	(3.765)
Trade open.	0.00170	0.00301	0.00180	−0.00135	−0.00135	−0.00746	−0.0170*
	(0.126)	(0.219)	(0.220)	(−0.168)	(−0.127)	(−0.707)	(−1.724)
Trade open. sq.	3.76e−05	2.38e−05	3.35e−05	3.10e−05	3.10e−05	6.07e−05*	0.000169**
	(0.601)	(0.380)	(1.030)	(1.023)	(0.805)	(1.850)	(2.895)
FDI ∗ trade open.	−0.00225	−0.00327	−0.00252*	−0.00250**	−0.00250**	−0.00218**	−0.00921***
	(−0.916)	(−1.363)	(−1.830)	(−2.056)	(−3.015)	(−2.341)	(−5.191)
FDI ∗ trade open. sq.	9.80e−07	3.86e−06	1.70e−06	2.53e−06	2.53e−06	7.88e−07	2.82e−05***
	(0.121)	(0.482)	(0.555)	(0.939)	(0.952)	(0.313)	(4.455)
Gov't size	−0.0600**	−0.0860***	−0.0287	−0.0425	−0.0425	−0.0394	−0.0600**
	(−2.138)	(−2.815)	(−0.885)	(−1.240)	(−1.652)	(−1.496)	(−2.467)
Inflation	−0.00187***	−0.00182***	−0.00215***	−0.00209***	−0.00209**	−0.00213**	−0.00107***
	(−6.300)	(−5.641)	(−4.828)	(−4.296)	(−2.666)	(−2.720)	(−3.793)
Sec. schooling	0.00206	0.00380	0.00251	0.00726	0.00726	0.00839	0.0149
	(0.117)	(0.195)	(0.205)	(0.571)	(0.674)	(0.870)	(1.399)
Log in. income		−0.216		−0.318**	−0.318*	−0.347*	−0.279*
		(−1.068)		(−2.181)	(−2.245)	(−2.012)	(−1.965)
Inv.		0.108***		0.137***	0.137***	0.145***	0.124***
		(4.126)		(5.419)	(8.563)	(11.69)	(9.032)
Constant	2.321**	2.988*	3.479***	2.881**	2.881	4.351**	4.408**
	(2.297)	(1.816)	(4.577)	(2.253)	(1.778)	(2.566)	(2.954)
Sample period	1970–1999	1970–1999	1970–2009	1970–2009	1970–2009	1970–2009	1970–2009
Clustered S.E.	No	No	No	No	Yes	Yes	Yes
FDI disinvestments	Included	Included	Included	Included	Included	Removed	Removed
Outliers	Included	Included	Included	Included	Included	Included	Removed
No. of observations	630	599	907	871	871	836	790
No. of countries	136						137
Adj. R-squared	0.327	0.375	0.256	0.312	0.312	0.323	0.315

Robust t-statistics in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. Five-year averaged panel. Period- and 10 different regional effects controlled throughout the regressions. Standard errors clustered at regional level where indicated. FDI disinvestments refer to negative FDI figures. Outliers refer to trade share in GDP greater than 200%.

Fig. 2 traces the effect of FDI on growth across different values of financial development. The solid line in the figure confirms the inverted-U-shaped effect of FDI whereby the dashed lines portray the confidence intervals of this effect.[27] FDI's influence on growth is generally positive (i.e., above the zero line). Considering the bottom band of the confidence interval, FDI has a strictly positive and statistically significant effect on growth below the financial development level of 116% and a statistically insignificant effect beyond. More than 95% of the financial development observations in our sample are below 116%, meaning only a small number of countries experience an insignificant effect. FDI's influence on growth attains its highest level when financial development is 54%. Weakening FDI effectiveness at higher levels of financial development can occur when financial markets become increasingly selective about supporting the domestic sector for projects, which would in turn hinder the backward and forward linkages within the host economy. Conversely, portraying FDI's effect on growth for different levels of trade openness, Fig. 3 confirms the U-shaped relationship predicted by the relevant coefficients in column 7 of Table 4.[28] FDI has a strictly positive influence on growth below the trade openness level of 114% and an insignificant effect beyond. Approximately 85% of trade openness observations in our sample are lower than 114%. Despite being positive for the large part of the sample, reduced FDI effectiveness on growth as the level of trade openness increases might indicate that FDI and openness become substitutes when trade becomes substantive, such that openness cancels out FDI's effect. This outcome can arise when factors such as foreign and domestic trading firms compete for scarce resources within the host economy, or foreign firms have a motive to exploit the cheap domestic labour or natural resources.

4.3. Dynamic panel data estimation

Our econometric investigation so far does not address any endogeneity between FDI and economic growth. Although this approach is in line with the MRA predictions, reverse causality from growth to FDI is an important consideration in the said relationship. In this section we address the endogeneity problem through a dynamic panel estimation of the FDI–growth relationship. This approach can also be considered as an 'external validation' of the 'gold standard' model predicted by the MRA to a different econometric approach.[29]

[27] FDI's effect is evaluated at median trade openness in the respective sample (65.2%). Standard errors to construct the confidence intervals are obtained with the 'delta method'.

[28] FDI's effect is evaluated at median financial development in the respective sample (28.99%). Standard errors to construct the confidence intervals are obtained with the 'delta method'.

[29] Normally it is preferable that the endogeneity is addressed through a strong instrument that approximates a randomized experiment, and in turn, captures an exogenous shock in FDI. However, different instruments provide different local average treatment effects, and countries may not respond to such treatments in a comparable way. Hence, we opt to extend Eq. (1) to a dynamic panel data model.

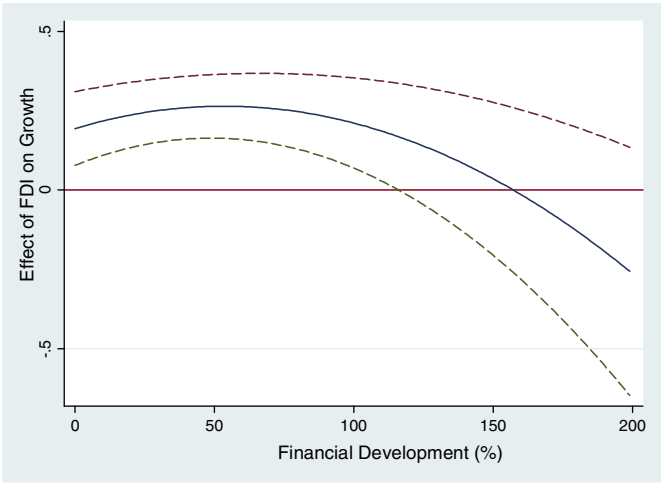

Fig. 2. The effect of FDI on economic growth contingent on financial development.

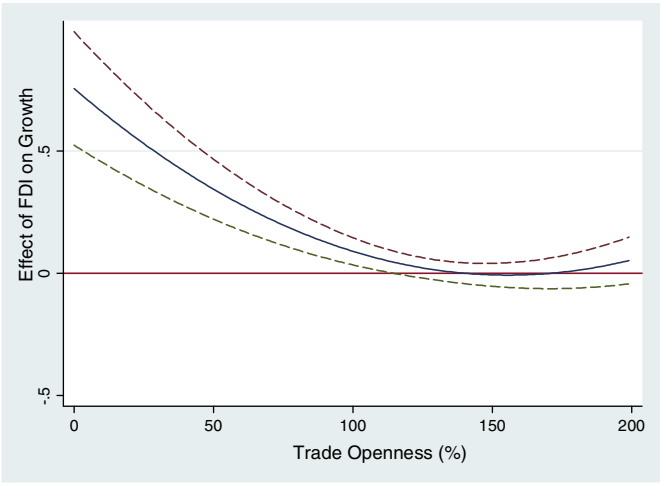

Fig. 3. The effect of FDI on economic growth contingent on trade openness.

Note that the dynamic panel approach introduces three additional changes to the MRA predictions above: a focus on income level (rather than growth), accounting for persistence in income level, and a focus on within-country rather than within-region variation. If our MRA results are correct, then a within-country focus should not make a difference to the results compared to the within-region focus. Size of the estimated coefficient of the lagged dependent variable $ln(y_{t-1})$ will determine how far we are apart from the MRA specification, given that the growth focus (i.e., $ln(y_t) - ln(y_{t-1})$) assumes a coefficient of 1 for $ln(y_{t-1})$.[30]

Table 5 documents the results. Column 1 replicates the 'gold standard' model in a dynamic panel setting, which is estimated with system-GMM method (Blundell and Bond, 1998). Column 2 estimates the same model only in differences (Arellano and Bond, 1991), while columns 3 to 10 replicates column 1 for developing countries, and when seven different regions are excluded from the global sample one by one. All of our estimations pass the standard dynamic panel tests of Hansen's overidentification and autocorrelation.

The results are striking. First, the 'gold standard model' predicted by the MRA above is reasonably robust to this econometric approach given the fact that the sign and significance of the explanatory variables are generally consistent with the previous findings. In particular, FDI alone has a positive and statistically significant coefficient globally, which is robust across all model variations in Table 5, indicating that a 1% increase in FDI's share in GDP in a given five-year period leads to about 6–7% growth in the income level. Second, absorptive capacity is still important, with trade openness being the most robust indicator globally as seen through its strongly significant interaction with FDI across different models in Table 5. The U-shaped effect of FDI on growth based on different levels of trade openness still holds. Financial development is estimated to be a significant absorptive capacity in a global sample that excludes Sub-Saharan Africa. Third, the factor inputs of schooling and physical capital investment are statistically significant and have positive coefficients, as expected in the country-specific standard production function. These results endorse our 'gold standard' FDI–growth model as robust to endogeneity treatment through dynamic panel estimation.

From a different perspective, it is not entirely surprising that our dynamic panel estimation results are aligned with the MRA predictions. The fact that the coefficient of the lagged dependent variable is estimated to be around 0.95 indicates that our dynamic panel estimation still approximates a growth process, which was the focus of the MRA.

5. Discussion and conclusions

The effect of FDI on economic growth has been of significant interest for decades. FDI is said to be an important source of savings and capital accumulation for the host economy, creating positive spillovers, facilitating labour training and backward and forward linkages across sectors, as well as being a conduit for the transfer of technology and organisational knowhow. A corpus of cross-country empirical literature has analysed the FDI–growth relationship, delivering mixed results. This has raised the question: do theoretical predictions point towards a real relationship, or are the perceived effects of FDI only wishful thinking? The analysis in this paper sought to bridge the gap in the literature on the FDI–growth relationship.

This paper makes three major contributions to the FDI literature. First, we offer the first quantitative assessment of the global FDI–growth relationship using 880 estimates drawn from 108 published studies. These estimates refer to almost the whole population of published results in the literature. Second, we conduct econometric investigation using the benchmark specification suggested by the MRA results. Using data from a global sample of 140 countries over the period 1970 to 1999, our empirical analysis in a subsequent step indeed corroborates several variations predicted by the MRA related to different results in econometric studies. This suggests that, considering the accumulated evidence in its entirety, accounting for variations exhibited by numerous models, and netting out the effects of sampling error, the MRA can permit a specification that can best fit the FDI–growth relationship. Finally, exploiting the implied model and covering the period 1970 to 2009, our own econometric analysis in the final step yields "informed" results for the FDI–growth linkage.

Our approach conclusively suggests that voluntary exchanges reflected in FDI do generate economic growth. Moreover, we identify five new and important results regarding the cross-country FDI–growth relationship. First, the FDI–growth relationship exhibits stronger within-region variation than within-country variation. That is, a region, as a larger unit, might host sufficiently different types of FDI that in turn demonstrate greater ability to enhance growth. Second, robust absorptive capacity variables are financial development and trade openness. Further, these two variables exhibit non-linearities in their absorptive capacity, such that FDI's positive effect on growth tapers off at very high levels of the latter two. Still, this finding suggests that theoretical predictions regarding FDI's positive effect on growth seem to rest a great deal on the absorptive capacity of the economy.

[30] We treat all the explanatory variables as endogenous and accordingly, use 'gmmystyle' instruments within the dynamic panel data context. We pay careful attention to standard dynamic panel analysis issues, such as the credibility of Hansen's and autocorrelation (AR) tests. Following the rule of thumb, our number of instruments are lower than the number of country groups in regressions. Our 'laglimits' are three to six, and we 'collapse' the instrument matrix in Stata.

Table 5
Dynamic panel data analysis – System GMM Estimation – 1970–2009.

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	Dependent variable: level of real GDP per capita									
Lagged dep. var.	0.958***	0.440***	0.978***	0.957***	0.949***	0.947***	0.971***	0.955***	0.947***	1.008***
	(38.96)	(3.888)	(52.45)	(31.88)	(36.25)	(38.18)	(38.02)	(37.29)	(41.29)	(52.65)
FDI	0.0612***	0.0611***	0.0541**	0.0556**	0.0565***	0.0663***	0.0735***	0.0597***	0.0718***	0.0642***
	(3.853)	(3.782)	(2.264)	(2.520)	(3.155)	(4.006)	(3.444)	(4.501)	(5.586)	(4.120)
Fin. dev.	0.00448***	0.00688***	0.00261*	0.00335***	0.00402***	0.00477***	0.00593***	0.00495***	0.00537***	0.00327***
	(3.628)	(2.702)	(1.729)	(3.046)	(3.109)	(3.522)	(3.207)	(3.868)	(3.824)	(2.851)
Fin. dev._sq.	−0.00002***	−0.00003***	−0.00001	−0.00002***	−0.00002***	−0.00002***	−0.00003***	−0.00002***	−0.00003***	−0.00002***
	(−3.988)	(−2.794)	(−1.098)	(−3.127)	(−3.631)	(−3.831)	(−3.385)	(−4.198)	(−3.670)	(−3.296)
FDI ∗ fin. dev.	−0.000135	−8.45e−06	−2.02e−05	−7.04e−05	2.20e−05	−0.000143	−0.0008**	−0.000158	−0.000154	−0.000210
	(−0.929)	(−0.0345)	(−0.145)	(−0.488)	(0.151)	(−0.966)	(−2.397)	(−1.193)	(−1.046)	(−1.602)
FDI ∗ fin. dev. sq.	6.98e−07	6.47e−07	2.68e−07	2.75e−07	−4.62e−08	6.46e−07	3.56e−06*	7.79e−07	9.44e−07	9.30e−07
	(1.046)	(0.599)	(0.292)	(0.427)	(−0.0712)	(0.968)	(1.846)	(1.254)	(1.265)	(1.523)
Trade open.	−0.00387*	0.00275	−0.00152	−0.00262	−0.00502**	−0.00426**	−0.00314	−0.00445*	−0.00247	−0.000238
	(−1.889)	(0.891)	(−0.761)	(−1.149)	(−2.327)	(−1.983)	(−1.504)	(−1.936)	(−1.129)	(−0.135)
Trade open. sq.	1.78e−05*	−4.98e−06	9.52e−06	1.31e−05	2.30e−05**	2.22e−05**	1.57e−05*	1.83e−05*	1.08e−05	2.03e−06
	(1.930)	(−0.410)	(0.961)	(1.221)	(2.314)	(2.264)	(1.652)	(1.796)	(1.118)	(0.259)
FDI ∗ trade op.	−0.0007***	−0.0008***	−0.0006	−0.0006*	−0.0007***	−0.0008***	−0.0004*	−0.0006***	−0.0009***	−0.0007***
	(−3.755)	(−4.386)	(−1.476)	(−1.659)	(−3.108)	(−4.272)	(−1.811)	(−3.524)	(−5.527)	(−4.048)
FDI ∗ trade op. sq.	2.4e−06***	2.5e−06***	1.81e−06	1.75e−06	2.08e−06**	2.78e−06***	1.22e−06	1.9e−06***	2.9e−06***	2.4e−06***
	(3.229)	(3.032)	(0.903)	(0.960)	(2.443)	(3.930)	(1.533)	(2.876)	(4.620)	(3.599)
Gov't size	−0.00186	−0.000801	−0.00543	−0.00373	−0.000658	−0.00358	−0.00537	−0.00194	−0.000893	−0.00197
	(−0.527)	(−0.162)	(−1.525)	(−1.085)	(−0.184)	(−0.892)	(−1.078)	(−0.591)	(−0.250)	(−0.860)
Inflation	−0.000165	0.000121	−0.000126	−0.000111	−0.000151	−0.000167	−0.000202	−0.000203	−0.000174	−1.39e−05
	(−1.345)	(1.362)	(−1.531)	(−1.143)	(−1.321)	(−1.386)	(−1.311)	(−1.104)	(−1.370)	(−0.186)
Sec. schooling	0.00303**	0.0166***	0.000803	0.00263**	0.00356***	0.00378***	9.63e−05	0.00340**	0.00309**	−0.000220
	(2.436)	(3.255)	(0.757)	(2.019)	(2.666)	(2.999)	(0.101)	(2.501)	(2.407)	(−0.174)
Inv.	0.00914***	0.00492	0.0108***	0.0101***	0.00924***	0.00910***	0.0104**	0.00995***	0.00958***	0.00841***
	(3.337)	(1.281)	(3.229)	(3.526)	(3.153)	(3.115)	(2.568)	(3.397)	(2.739)	(3.341)
No. of observations	736	616	556	609	691	699	521	593	713	670
No. of countries	137	135	110	118	126	129	99	114	133	116
Hansen's J	0.259	0.116	0.149	0.197	0.172	0.232	0.176	0.341	0.149	0.236
AR(3)	0.437	0.361	0.136	0.155	0.698	0.385	0.525	0.208	0.653	0.178
No. of instruments	90	89	104	90	90	90	90	90	90	90
Avg. no. of obs. for each country	5.372	4.563	5.055	5.161	5.484	5.419	5.263	5.202	5.361	5.776
Level + difference equation	Yes	Only diff. eq.	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Sample excludes	–	–	Developed	Europe	Middle East	Southeast Asia	Africa	LAC	East Asia	CEEC

Robust z-statistics in parentheses. Standard errors clustered at the country level. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. All regressions include period dummies. Five-year averaged panel over 1970–2009. Because we use lag limits three to six, the relevant autocorrelation test is AR(3).

Third, it is contemporaneous, not lagged, FDI that contributes more strongly to economic growth. Fourth, higher levels of FDI are associated with larger governments, more developed financial markets, lower inflation, higher levels of schooling, and higher levels of foreign aid. Fifth, the FDI–growth relationship holds globally as strongly as in developing countries because, contrary to theoretical predictions, no evidence is found that FDI benefits developing countries significantly more than countries in the developed world. These results are robust to 'external validation' facilitated by the dynamic panel estimation that also addresses the endogeneity problem in the FDI–growth relationship.

What are the implications for policy and future research? Alfaro et al. (2004) argue that the lack of development of local financial markets and human capital can adversely limit an economy's ability to take advantage of potential FDI benefits. The results of our paper suggest that while FDI increases growth, the full benefits of FDI might not be realised in the absence of well-functioning financial markets, higher levels of international trade. Policymakers in host countries should aim to improve local conditions to attract FDI inflows, since better local conditions not only attract foreign companies but also allow host economies to maximise the benefits of foreign investments.

This paper has focused on the FDI–growth relationship at the country level. It is important to note that the full gamut of theoretical predictions for the growth-enhancing effects of FDI, such as spillovers, externalities and technology transfer, is difficult to capture in cross-country models. Some modelling facts, especially the use of reduced-form specifications, coupled with sampling error and real variations in the relationship, also seem to undermine the functionality of the cross-country data. Nevertheless, our cross-country analysis detects a macroeconomic effect arising from essentially microeconomic actions. These suggest that while cross-country data should not necessarily be disregarded, the economic effects of FDI are likely to be stronger and more noticeable in the more disaggregated sectors of the economy.

Appendix A. Supplementary data

Supplementary data to this article can be found online at http://dx.doi.org/10.1016/j.econmod.2015.08.009.

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