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Does the worldwide shift of FDI from manufacturing to services accelerate economic growth? A GMM estimation study

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A B S T R A C T

We examine the effect of manufacturing and service FDI (foreign direct investment) on their own sector growth, the spillover to the other sectors and the overall economy in host countries. We identify significant sectoral and inter-industry spillover effects with various data classifications and types of FDI flows. Evidence reveals that growth effect of manufacturing FDI operates by stimulating activity in its own (manufacturing) sector and is prevalent in Latin America-Caribbean, in Europe-Central Asia, middle to low-income countries and economies with large industry share. A surge of service FDI is likely to spur growth in service industries but hurt activity in manufacturing industries. Financial service FDI enhances growth in South-East Asia and the Pacific, high income countries and service-based economies by stimulating activity in both manufacturing and service sectors. However, nonfinancial service FDI drains resources and hurts manufacturing industry in the same group of countries. We conclude that a shift from manufacturing to service FDI is likely to lead to deindustrialization in certain regions and types of economies if this shift is spearheaded by nonfinancial FDI.

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1. Introduction

The foreign direct investment (FDI) continues to tantalize researchers and governments because of its anticipated spillovers on economic growth, which make it a stable development engine. Growth oriented governments of emerging economies and developing countries have been competing to entice foreign capital with various attractive schemes. Now FDI stands as the most important foreign financing in these economies. A further recent development in international capital flows is the emergence of service FDI which has been gradually supplanting the traditional manufacturing FDI. The main issue at the present is whether this shift is beneficial to host countries or not.

Research on the economic impact of FDI has been two pronged. The macro approach looks at the cross-country growth effects of FDI and generally finds that foreign inflows overall benefit the host country's economy. The micro approach examines plant-level productivity effects of FDI on firms in a single country and finds much less clear-cut results. Both approaches have obvious shortcomings. The first one is not able to control for industry-specific differences, which bias the findings and leave many questions unanswered. The second is country specific and therefore does not allow cross-country comparisons or a generalization of the findings. Moreover, none of the existing studies emphasize the growth or productivity impact of an inter-sectoral shift in FDI from manufacturing to services. Last but not least, all of the studies in the literature are based on cross-sectional or panel data analysis and take period averages. We argue that the time dimension of the data is essential in capturing the change in the growth effect caused by such a shift in trends. However, this dimension is entirely lost in the existing studies, which are all static.

In this study we address all of these issues. We examine the growth effect of the shift from manufacturing to service FDI, at the industry level and across countries. We do this by considering the impact of manufacturing and service FDI in both sectors, disaggregating the service FDI into financial and nonfinancial sectors, and by using an econometric methodology that controls for endogeneity, a problem prevalent in time series, while allowing us to preserve the time dimension of the data. We also control for additional effects that may otherwise bias results.

Since industry-specific FDIs differ in the technology they transfer to the host country, it is crucial that the analysis of the growth effects of FDI is conducted at the level of the absorbing sector[2]. Moreover, due to a larger variation in capital intensity of production, service industries differ more in their "hard/soft" technology mixes than manufacturing industries which, in turn, requires further disaggregation of service FDI into financial and nonfinancial FDI.

The contribution of this study to the literature is twofold. First, it is a comprehensive industry analysis using the largest and the longest data span available (1990–2004 and 60 countries), which goes well beyond aggregate growth studies. Second, we disaggregate total FDI into manufacturing, services, financial and nonfinancial services and study the industries where growth is affected by different types of FDI flows. We then divide the sample according to countries' development levels, geographical location, and the relative size of the manufacturing and service sectors, and examine the sectoral impact on each sub-sample of a shift of FDI from manufacturing towards services.

The second contribution of our study is the use of the Blundell-Bond GMM estimator (Arellano and Bover, 1995; Blundell and Bond, 1998). The most important drawback of the traditional approach of the cross-sectional time-averaging methodology is that by its nature, it cannot capture the dynamic aspects of a shift in the sectoral flows of FDI. By contrast, the GMM estimator allows us to exploit both the time series dynamics and the pooled country characteristics of the data while controlling for endogeneity and omitted variable biases.

[2] Manufacturing FDI transfers predominantly "hard" technology (equipment and industrial processes), whereas service FDI typically transfers "soft technology" (technical, management and marketing know-how, expertise, organizational skills and information).

We find strong own industry effect of manufacturing FDI and positive spillovers through services industry in different categories. The growth effect of service FDI is concealed by conflicting impacts of its components. Whereas financial FDI's contribution to growth is mostly positive in most categories, that of the nonfinancial FDI's is predominantly negative, often within the same categories and most of their influence spreads out to the economy via their spillovers on manufacturing industry.

The organization of the paper is as follows. After a brief review of the stylized facts and the literature review (Section 2), we describe the model, the data, and the empirical methodology (Section 3). In Section 4 we discuss the results and conclude in Section 5.

2. Stylized facts and literature review

The gap between service and manufacturing FDI started to grow in 1970s when service FDI accounted for about a quarter of total FDI stock, and continued to widen to the present. Service FDI stock share increased to 49% by 1990 and to 60% by 2002, reaching an estimated dollar amount of 4 trillion. At the same time during 1990–2002, the shares of both agriculture and manufacturing FDI stock have been continuously declining, from 9 to 6% and from 42 to 34%, respectively (UNCTC 1989a, p. 8; UNCTAD, WIR, 2004).[3]

The shares of the FDI net inflows (the difference between purchases and sales of domestic assets by foreigners) by sectors display very similar patterns. During 1990–2004, the period of study of this paper, the share of the service FDI net inflows in the sample of 60 examined countries rose by 11%, from 44 to 55%, while the share of manufacturing FDI net inflows fell by 12% from 33 to 21% (Fig. 1).[4]

The shift away from agriculture and manufacturing towards services has been a long known phenomenon of the developed world.[5] The share of service sector increased from 60 to 70% of GDP in the period 1990–2002 (World Bank, 2003) and in 2001 the service sector accounted on average for 72% of GDP in the developed countries and 52% of GDP in the developing countries (UNCTAD, 2003f). Meanwhile, the manufacturing sector share shrank in all high income countries, except for Japan, from 25 to 20% between 1980 and 1998 in a phenomenon sometimes called "deindustrialization".

A voluminous literature examines the relation between total FDI and aggregate growth.[6] Previous studies on spillover effects of total FDI usually find a positive relation with growth, if specific conditions such as skilled labor, high wealth and developed financial markets are met (Borensztein et al., 1998; Blomstrom et al., 1994, Alfaro et al., 2008). However, at the microeconomic level, where all studies have been conducted within the manufacturing sector, results are less clear-cut. Some case studies indicate limited positive spillovers of FDI (Haskel et al., 2007; Blalock and Gertler, 2003), and others find no or negative spillovers (Aitken and Harrison, 1999; Gorg and Strobl, 2001; Lipsey, 2003, 2004). Based on this inconclusive findings, Lipsey and Sjoholm (2005) suggest a need for further industry level research by arguing that "….the question shifts from how inward FDI affects every host country and industry to which types of industries and host countries are affected". To this day, the only industry level study we have been able to identify is Aykut and Sayek (2007) who examine the effects of sectoral FDI on aggregate growth only. Their analysis has the same drawbacks as the other studies in that it is a static framework and addresses neither the industry-specific growth effects nor disaggregation of services FDI.

[3] UNCTAD's definition of services differs by two industries from the one used by the World Bank, which follows ISIC's classification 3.1. UNCTAD include Gas, Water and Electricity production and Construction, while ISIC's classification does not. These figures are based on the UNCTAD's classification of services.

[4] These figures are based on the UNCTAD's classification of services. See above.

[5] In a study of 16 developed countries from 1870 to 1987, Maddison (1989) reports an almost ten-fold decrease in the share of agriculture in GDP, which declined form 39% to 4%, a substantial increase in the share of industry (manufacturing, mining, construction, and utilities) from 26 to 36%, and an even larger increase in the share of services, which rose from 35 to 60%.

[6] See Lim, 2001, Doytch, 2005 and Crespo and Fontoura, 2007 for a survey of the literature.

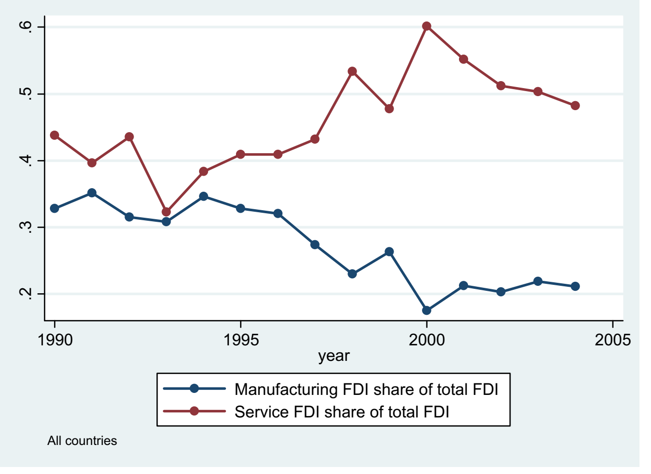

Fig. 1. Manufacturing and service FDI shares.

3. Conceptual framework, empirical methodology and data

3.1. Conceptual framework

Productivity spillovers from FDI to domestic firms occur as externalities to the transfer of superior technology from foreign to domestic subsidiaries' multinational enterprises (MNE). Taking advantage of the multi-country dimension of the data, we consider the growth effects of different FDI flows in different sectors. As such, our analysis is on horizontal (intra-industry) spillovers. Because of the nature of our data, we are not examining vertical (inter-industry) spillovers, which occur thanks to technological knowledge provided by MNEs through vertical input-output linkages.

A voluntary or involuntary transfer of MNEs' nontangible assets to domestically owned firms lowers the average cost curves of the latter and increases their productivity. This is a positive spillover. However, all spillovers are not positive and FDI can sometime harm domestic firms (Aitken and Harrison, 1999). This happens when imperfectly competitive domestic firms face competition from the foreign firm in the same market. The MNE can compete in quantity and capture some of the domestic market. The productivity of domestic firms declines as they move up their new average cost curve and spread their fixed costs over a smaller share of the market. A negative intra-industry spillover can also happen if the MNE that enters one industry drains resources from another industry, mainly in the form of skilled labor, attracted to higher compensations. In this case, the productivity of domestic firms in the other industry falls again because their cost curve shifts out. Both cases of negative spillovers would be translated into lower production, and dampened growth in the industry.

We should note that we use the term "spillover" loosely and do not distinguish between spillovers due to change in factor productivity, knowledge/technology diffusion or scale economies. We term spillover any such externalities that MNEs introduce in the host country, which affect sectoral growth rates.

We model these growth effects following the empirical growth literature based on the neoclassical Solow-Swan, Ramsey-Coopmans-Kass model. In the cross-sectional version, when initial conditions and technological progress are controlled for, growth depends on the gap between the initial per capita output and its steady-state-value. The hypothesis is that the parameter estimate, also called the catching-up term in the literature, should be negative, suggesting that countries starting below a steady-state level of output should grow faster than those close to this level and achieve convergence. Since the innovative analysis of Mankiw et al. (1992), who introduced human capital, it has been customary in the literature to include additional control variables to the model.

The base-line model estimated using *panel data* tests the hypothesis of conditional convergence. The implication is that the growth equation is a dynamic equation in output.[7]

$$\log y_{it} = (1+\beta)\log\left(y_{i,t-1}\right) + \Gamma W_{it} \tag{1}$$

where the subscripts i and t describe the cross-sectional and time dimensions of the panel data, respectively; y_{it} is the per capita output of country i, W_i is a vector containing the log of the "traditional" growth determinants, such as population growth rate, technological progress and depreciation rate, human and physical capital, as well as the more recently developed determinants, such as FDI and institutional factors. Although, as we mention below, our estimates of the convergence parameter β are within the ballpark of the empirical results obtained from similar samples, in this study we will highlight only the growth effect of the sectoral FDI flows, which is one of the elements of the W_i vector.

3.2. Empirical methodology

The empirical model that we analyze is

$$\log y_{it}^{k} = \beta_0 + (1+\beta_1)\log\left(y_{i,t-1}^{k}\right) + \beta_2 x_{it} + \beta_3 f_{it}^{j} + \beta_4 \eta^{t} + \mu_i + \epsilon_{it} \tag{2}$$

with $\mu_i \sim i.i.d(0,\sigma_{\mu_i})$, $\epsilon_{it} \sim \text{i.i.d.}(0,\sigma_\epsilon)$, $E[\mu_i\epsilon_{it}] = 0$ and where $i = 1,..,60$ and $t = 1,..,15$, the superscript k stands for a *GDP index* (k = GDP, manufacturing value added, and services value added), the superscript j is an *FDI index* (j = manufacturing FDI, service FDI, financial FDI, and nonfinancial service FDI). Accordingly, y_{it}^{k} is real per capita output in industry k, in constant year 2000 prices, $y_{i,t-1}^{k}$ is its lagged level, f_{it}^{j} is the GDP share of FDI net inflows into the jth industry. The last variable is the most relevant determinant for this study, which mainly examines the coefficient β_3.

The row vector x_{it} consists of the most commonly used control variables in the growth literature (Doytch, 2005) comprising the investment share of GDP, the real lending interest rate, gross secondary school enrolment ratio, government consumption share of GDP and government stability. The variables μ_i and η_t are, respectively, a country-specific effect and a time-specific effect represented by year dummies. The country-specific effect that is most commonly used is a fixed (within-group) effect, because a random effect assumes an independent distribution of the explanatory variables from the individual effects, an assumption that is violated between $y_{i,t-1}$ and μ_i. The time-specific effect is a row vector of 15 year-dummy variables.

The combinations between k GDP indexes and j FDI indexes give twelve distinct regressions. We regress three per capita growth rates (aggregate GDP, manufacturing value added and services value added) on four measures of FDI/output ratios (manufacturing, service, financial and nonfinancial service FDI). In addition, we examine the impact of total FDI on total GDP per capita growth as the thirteenth case, a benchmark most frequently used in the literature.

The simplest methodology, which is more suitable for cross-sectional than for panel data analysis, is the *pooled OLS* estimation. However, this method fails to account for the time-series dimension of data since it puts all observations together into a "pool" and creates two major flaws: (i) it fails to account for the unobserved country-specific (fixed) effects that cause an omitted variable bias, which then is picked up by the error term; (ii) it fails to control for the potential endogeneity problem. The correlation between some of the independent variables and country-specific effects is again picked up in the error term.

[7] See Islam (1995), Caselli et al. (1996), Durlauf and Quah (1999), Durlauf et al. (2004).

The method of *fixed effects* is designed to control for the unobserved country-specific time-invariant effects in the data. However, it corrects for the possible correlation between these effects and some of the independent variables, conditioning them out by taking deviations from time-averaged sample means. The result of applying such a procedure is that the dependent variable is stripped of its long-run variation – an approach that may be inappropriate for studying a dynamic concept. Growth episodes are more similar within than across countries and the within-country variation may not be enough to identify growth effects (Pritchett, 2000). The lost long-run variation is alternatively captured by the "between" estimator.

A technical consequence of the within transformation is that it increases standard errors by exacerbating any measurement errors. This is especially problematic in the case of data with a small time dimension. Another technical issue is that the within approach is not informative when we deal with variables with little time variation or ones that are not measured frequently enough. Without an instrument, this approach does not address the problem of endogeneity either, and without time dummies it does not control for the unobserved common time effects among countries, which are then mistakenly picked up by a positive cross-sectional correlation. Overall, both cross-section approaches are not a good tool for analyzing a dynamic relationship between variables and where time-averaging is conceptually not sensible.

The correlation between lagged dependent variables and the unobserved residual is precisely the reason why panel data is to be preferred to cross-sectional when analyzing growth effects. Cross-section estimates produce a bias, caused by the correlation between $y_{i,t-1}$ and μ_i, which disappears in samples with large time dimension but does not disappear with time-averaging. Thus, if such a correlation exists, the true underlying structure has a dynamic nature and time-averaging cross-section techniques introduce a bias that cannot be removed by controlling for fixed-effects. Therefore, to avoid these pitfalls, we stress the importance of using the GMM methodology.

The most widely used alternative to the within estimation are the methods for dynamic panel estimation. Both dynamic panel GMM estimators- *Arellano-Bond difference and Blundell-Bond system GMM* are specifically designed to capture the joint endogeneity of some explanatory variables through the creation of a matrix of "internal" instruments. Arellano-Bond difference GMM uses lagged level observations as instruments for differenced variables. Blundell-Bond system GMM uses both lagged level observations as instruments for differenced variables and lagged differenced observations as instruments for level variables. Both estimators have one set of instruments to deal with endogeneity of regressors and another set to deal with the correlation between lagged dependent variable and the induced MA(1) error term.[8] A necessary condition for both difference and system GMM is that the error term does not have second order serial correlation, otherwise the standard errors of the instrument estimates grow without bound. For this reason Arellano and Bond (1991) have developed a second order autocorrelation test on which we base our analysis.[9]

A potential problem of the Arellano-Bond difference GMM estimator is that, under certain conditions, the variance of the estimates may increase asymptotically and create considerable bias if: (i) the dependent variable follows a random walk, which makes the first lag a poor instrument for its difference, (ii) the explanatory variables are persistent over time, which makes the lagged levels weak instruments for their differences, (iii) the time dimension of the sample is small (Alonso-Borrego and Arellano, 1996 and Blundell and Bond, 1998).

An additional necessary condition for the efficiency of the Blundell-Bond system GMM estimator is that, even if the unobserved country-specific effect is correlated with the regressors' levels, it is not correlated with their differences. The condition also means that the deviations of the initial values of the independent variables from their long-run values are not systematically related to the country-specific effects. These sets of conditions can be written as follows.

[8] For an application to growth regression of Arellano Bond methodology see Caselli et al. (1996) and Easterly et al. (2007) and that of Blundell and Bond see Beck et al. (2000).

[9] By construction, the differenced error term is first-order serially correlated even if the original error term is not.

a) *The standard GMM conditions* of no second order autocorrelation in the error term[10]

$$\begin{aligned} E\left[y^k_{i,t-s}\left(\epsilon_{it} - \epsilon_{i,t-1}\right)\right] &= 0 \quad for\ s \geq 2 \quad and\ t = 3,\ldots T \\ E\left[x_{i,t-s}\left(\epsilon_{it} - \epsilon_{i,t-1}\right)\right] &= 0 \quad for\ s \geq 2 \quad and\ t = 3,\ldots T \\ E\left[f^j_{i,t-s}\left(\epsilon_{it} - \epsilon_{i,t-1}\right)\right] &= 0 \quad for\ s \geq 2 \quad and\ t = 3,\ldots T \end{aligned} \tag{3}$$

b) *Additional conditions* of no correlation of the unobserved country-specific effect with their differences:

$$\begin{aligned} E\left[\left(y^k_{i,t-1} - y^k_{i,t-2}\right)\left(\mu_i + \epsilon_{it}\right)\right] &= 0 \\ E\left[\left(x_{i,t-1} - x_{i,t-2}\right)\left(\mu_i + \epsilon_{it}\right)\right] &= 0 \\ E\left[\left(f^j_{i,t-1} - f^j_{i,t-2}\right)\left(\mu_i + \epsilon_{it}\right)\right] &= 0 \end{aligned} \tag{4}$$

A problem with System GMM estimator can arise if the instruments are too many, leading to overfitting of the model (Roodman, 2006). Unfortunately, there is little guidance in the literature to determine how many instruments are "too many" (Roodman, 2006; Ruud, 2000). A recommended rule of thumb by Roodman is that instruments should not outnumber individuals (or countries). We experimented both with different numbers of lags in the instrumental matrix and results are largely consistent. We present here a set of results based on the minimum optimum lags, an approach that we selected to preserve the degrees of freedom.

3.3. Data

All variables, except the FDI net inflows, secondary school enrolment ratio and government stability, are from *World Development Indicators* (WDI), the World Bank web site and the reports of the Economic Intelligence Unit. The secondary school enrolment ratio is compiled from the web site of, *United Nation Educational, Scientific and Cultural Organization* and *World Development Indicators* (WDI). Government stability series are from the *International Country Risk Guide* reports. We compiled the FDI net inflow series from various sources, consisting of the *Organization for Economic Cooperation and Development* web site (all OECD countries), *United Nations Conference on Trade And Development* country profiles, Statistics of FDI in ASEAN (2005) and government institutions and investment agencies' web sites.[11]

The three dependent growth variables - GDP, manufacturing value added, and services value added are percentage per capita annual growth rates in constant local currency. Manufacturing refers to industries belonging to International Standard Industrial Classification (ISIC), revision 3, divisions 15–37. Services correspond to ISIC divisions 50–99. Services include value added in wholesale and retail trade (including hotels and restaurants), transport, and government, financial, professional, and personal services such as education, health care, and real estate services. Also included are imputed bank service charges, import duties, and any statistical discrepancies noted by national compilers as well as discrepancies arising from rescaling.

Gross fixed capital formation as a share of GDP consists of plant, machinery, and equipment purchases, construction of roads, railways, and the like, including schools, offices, hospitals, private residential dwellings, and commercial and industrial buildings, land improvements (e.g., fences, ditches). According to the 1993 SNA, net acquisitions of valuables are also considered capital formation.

[10] To instrument the FDI and the lagged output we used Stata's *GMM-style option*, and to instrument the elements of the x_{it} matrix, all other explanatory variables were instrumented with the *iv-style option*.

[11] We would like to acknowledge L.-M. Saavedral for her help with data collection at the UN Statistical Library.

Real lending interest rate is the difference between the rate charged by banks on loans to prime customers and the annual inflation rate, measured by the GDP deflator. The latter is calculated as the ratio of GDP in current local currency to GDP in constant local currency (base year varies by country).

Gross secondary school enrollment ratio is the ratio of total enrollment, regardless of age, to the population of the age group that officially corresponds to the level of education shown.

General government final consumption expenditure as a share of GDP is government current expenditures for purchases of goods and services, including compensation of employees, and most expenditure on national defense and security, excluding government military expenditures, which are part of government capital formation.

Government stability is a variable compiled by the *International Country Risk Guide*. It has three components consisting of government unity, legislative strength and popular support. It assesses how well the government can carry out its declared programs and can stay in the office. It is an index from 0–12, where an increase reflects an improvement.

The key independent variable is the ratio of FDI flows to GDP, both in current USD. All *FDI* series are net inflows, accounting for the purchases and sales of domestic assets by foreigners in the corresponding year. In order to match the definition of services from WDI, we subtracted FDI in Gas, Water and Electricity production and Construction from FDI in services obtained from other sources. The primary sources for data on FDI by industries are most often specialized investment government boards and agencies and sometimes general statistical agencies or ministries in host countries. The choice of the industry data to be compiled and reported is made locally. When the reported data is already aggregated at a certain level, it is difficult, if not impossible, to verify if all industries belonging to a sector are actually included in the data. The only way to assess the data quality is to explore the primary sources. For this study, we have cross-referenced the data with all available sources, including national statistical and investment agencies whenever available.

The GMM approach is based on the assumption of absence of second order serial correlation in the error terms. However, if the slope parameter is heterogeneous, the estimates will be inconsistent, the error terms will be serially correlated, which violates the assumption of no serial correlation. One solution to this is to split the sample according to regions or shared characteristics among groups. Accordingly, we divide the sample by geographical regions and levels of development following the World Bank classifications (Appendix 1). We also group economies as manufacturing-based, services-based and mixed economies as follows. We compare each observation of manufacturing and services value added shares of GDP to the 60-country average for each year. We classify the economy as *manufacturing-based* (*services-based*) if it has both a share of manufacturing (services) larger than the average for a particular year and the share of services (manufacturing) smaller than the average for the same year. Otherwise, the economy is defined as *mixed*.

4. Empirical results

Disparities within the service sector, combined with the differences across sectors make the analysis of total FDI-growth effects opaque and misleading, since much of the FDI influence is revealed only at a sub-sectoral level. This could be the reason why previous studies on spillover effects of total FDI find "mixed evidence" and "no universal relationships" (Lipsey, 2004) and that "…studies do not individually find that wage or productivity spillovers do not exist. Mostly they find either positive or negative spillovers"(Lipsey and Sjoholm, 2005).

To address these concerns, in the following section we analyze the industry growth effects of sectoral FDI flows (manufacturing, services, financial, and nonfinancial services). In doing so, we consider own effects and aggregate growth effects of these flows, and distinguish between unbalanced sample that spans the period 1990–2004 and balanced sample covering the period 1998–2004. The two samples have their own distinctive advantages. The unbalanced sample is longer and, hence, reflects the dynamics of the flows better and offers a larger degree of freedom. However, the number of countries at each point in time is not constant and increases over time. Thus, it is hard to distinguish between the cross-sectional and time-series variations. The balanced sample does not have this disadvantage since the number of countries is constant at each period in time. But it is shorter and thus captures the variations in flows during the last 7 years instead of 15 years.

We present in Tables 1 and 2 the results for the estimates of β_3, the aggregate growth effect of total FDI. All tables show the estimates from the GMM approach. The tables are divided into three panels corresponding to three ways of classifying the data: geographical regions, income groups, and relative sector shares. Table 1 shows the results for total FDI and manufacturing FDI. Table 2 displays the estimates of β_3 for aggregate services FDI and its components, financial and nonfinancial services FDI and industry-based FDI. To save space, we do not report the full regression results. However, to give an overall view of the estimated regression equation, we provide in Appendix 2 the results for the benchmark model describing the aggregate growth-total FDI relation and the remaining independent variables.

Table 1
Growth effects of total FDI and Manufacturing FDI[a]

	Sample	Total FDI	Manufacturing FDI		
		Aggregate growth	Manufacturing growth	Service growth	GDP growth
All countries	1990–2004	**0.158****	0.110	−0.025	0.043
		(0.05)	(0.21)	(0.13)	(0.10)
	1998–2004	**0.129***	0.081	0.238	0.028
		(0.07)	(0.70)	(0.33)	(0.31)
Latin America & the Caribbean (LAC)	1990–2004	0.082	**3.383****	0.359	1.140
		(0.19)	**(1.26)**	(0.77)	(0.82)
	1998–2004	−0.468	**7.294****	[1.615**]	**3.058****
		(0.39)	**(2.23)**	[(0.83)]	**(1.09)**
	1990–2004	0.102	**0.29****	0.082	0.059
		(0.06)	**(0.10)**	(0.09)	(0.07)
Europe & Central Asia (ECA)	1998–2004	0.122	−0.352	0.222	−0.093
		(0.10)	(0.46)	(0.408)	(0.20)
	1990–2004	0.131	0.148	−0.368	−0.247
		(0.13)	(0.66)	(0.35)	(0.32)
South & East Asia and the Pacific (SEAP)	1998–2004	**0.173****	0.027	0.117	0.207
		(0.05)	(0.69)	(0.26)	(0.19)
	1990–2004	0.146	−0.409	0.7876	−0.760
		(0.13)	(1.48)	(2.32)	(1.68)
Low income Economies	1998–2004	0.080	[2.316**]	**4.161****	**1.667***
		(0.24)	[(0.97)]	**(1.91)**	**(0.98)**
	1990–2004	0.170	**2.807****	**2.062****	**2.118****
		(0.30)	**(1.41)**	**(0.66)**	**(0.79)**
Middle Income economies	1998–2004	−0.529	2.822	**2.073****	**2.513****
		(0.45)	(2.51)	**(0.87)**	**(1.20)**
	1990–2004	**0.141****	0.126	−0.107	−0.045
		(0.05)	(0.18)	(0.14)	(0.13)
High income Economies	1998–2004	0.096	−0.520	0.052	0.084
		(0.07)	(0.42)	(0.25)	(0.19)
	1990–2004	[0.2682**]	[2.662*]	**2.48****	**2.264****
		[(0.16)]	[(1.60)]	**(1.05)**	**(0.83)**
Manufacturing Based Economies	1998–2004	0.220	2.155	3.150	**2.104***
		(0.21)	(2.59)	(2.05)	**(1.28)**
	1990–2004	**0.229****	0.093	−0.010	0.045
		(0.07)	(0.15)	(0.09)	(0.11)
Mixed Economies	1998–2004	**0.2****	−0.308	0.030	−0.157
		(0.07)	(0.52)	(0.18)	(0.20)
	1990–2004	−0.257	0.729	−0.519	−0.456
		(0.19)	(0.76)	(0.60)	(0.63)
Services Based Economies	1998–2004	**−0.417***	**2.331****	−0.276	−0.292
		(0.22)	**(0.95)**	(0.34)	(0.42)

** and * represent marginal significance levels with less than 5%, and with equal or less than 10%, respectively.
[a] The first entry in each cell is the estimate of the FDI coefficient on output. Figures in parentheses are the standard errors. Figures in square brackets are estimates with second order autocorrelation condition in the error. The coefficients and the standard errors are robust to heteroscedasticity and obtained from one-step Blundell-Bond System GMM with instrumental variables.

Table 2
Growth effects of Services FDI, Financial and Nonfinancial Services FDI[a]

	Sample	Aggregate Services FDI			Financial Services FDI			Nonfinancial Services FDI		
		Manuf. Growth	Service growth	GDP growth	Manuf. growth	Service growth	GDP growth	Manuf. Growth	Service growth	GDP growth
All countries	1990–2004	−0.081	0.29**	0.17*	0.937*	0.405**	0.345*	−0.634**	0.092	−0.033
		(0.21)	(0.09)	(0.09)	(0.30)	(0.17)	(0.12)	(0.20)	(0.19)	(0.19)
	1998–2004	−0.412**	0.308**	0.144	[0.91**]	0.437**	0.31**	[0.213]	0.120	−0.027
		(0.14)	(0.08)	(0.09)	[(0.40)]	(0.14)	(0.10)	[(0.43)]	(0.19)	(0.18)
Latin America & the Caribbean (LAC)	1990–2004	0.148	0.272	[0.188]	−1.328	[-0.131]	[-0.734]	−1.020	[0.213]	0.043
		(0.41)	(0.22)	[(0.20)]	(1.64)	[(0.66)]	[(0.82)]	(1.04)	[(0.43)]	(0.42)
	1998–2004	−0.239	0.144	−0.253	−6.448	−2.779	−4.139	−1.526	0.086	−0.755
		(0.62)	(0.41)	(0.45)	(4.32)	(2.15)	(2.61)	(1.68)	(0.72)	(1.02)
Europe & Central Asia (ECA)	1990–2004	0.224	0.142	0.057	−0.130	0.073	0.286*	0.525	0.051	[0.066]
		(0.24)	(0.18)	(0.12)	(0.84)	(0.18)	(0.17)	(0.51)	(0.10)	[(0.09)]
	1998–2004	−0.460	0.165	0.046	−0.988	−0.657	0.202	0.604**	−0.176	0.019
		(0.35)	(0.22)	(0.17)	(0.93)	(0.48)	(0.21)	(0.26)	(0.35)	(0.19)
South & East Asia and the Pacific (SEAP)	1990–2004	−0.521**	0.302*	0.093	0.919**	0.278*	0.431**	−1.024**	0.126	−0.124
		(0.10)	(0.11)	(0.10)	(0.22)	(0.11)	(0.10)	(0.08)	(0.22)	(0.18)
	1998–2004	−0.479**	0.432**	0.17**	0.913**	0.397**	0.492**	−0.856**	0.090	−0.091
		(0.10)	(0.08)	(0.07)	(0.19)	(0.11)	(0.09)	(0.12)	(0.20)	(0.17)
Low Income Economies	1990–2004	1.131**	0.323	0.388	1.671	−1.309	−0.516	1.415**	0.528	0.824**
		(0.53)	(0.26)	(0.26)	(1.68)	(0.90)	(1.01)	(0.48)	(0.50)	(0.39)
	1998–2004	0.432	−0.194	0.062	3.187**	−0.908	−0.141	0.630	0.201	0.648**
		(0.42)	(0.35)	(0.29)	(1.32)	(1.08)	(0.90)	(0.41)	(0.29)	(0.24)
Middle Income Economies	1990–2004	−0.092	[0.388**]	0.190	0.381	[0.709]	[0.501]	0.604	[0.304]	0.501
		(0.39)	[(0.18)]	(0.21)	(1.28)	[(0.62)]	[(0.81)]	(0.62)	[(0.27)]	(0.35)
	1998–2004	−0.341	0.362**	0.046	−0.282	[0.476]	−0.040	0.290	0.274	0.414
		(0.64)	(0.15)	(0.17)	(2.30)	[(1.00)]	(0.91)	(0.64)	(0.26)	(0.40)
High Income Economies	1990–2004	−0.107	0.218**	0.224	1.177**	0.443**	0.386**	−0.696**	0.012	−0.149
		(0.18)	(0.09)	(0.28)	(0.27)	(0.12)	(0.07)	(0.17)	(0.10)	(0.12)
	1998–2004	−0.61**	0.139**	0.047	[1.153**]	0.359**	0.362**	[-1.017**]	−0.052	−0.262**
		(0.16)	(0.04)	(0.09)	[(0.09)]	(0.04)	(0.05)	[(0.11)]	(0.10)	(0.10)
Manufacturing Based Economies	1990–2004	[0.428]	0.75**	[0.662**]	1.233	0.748	[0.576**]	[0.370]	1.052	0.664
		[(0.48)]	(0.32)	[(0.19)]	(1.79)	(0.90)	[(0.17)]	[(0.84)]	(0.77)	(0.58)
	1998–2004	0.066	0.215	0.367	1.809*	−0.825	0.329*	0.403	0.625	0.567
		(0.65)	(0.44)	(0.24)	(1.24)	(1.33)	(0.12)	(0.86)	(0.78)	(0.66)
Mixed Economies	1990–2004	0.141*	0.219*	0.255**	−0.828	0.059	0.051	1.256**	0.400	0.599**
		(0.23)	(0.13)	(0.10)	(0.54)	(0.39)	(0.31)	(0.32)	(0.29)	(0.27)
	1998–2004	−0.04	0.220	0.236**	0.245	0.758	0.453	0.389	0.195	0.321**
		(0.19)	(0.14)	(0.08)	(0.64)	(0.47)	(0.34)	(0.52)	(0.19)	(0.11)
Services-based economies	1990–2004	−0.533	−0.017	0.028	1.248**	0.314**	0.54**	−0.944**	−0.040	−0.203
		(0.42)	(0.15)	(0.17)	(0.15)	(0.14)	(0.13)	(0.30)	(0.15)	(0.17)
	1998–2004	[-1.107**]	−0.050	−0.232	1.279**	0.272**	0.441**	[-1.322**]	−0.159*	−0.344**
		[(0.37)]	(0.12)	(0.16)	(0.17)	(0.07)	(0.06)	[(0.27)]	(0.09)	(0.11)

** and * represent marginal significance levels with less than 5% and with equal or less than 10%, respectively.
[a] See footnote in Table 1.

Results are not reliable in the presence of second order autocorrelation in the error model, therefore we report them in brackets. In addition to system GMM estimation, we also ran pooled OLS (POLS) with $\mu_i = 0$ and the fixed country effects model with $\mu_i \neq 0$. Appendix 3 shows for illustrative purposes the growth effects obtained by POLS and FE approaches for the growth effect of total FDI and aggregate and sectoral growth effect of manufacturing FDI. Complete set of results are available from the authors. In the rest of the paper, we discuss the own and inter-sectoral growth effects of different types of FDI flows.

4.1. The effect of total FDI on real GDP per capita growth

We start from the most general level of aggregation by looking at the total FDI effects on overall growth in 'all countries' (Table 1, top left cell). Both the unbalanced (1990–2004) and the balanced (1998–2004) data panels reveal a significant effect of total FDI on overall growth (full sample). This effect is mimicked in SEAP, high income economies and mixed economies (first column). Surprisingly, we find a negative impact of total FDI on overall growth in the services-based economies. In the other categories, the insignificant growth-FDI estimate conceals important disaggregation effects. We further inspect this finding below when we examine the cross-industry growth effects.

4.2. Growth effects of manufacturing FDI

First consider the aggregate growth effect of manufacturing FDI flows (Table 1, last column). Manufacturing FDI flows have a significant impact on growth rates in several categories, in contrast to services FDI as we will see later. This effect is mostly noticeable in the aggregate growth of the LAC region in contrast to SEAP where it is clearly insignificant. Aggregate growth in low and middle income groups as well as in countries with large manufacturing bases also benefits from manufacturing FDI flows.

How does this effect permeate through manufacturing and services sectors (Table 1, right panel)? Evidence points to strong own industry effect in several geographical regions and to positive spillovers through the services sector in different categories (2nd column). Manufacturing FDI stimulates growth in manufacturing industry in LAC in both balanced and unbalanced samples. We also observe some spillovers when we consider income distributions. Manufacturing FDI helps growth in manufacturing sectors in middle income economies but also spills over to services industry in low and middle income economies and countries with relatively large manufacturing sectors (3rd column). The intra-industry spillovers of manufacturing FDI are thus stronger in less wealthy economies and manufacturing based economies.

4.3. Growth effects of service FDI

The analysis of growth effects of service FDI reveals some unexpected and surprising results, reflecting the complexities of intra-industry connections (Table 2, left panel). First, in contrast to manufacturing FDI, growth effects of these flows are unsystematic and some have negative cross-industry effects, as indicated by the significant negative entries in various categories. The fall in growth following the entry of the MNE is an illustration of domestic firms' cost curves shifting out, possibly as a result of resource drain by foreign firms. Furthermore, both positive and negative growth effects are mostly intra-industry rather than in the service sector.

The aggregate growth effect of service FDI is mostly insignificant, largely due to conflicting inter-sectoral effects that cancel each other's impact (3rd column). Examination of disaggregated industry growth effects of service FDI is, therefore, more revealing. In the full sample (all countries), evidence suggests an unambiguous positive effect of service FDI in its own sector (top 2nd cell) and on aggregate growth (top 3rd cell). This sharply contrasts with significant negative spillovers in manufacturing in the same sample (top 1st cell).

The positive own-sector impact of service FDI in all countries is reproduced primarily in ECA, SEAP, middle and high income economies, and economies with relatively small services share (2nd column). The positive aggregate growth effect in SEAP suggests that service sector growth generated by service

FDI flows outweighs the contraction in the manufacturing caused by the same flows (top left panel). The performance of firms operating in service and manufacturing sectors in mixed economies is enhanced by service FDI and generates a positive aggregate growth effect (3rd column). Evidence for LAC and service based economies is weak or negative, which calls for further investigation of service flows. In the next section we turn to the analysis that disaggregates the service sector into its financial and nonfinancial components.

4.4. Growth effects of financial and nonfinancial service FDI

A comparison of middle and right panels with left panel in Table 2 gives a remarkable insight into the way service FDI works through to the economy. First, financial FDI contributes positively to aggregate growth in most categories (3rd column, middle panel), while nonfinancial FDI's contribution is predominantly negative often within the same categories (3rd column, right panel). This negative impact accounts for most of the negative spillover of aggregate service FDI flows that we observed on manufacturing output. Second, although financial and nonfinancial FDI are components of service FDI, most of the nonfinancial FDI's influence spreads out to the economy via the manufacturing sector, rather than the service sector.

The strong aggregate growth effect of financial FDI is also found in ECA and, particularly, in SEAP, high income economies, and economies with high shares of manufacturing and service industry (3rd column, middle panel). In the latter three categories, both sectors benefit from financial FDI flows, corroborating the strong growth results for all countries. In low income countries and economies with high manufacturing shares financial FDI spills over the manufacturing industry and increases growth more than proportionally without any significant impact in its own sector (1st column, middle panel).

The right panel in Table 2 illustrates the impact of nonfinancial service FDI on industry growth rates. A comparison with left panel reveals a remarkable result about the drain that these flows cause in the manufacturing sectors in several categories. The negative spillover of nonfinancial service FDI on manufacturing almost entirely accounts for the negative growth rates caused by aggregate service FDI seen in the left panel.

'All countries' manufacturing growth is hurt by nonfinancial service FDI (top left cell). This contrasts with the boost it receives from financial service FDI (top middle cell). Thus, the negative manufacturing growth elasticity of service FDI (-0.41) can, at least partially, be explained by the negative spillover from nonfinancial service FDI into this industry.

Further scrutiny of the data reveals additional negative spillover effects of aggregate services FDI in manufacturing in different categories such as SEAP, high income countries and services economies (1st column, left panel). These are mainly due a contraction in manufacturing growth triggered by nonfinancial services FDI in the same categories (1st column, right panel). This result suggests that the positive spillovers from financial services FDI (first column, middle panel) are not able to defuse the negative ones.

Comparison across the three panels also sheds light on often insignificant growth effects of aggregate service FDI (3rd column, left panel). In high income and service based economies, negative spillovers of nonfinancial service FDI flows on total growth are neutralized by positive spillovers of financial service FDI (3rd column, middle and right panels). Both effects account for the negligible aggregate growth estimates of total service FDI flows in these categories. The insignificant impact of service FDI in its own industry in services-based economies (2nd column, bottom panel) can also be explained by the negative impact of nonfinancial service FDI, which cancels the positive effect of financial FDI (2nd columns, middle and right panels).

However, the impact of nonfinancial service FDI is not all harmful. In several instances these flows complement the financial service FDI and contribute positively to sectoral growth or aggregate. For example, manufacturing growth in ECA, low income countries, and mixed economies, gain from these flows (1st column, middle and right panels), accounting for the positive aggregate growth estimates of service FDI in the same categories (1st column, left panel). In manufacturing based and mixed economies financial FDI and nonfinancial FDI flows boost the GDP growth, respectively, and account for the strong aggregate growth effect of services FDI (column 3, all panels).

What do industry FDI flows say about the channels through which the growth effect spills over to the whole economy? Next, we turn to this question.

4.5. Discussion: sectoral flows and aggregate growth effect of total FDI

A comparison of total FDI in Table 1 and aggregate services in Table 2 shows that the strong growth effect of total FDI on all the economies (first cell, Table 1) can be partly traced back to the significant impact of aggregate services FDI in the service sector, which outweighs its negative spillover in the manufacturing industry (top left panel, Table 2). This pattern is replicated in SEAP. In high income economies and service based economies the total growth effect of aggregate services FDI is insignificant. Yet, in these categories strong aggregate FDI-growth relation of Table 1 can be similarly traced back to services growth (Table 2, left middle panel), which offsets the negative manufacturing spillover of aggregate service FDI flows. In all categories, the negative spillovers are caused by nonfinancial service FDI flows (right middle panel).

Evidence also suggests a compelling story for the industry shares (bottom panels). The favorable growth effect of total FDI in mixed economies (Table 1, bottom left panel) is mainly explained by the positive impact of service FDI in aggregate growth (Table 2, bottom left panel). This time, the component of service FDI that contributes to this growth effect is the nonfinancial service FDI flows, via its positive inter-sectoral spillover in manufacturing (bottom right panel). In contrast, the unfavorable aggregate growth effect of FDI in service based economies, which we have seen in Table 1, can be traced back to the negative, albeit weak spillover of service FDI in the manufacturing sector (Table 2, left bottom panel). These spillovers are entirely due to nonfinancial FDI that leads to a contraction in manufacturing and services, offsetting the growth-enhancing effect of financial FDI in both industries (Table 2, bottom middle and right panels).

At first blush we can tentatively deduce that the benefits of a shift from manufacturing FDI to service FDI is at best inconclusive if not detrimental to economic activity. On the one hand, we confirm the established positive correlation of manufacturing FDI with growth, which means that a decline in manufacturing FDI will hurt growth. On the other hand, while benefiting its own sector, service FDI, and more specifically FDI into nonfinancial services industry, will often drain large resources from manufacturing sector. Among some groups of countries, therefore, a rise in the service FDI combined with a decline in the manufacturing FDI is likely to hurt manufacturing industry from both directions. This effect would be most painful in economies with relatively large service sectors because of potential collapse of the manufacturing industry without a significant compensating benefit in the service industry.

The shift would also lead to deindustrialization in manufacturing in other groups of economies because at least one of the two channels would be operative. The fall in manufacturing growth would be triggered either directly by the decline in manufacturing FDI (LAC, relatively less wealthy countries) or by negative spillovers of the increase in service FDI (SEAP, high income countries).

On the bright side, there is an exception to this picture where one group of countries would clearly benefit from the switch from manufacturing to services FDI flows. In countries with mixed industry bases, both industries would benefit equally from the services FDI flows, while a decline in manufacturing FDI would have negligible effect on growth. In other groups, the net impact of the shift is qualitatively more neutral. Either both channels cancel each others' effect on manufacturing growth (low income) and services growth (manufacturing based), or the second channel becomes uncertain because the negative spillover of services FDI on manufacturing growth is tempered by higher growth in services (SEAP).

5. Robustness checks

We tried alternative ways of modeling the growth equation. One approach is to include simultaneously the different components of FDI flows in the regression equation to prevent omitted variable bias.[12] To

[12] We thank an anonymous referee of this journal for pointing out this question to us.

check whether our results showed such bias, we estimated two models each involving several types of FDI flows. The first one includes manufacturing and services, and the second one includes manufacturing, financial and nonfinancial services, all simultaneously. Estimates showed a consistent robustness across models, with positive estimates of manufacturing FDI and negative estimates of services FDI on manufacturing growth, positive impact by financial FDI and negative impact by nonfinancial service FDI (results are available from the authors upon request).

However, we decided to keep our approach in the paper because we trust the estimates more for the following reasons: (i) FDI inflows to various sectors are correlated because they are affected by the same external shocks and are drawn to host country by similar domestic factors, which are likely to be co-moving at the sectoral level. These factors are likely to introduce severe multicollinearity problems and can affect the standard deviations of coefficients; (ii) the GMM methodology is a prolific generator of instruments, with a quadratic instrument count in time dimension T. Therefore, it exhausts a large number of degrees of freedom when two or three kinds of FDI are added together in the model, violates the Roodman rule mentioned above, and weakens the test results. In contrast, by separating the manufacturing and services FDI we were able to isolate each effect without cross-contamination and compare the industry effect with that of the total FDI.

We also explored the use of regional dummies and income-level dummies instead of splitting the sample into regions and income levels. The outcome was less clear-cut and often insignificant. This result suggests that dummies are not able to account for regional heterogeneity within subgroups as explicitly as the sub-samples, possibly because region-specific variables reflect the effect of several unknown factors besides the regional idiosyncrasies.

6. Conclusion

This study examined sectoral growth effects of industry FDI flows using a dynamic panel estimator of system GMM with instrumental variables, which overcomes several econometric pitfalls. We take advantage of the time series dimension of the data to examine the repercussions of the shift away from manufacturing FDI to services FDI and to study the impact of the industry flows into their own sectors and their spillovers to other sectors. While controlling for the traditional determinants of growth, we reduce the heterogeneity bias by breaking down the data according to geographical regions, income distribution and relative sector shares in the economies. We disaggregate total FDI into manufacturing and service FDI and the latter into financial and nonfinancial service FDI. This is the first systematic cross-country analysis of the disaggregated growth-FDI relationship.

We find that different components of FDI flows have different effects on sectoral growth. Aggregate FDI is growth enhancing at the aggregate level, a result that confirms that of the previous studies. Digging into the data at the industry level, we show that this effect operates often through the manufacturing sector and it is most evident in Latin America and Caribbean region, and Europe and Central Asia, in low income countries, and countries with large manufacturing bases. In contrast, against what would be commonly expected, we find that service FDI is not always growth enhancing, and is likely to lead to deindustrialization in some specific economies. Further disaggregation reveals that the culprit behind this unexpected result is the nonfinancial service FDI, which drains resources and hurts growth in manufacturing industry in South East Asia and the Pacific region, high income countries and services-based economies. Conversely, financial service FDI spurs growth by stimulating economic activity in both manufacturing and services sectors in the same three groups.

Our findings have a clear policy implication concerning the incentives given by governments to attract FDI. It appears that investment plans by MNEs in the manufacturing sector is likely to be a growth enhancing decision for the host country. However, decisions concerning services FDI should be based on the level of the development of the economy, the share of manufacturing and service industries, the geographical location of the country and most important, whether the MNEs will invest in financial or nonfinancial service sector.

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Appendix 1. Country list

Full sample

Argentina, Armenia, Australia, Austria, Bangladesh, Bolivia, Brazil, Bulgaria, Canada, Chile, China, Colombia, Costa Rica, Cyprus, Czech Republic, Denmark, Ecuador, El Salvador, Estonia, Finland, France, Germany, Honduras, Hong Kong, China, Hungary, Iceland, India, Indonesia, Ireland, Israel, Italy, Japan, Kazakhstan, Korea, Rep., Malaysia, Mexico, Morocco, Myanmar, Netherlands, Norway, Pakistan, Paraguay, Peru, Philippines, Poland, Portugal, Russian Federation, Singapore, Spain, Sweden, Switzerland, Thailand, Tunisia, Turkey, Uganda, United Kingdom, United States, Venezuela, RB, Vietnam

Latin America & the Caribbean

Argentina, Bolivia, Brazil, Chile, Colombia, Costa Rica, Dominican Republic, Ecuador, El Salvador, Honduras, Mexico, Paraguay, Peru, Venezuela, RB.

Europe & Central Asia

Armenia, Austria, Bulgaria, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Hungary, Iceland, Ireland, Italy, Kazakhstan, Netherlands, Norway, Poland, Portugal, Russian Federation, Spain, Sweden, Switzerland, Turkey, United Kingdom.

South & East Asia and the Pacific

Australia, Bangladesh, China, Hong Kong, China, India, Indonesia, Japan, Korea, Rep., Malaysia, Myanmar, Pakistan, Philippines, Singapore, Thailand, Vietnam.

Low Income group

Armenia, Bangladesh, Bolivia, Brazil, Bulgaria, China, Colombia, Dominican Republic, Ecuador, El Salvador, Honduras, India, Indonesia, Kazakhstan, Morocco, Myanmar, Pakistan, Paraguay, Peru, Philippines, Russian Federation, Thailand, Tunisia, Turkey, Uganda, Vietnam.

Middle Income group

Argentina, Chile, Costa Rica, Czech Republic, Estonia, Hungary, Malaysia, Mexico, Poland, Venezuela, RB.

High Income group

Australia, Austria, Canada, Cyprus, Denmark, Finland, France, Germany, Hong Kong, Iceland, Ireland, Israel, Italy, Japan, Korea, Rep., Netherlands, Norway, Portugal, Singapore, Spain, Switzerland, United Kingdom, United States.

Appendix 2.

Determinants of real GDP per capita growth[a].

Unbalanced panel	All countries	LA & C	E & CA	S & EA	Low income	Middle income	High income	Man. based	Mixed	Services-based
Real GDP per capita growth										
Coefficient (Std. Err.)										
log of lagged GDP per capita level	0.988** (0.00)	0.995** (0.01)	0.983** (0.00)	0.988** (0.00)	0.973** (0.01)**	0.928** (0.02)	0.981** (0.01)	0.987** (0.01)	0.990** (0.00)	0.997** (0.00)
Gross fixed capital formation share of GDP	0.186** (0.04)	0.348** (0.10)	−0.060 (0.08)	0.174** (0.07)	0.193** (0.04)	0.281** (0.11)	0.054 (0.07)	0.145** (0.06)	0.187** (0.05)	0.516** (0.13)
Real lending interest rate	−0.024 (0.017)	−0.003 (0.02)	−0.024 (0.04)	−0.097 (0.13)	−0.019 (0.02)	0.008 (0.02)	−0.048 (0.07)	−0.021 (0.04)	−0.004 (0.02)	−0.025 (0.02)
Gross secondary school enrolment ratio	0.039** (0.010)	0.028 (0.03)	0.027** (0.01)	0.023 (0.016)	0.090** (0.03)	0.023 (0.02)	0.009 (0.01)	0.037 (0.04)	0.033** (0.01)	−0.001 (0.02)
Government consumption share of GDP	−0.000 (0.00)	0.000 (0.00)	−0.001** (0.00)	0.001 (0.00)	0.000 (0.00)	−0.001 (0.00)	−0.001 (0.00)	−0.002* (0.00)	0.000 (0.00)	0.000 (0.00)
Government stability	0.005** (0.00)	0.008** (0.00)	−0.001 (0.00)	0.007 (0.01)	0.005** (0.00)	0.011** (0.00)	0.002 (0.00)	0.006 (0.01)	0.003 (0.00)	0.003 (0.00)
Total FDI share of GDP	0.158** (0.05)	0.082 (0.19)	0.102 (0.06)	0.131 (0.13)	0.146 (0.13)	0.170 (0.30)	0.141** (0.05)	0.268** (0.12)	0.229** (0.07)	−0.257 (0.19)
Constant	0.022 (0.02)	−0.063 (0.04)	0.206** (0.04)	0.0194 (0.05)	0.069 (0.04)	0.522** (0.17)	0.196 (0.08)	0.077 (0.06)	0.017 (0.03)	−0.0038 (0.03)
Number of observations	524	143	203	129	167	99	258	95	286	143
Number of groups	55	14	21	15	21	10	24	19	42	23
Arellano-Bond test for A R(2) in first differences	0.968	0.133	0.139	0.298	0.675	0.226	0.398	0.054	0.799	0.506

Panel 1998–2004

Real GDP per capita growth	All countries	LA & C	E & CA	S & EA	Low income	Middle income	High income	Manufacturing Based	Mixed	Services-based
Coefficient (Std. Err.)										
log of lagged GDP per capita level	0.988** (0.00)	0.971** (0.02)	0.982** (0.00)	0.988** (0.00)	0.978** (0.01	0.916** (0.04)	0.979** (0.01)	0.981** (0.01)	0.990** (0.03)	0.100** (0.01)
Gross fixed capital formation share of GDP	0.251** (0.06)	0.523** (0.13)	−0.020 (0.12)	0.299** (0.05)	0.276** (0.08)	0.406** (0.15)	−0.027 (0.10)	0.193** (0.10)	0.297** (0.09)	0.615** (0.19)
Real lending interest rate	−0.052** (0.03)	−0.075** (0.03)	−0.088 (0.06)	−0.017 (0.07)	−0.068** (0.02)	−0.143 (0.10)	0.096 (0.07)	−0.105 (0.14)	−0.021 (0.04)	−0.059 (0.04)
Gross secondary school enrolment ratio	0.042** (0.01)	0.083 (0.07)	0.022* (0.01)	0.030 (0.02)	0.076** (0.02)	0.099 (0.07)	0.025** (0.01)	0.082 (0.08)	0.034** (0.01)	0.006 (0.03)

(*continued on next page*)

(*continued*)

Panel 1998–2004										
Real GDP per capita growth	All countries	LA & C	E & CA	S & EA	Low income	Middle income	High income	Manufacturing Based	Mixed	Services-based
Government consumption share of GDP	−0.00003 (0.0004)	0.001 (0.00)	0−0.002** (0.00)	0.001* (0.00)	0.001 (0.00)	0.001 (0.00)	−0.002** (0.00)	−0.003 (0.00)	0.001 (0.00)	0.000 (0.01)
Government stability	0.002 (0.002)	0.009 (0.01)	−0.003 (0.00)	−0.008** (0.00)	−0.001 (0.00)	0.011** (0.01)	−0.002 (0.00)	0.002 (0.00)	0.002 (0.00)	−0.002 (0.03)
Total FDI share of GDP	0.129 (0.07)*	−0.468 (0.39)	0.122 (0.10)	0.173** (0.05)	0.080 (0.24)	−0.529 (0.45)	0.096 (0.07)	0.220 (0.21)	0.200** (0.07)	−0.417* (0.22)
Constant term	0.032 (0.03)	0.053 (0.08)	0.242** (0.06)	0.113** (0.04)	0.085 (0.06)	0.531* (0.30)	0.263** (0.09)	0.118 (0.09)	−0.0157 (0.04)	−0.044 (0.04)
Number of observations	269	71	95	72	101	57	111	64	131	74
Number of groups	54	13	21	14	20	10	24	17	39	22
Arellano-Bond test for AR(2) in first differences	0.408	0.263	0.740	0.175	0.165	0.180	0.396	0.159	0.103	0.087

** and * represent marginal significance levels with less than 5%, and with equal or less than 10%, respectively.LAC, ECA, SEAP stand for Latin America and Caribbean; Europe and Central Asia; and South and East Asia and Pacific, respectively.

[a] Figures in parentheses are the standard errors.

Appendix 3.

Panel OLS (POLS) and Fixed Effects (FE) estimate results.[a] Growth effect of total FDI and Manufacturing FDI.

	Sample	Total FDI		Manufacturing FDI					
				Manufacturing growth		Service growth		GDP growth	
		POLS	FE	POLS	FE	POLS	FE	POLS	FE
All countries	1990–2004	0.128** (0.00)	0.087* (0.07)	0.611** (0.01)	0.346** (0.02)	0.082 (0.30)	0.179** (0.01)	0.252** (0.01)	0.243** (0.00)
	1998–2004	0.094** (0.03)	0.080* (0.08)	0.441** (0.03)	0.198 (0.19)	0.094 (0.21)	0.103* (0.07)	0.194* (0.05)	0.182** (0.01)
Latin America & the Caribbean (LAC)	1990–2004	0.004 (0.98)	−0.047 (0.80)	1.954** (0.04)	2.267** (0.05)	0.261 (0.52)	0.636 (0.18)	0.629 (0.16)	0.564 (0.28)
	1998–2004	−0.114 (0.49)	−0.229 (0.23)	3.558** (0.03)	2.147 (0.33)	1.278** (0.01)	1.235* (0.07)	1.439** (0.03)	0.245 (0.75)
Europe & Central Asia (ECA)	1990–2004	0.181** (0.00)	0.111** (0.00)	0.373** (0.01)	0.173** (0.07)	−0.012 (0.84)	0.059 (0.22)	0.103** (0.04)	0.138** (0.00)
	1998–2004	0.145** (0.00)	0.076* (0.10)	0.317 (0.10)	0.122 (0.48)	−0.012 (0.87)	0.023 (0.74)	0.088 (0.21)	0.131** (0.01)
South & East Asia and the Pacific (SEAP)	1990–2004	0.075 (0.43)	−0.045 (0.78)	0.473 (0.35)	0.688 (0.30)	−0.167 (0.51)	0.001 (1.00)	0.097 (0.69)	0.200 (0.61)
	1998–2004	0.074 (0.39)	0.074 (0.54)	0.169 (0.77)	0.658 (0.25)	0.134 (0.56)	0.082 (0.81)	0.110 (0.66)	0.395 (0.25)
Low income economies	1990–2004	0.108 (0.36)	−0.111 (0.54)	0.207 (0.80)	0.479 (0.66)	−0.268 (0.49)	−0.308 (0.58)	0.376 (0.38)	−0.367 (0.52)
	1998–2004	0.096 (0.41)	−0.011 (0.95)	1.047 (0.27)	0.972 (0.27)	0.525 (0.23)	0.688 (0.21)	0.982* (0.06)	0.290 (0.52)
Middle income economies	1990–2004	0.174 (0.33)	0.103 (0.57)	2.410** (0.01)	1.939** (0.02)	1.349** (0.00)	0.901** (0.03)	0.952** (0.04)	0.872** (0.02)
	1998–2004	0.035 (0.87)	0.145 (0.36)	2.779** (0.01)	1.648 (0.11)	0.961** (0.04)	0.856** (0.03)	0.823 (0.71)	0.789** (0.02)
High income economies	1990–2004	0.114** (0.01)	0.086** (0.04)	0.354* (0.07)	0.124 (0.20)	−0.009 (0.92)	0.044 (0.43)	0.111 (0.13)	0.147** (0.01)
	1998–2004	0.101** (0.02)	0.074* (0.08)	0.097 (0.65)	−0.016 (0.91)	−0.035 (0.63)	0.018 (0.73)	0.063** (0.41)	0.112* (0.07)
Manufacturing based economies	1990–2004	0.295** (0.00)	0.013 (0.90)	3.125** (0.01)	1.550 (0.20)	1.020** (0.02)	0.783 (0.14)	1.696 (0.00)	0.840* (0.09)
	1998–2004	0.204** (0.03)	0.006 (0.96)	2.146* (0.09)	−0.262 (0.85)	0.536 (0.37)	0.571 (0.50)	1.058 (0.15)	0.504 (0.39)
Mixed economies	1990–2004	0.129** (0.02)	0.103 (0.23)	0.455** (0.02)	0.133 (0.19)	0.047 (0.54)	0.093 (0.12)	0.191** (0.02)	0.077 (0.28)
	1998–2004	0.114* (0.05)	0.095 (0.18)	0.228* (0.07)	0.035 (0.83)	0.131* (0.07)	0.052 (0.34)	0.172** (0.02)	0.026 (0.71)
Services based economies	1990–2004	−0.066 (0.36)	−0.023 (0.72)	0.277 (0.66)	−0.048 (0.95)	−0.210 (0.47)	0.130 (0.72)	−0.169 (0.52)	0.287 (0.24)
	1998–2004	−0.100 (0.19)	−0.117* (0.09)	0.326 (0.70)	0.312 (0.79)	−0.199 (0.44)	0.186 (0.49)	−0.278 (0.42)	0.568 (0.15)

[a] See notes to Table Appendix 2. The first entry in each cell is the estimate of the FDI coefficient on output.

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