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Do Multinational Enterprises Contribute to Convergence or Divergence? A Disaggregated Analysis of US FDI

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Abstract

It is a widely held belief that foreign direct investment (FDI) has a positive effect on economic growth. We test this hypothesis by performing convergence regressions derived from a model of endogenous technological change. We estimate the rate of growth in per-capita income, relative to the per-capita income of the United States, in terms of US FDI, human development, financial development, and trade. We apply a panel approach, instrumenting for explanatory variables and correcting for correlated errors by clustering by countries. The heterogeneity of FDI is taken into account by considering various FDI-related activities in addition to the conventionally used FDI stocks and flows. Furthermore, we draw on industry-specific FDI data, rather than exclusively on aggregated data. Our empirical analysis puts into question the currently prevailing euphoria about FDI as a means to induce economic catching-up processes of developing countries. We conclude that the central challenge facing policymakers is not to attract FDI, but to improve the local conditions required to benefit from the widely perceived unique advantages of FDI. In addition, our findings support the proposition that FDI stocks do not adequately reflect FDI-related economic activities.

Resumen

Se considera ampliamente que la inversión extranjera directa (IED) tiene un efecto positivo sobre el crecimiento económico. Sometemos esta hipótesis a prueba mediante regresiones de convergencia, derivadas de un modelo de cambio tecnológico endógeno. Estimamos la tasa de crecimiento del ingreso per cápita *en relación con el ingreso* per cápita *de Estados Unidos, en términos de la IED, el desarrollo humano, el desarrollo financiero y el comercio norteamericanos. Aplicamos un enfoque de panel al instrumentar las variables explicativas y corregir los errores correlacionados, mediante la agrupación por países. Se toma en cuenta la heterogeneidad de la IED al considerar varias actividades relacionadas con la misma, además de los montos y flujos de IED de uso convencional. Más aún, diseñamos sobre datos de IED específicos a la industria, más bien que sobre datos agregados. Nuestro análisis empírico pone en entredicho la euforia que prevalece actualmente respecto a que la IED es un medio para inducir los procesos de convergencia económica de los países en desarrollo. Concluimos que el reto central que enfrentan los encargados de las políticas no es atraer IED, sino mejorar las condiciones locales que se requieren para beneficiarse de lo que ampliamente se percibe como ventajas únicas de la IED. Además, nuestros resultados apoyan la proposición de que las existencias de IED no reflejan adecuadamente las actividades económicas relativas a la IED.*

Introduction

Governments around the world take part in fierce international competition for foreign direct investment (FDI), not least by offering subsidies to multinational companies. Developing and newly industrializing countries are strongly advised, even by former critics of multinational companies such as the United Nations (UN 2002), to draw on FDI in order to supplement domestic savings and induce catching-up processes. This reflects the widely held belief, particularly among policymakers, that FDI has positive effects on economic growth. The underlying argument is that FDI represents "a composite bundle of capital stocks, know-how, and technology, and hence its impact on growth is expected to be manifold" (De Mello 1997: 1). FDI is often considered the dominant channel of international transfers of technology to developing countries (JBIC Institute 2002; Borensztein 1998; UNCTAD 1999.

Yet, it is surprisingly hard to come by conclusive evidence supporting the predominant view on the growth impact of FDI. The unique advantages of FDI over domestic investment as well as other forms of capital imports may be compromised in various ways (Section 1). Several studies point to the relevance of supportive host-country conditions, which are often lacking in developing countries. The growth impact of FDI may also depend on investors' motivations and the type of FDI. The heterogeneity of FDI is largely ignored in the literature.

It is in two ways that we attempt to overcome this limitation (Section 2). First, we consider various FDI-related activities such as R&D undertaken by foreign affiliates and technology imports, in addition to the conventionally used FDI stocks and flows. Second, we apply disaggregated FDI data for specific industries, in contrast to the aggregate stock or flow data typically used in previous studies. We draw on the detailed online data base provided for US FDI by the US Department of Commerce, Bureau of Economic Analysis (BEA).

We perform convergence regressions estimating the cross-country contribution of different dimensions of US FDI in different industries to convergence and growth. The form of these estimates is derived from a model of endogenous technological change (Section 3). The convergence regressions estimate the rate of growth in *per-capita* income of host countries, relative to the *per-capita* income of the United States, in terms of US FDI, human development, financial development, and trade. The independent variables are also interacted with relative *per-capita* income, to obtain a measure of their impact on convergence. We apply a panel approach, instrumenting for explanatory variables and correcting for correlated errors by clustering by countries. We also use a robust estimate to control for heteroskedasticity.

We find that FDI dimensions for which the results are significant have a positive effect on the growth of relative income of fairly advanced host countries (Section 4). However, the effect on relative growth diminishes for lower-income countries. FDI contributes to convergence only for countries classified by the World Bank as high-income countries, and could contribute negatively for middle and low-income countries. This finding has important policy implications, as we conclude in Section 5.

1.- Where Do We Stand?

Some recent studies support the view that FDI contributes to factor productivity and income growth in host countries (OECD 2002: 13). Using FDI stock and/or flow data and applying OLS estimates, Ram and Zhang (2002) as well as Khawar (2005) find the nexus between FDI and the host countries' economic growth to be positive. Blonigen and Wang (2004) present Seemingly Unrelated Regression (SUR) estimates of the determinants of *per-capita* growth across countries, including decade-averages of FDI inflows, for the 1970s and 1980s. In their estimates for developing countries, the growth impact of FDI turns out to be positive.

Yet it remains debatable if, and under which conditions, FDI leads to convergence. Several studies suggest that the growth impact of FDI depends on whether or not certain pre-conditions are met in the host countries. Balasubramanyam *et al*. (1996) stress that openness to trade is essential. According to De Mello (1997), the larger the technological gap between the host and the home country of FDI, the smaller the impact FDI will have in the former. Alfaro *et al*. (2001) conclude that, below a threshold level of financial market development in the host country, FDI will not exert beneficial effects on growth. Borensztein *et al*. (1998) show that FDI raises growth only in countries with a sufficiently qualified labor force.[1] In one way or another, these studies echo an earlier finding of Blomström *et al*. (1994), namely that developing countries must have reached a minimum level of economic development before they can capture the growth-enhancing effects of FDI.

Most of the earlier studies have some limitations in common, which may have as a consequence that the growth effects of FDI are overstated. First of all, the endogeneity of the FDI variable is often ignored. According to Carcovic and Levine (2002), the exogenous component of FDI flows does not exert a significant independent influence on *per-capita* income growth.[2]

[1] While Ram and Zhang (2002) as well as Khawar (2005) do not find any evidence supporting the complementarity between FDI and the host country's level of education, Blonigen and Wang (2004) report a similar pattern as in Borensztein *et al.* (1998), even though the turning point is shown to be at a lower level of education.

[2] Blonigen and Wang (2004) argue, however, that this result is due to "inappropriate pooling of wealthy and poor countries."

Second, most studies consider FDI flows. By contrast, the relationship between FDI stocks and growth "is a matter on which we totally lack trustworthy conclusions" (Caves 1996: 237). Dutt (1997), who uses stock data, even finds a significantly negative growth impact of FDI.

Third, FDI dimensions other than stocks and flows are hardly considered in the literature on the FDI-growth nexus, even though they can reasonably be expected to play a role:

- The reasoning of Balasubramanyam *et al*. (1996) implies that world-market oriented FDI is superior to purely local-market oriented FDI because the former is more in line with comparative cost advantages of host countries.[3] This suggests to consider FDI-related exports as an important dimension of FDI.
- UNCTAD (1998: 111-116) argues that multinational companies are increasingly pursuing complex integration strategies. Hence, the convergence effects of FDI may depend on the extent to which developing host countries are part of the sourcing and marketing networks of multinational companies. This can be checked by looking at another FDI dimension, namely the degree of vertical integration of foreign affiliates (proxied by imports from, and exports to the parent company).
- The significance of technological spillovers, which are widely believed to be crucially important for FDI to promote growth, is likely to depend on (i) the supply of superior technology and know-how by multinational companies, and (ii) the capacity of host countries to absorb superior technology and know-how. Hence, FDI may induce divergence, rather than convergence, not only because host countries lack absorptive capacity (Görg and Greenaway 2002; Xu 2000), but also because multinational companies supply less technology to developing countries. The latter proposition can be checked by considering FDI dimensions such as R&D activities of foreign affiliates and technology transfers by parent companies.

Fourth, the literature largely ignores another aspect of the heterogeneity of FDI by using aggregate stock or flow data. Nunnenkamp and Spatz (2004) argue that the motivations underlying FDI differ across sectors and manufacturing industries. It cannot be ruled out that this translates into varying growth effects of FDI in particular industries. For example, the growth effects tend to be compromised if FDI crowds out local investment.[4]

[3] Nunnenkamp and Spatz (2004) argue that so-called efficiency-seeking FDI is more likely to bring in technology and know-how that is compatible with the host country's level of development, and to enable local suppliers and competitors to benefit from spillovers through adaptation and imitation. Moreover, this type of FDI is supposed to generate growth-enhancing export earnings.

[4] Fears of crowding-out, which were widespread in developing countries in the past, may have receded since several cross-country studies have found no evidence to this effect (Lipsey 2000). However, Agosin and Mayer (2000) show that crowding-out has been the norm in Latin America.

Crowding-out may depend on the sectoral structure of FDI. FDI in the services sector, often related to privatization programs, is an obvious case in point, but local investment may also be replaced in manufacturing industries in which local producers lack competitiveness. At the same time, FDI-related spillovers tend to be industry-specific (Kokko 2002). For instance, resource seeking FDI in the primary sector often takes place in economic enclaves with weak linkages to the local economy.

All this suggests that favorable growth effects of FDI cannot be taken for granted. Poor countries may find themselves in a trap which is difficult to escape: FDI-related technology transfers and spillovers to the local economy would be required most urgently in poor countries to narrow particularly wide productivity gaps. However, the supply of superior technology by multinational companies to poor countries could be constrained by the type of FDI these host countries tend to attract. Furthermore, local firms may be too far behind in terms of technological and managerial development to benefit from imitating technologies applied by foreign investors and to become involved in corporate networks.

2.- Data on US FDI and Stylized Facts

It is in two respects that detailed FDI data are required for a large number of host countries to perform a cross-country analysis that accounts for the heterogeneity of FDI. First, in addition to conventionally used FDI dimensions such as FDI stocks and flows, other dimensions that may be relevant for the economic growth effects of FDI have to be covered. These include: R&D activities of foreign affiliates, technology transfers from parent companies to affiliates, the export orientation of affiliates, and the integration of affiliates into parent companies' sourcing and marketing networks. Second, sectorally disaggregated data are needed to assess the relevance of industry characteristics in shaping the growth impact of FDI. To the best of our knowledge, there is only one data source that meets both requirements: the online data base provided by the US Department of Commerce, Bureau of Economic Analysis (BEA), for US FDI abroad as well as the activities (so-called operational data) of majority owned non-bank affiliates of US parent companies. Hence, the subsequent analysis is restricted to the economic growth effects of US FDI ,which accounted for slightly more than a quarter of worldwide outward FDI stocks in 2003 (UNCTAD 2004: Annex table B.4).

We apply BEA data on various FDI dimensions for the period 1980-2000.[5]

[5] US direct investment position abroad on a historical cost basis; US direct investment abroad, capital outflows; US direct investment abroad, income; royalties and license fees, US parents' receipts; research and development performed by affiliates; US exports of goods shipped to affiliates by US parents; US imports of goods shipped by affiliates to US parents; employment of affiliates; employee compensation of affiliates; gross product of affiliates; sales

Furthermore, we draw on industry-specific BEA data for petroleum,[6] manufacturing, wholesale trade, finance (except depository institutions),[7] services,[8] and other industries.[9] The manufacturing sector is broken down further into food and kindred products, chemicals and allied products, primary and fabricated metals, industrial machinery and equipment, electronic and other electric equipment, transportation equipment, and other manufacturing.

A simple inspection of the data indicates that for developing countries, and especially the poorest among them, it may be more difficult to derive economic benefits from FDI than to attract FDI.[10]

For example, intra-firm trade of US affiliates operating in developing countries with US parents is less advanced than the share of developing countries in US FDI stocks (30 % in 2000) would suggest, once the exceptional case of Mexico is excluded. This is especially so for African host countries, where more than 80 % of total sales by US affiliates in the manufacturing sector were destined to local markets.

FDI-induced convergence of poor developing countries also appears to have been hindered by relatively weak R&D activities of US affiliates. The concentration of R&D activities in developed host countries is not unexpected, considering relative factor endowments in developed and developing countries. However, developing countries also received considerably less technology transfers, measured by royalties and license fees paid by US affiliates to their parent companies, than their share in US FDI stocks would have suggested.The limited supply of advanced technologies by US direct investors to developing host countries may have constrained the potential of growth-enhancing spillovers to the local economy.

The sectoral structure of US FDI in developing host countries offers further insights to this effect. Resource seeking FDI in the primary sector figures prominently in poor developing countries. US FDI in the petroleum industry accounted for more than 60 % of total US FDI stocks in Africa in 2000. FDI in this industry is often in economic enclaves with few linkages to the local product and labor markets. Rather than enhancing economic development of poor host countries, it tends to induce rent-seeking and might cause "Dutch disease" effects (Nunnenkamp and Spatz 2004).

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by affiliates to foreign countries other than the host country; sales by affiliates to the United States; total sales by affiliates.

[6] Petroleum, which comprises oil and gas extraction as well as petroleum and coal products, is used as a proxy for the primary sector that receives resource seeking FDI. The primary sector as a whole cannot be singled out from BEA data as agriculture and mining were included in "other industries" in the period of observation.

[7] Real estate and holding companies are subsumed under "finance" in the BEA source.

[8] "Services" according to BEA statistics comprise, inter alia, business services, hotels, health services, motion pictures, as well as engineering, architectural and surveying services.

[9] Some services items such as transportation and communication are included in "other industries."

[10] For a more detailed presentation of stylized facts on US FDI in developed and developing countries, see the Working Paper version of this article (http://www.uni-kiel.de/ifw/pub/kap/2005/kap1242.pdf).

The share of developing countries in industry-specific FDI stocks held by the United States in all host countries ranges from 19 % in chemicals and metals to 50 % in electronic equipment. US FDI in the labor intensive electronic equipment industry is in accordance with factor endowments typically prevailing in developing countries. Positive growth effects may have been supported by the strong export orientation of US affiliates and the high degree of vertical integration in this industry. On the other hand, technology transfers to affiliates operating in the electronic equipment industry are clearly below the manufacturing average. By contrast, machinery stands out in terms of high technology transfers, and transport equipment in terms of high R&D activities undertaken by US affiliates. Mainly developed host countries of US FDI may have benefited from the application of recent technologies in these industries, considering that about three quarters of US FDI stocks were located in developed countries. This applies even more so to the chemical industry, which ranks second (behind machinery) when local R&D and technology transfers are taken together.

Likewise, mainly developed countries appear to have benefited from high technology transfers in services industriesThe share of developing countries in industry-specific FDI stocks was particularly low (16.5 %) in "services" (as defind by BEA). Considering the group of five industries in which technology transfers exceeded the average of 4.57 % of US affiliates' value added (food, chemicals, machinery, wholesale trade, and services), 78 % of US FDI stocks were located in developed host countries. By contrast, the share of developing countries in US FDI stocks was relatively high (34 %) for the group of seven industries in which technology transfers remained below the average. This pattern underscores our proposition that FDI may lead to divergence, rather than convergence.

3.- Model and Estimation Approach

A recent strand of the literature on endogenous technological change has expanded the scope of both theoretical and empirical studies to include the possibility of long-term differences in growth rates. The historical record shows that growth rates indeed differ substantially across countries over long periods of time. Pritchett (1997) estimates that the proportional gap in *per-capita* GDP between the richest and poorest countries grew more than five-fold from 1870 to 1990. According to Maddison (2001), the proportional gap between the richest group of countries and the poorest grew from 3 in 1820 to 19 in 1998. The divergence between rich and poor countries continued through the end of the twentieth century, even though various rich and middle-income countries have been converging to parallel growth paths over the past 50 years or so (Barro and Sala-i-Martin 1992; Mankiw, Romer and Weil 1992; Evans 1996). For example, the proportional gap in *per-capita* GDP

between Mayer-Foulkes' (2002) richest and poorest convergence groups grew by a factor of 2.6 between 1960 and 1995, the period usually studied in cross-country regressions.

In the last decade, the empirical growth literature has arrived at the consensus that technological differences are a central factor underlying divergence. Easterly and Levine (2001) estimate that about 60 % of the cross-country variation in growth rates of *per-capita* GDP is attributable to differences in productivity growth. Klenow and Rodríguez-Clare (1997) estimate that in their sample about 90 % of the variation is attributable to differences in productivity growth. Thus divergence reflects long-lasting cross-country differences in rates of technological progress.

Howitt and Mayer-Foulkes (2005) and Aghion, Howitt and Mayer-Foulkes (2005) develop models extending the theory of endogenous technological change so that it can account for underdevelopment. In these models, technological leaders and some groups of following countries grow at the rate of the leading technological edge, while other followers further behind may grow at a lower rate. Essentially, what defines underdevelopment are economic phenomena that impede technological change, for example, threshold requirements in human capital accumulation to attain R&D and institutional development necessary for credit markets to fuel desired levels of technological change. When these failures are not too strong, countries will lag in levels but not in growth, while for stronger failures countries will also attain lower growth rates.

Both papers introduce models for closed economies in which growth occurs through technological transfers (exchange of ideas) whose rate is governed by local characteristics of the economy. These local characteristics determine the rate of absorption of innovations occurring worldwide or, for simplicity, in leading economies. A convergence effect exists because the farther behind an economy lags, the more technologies can be tapped from world knowledge. However, divergence is possible because local conditions may make the rate of absorption too low. Thus, the extent to which follower economies will converge in growth rates or levels to the leading economies is endogenously determined. Essentially, the model for small countries[11] is of the form:

$$a_{t+1} = \mu(X(a_t)) + \frac{1-\mu(X(a_t))}{1+g_t} a_t , \qquad (1)$$

where $a_t = A_t / \overline{A}_t$ represents the technological level At of a small country with respect to the leading technological edge $\overline{A}_t$, μ represents the probability of

[11] Countries are regarded as small if they have an insignificant effect on the rate of growth of the leading technological edge.

innovation in each intermediate sector, itself a function of variables Xt (such as financial development or a threshold effect for the possibility of R&D) which might in turn depend on at. Finally, gt represents the growth rate of the technological frontier.

As mentioned in the beninning, it is widely believed that FDI works like financial development. If this is true, the above model can be considered an adequate point of departure for the econometric estimates. We assume in the following that there is a set of variables Xt influencing the probability of innovation and, therefore, determining the magnitude (and sign) of convergence. These variables include FDI and variables that are essential to control for if the impact of FDI is to be ascertained, namely financial development, trade, as well as human and physical capital.

We follow Aghion, Howitt and Mayer-Foulkes (2005), who evaluate the effects of financial development on convergence, and use worker productivity as a proxy for technological levels, because these cannot be measured directly.[12] Hence, the relative technological level at is represented by relative *per-capita* income to the United States, which proxies for the leading technological edge. The estimate has the form of a standard growth regression in the relative income variable, except for the inclusion of an interaction term between financial development ("credit") —the variable influencing convergence— and the initial relative income term.[13] Here, we perform a similar estimate, except that we expand the variables influencing convergence to include credit, US FDI, openness to trade, capital and human capital. Also, we consider a panel rather than just a cross-section, and instrument all stock variables.

Let i index countries and t time, and let Xi,t stand for the variables influencing convergence, yi,t represents the log of *per-capita* income of country i. Define the relative *per-capita* income to the United States, a deflated variable that proxies for at, by:

$$\hat{y}_{i,t} = y_{i,t} - y_{US,t} \quad (2)$$

We estimate the following equation, which we call a convergence regression:

$$\Delta\hat{y}_{i,t+5} = \beta_0 + \beta_y \hat{y}_{i,t} + \beta_X \overline{X}_{i,t} + \beta_{Xy} \overline{X}_{i,t} \bar{\hat{y}}_{i,t} + \beta_Z Z_{i,t} + \varepsilon_t + \eta_{i,t}. \quad (3)$$

Here Δ is the forward difference operator, so that the dependent variable is the growth rate of relative *per-capita* income. Xi,t are variables influencing convergence, stated in a bounded form consistent with a steady-state analysis. In our case, these variables characterizing the economy are the

[12] The estimates of technological levels depend on assumptions on the production function and on measurements of human and physical capital which are not very precise and, in any case, are scarce for low-income countries.
[13] It is shown under some assumptions that this regression model can be derived from a log-linear approximation to (1).

ratios of private credit, US FDI, imports plus exports, and physical capital to GDP, and the absolute variable, log life expectancy (which proxies for human capital). Averages of Xi,t and $\hat{y}_{i,t}$ over the five-year period t to t + 5 are used because the convergence effect that is modeled occurs continuously over this period. Finally, Zi,t are other variables and their coefficients. In particular, we use for Zi,t the change in the ratio of physical capital to GDP and the change in life expectancy, thus controlling for the effects of physical and human capital accumulation on growth. We also include a fixed time effect εt in some of the regressions. All variables in the regression are stationary variables.

Thus, our estimates control for the most important variables that could have an impact on economic growth, and also for the most important variables which could be related to FDI, namely physical and human capital accumulation, institutional arrangements affecting the economy (represented by the amount of private credit as a ratio to GDP), and openness to trade.

Physical and human capital accumulation are considered in two ways. First, we enter capital stocks which may themselves determine growth and convergence rates. In the case of physical capital, we use the ratio to GDP, which is a stationary variable and less subject to endogenous variation (Klenow and Rodríguez-Clare, 1997). Second, we control for changes in the physical capital ratio and for changes in life expectancy within each period (our flow variables), that is, for changes in inputs which may give rise to growth independently of any FDI effects.

As shown in Aghion, Howitt and Mayer-Foulkes (2005), the rate of convergence estimated for each country is $\beta_y + \boldsymbol{\beta}_{\mathbf{X}y}\overline{\mathbf{X}}_{i,t}$. Convergence occurs if this is negative. If a variable in Xi,t promotes convergence it will have a negative coefficient in βiXy. Also, relative income levels depend positively on the non-interacted coefficient βiX. A positive sign for the non-interacted coefficient βiX (the intercept) means that US FDI promotes the growth of *per-capita* income relative to the United States for countries with an income at the US level. If the sign for the interacted coefficient βiXy (the slope) is positive, The growth effect diminishes for lower-income countries

The sample is defined by those countries for which the private credit variable, *per-capita* income, and life expectancy are available over the quinquenia 1980-1985 to 1995-2000, amounting to 313 observations.[14] For part of this sample, trade and physical capital variables are unavailable. So as not to reduce the sample, we made the observation for these variables "zero" and included a dummy for "Not available (NA)".

In convergence regression (3), the error term may be correlated with the variables $\mathbf{X}_{i,t}$ influencing convergence (due to endogeneity), and with the

[14] Including life expectancy only eliminates four observations.

mean relative income level $\bar{y}_{i,t}$ occurring through the period t to t + 5. In addition, the errors may be correlated across time periods for each country. The second problem is corrected using clustering and a robust estimate of the errors. To correct for the first problem, all of the variables $\overline{X}_{i,t}$ and their interactions with $\bar{\hat{y}}_{i,t}$ are instrumented . Table 1 lists the set of instruments.

Table 1

Instruments Used for the Convergence Determinants

Convergence determinant	**Instruments**
Private credit	Legal origin dummies
US FDI	Log distance to US, log area, tropical, latitude, landlocked
Openness to trade	Exports and imports in 1958
Life expectancy	Life expectancy in 1962

Legal origin dummies for English, French, German and Scandinavian legal systems are exogenous variables mostly determined long before our estimation period 1980-2000. These variables are intimately associated with the property rights regime that makes private credit possible and instrument for the institutional structure of countries. They are used by Levine, Loayza and Beck (2000) and later Aghion, Howitt and Mayer-Foulkes (2005) to study the impact of financial development on economic growth. The four dummies were supplemented by a "legal origin not available" dummy so as not to reduce the sample.

In the case of US FDI, the distance to the United States is a natural instrument. The remaining variables log area, tropical, latitude, and landlocked may also have a bearing on the incentives for FDI, and are found to be statistically relevant. Moreover, since instruments are in fact used jointly, the presence of these geographical instruments strengthens the instrument set as a whole. The instruments are fairly effective, as can be seen from the OLS regressions for US FDI stocks (historical cost basis) and R&D expenditures of US affiliates, taken over the regression sample (Table 2). For openness to trade and life expectancy, we simply use the corresponding variables for 1958 and 1962, respectively.

Table 2

Selected Dimensions of US FDI Regressed on Instruments[a]

	US FDI stocks (historical cost basis)	R&D by US affiliates
Log distance to US	-0.046	-0.019
	[1.73]	[2.01]*
Log area	-0.044	-0.017
	[3.53]**	[5.14]**
Latitude	-0.002	0
	[1.78]	[0.87]
Landlocked	0.298	-0.028
	[4.29]**	[1.35]
Tropical	0.19	0.001
	[3.22]**	[0.11]
Constant	1.347	0.362
	[5.16]**	[4.27]**
Observations	317	129
R-squared	0.17	0.24

[a]Robust t statistics in square brackets;
* significant at 5 %; ** significant at 1 %

Source: Own calculations based on BEA

4.- Empirical Results

We use convergence regression (3) to estimate the effect of US FDI on the growth of income relative to the United States, according to the relative income of each country. Estimates are run for each of the 13 FDI dimensions listed in Section 2. At the same time, we make use of the industrial classification of the BEA data. In addition to applying aggregate FDI data for all industries and total manufacturing, we run the estimates on the basis of industry-specific data for 12 industries (petroleum, wholesale trade, finance, services, other industries, food and kindred products, chemicals and allied products, primary and fabricated metals, industrial machinery and equipment, electronic and other electric equipment, transportation

equipment, and other manufacturing).[15] In principle, this results in 13*14 regressions. For 54 regressions there were more than 50 US FDI data points (in the 1980-1995 sample, which has 313 observations).

The availability of data for physical capital, which ends in 1992, was another limiting factor in running the regressions. Extrapolation was used to generate the 1990-1995 average of the level and the rate of change of physical capital. However, it was impossible to include physical capital in the 1995-2000 period.

The change in physical capital is clearly endogenous with economic growth errors, but this variable need not necessarily be instrumented since we are not interested in an estimate of its coefficient. Moreover, we do not have any specific instruments for it. Nevertheless, since our set of instruments is relatively large, it is possible to run the estimates instrumenting for all variables. Note also that the inclusion of time dummies, a somewhat non-economic variable, could reduce the significance of results. Finally, excluding the physical capital variable allows considering a larger sample. According to these considerations, the regressions were run in five different ways (Table 3).

Overall, the findings are similar across regression sets. Table 4 presents a comparison of estimates 1 to 5 when applied to US FDI stocks on historical cost basis, for both the instrumented and non-instrumented versions.[16] Most of the results achieved for controlling variables are plausible. Initial relative income is always significantly negative with little variation in coefficient values. Likewise, life expectancy, which proxies for human capital, obtains fairly robust results. Both, the level of life expectancy and its interaction with initial relative income are significantly positive. Physical capital, trade and private credit lose significance after instrumentation. By contrast, the instrumentation increases the coefficient obtained for US FDI, as is to be expected for a variable that is positively correlated with shocks to economic growth. The coefficients of US FDI and its interaction with initial relative income are hardly affected when varying the sample and instrumentation according to estimates 1 to 5. Both coefficients turn out to be significantly positive. The positive sign of the interaction term means that US FDI leads to divergence rather than convergence for host countries below a certain threshold of relative income (see below for details).

[15] See Section 2 for detailed description.

[16] The complete regression results for other FDI dimensions and particular industries are not reported here, but are available from the authors upon request.

Table 3

Description of Estimates

Estimate	Sample	Instrumented variables
1	1980-1995	All stock variables and also physical and human capital change
2	1980-1995	All stock variables
3	1980-1995	All stock variables; no time dummies used
4	1980-2000	All stock variables; NA dummy for physical capital included
5	1980-2000	All stock variables; all physical capital variables excluded

The finding that the non-interacted as well as the interacted coefficients of US FDI are positive also applies to other FDI dimensions and particular industries. This can be seen in Figure 1 which portrays the histograms of all these coefficients as well as the corresponding t-statistics. Almost all non-interacted coefficients are significant at the 5 % level; the same is true for roughly half of the interacted coefficients. The results achieved from a regression across the total set of FDI coefficients underscore that the choice between estimates 1 to 5 has little effect. The underlying regression equation is as follows:

$$c_i = \sum_{Industries\ j} \alpha_i I_{ij} + \sum_{FDIdimensions\ j} \beta_i F_{ij} + \sum_{Estimate\ j} \eta_{ij} \qquad (4)$$

This regression reveals the effect on US FDI coefficients of belonging to a specific industry or FDI dimension. Iij is “one” if coefficient i belongs to industry j and “zero” otherwise, and similarly in the case of Fij for FDI dimensions. Fixed effects ηij for each estimate j = 1 to 5 are also included.

Table 4

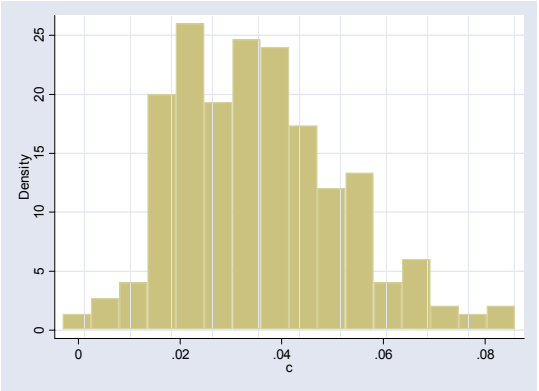
Comparison between Convergence Regressions for p*er-capita* Income Relative to US[a]
(Instrumented Variables[b], Clustered by Countries, Robust Estimates)

	1	2	3	4	5	1(OLS)	2(OLS)	3(OLS)	4(OLS)	5(OLS)
Initial relative income y	-0.31 (7.52)**	-0.316 (7.46)**	-0.336 (6.67)**	-0.301 (6.15)**	-0.293 (6.81)**	-0.327 (17.62)**	-0.328 (16.97)**	-0.328 (16.97)**	-0.34 (19.40)**	-0.342 (19.61)**
US FDI(stocks at hist. cost)	0.022 (3.15)**	0.023 (3.11)**	0.022 (2.44)*	0.02 (2.34)*	0.02 (2.79)**	0.015 (3.49)**	0.014 (3.11)**	0.014 (3.11)**	0.014 (3.37)**	0.013 (2.84)**
US FDI × Average y	0.02 (2.31)*	0.021 (2.41)*	0.021 (1.97)	0.018 (1.97)	0.02 (2.63)**	0.008 (2.95)**	0.007 (2.86)**	0.007 (2.86)**	0.007 (2.98)**	0.008 (3.00)**
Life expectancy	0.207 (6.53)**	0.21 (6.44)**	0.233 (6.15)**	0.208 (6.28)**	0.19 (6.14)**	0.228 (10.17)**	0.224 (9.14)**	0.224 (9.14)**	0.223 (10.02)**	0.223 (10.51)**
Life expect × Average y	0.069 (6.69)**	0.071 (6.66)**	0.077 (6.24)**	0.066 (5.59)**	0.066 (6.26)**	0.069 (13.16)**	0.07 (12.89)**	0.07 (12.89)**	0.071 (14.62)**	0.071 (15.02)**
Private credit	-0.014 (1.29)	-0.013 (1.13)	-0.009 (0.73)	-0.013 (1.03)	-0.005 (0.55)	-0.018 (2.87)**	-0.018 (2.90)**	-0.018 (2.90)**	-0.021 (3.69)**	-0.012 (2.97)**
Private credit × Average y	-0.025 (1.38)	-0.022 (1.18)	-0.005 (0.19)	-0.015 (0.53)	-0.034 (1.76)	-0.016 (2.93)**	-0.017 (3.02)**	-0.017 (3.02)**	-0.018 (3.65)**	-0.015 (3.87)**
Trade	0.01 (1.54)	0.009 (1.43)	0.008 (1.17)	0.01 (1.60)	0.008 (1.38)	0.012 (2.99)**	0.011 (2.88)**	0.011 (2.88)**	0.013 (3.30)**	0.013 (3.47)**
Trade × Average y	0.002 (0.27)	0.001 (0.20)	-0.001 (0.19)	0.001 (0.21)	0.001 (0.17)	0.006 (2.53)*	0.006 (2.47)*	0.006 (2.47)*	0.009 (3.27)**	0.009 (3.71)**
NA Trade	0.04 (1.51)	0.037 (1.40)	0.029 (1.05)	0.031 (1.22)	0.032 (1.36)	0.052 (2.94)**	0.049 (2.83)**	0.049 (2.83)**	0.054 (3.21)**	0.057 (3.75)**
NA Trade × Average y	0.005 (0.19)	0.003 (0.11)	-0.01 (0.34)	-0.001 (0.04)	0.001 (0.05)	0.027 (2.47)*	0.026 (2.41)*	0.026 (2.41)*	0.034 (3.18)**	0.038 (3.85)**
Capital	0.012 (1.01)	0.012 (0.95)	0.021 (0.88)	0.022 (1.36)		0.012 (2.35)*	0.011 (2.21)*	0.011 (2.21)*	0.011 (2.50)*	
Capital × Average y	-0.012 (0.57)	-0.016 (0.71)	-0.022 (0.68)	-0.008 (0.32)		0.006 (1.15)	0.005 (1.05)	0.005 (1.05)	0.008 (2.00)*	
NA Capital	0 (0.03)	0.003 (0.25)	0.014 (0.80)	0.016 (0.93)		-0.001 (0.20)	0.001 (0.11)	0.001 (0.11)	0.002 (0.34)	
NA Capital × Average y	-0.002 (0.45)	-0.002 (0.37)	0.004 (0.34)	0.007 (0.69)		0.002 (0.68)	0.003 (0.86)	0.003 (0.86)	0.004 (1.35)	
dCapital	0.006 (1.50)	0.007 (1.70)	-0.009 (0.25)	-0.015 (0.36)		0.007 (2.10)*	0.007 (2.34)*	0.007 (2.34)*	0.007 (2.32)*	
dLife Expectancy	-0.144 (0.89)	-0.06 (0.38)	0.595 (1.11)	0.007 (0.02)	-0.425 (1.37)	-0.02 (0.14)	0.048 (0.33)	0.048 (0.33)	-0.128 (1.50)	-0.144 (1.78)
Dummy 1980-1985		-0.003 (1.05)	-0.004 (1.16)	0.001 (0.09)	0.007 (1.68)		-0.003 (1.11)	-0.003 (1.11)	0.001 (0.27)	0.003 (1.28)
Dummy 1985-1990		0.004 (1.72)	0.004 (1.15)	0.007 (1.21)	0.015 (3.73)**		0.004 (1.91)	0.004 (1.91)	0.008 (1.98)*	0.01 (4.29)**
Dummy 1990-1995				0.004 (0.83)	0.012 (3.07)**				0.004 (1.07)	0.006 (3.42)**
Dummy NA Capital				-0.011 (1.30)					-0.004 (1.02)	
Constant	-0.942 (7.41)**	-0.953 (7.29)**	-1.053 (6.58)**	-0.949 (6.81)**	-0.871 (6.83)**	-1.031 (11.50)**	-1.011 (10.14)**	-1.011 (10.14)**	-1.014 (11.12)**	-1.017 (11.70)**
Observations	313	313	313	391	391	313	313	313	391	391
R-squared	0.7	0.7	0.61	0.62	0.66	0.76	0.77	0.77	0.77	0.76

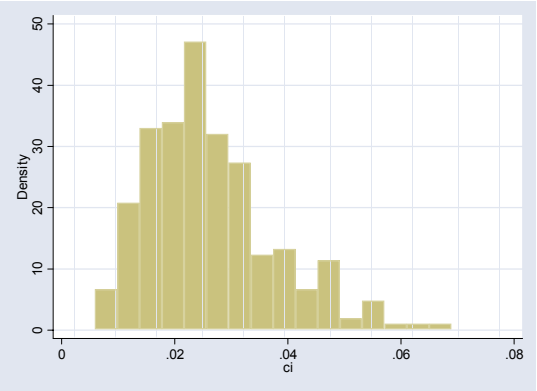
[a] All regressions use FDI stock data in all industries. Robust t-statistics in parentheses; *,** significant at 5 % and 1 %, respectively. —
[b] Instruments: legal origin, tropical, distance to US, area, latitude, landlocked, exports and imports in 1958, life expectancy in 1962.

Source: Own calculations based on BEA.

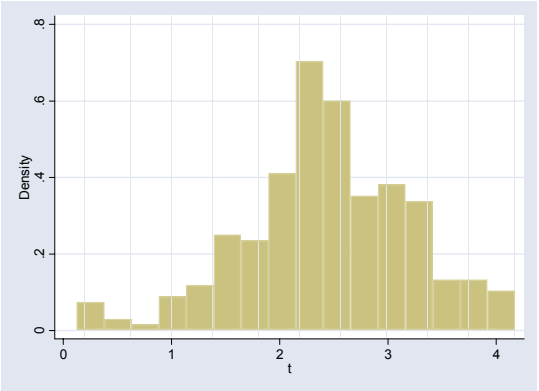
Figure 1
Histograms for US FDI Coefficients and their t-Statistics
(from 5 sets of regressions)



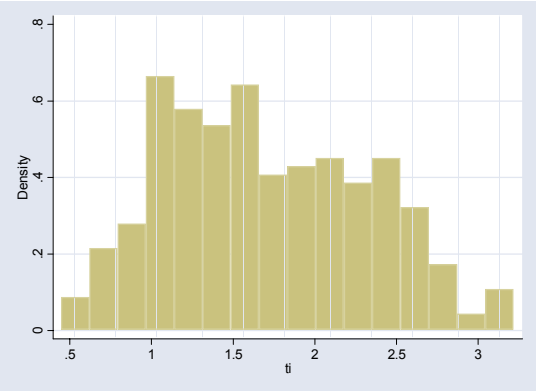
1.1 Non-interacted Coefficients



1.2 Interacted Coefficients



1.3 Non-interacted t-Statistics



1.4 Interacted t-Statistics

The regression effects show that the three estimates for the 1980-1995 sample are essentially the same (Table 5, lower panel). The results obtained for the 1980-2000 sample including physical capital give slightly higher non-interacted coefficients which are slightly less significant. By contrast, the exclusion of the physical capital variable has the effect that all coefficients are higher and more significant.

Table 5

Comparison of Coefficients across Regression Sets

	Industries, FDI dimensions and regression effect	Non-interacted coefficient	Interacted coefficient	Non-interacted t-statistic	Interacted t-statistic
Industries[a] (all industries as reference)	Petroleum	0.008	0.006	-0.232	0.11
		(2.78)**	(2.05)*	(1.47)	(0.73)
	Total manufacturing	-0.004	0.001	-0.12	-0.149
		(2.00)*	(0.51)	(1.02)	(1.33)
	Food and kindred products	-0.025	-0.001	-1.261	-0.186
		(10.26)**	(0.34)	(9.51)**	(1.48)
	Chemicals and allied products	-0.009	0.001	-0.415	-0.118
		(4.18)**	(0.61)	(3.52)**	(1.05)
	Primary and fabricated metals	-0.011	0.015	-0.754	0.122
		(3.32)**	(4.72)**	(4.09)**	(0.70)
	Electronic and other electric equipment	-0.009	0.013	-0.233	0.336
		(3.18)**	(4.83)**	(1.47)	(2.23)*
	Other manufacturing	-0.01	-0.001	-1.144	-0.648
		(3.02)**	(0.23)	(6.20)**	(3.69)**
	Wholesale trade	0.008	0.012	-0.047	0.083
		(3.32)**	(5.15)**	(0.36)	(0.66)
	Finance	-0.009	0.02	-0.919	0.097
		(2.79)**	(6.35)**	(4.98)**	(0.55)
	Services	0.005	0.019	0.16	0.564
		(2.22)*	(8.32)**	(1.20)	(4.46)**
	Other industries	0.01	0.013	0.476	0.328
		(2.95)**	(4.13)**	(2.58)*	(1.86)
FDI dimensions[b] (stocks at historical cost as reference)	Capital outflows	0.005	0.006	-0.434	-0.282
		(1.10)	(1.45)	(1.76)	(1.20)
	Income	0.006	0.004	0.074	-0.197
		(3.22)**	(2.39)*	(0.70)	(1.97)
	Royalties and license fees	0.004	0.007	0.659	0.637
		(1.58)	(2.78)**	(4.31)**	(4.38)**
	Total sales by affiliates	0.012	0.004	-0.268	-0.305
		(5.77)**	(1.80)	(2.29)*	(2.74)**
	Sales by aff. to the United States	0.019	0.026	0.015	0.031
		(4.12)**	(6.10)**	(0.06)	(0.13)
	Sales by aff. to foreign countries (except host country)	0.024	0.023	0.413	0.769
		(5.32)**	(5.38)**	(1.68)	(3.29)**
	Employment of affiliates	0.02	0.004	-0.397	-0.538
		(10.72)**	(2.44)*	(3.94)**	(5.62)**
	Employee compensation of affiliates	0.024	0.009	-0.213	-0.45
		(13.20)**	(4.98)**	(2.11)*	(4.70)**
	US imports shipped by aff. to US parents	-0.005	0.003	-1.363	-0.763
		(1.10)	(0.69)	(5.55)**	(3.26)**
	US exports shipped to aff. by US parents	0.02	0.016	0.003	-0.053
		(7.18)**	(6.06)**	(0.02)	(0.36)
Regression effect (1980-1995 sample, capital **changes not**	1980-1995 sample, all variables instrumented	-0.001	0	-0.254	-0.06
		(0.46)	(0.22)	(2.68)**	(0.66)
	1980-1995 sample, capital changes not instrumented, no time dummies	0.002	-0.002	0.174	-0.069
		(1.16)	(1.12)	(1.84)	(0.77)
	1980-2000 sample, capital changes not instrumented	0.007	0.002	-0.198	-0.129
		(4.26)**	(1.42)	(2.09)*	(1.43)
	1980-2000 sample, capital excluded (see text)	0.005	0.005	0.447	0.417
		(2.95)**	(3.28)**	(4.71)**	(4.62)**
	Constant	0.025	0.013	2.804	1.855
		(10.78)**	(6.38)**	(22.61)**	(15.71)**
	Observations	270	270	270	270
	R-squared	0.72	0.52	0.63	0.48

[a]Industrial machinery and transportation equipment not significantly different from the reference.— [b]R&D by affiliates not significantly different from the reference.

Source: own calculations based on BEA.

The findings reported so far strongly suggest that US FDI, in general, contributes to convergence only in host countries that have achieved a relatively high *per-capita* income already. Yet, the estimates run for different dimensions of FDI and for FDI in particular industries support the proposition that FDI is a heterogeneous phenomenon. As concerns FDI dimensions, results for US FDI in all industries and total manufacturing can be summarized as follows:[17]

- Using aggregated data for all industries, it turns out that both coefficients of US FDI outflows (non-interacted and interacted) are considerably higher than those of US FDI stocks on historical cost basis. This is consistent with previous studies which typically show weaker growth effects when relying on stock data.[18]
- Compared to FDI stocks, almost all other FDI dimensions obtain a higher coefficient of the non-interacted FDI term. In particular when using aggregated data for all industries, as most previous studies do, the effects of FDI appear to be understated by measuring FDI on the basis of stock data. This is probably because FDI stocks do not adequately reflect FDI-related activities of foreign affiliates. The effects turn out to be strongest if FDI is measured by R&D activities undertaken by US affiliates in host countries.
- The interacted FDI term remains insignificant for several FDI dimensions. For example, we find evidence of divergence effects with regard to the employment of affiliates, their sales to the United States and shipments to parent companies. By contrast, the coefficient and significance of the interacted term is particularly high for R&D by affiliates.

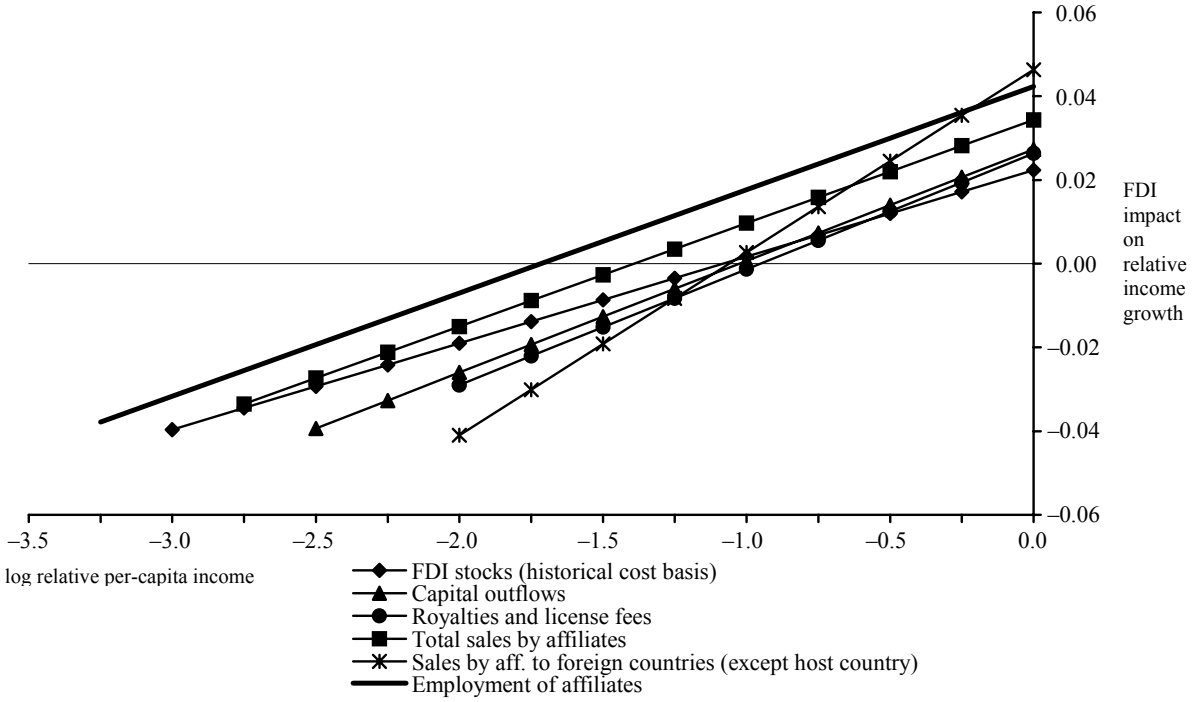
The second panel of Table 5 compares the coefficients of the non-interacted and interacted FDI terms between FDI dimensions by running regression (4) across the total set of FDI coefficients. The results underscore that higher coefficient values, though often associated with lower significance, are achieved when considering FDI dimensions other than FDI stocks on historical cost basis. In most instances, both the non-interacted and the interacted terms turn out to be higher compared to the reference of FDI stocks. However, making full use of the coefficients achieved in industry-specific estimates results in two deviations from the findings based on aggregated FDI data for all industries. First, the effects of FDI outflows are no longer stronger than the effects of FDI stocks. Second, royalties and license fees, which proxy

[17] For details, see the working paper version of this article.
[18] See Section I as well as Nunnenkamp and Spatz (2004).

technology transfers from US parents to their foreign affiliates, still obtain a higher coefficient of the interaction term, but the non-interaction term turns insignificant when compared to that of FDI stocks.[19]

The regression results in Table 5 can be used to estimate the impact of different FDI dimensions, as well as FDI in different industries, on economic growth and convergence in the host countries of US FDI. Figure 2 presents the calculations for selected FDI dimensions. It turns out that the threshold of relative *per-capita* income beyond which convergence occurs depends on which FDI-related activity is considered.

Figure 2. Estimated Impact of US FDI: Selected FDI Dimensions[a]



[a]Individual graph lengths adapted to reflect average sample range for each FDI dimension.
Source: own calculations based on BEA.

Most notably, only high-income host countries (according to World Bank classification) are likely to benefit from technology transfers from US parent companies.[20] This supports the reasoning in Sections 1 and 3 that many developing countries lack absorptive capacity and are plagued by local conditions impeding technological spillovers. Even when considering

[19] R&D performed by US affiliates is not listed in Table 5 as industry-specific data are largely lacking for this FDI dimension.
[20] Note that high-income countries have a log relative *per-capita* income of –1.4 or higher.

employment or total sales of US affiliates, however, convergence effects appear to be restricted to fairly advanced host countries in the upper middle or higher income groups.

Turning to industry-specific estimates, it has to be recalled that the number of FDI-related observations is often below 50. Estimates are based on a larger number of observations for almost all particular industries only if FDI stocks on historical cost basis are used. Hence, we start with this FDI dimension to estimate the industry-specific coefficients of the non-interacted and interacted terms (results not shown). Both coefficients remain insignificant for three industries: In the case of "finance", this may be due to the inclusion of FDI in real estate and holding companies. Likewise, "other manufacturing" represents a fairly heterogeneous set of industries. More surprisingly perhaps, it is also for chemicals that both FDI coefficients are insignificant. A possible explanation is that US FDI in this industry is extremely concentrated in industrialized host countries (Section 2).[21] . However, the estimates based on some other FDI dimensions (e.g., sales to foreign countries as well as royalties and license fees) suggest another explanation, namely that stock data do not adequately reflect FDI-related activities, especially so in the chemical industry.

In addition to the aforementioned industries, the interaction term remains insignificant for FDI stocks in industrial machinery and equipment. Divergence effects of FDI in this industry may have been contained by particularly high technology transfers to US affiliates and their particularly strong export orientation (Section 2). However, the number of FDI-related observations in machinery is too small to draw strong conclusions. Moreover, similar to chemicals, the results for machinery vary considerably across FDI dimensions: Considering royalties and license fees, instead of FDI stocks, both the non-interaction and the interaction terms turn out to be insignificant, whereas both terms are significantly positive when considering the sales of US affiliates to foreign countries other than the host country.

Different industry characteristics notwithstanding, the results are fairly similar for FDI stocks in the remaining industries. Yet, it is also for these industries that relying exclusively on stock data may provide a misleading picture on the effects of FDI on growth and convergence. As before with regard to FDI dimensions, the first panel of Table 5 compares the coefficients of the non-interacted and interacted FDI terms between industries, based on the total set of FDI coefficients with all industries serving as the reference.[22] There are three categories of industries:

[21] The results based on FDI stocks are relatively weak for the metal industry, too, which represents another manufacturing industry with an extremely strong concentration of US FDI in industrialized countries.

[22] There are no entries for industrial machinery and transportation equipment as the regression underlying Table 5 is restricted to coefficients based on at least 50 observations.

(i) Relatively high coefficients for both the non-interaction and interaction terms are shown for petroleum, wholesale trade, services, and other industries.

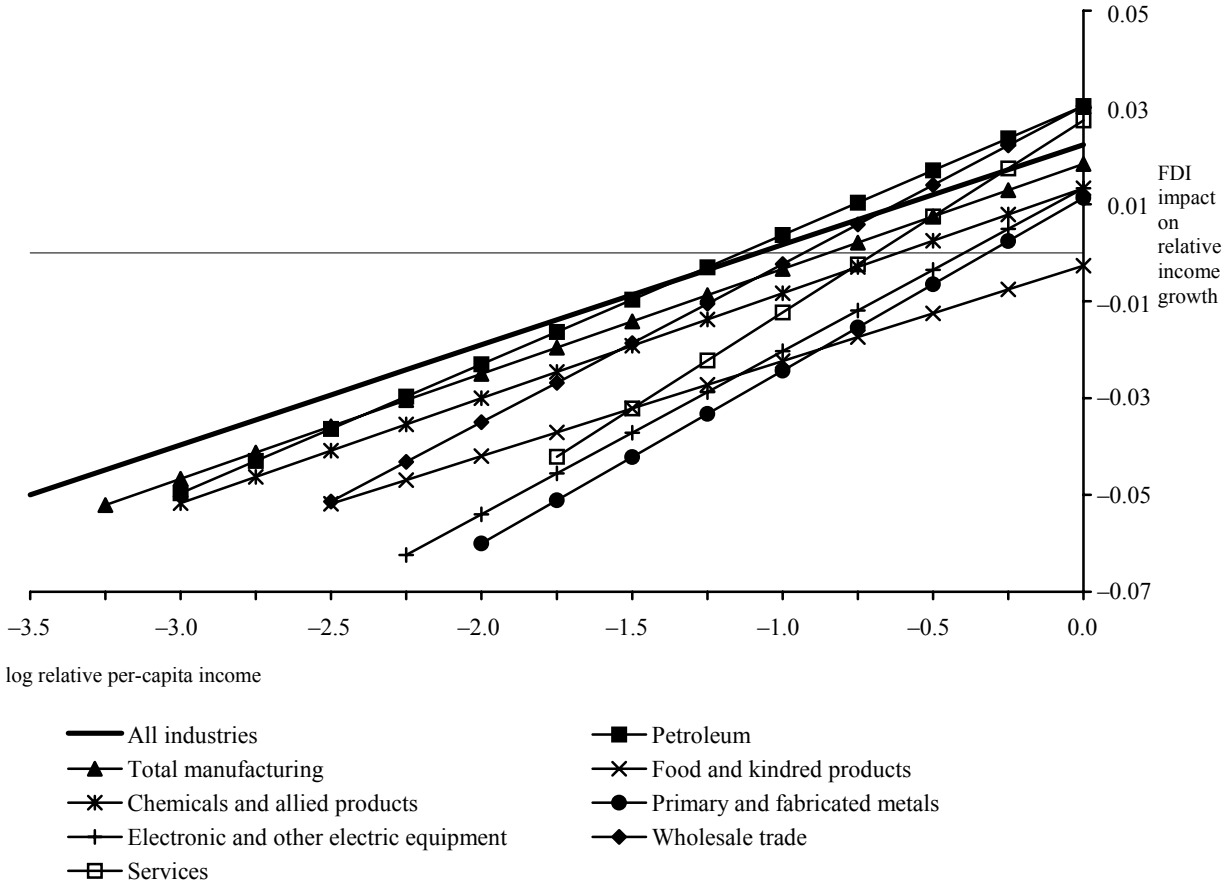
(ii) Manufacturing as a whole as well as food, chemicals, and other manufacturing obtain a lower coefficient of the non-interaction term, while the interaction term reveals little difference compared to the reference of all industries.

(iii) Divergence effects appear most likely in the metal industry, in electronic and electric equipment, and in finance. It may be surprising that electronic and electric equipment belongs to this category. US FDI in this relatively labor intensive industry tends to be in accordance with factor endowments prevailing in developing host countries. As noted in Section 2, however, convergence induced by FDI in electronic and electric equipment may have been hindered by minor technology transfers.

The estimated impact of US FDI on convergence, portrayed in Figure 3 for selected industries, underscores the differences across industries outlined above. For host countries close to US income levels, we observe relatively strong convergence effects if US FDI takes place in the services sector (wholesale trade and "services" as defined by BEA) and in the petroleum industry. By contrast, convergence effects are marginal at best, even in most advanced host countries, for FDI in some industries, including food, metals, and electronic and electric equipment. All industries have in common, however, that the threshold of relative *per-capita* income beyond which US FDI leads to convergence is fairly high, i.e., in the range of high-income countries as defined by the World Bank.

Figure 3

Estimated Impact of US FDI: Selected Industries[a]



[a]Individual graph lengths adapted to reflect average sample range for each industry.

Source: own calculations based on BEA.

5.- Summary and Conclusions

In this paper, we perform convergence regressions that estimate the rate of growth in *per-capita* income, relative to the *per-capita* income of the United States, in terms of US FDI, human development, financial development, and trade. We apply a panel approach, instrumenting for explanatory variables and correcting for correlated errors by clustering by countries. We also use a robust estimate to control for heteroskedasticity. At the same time, we account for the heterogeneity of FDI that is largely ignored in previous empirical studies on the growth impact of FDI. We consider various US FDI-

related activities, in addition to the conventionally used FDI stocks and flows. Furthermore, we draw on industry-specific FDI data, rather than exclusively relying on highly aggregated data.

Our findings support the proposition that the widely used measure of FDI stocks does not adequately reflect FDI-related economic activities of foreign affiliates of US based multinational companies. FDI dimensions such as the employment of US affiliates and their total sales are more likely to contribute to convergence than the mere presence of US affiliates, as reflected in FDI stocks. By contrast, convergence effects are less likely to result from technology transfers by US parent companies. This supports the view that many developing countries lack absorptive capacity and are plagued by local conditions impeding technological spillovers.

Differences in growth and convergence effects are less pronounced when comparing US FDI across industries. This may be due, at least partly, to data limitations. Based on FDI stocks, we found similar results for industries revealing different characteristics in terms of factor intensities and export orientation. Yet, divergence effects appear to be more likely in some industries, including the electronic and electric equipment industry. Convergence effects in this relatively labor intensive industry, in which US FDI tends to be in accordance with factor endowments prevailing in developing countries, may have been hindered by weak technological spillovers.

These differences across FDI dimensions and industries notwithstanding, the convergence regressions have one important thing in common. While economic activities related to US FDI have a positive effect on the growth of relative income in fairly advanced host countries, therefore contributing to their convergence to US income levels, this effect diminishes for lower-income host countries. In most host countries classified by the World Bank as low-or middle-income countries, US FDI tends to widen income differentials.

Our analysis puts into question the currently prevailing euphoria about FDI as a means to induce or strengthen economic catching-up processes of developing countries. Hopes raised by international organizations, notably the United Nations, that FDI could help eradicate poverty appear to be highly unreasonable. The central challenge facing policymakers in developing countries is not to attract FDI, but to improve the local conditions required to benefit from the widely perceived unique advantages of FDI. The absorptive capacity of host countries in making use of superior technologies applied by foreign direct investors appears to be crucially important in this regard. Local firms are often too far behind the technological frontier to grasp opportunities for technological and managerial imitation.

This leads to the conclusion that policymakers in developing countries should focus their attention on local economic phenomena that impede technological progress. Human capital formation, institution building and local enterprise development may help raise the rate of absorption of

technological and managerial innovations available worldwide. Unless the technological gap is narrowed in this way, it makes little sense to enter into the fierce international competition for FDI by offering fiscal incentives and outright subsidies, in order to attract FDI in technologically advanced operations. Developing countries should use scarce public resources more productively.

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