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GROWTH AND THE QUALITY OF FOREIGN DIRECT INVESTMENT: IS ALL FDI EQUAL?

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Growth and the Quality of Foreign Direct Investment: Is All FDI Equal?

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Abstract

In this paper we distinguish different "qualities" of FDI to re-examine the relationship between FDI and growth. We use 'quality' to mean the effect of a unit of FDI on economic growth. However, this is difficult to establish because it is a function of many different country and project characteristics which are often hard to measure. Hence, we differentiate "quality FDI" in several different ways. First, we look at the possibility that the effects of FDI differ by sector. Second, we differentiate FDI based on objective qualitative industry characteristics including the average skill intensity and reliance on external capital. Third, we use a new dataset on industry-level targeting to analyze quality FDI based on the subjective preferences expressed by the receiving countries themselves. Finally, we use a two-stage least squares methodology to control for measurement error and endogeneity. Exploiting a new comprehensive industry level data set of 29 countries between 1985 and 2000, we find that the growth effects of FDI increase when we account for the quality of FDI.

Key words: foreign direct investment, economic growth, industry data, spillovers, instrumental variables.
JEL Classification: F23, F36, F43, O40.

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1 Introduction

Policy makers and academics often maintain that foreign direct investment (FDI) can be a source of important productivity externalities for developing countries. In addition to supplying capital, FDI can be a source of valuable technology and know-how and foster linkages with local firms that can help to jumpstart an economy. Despite the strong conceptual case for a positive relationship between economic growth and FDI, the empirical evidence has been mixed.[1]

While academics tend to treat FDI as a homogenous capital flow, policy makers, on the other hand, seem to believe that some FDI projects are better than others. National policies toward foreign direct investment (FDI) seek to attract some types of FDI and regulate other types in a pattern which seems to reflect a belief among policymakers that FDI projects differ greatly in terms of the national benefits to be derived from them. UNCTAD's World Investment Report 2006 for instance describes "quality FDI" as "the kind that would significantly increase employment, enhance skills and boost the competitiveness of local enterprises." Policymakers from Dublin to Beijing have implemented complex FDI regimes with a view to influencing the nature of the FDI projects attracted to their shores. Sean Dorgan, Chief Executive of Ireland's Industrial Development Agency, for example, claims that "the value of inward investment must now be judged on its nature and quality rather than in quantitative measures or job numbers alone."[2] Chinese officials have openly stated that the new challenge for the country is to attract more "high quality foreign direct investment."[3]

In this paper we attempt to distinguish different qualities of FDI to re-examine the relationship between FDI and growth. We use 'quality' to mean the effect of a unit of FDI on economic growth. However, this is difficult to establish because it is a function of many different country and project characteristics which are often hard to measure and the data quality is generally poor or available at a broad aggregate levels. Hence, we differentiate "quality FDI" in several different ways. First, we look at the possibility that the effects of FDI differ by sector and industries. Second, we differentiate FDI based on objective qualitative industry characteristics including the average skill intensity and reliance on external capital. Third, since no one characteristic of FDI can determine quality and because the quality of FDI is the interaction of investment and country characteristics, we use a new dataset on industry-level targeting to analyze quality FDI based on the subjective preferences expressed by the receiving countries themselves. Finally, we use a two-stage least squares methodology to control for measurement error and endogeneity. In order to do this, we exploit a comprehensive industry level data set of 29 countries between 1985 and 2000. To summarize our findings, the growth effects of FDI increase when we account for characteristics which might affect the quality of FDI.

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[1] See Blomström and Kokko (1998), Gorg and Greenaway (2004), Lipsey (2002), Barba-Navaretti and Venables (2004), and Alfaro and Rodriguez-Clare (2004) for surveys of spillover channels and empirical findings. For Western European countries, the evidence has been more positive, see for example Haskel, Pereira and Slaughter's (2002) study for U.K. and Gorg and Strobl's (2002) analysis of the high-tech sector in Ireland.

[2] Taken from IDA Annual Report, 2006.

[3] See http://www.china.org.cn/english/BAT/42600.htm.

One explanation for the ambiguity of the evidence is that the growth effects of FDI may vary across industries.[4] In particular, potential advantages derived from FDI might differ markedly across the primary, manufacturing and services sectors.[5] More generally, there might also be differences among industries within a sector. Using firm level data from the U.K., Girma, Greenaway, and Wakelin (2001), for example, find no evidence of intra-industry spillovers in the aggregate, but strong effects when they relate the extent of spillovers to industry characteristics.[6] Most of the macro empirical work that has analyzed the effects of FDI on host economies, however, has not controlled for the sector in which FDI is involved, mostly due to data limitations. Indeed, we find that when we control for industry characteristics and time effects, the relation between FDI and economic growth is no longer ambiguous but rather positive and significant. Our results imply that an increase in FDI flows from the 25th to the 75th percentile in the distribution of flows is associated with an increase of 13% in growth over the different industries' sample means.

Industry level analysis also enables us to differentiate FDI according to its industry-average characteristics. The macro literature has emphasized the dependence of productivity spillovers on the absorptive capacity of the local economy, with specific reference to human capital, financial development, and openness.[7] The importance of human capital presumably relates to the ability of a highly skilled domestic work force to adopt advanced technology. If the transfer of new technology and skills is one of the beneficial effects of FDI, we might expect the relationship between industry growth rate and FDI levels to be stronger in industries that are highly skill dependent. We investigate as well whether the relationship is stronger for industries that are particularly reliant on external finance as defined by Rajan and Zinagles (1998). We find that the relation between FDI at the industry level and growth in value added is stronger both for industries with higher skill requirements and for industries more reliant on external capital.[8] These results, apart from being consistent with the existing macro literature and hypothesized benefits of FDI, are further evidence of important cross-industry differences in the effects of FDI.

There are, of course, numerous project and industry characteristics which may affect the quality of foreign direct investment such as the mode of entry (Greenfield vs M&A), the country of origin, and many

[4] In this paper, "industry" refers to the 2 digit ISIC classification level.

[5] UNCTAD World Investment Report (2001:138), for instance, notes that, "[I]n the primary sector, the scope for linkages between foreign affiliates and local suppliers is often limited…. The manufacturing sector has a broad variation of linkage intensive activities. [In] the tertiary sector the scope for dividing production into discrete stages and subcontracting out large parts to independent domestic firms is also limited." The services sector accounts for 71% of FDI statistics, the manufacturing sector for only 27%, and agriculture for less than 1%.

[6] The authors find spillovers to be greater in higher skill industries. Similarly, Kathuria (2000), investigating spillovers from foreign firms in 26 Indian manufacturing industries, finds strong evidence of positive spillovers in "scientific" industries (drugs, pharmaceuticals, chemicals, electronics) relative to "non-scientific" ones (automobiles, non-electrical machinery, metal products).

[7] Borensztein, De Gregorio, and Lee (1998) and Xu (2000), for example, report a positive relationship only when a country has a minimum threshold of human capital. Alfaro, Chanda, Kalemli-Ozcan, and Sayek (2004), Durham (2004), and Hermes and Lensink (2003) find that only countries with well developed financial markets benefit significantly from FDI. Balasubramanyam, Salisu and Sapsford (1996) findings highlight the role of the export orientation of the country.

[8] In related work, Prasad, Rajan, and Subramanian (2006) find that in countries with weaker financial systems, foreign capital does not contribute to the growth of financially dependent industries.

others.[9] In this paper we are constrained by the availability of data at the industry level, however we are able to include subjective measures of quality as determined by policymakers themselves. Countries presumably target for investment promotion industries they believe to be especially beneficial.[10] For example, while export oriented high tech manufacturing firms may be suitable for one country, labor intensive textiles might be more appropriate for other countries. Indeed, while academics, especially those who employ national FDI statistics, might tend to treat FDI as homogenous, policy makers most surely do not. More than 160 governments have established investment promotion agencies (IPAs) to attract foreign direct investment, and more than 70% of these agencies report that they focus their resources on a small number of "target" industries that they deem to be of particular benefit (see Charlton et al. (2004). For example, the Czech investment promotion agency CzechInvest targets automotive manufacturing, electronics, plastics, and business services.[11] We argue that using countries' own targets to subjectively distinguish between industries is appropriate because the national benefits of an FDI project are determined by the interaction of project and country characteristics. First, policymakers' concepts of 'quality FDI' are likely to be based on a complex combination of different country characteristics such as human capital skills, financial dependence. Second, for any host country, the desirability of an industry will involve an interaction between the characteristics of the industry and the characteristics of the country. We test whether the benefits of FDI are stronger in the industries to which governments accord special priority.[12] Including only these targeted industries increases the significance of our results. We find in these selected industries that increasing FDI flows from the 25th to the 75th percentile in the distribution of flows occasions an increase of 73% in growth over the different industries' sample means.

Of course, these correlations might not imply causality. An important concern in the FDI growth literature is that growth may itself spawn more FDI. Alternatively, some third variable might affect a country's growth trajectory and, thereby, its attractiveness to foreign capital.[13] In these cases, the coefficients on the estimates are likely to overstate the positive impact of foreign investment. As a result, one could find evidence of positive externalities from foreign investment where no externalities occur.

Our ideal specification in this paper would be to correlate economic growth with exogenous changes in a homogenous type of FDI. Unfortunately, as described above, we cannot do this because FDI projects, as measured through balance of payments statistics, are neither homogenous nor exogenous. In short, we may have both endogeneity and measurement problems. Either our OLS results are biased downward because FDI statistics fail to accurately capture the heterogeneous impact of different types of

[9] Javorcik, Saggi and Spatareanu (2004), for example, find significant differences between spillover effects associated with foreign investors of different origin in Romania. Our data, however, do not allow controlling for these differences.
[10] According to UNCTAD (2001), targets are investors which: (a) Already have a presence in the host economy; (b) Are part of the supply chain; (c) Are users of countries' own resources, including raw materials and human skills; (d) Are active in strong production sectors with growth opportunities; (e) Help to establish new core competencies.
[11] See Charlton et al. (2004) and www.czechinvest.org.
[12] Using survey data verified by the annual reports of investment promotion agencies, we are able to identify which industries were targeted over which periods.
[13] Our estimates include fixed effects which control for time invariant effects.

foreign investment, introducing a form of measurement error into our ideal specification, or our OLS results are biased upward because of some reverse causation.

One way to address both problems is to use instrumental variables at the industry level.[14] To identify the effect of FDI on growth, we need an instrument that is correlated with the "idealized" quality-adjusted FDI volumes, but not with growth. We show industry targeting to be such an instrument. Targeting an industry for investment promotion should, if it is found to be effective, lead to an increase in both the quality and quantity of FDI. Our instruments satisfy conditions of relevance and exogeneity. The exclusion restrictions implied by our instrumental variable regression is that, conditional on the controls included in the regression, FDI targeting has no effect on current industry growth. The major concerns with these exclusion restrictions is that targeting is a policy choice which might be correlated with the current environment and have a direct effect on economic performance, or that industry targets are chosen based on expectations of future growth. We perform several tests, among them, overidentification tests to analyze whether FDI targeting has a direct effect on growth. We find no evidence of a direct effect of targeting on growth. Also lagged growth has a non-significant effect on industry targeting. Recognizing the selection problem that arises from the fact that industry-targeting activity is a choice rather than a natural policy experiment, we also use propensity score matching to ensure that we have a valid control group. Our main results are robust to this specification.

In our instrumental variable (IV) strategy, we find a strong first-stage relationship between the decision to target an industry and FDI flows to that industry. Our two-stage, least square estimates of the effect of FDI flow on industry value added growth is significant. As observed above, our results imply that increasing FDI flows from the 25th to the 75th percentile in the distribution of flows results in a 34% increase in growth over the sample mean in our preferred specifications. There is also considerable evidence that investment promotion attempts to encourage higher quality FDI.[15]

The estimated coefficient using the IV strategy is lower than its OLS counterpart on the subsample of targeted industries. That our IV estimates are higher than their OLS counterparts for the entire sample suggests that there is some attenuation bias caused by measurement error that outweighs the bias caused by endogeneity resulting from reverse causality. These results may be evidence of measurement error in the FDI data, but they may also be evidence that the quality of FDI is heterogeneous *within* as well as between industries and when countries target an industry for FDI they increase both the quantity and quality of the projects in that industry. In the process of targeting an industry for FDI, investment promotion agencies work at the project level to identify and attempt to attract foreign investors within their target industries that

[14] At the macro level, the literature has used real exchange rates and lagged values of FDI as instruments. See Blonigen (1997), Klein and Rosengren (1994), and Wheeler and Mody (1992).

[15] Further evidence that IPAs consciously target "quality" FDI is provided by the FDI consultancy OIR, which sells to national investment promotion agencies data about firms intending to respond with overseas investments. OIR clients can purchase data in several categories. By mode of entry, 100% of clients choose data on greenfield projects; 30% data on M&A projects; by functional category, 100% choose data on production facilities and R&D centers, fewer than 70% data on back office functions, and fewer than 50% data on marketing/sales facilities.

are believed to be especially beneficial to the host country. Hence, if targeting industries in which FDI is expected to promote growth (high tech, high skill, greenfield, and so forth) then our IV coefficient should be higher than our OLS coefficient. Despite limitations of the data, our instrumentation strategy yields similar results to the other exercise we conducted that attempted distinguish among the different forms and the quality of FDI. Overall, growth effects increase when we account for the "quality" of FDI. Our estimates should be interpreted with caution particularly in terms of deriving policy implications in favor of promoting FDI. An analysis of such question should consider the cost of incentives used versus the potential benefits. This kind of analysis is beyond the scope of this paper.

The rest of the paper is organized as follows. Section 2 provides an overview of the data. Section 3 explores the role of heterogeneity at the industry level. Section 4 presents empirical evidence on complementarities across sectors and analyzes differences in the quality of FDI. Section 5 discusses FDI targeting and our instrumentation strategy. Section 6 concludes.

2 Data and Descriptive Statistics

2.1 Foreign Direct Investment: Industry Data

Figure 1 breaks down national FDI statistics into seven sectors. The columns show the sum of inward FDI in constant 2000 U.S. dollars over the period 1985-2000. Finance, business, and real estate account for more than half, 53%, of FDI, manufacturing for 27%. The line in Figure 1 plots the ratio of FDI flows to total value added in the sector, which varies widely across industries from almost 15% in finance, business services, and real estate to less than 1% in agriculture.

Annual data on FDI inflows and stocks at the industry level are available from the OECD's International Direct Investment database. The OECD data are available at the International Standard Industrial Classification (Revision 3) secondary level classification. Nineteen industries, six in manufacturing, three in the agriculture and mining sectors, and ten in services, are listed and characterized in Table 1. As we are interested in the growth effects of FDI, we use data for three five-year periods between 1985 and 2000. In the robustness section, we also use three-year averages and, from Dun & Bradstreet's WorldBase database of public and private companies, an alternative measure of industry FDI based on the number of foreign firms. We also use an alternative specification in the robustness section using annual industry total factor productivity (TFP) growth as the dependent variable. Although our preferred dependent variable would be TFP growth, because data for industry-level capital stock is missing for many countries, the number of observations available to us is significantly reduced.

The main source of data on industry value added is the Industrial Statistics Yearbook of the United Nations Statistical Division, which reports data by industry (also using ISIC Rev. 3 classifications), but at the 3-digit level, for 29 industries. We mapped this data to the higher level of aggregation demanded by the OECD data. Our growth variable measures the growth of value added in each industry in each country for three five year periods between 1985 and 2000, measured by the difference in the log values over the period.

We derive an appropriate deflator for manufacturing value added in 1995 from the difference between constant local currency and current local currency growth in total manufacturing value added reported by the World Bank.[16] The initial share of the industry was derived by dividing the value added for each industry by the total national manufacturing value added.

Appendix A explains all data and sources in detail. Table 1 presents summary statistics for these variables. Table 2 presents the correlation matrix.

2.2 "Qualitative" Characteristics of Foreign Direct Investment

To test the differential effect of FDI, we divide sectors according to reliance on external finance (equity) and intensity of human capital. We use a measure of dependence on external finance (equity rather than cash generated flows) as defined by Rajan and Zingales (1998). Our measure of skill is the ratio of high skilled workers to other workers in German industries, following Carlin and Mayer (2003). Occupational data are based on the new version of the International Labor Office's International Standard Classification of Occupations, ISCO 88. White-collar high-skill includes legislators, senior officials and managers, professionals, and technicians and associate professionals. White-collar low-skill includes clerks, service workers, and shop and sales workers. Blue-collar high-skill includes skilled agricultural and fishery workers and craft and related trade workers. Blue-collar low-skill includes plant and machine operators and assemblers and elementary occupations. Monetary intermediation has the highest skill requirements while transport has the lowest. Table 1 presents the main summary statistics by sector.

For any country, the benefits of an FDI project are, as noted earlier, determined by the interaction of project and country characteristics. Because countries presumably target for investment promotion industries they believe will be especially beneficial—for example, one country might choose export-oriented, high tech manufacturing firms, another low tech call centers—we use in addition to objective industry characteristics a subjective criteria determined by the host countries.

We do this by exploiting policy changes in FDI attraction that operate at the industry level. Our industry-level investment promotion variable is constructed from survey information collected directly from promotion agencies; see Charlton et al. (2004) and Charlton and Davis (2006). Investment promotion describes the set of policies governments employ to attract foreign investment. More than 160 national level, and more than 250 sub-national, investment promotion agencies worldwide are tasked with performing various activities to attract foreign direct investment. Wells and Wint (1991) grouped these activities into four functional categories: national image building (for example, many IPAs disseminate favorable information about their countries through advertising campaigns, participation in investment exhibitions, and trade missions); investment generation (specific firm or industry specific research and sales presentations); facilitation services for potential investors (e.g., assistance with identifying potential

[16] Where total manufacturing value added data was unavailable, we derive a deflator from constant and current GDP data, also from the World Bank.

locations and meeting regulatory criteria and fast-track investment approval processes); and policy advocacy (many agencies, for example, provide feedback from foreign investors to policy makers and might lobby for pro-investment policies).

Our approach takes advantage of the fact that IPAs tend to focus their investment promotion resources on small numbers of "target industries." A survey of more than 120 national investment promotion agencies revealed that more than 70% report target industries; see Charlton et al. (2004). For example, CINDE, the Costa Rican Investment Board established in 1982, initially targeted only the electronics industry. In 1994, it announced expansion into medical devices and later into a range of business service industries. Similarly the Danish IPA focuses on just a small number of target industries, reporting that its strategy is to "concentrate especially on three focus areas where Denmark has global strengths: Life Sciences, ICT, and Renewable Energy."[17] What does targeting an industry for FDI actually involve? More than half of a subgroup of survey respondents asked to describe how targeting polices were implemented in practice acknowledged their organizational structure to be designed around target industries with specialized staff responsible for specific industries. For example, Invest in Sweden Agency (ISA) reports that it focuses on the automotive, life sciences, communications and wood processing industries and these priorities are reflected in its organization structure which includes discrete management units for each target industry—staff in these units focus their efforts specifically on target industries.[18] More than 80% of these reported that they offered targeted industries special services such as investment incentives and investor facilitation. All reported that they give priority to potential investors in target industries.[19] In practice, this involved focusing marketing activities, as well as fiscal and financial incentives, on special audiences related to the target industries (as well as projects within targeted sectors).

Charlton et al. (2004) conducted in 2003 a detailed survey of 28 OECD countries' targeting strategies.[20] IPAs were asked which industries they had targeted between 1990 and 2001 and the dates on which targeting had begun and ended.[21] Five countries that reported that they did not target specific industries were dropped from the sample.[22] In some cases, target industry choices do not neatly match the industry categories for which FDI data is available. We deal with this problem in two ways. First, if the reported industry target cuts across several industries in the OECD data, we ignore it as an observation. For example, Poland reported that it targets "automotive manufacturing, business services, and R&D" for FDI. The first two industries fit neatly into the OECD industry categories; R&D, being too broad to assign to a specific industry, is excluded from the sample. Second, if the target industry is a subset of a more

[17] See www.investindk.com.
[18] See Invest in Sweden Agency, Annual Report, 2006/07.
[19] Invest in Spain, for example, lists four target sectors which qualify for incentives "(1) extractive and processing industries; (2) specific food processing and fish-farming industries; (3) industrial support services which markedly improve commercial structures; and (4) specific tourist facilities" See http://www.investinspain.org/incentives.htm.
[20] More recently, Harding and Javorcik (2007) have implemented a similar methodology.
[21] Prior to the 1990s, the practice of targeting FDI was not widespread (and few countries had IPAs). To test the robustness of our results, we nevertheless restrict the FDI data to 1990s in the robustness section.
[22] We exclude these countries in order to be able to directly compare OLS and IV estimates.

aggregated industry reported in the OECD data, we include the data point. For example, Australia identified "wood products" as a target for foreign investment. At the highest level of dis-aggregation, the OECD FDI data reports figures for "textiles and wood products." Although Australia targets only one of these industries, we include the observation in the sample. In most cases, the IPA industry choices correspond closely to the OECD's SIC classifications. We end up with annual FDI flow data for 19 sectors and industries in 22 countries over 12 years from 1990 to 2001.

The most popularly targeted industries in the OECD subsample are telecommunications, chemical and plastics manufacturing, and business services (see Table 1). The survey also revealed two main rationales for investor targeting. Some IPAs stated that their objective was to focus scarce promotion resources on industries in which the country had a competitive advantage. Other IPAs attempted to use targeting to focus investment promotion on improving the quality of FDI flows. For many IPAs, this meant using investment promotion to attract industries that diversified and brought new skills and technology to the local economy. The survey revealed the most commonly targeted industries to be high-tech manufacturing industries. Six industries—electronics and electrical equipment, tourism and tourist amenities, industrial machinery and equipment, information and communication technologies, food and kindred products, and crop agriculture—were targeted by more than 40% of the countries surveyed. Several industries including those in the wholesale and retail trade sectors were not targeted by any countries.[23]

A concern that arises with any survey data is the potential for respondents to misreport. Surveys that require historical recollection might be biased if records are incomplete or not consulted. Staff turnover, absence of record-keeping regulations, and changes in computer systems might contribute to reporting errors, and IPAs might have an incentive to misreport in order to rationalize their behavior ex-post (e.g., capitalizing on exogenous increases in FDI by later claiming that the growth industry had been the subject of promotional efforts).

Our survey design mitigates these concerns. The first survey, of IPA websites and annual reports, yielded information on priority industries for 28 OECD IPAs, but historical records and other information was available for only 12, and often did not extend back to the beginning of our sample period. Charlton et al. (2004) followed this with a written survey, sent to OECD IPAs and followed up by several rounds of communication that achieved a remarkable 100% response rate. In 2003, the authors inserted questions on industry targeting into a telephone survey on various aspects of investment promotion. Respondents were presented with information gleaned from the two previous rounds of research and asked to fill in missing information. Where the three sources of information were discrepant, documented information, when available, was weighted most heavily.

[23] For further information on targeting practices within investment promotion, see Charlton et al. (2004).

3 Results: Foreign Direct Investment and Growth at the Industry Level

The purpose of our empirical analysis is to examine the relation between growth and FDI at the industry level. To focus on the effect of a small number of variables without incurring excessive omitted variable bias, we control for industry and country fixed effects. Our specification enables us to focus specifically on a small number of control variables without worrying about bias from unobserved country or industry characteristics. This approach can be thought of as an analysis of deviations from average growth rates, that is, it asks: is abnormal industry growth associated with abnormal industry characteristics in a particular country? Hence, we look at whether, in the same industry, growth in value added is greater in a country with higher FDI flows than in a country with lower FDI flows. We estimate the following model by OLS.

$$GROWTH_{ict} = \alpha Ln\left(FDI_{ict}\right) + \beta \log(INITIAL\ \ VALUE\ ADDED_{ict}) + \phi \frac{VALUE\ ADDED_{ict}}{VALUE\ ADDED_{ct}} + \lambda X_{ict} + \delta_i + \delta_c + \delta_t + \varepsilon_{ict} \quad (1)$$

where $GROWTH_{ict}$ is the five-year average growth in the value added of industry *i* in country *c* at time *t.* In the robustness section, we also use three-year average growth. FDI_{ict} is the volume of FDI inflows in industry *i* in country *c* at time *t.* In the regression analysis, we use the log of the FDI inflows variable. The analysis includes a full set of industry, country, and time dummies used to control for extraneous industry and country specific sources of growth: δ_i refers to industry dummies; δ_c are country dummies that capture time invariant country specific factors that might drive cross-country differences in growth; δ_t is a vector of year dummies included to control for cross country correlation over time due to common world shocks. As well as controlling for industry heterogeneity, another appealing feature of industry analysis is that it mitigates some of the effects of unobserved heterogeneity and model misspecification, which are difficult to control at the national level.

We also include two measures of the initial state of the industry. The industry's initial (log) level of value added, Log($INITIAL\ VALUE\ ADDED_{ict}$), controls for industry mean reversion, whereby sectors that have grown rapidly in the past are less likely to continue to grow rapidly in the future.[24] The industry's initial share of total value added in the country, $VALUE\ ADDED_{ict}/VALUE\ ADDED_{it}$, captures agglomeration effects, whereby industries that develop early in a particular country enjoy continued, relatively strong growth. X_{ict} is a set of control variables, ε_{ict} an error term. The estimation procedure uses White's correction for heteroskedasticity in the error term.

Table 3 presents the main results. Column (1) shows a positive, albeit not significant, relation between FDI and growth of value added, controlling for country fixed effects.[25] The relation becomes positive and economically and statistically significant when we include a full set of country, industry, and time effects as well as additional industry characteristics, as can be seen in column (2). To get a sense of the

[24] See Carlin and Mayer (2003) for an analysis of the extent to which relative growth rates are attributable to initial industry allocations. They find a small share of industry growth performance to be attributable to mean reversion.
[25] The correlation matrix in Table 2 shows a negative relation between growth of value added and the log of FDI.

magnitude of the effect of FDI inflows on growth of value added in the average industry, consider an increase from the 25th to the 75th percentile in the distribution of flows. Based on the results presented in column (2), the increase in growth of value added is, on average, 2% higher in the country with higher flows. This represents a 13% increase in growth over the sample mean. Note that our results may underestimate the effects of FDI on growth as we analyze only intra-industry effects.[26] However, since we use wide industry categories (2 digit) this effect is likely to be small. Given potential concerns about trends in the data, we modify specification (1) in columns (3) and (4) and include time dummies interacted with country and industry dummies respectively.[27] Our main results remain significant with a slightly higher estimated coefficient on the FDI variables in (4).

We present robustness tests for the OLS results in Appendix B. We use an alternative specification with industry total factor productivity (TFP) growth as the dependent variable, and the ratio of FDI to industry capital stock as the main regressor. Given the data limitation, our estimation uses yearly data and hence growth estimates should be interpreted with caution. Our results, however, are supportive of our previous findings. We also rerun our basic specification, using three- instead of five-year periods, and include a measure of FDI based on international firm level data from Dun and Bradstreet. Overall, the results suggest a positive and significant relation between FDI flows and growth in value added at the industry level. Because our methodology is subject to concerns about endogeneity and our FDI data do not describe homogenous investment projects opening the possibility for measurement biases, these results require careful analysis. We address these concerns in Section 5.

4 Foreign Direct Investment and Industry Characteristics

Several recent studies have investigated how national characteristics might affect host countries' capacity to benefit from FDI. These studies postulate that the size of spillovers from foreign firms depends on the so-called *absorptive capacities* of domestic firms, that is, their ability to respond successfully to new entrants, new technology, and new competition. Domestic firms' success is, to some extent, determined by local characteristics such as the domestic level of level of human capital (Boreinsztein, De Gregorio, and Lee (1998), Blomström and Kokko (2003)) and the development of local financial markets (Alfaro et al. (2004, 2006). Weaknesses in these areas might reduce the capacity of domestic industries to absorb new technologies and respond to the challenges and opportunities presented by foreign entrants. Variation in absorptive capacities between countries (and industries within countries) is a promising line of research, offering, potentially, an appealing synthesis of the conflicting results that have emerged from the literature.

FDI studies have documented the dependence of spillovers on various national characteristics, but not considered how this dependence varies across industries. These national-level studies are subject to the

[26] A new group of papers has explored the existence of positive externalities from FDI towards local firms in upstream industries (suppliers) with more encouraging results, see Javorcik (2004) and Alfaro and Rodríguez-Clare (2004).
[27] We find manufacturing and services sector dummies to be positive and significant, suggesting that manufacturing and services have grown faster than agriculture.

objection that unobserved heterogeneity of countries could be correlated with the national characteristics being tested, thereby complicating interpretation of their interaction coefficients. Industry analysis is consequently an important cross check on the validity of interpretations of these studies' results.

Among other benefits, FDI is presumed to bring skills, technology, and capital to the host country. We test whether the growth effects of FDI are stronger in industries that are particularly dependent on skills and external finance.

4.1 Foreign Direct Investment and Financial Dependence

In this subsection, we assess whether an industry's degree of dependence on external finance affects the relationship between FDI and growth.[28] In a cross-country analysis, Alfaro et al. (2004) find that FDI benefits countries with well-developed financial markets significantly more than it does countries with weaker markets. The authors find no direct effect of FDI on growth, but obtain consistently significant results when FDI is combined in an interaction term with a range of measures of financial development.

We examine the industry-level implications of Alfaro et al.'s (2004) hypothesis. Industry analysis is motivated by recent papers that analyze the effect of financial development on economic growth at the industry level (Rajan and Zingales (1998), Cetorelli and Gambera (2001), Fisman and Love (2003, 2004), and Carlin and Mayer (2003)). These papers identify differences in the degree of financial dependence among industries, and test whether industries that are particularly dependent on external finance grow more strongly in countries with well-developed financial markets.[29]

These inter-industry differences provide a convenient test for the relationship between financial development and FDI effects. If a country's ability to benefit from FDI is related to its financial development (particularly the availability of external financing), then this relationship is presumably strongest in industries that are relatively more dependent on external finance. We expect a stronger relationship between FDI and growth in industries dependent on external finance.

The variable financial dependence, the dependence of industries on equity financing, is taken from Rajan and Zingales (1998), who measure the ratio of net equity issues to capital expenditures for U.S. firms in each industry during the 1980s. The dependence of U.S. firms on equity finance is a good proxy for the demand for equivalent finance in other countries because the United States, being the most highly developed

[28] There is considerable evidence that well-developed financial systems directly enhance growth by reducing transaction costs and improving the allocation of capital; see King and Levine (1993a, b) and Levine, Beck and Loayza (2000). In addition, there are several plausible reasons to expect that financial markets might complement the spillover effects of foreign direct investment. First, the successful acquisition of new technologies introduced by foreign firms will generally involve a process of reorganization and reinvestment by domestic competitors. To the extent that this process is externally financed from domestic sources, efficient financial markets will enhance the domestic industry's competitive response. Well-developed financial markets also enable other domestic firms and entrepreneurs to capitalize on linkages with new multinationals; see Alfaro et al. (2004, 2006).

[29] These papers demonstrate significant interactions between a range of measures of financial development (e.g., size of the banking sectors and stock markets, accounting standards, bank concentration) and a range of industry characteristics (e.g., dependence on external finance, dependence on trade credit). Carlin and Mayer (2003) also investigate the effect of these interactions on industry-level measures of fixed investment and research and development.

financial market in the world, represents the best available measure of the underlying requirements of firms operating in those industries.

We investigate whether industries that are more reliant on external finance grow faster in countries with more FDI, controlling for industry and country specific effects. Table 4 presents our main OLS results. Columns (1)-(3) report the results of additional robustness tests in which we use instead an interaction term between the FDI variable and external finance as defined by Rajan and Zingales (1998). We find growth in industries more reliant on external finance to be more sensitive to FDI. Column (3) shows the estimated effects to be higher when we restrict the sample to the manufacturing sector. To test the differential effect of FDI, we subdivide our sample into industries with high dependence on external finance and run equation (1) on each group of industries. The estimates in column (4) indicate that an interquantile movement in the distribution of the FDI variable implies for industries with low dependence on external finance 11% more growth over the sample mean, the estimates reported in column (5) that a similar movement implies for industries with high external finance 16% more growth over the sample mean.

4.2 Foreign Direct Investment and Human Capital

We also assess here whether an industry's skill intensity affects the relationship between FDI and growth. To the extent that spillovers represent the productivity-enhancing effects of technology diffusion, there are strong reasons to expect that human capital aids the spillover process. Spillovers can occur through several channels. The movement of skilled employees from MNEs to domestic firms affords an opportunity for new knowledge to penetrate the domestic market. Similarly, "demonstration effects" might be observed, whereby a local firm improves its productivity by copying or reverse engineering some technology used by MNEs operating in the local market. Alternatively, domestic firms, instead of learning directly from foreign firms, might be driven by competition from multinationals to adopt technologies that make them more productive, often referred to as a "competition effect."

Balasubramanyam (1998) finds that host country characteristics determine the technology imported by MNEs. Higher technology spillovers occur in countries with high levels of education and more competitive local markets. Borensztein, De Gregorio, and Lee (1998), in a study of 69 developing countries, found FDI to be positively associated with growth only in countries with sufficiently high levels of human capital. This is presumably because a highly skilled domestic work force increases an economy's abiltiy to adopt advanced technology (Behabib and Spiegel,(1994) and Nelson and Phelps (1966)). Xu (2000), finding similarly strong evidence of the diffusion of technology from U.S. MNEs to affiliates in developing countries, but weak evidence of such diffusion in less developed countries, similarly concludes that the level of human capital is a crucial determinant of whether a country will benefit from the technology spillovers of MNEs.

Industry level analysis enables us to design a test for one aspect of this conditional relationship. If human capital does affect the capacity of the host economy to absorb the benefits of FDI, we would expect

this effect to be stronger in industries in which the spillover channels are more reliant on skilled labor. To competitively respond to the challenges and opportunities posed by foreign entrants, domestic industries require skilled labor capable of adopting new technologies, increasing the quality of their products, or improving the efficiency of their production process. The more skill-reliant the industry, the larger the effect of FDI on growth.

The proxy for industry skill intensity follows Carlin and Mayer's (2003) index of skill levels in each German manufacturing industry. Germany is the country in the world with the lowest share of workers without qualifications in manufacturing industries (Machin and Van Reenen, (1998)). They therefore conclude that Germany has a highly developed labor market and that German industry skill ratios are a good proxy for the underlying skill requirements of firms operating in each industry. To reduce feedback from industry growth to industry characteristics, we remove Germany from our sample of countries. We divide our sample into high and low skill industries and, to minimize differences in the quality of FDI, include only manufacturing industries. The results in Table 4, column (6)-(10) demonstrate that there are, indeed, substantial benefits from FDI in sectors with higher skill requirements. Column (8), in particular, shows the effects to be greater when the sample is restricted to the manufacturing sector. Comparisons of the estimated coefficients, columns (9) and (10), show the effects of FDI on industry growth to be twice for high skill sectors what they are for low skill sectors. The estimate in column (9) and (10) indicate, respectively, that an interquantile movement in the distribution of the FDI variable implies 7% more growth over the sample mean for industries with low skill and 15% for industries with high skill.

4.3 Foreign Direct Investment and Country Targets

In this section, we use subjective criteria chosen by the host countries to distinguish between industries. This is appropriate for two reasons. First, policymakers' concepts of 'quality FDI' are likely to be based on a complex combination of different characteristics including skills, financial dependence and other characteristics. Second, for any host country, the desirability of an industry will involve an interaction between the characteristics of the industry and the characteristics of the country. Costa Rica's IPA, CINDE, for example reports that it currently targets medical devices, electronics and a range of services because it wishes to concentrate "its efforts in promoting Costa Rica as a competitive place for investing in sectors which can be benefited from the country's strengths." [30]

We exploit the industry-targeting variable described above to test the relationship between FDI and growth on the subset of industries targeted for foreign investment promotion. Specifically, we run equation (1) on the subsample of industries that our survey revealed to be targeted for investment promotion. Table 5 presents our main OLS results. We find growth in targeted industries to be more sensitive to FDI than average. The estimates in column (1) suggest that an interquantile movement in the distribution of the FDI

[30] CINDE Annual Report 2006.

variable implies 73% more growth over the sample mean, significantly more than the average increase across all industries.

We offer three possible explanations for these results, which require careful analysis, and which we elaborate in the following section. One is that the effect of FDI on growth varies across industries, and that governments are correctly identifying the industries in which FDI is most beneficial. However this result runs counter to the generally mixed evidence on the success of industry policy, so we consider several alternative explanations. Our results suggest that expending resources on FDI attraction increases the inflow of FDI. However we say nothing about the cost of FDI promotion, nor its net benefits (which is not the focus of this paper), and so our results should not be interpreted as supporting industry policy.[31] A second possibility is that the act of targeting FDI in a particular industry alters the impact of FDI on growth in that industry. For example, investment promotion might have a positive effect on the quality of FDI attracted to a location if the investment promotion agency focuses its resources on especially desirable projects. A third possibility is that some endogeneity in the process is correlated with industry targeting. Perhaps foreign investors are attracted to high growth industries and investment promotion agencies choose these as their target industries. We investigate these possibilities below.

5 IV Results: Endogeneity and Heterogeneity

5.1 Instrumentation methodology

Due to endogeneity and measurement problem concerns, in order to identify the effect of FDI on growth we need an instrument that is correlated with the "idealized" quality-adjusted FDI volumes, but not with growth. In this section, we transform our industry-targeting information into a binary variable with industry, country, and time variation, and show that it satisfies both the validity and excludability requirements as explained below.

Table 6 highlights the strong relation between industry targeting and FDI flows. In particular, the table presents the results of the following OLS regression.

$$FDI_{ict} = \alpha_{FDI} + \beta_{FDI} IndustryT\arg eting_{it} + \lambda_{FDI} X_{ict} + \delta_i + \delta_c + \delta_t + \varepsilon_{FDI\,ict} \quad (2)$$

where FDI_{ict} is the measure of FDI activity in industry *i* in country *c* at time *t*, targeting is a dummy equal to one in the period following the targeting of industry *i* by country *c*, and X_{ict} is a set of control variables. The regression includes a full set of country, industry and time effects. In columns (1)-(5) we use as a proxy variable for foreign activity the log of FDI flows from the *Balance of Payments*, and in column (6) the number of foreign firms.

Overall, there is a positive and significant effect of industry targeting on foreign firm activity. The results in column (1) were obtained using as main regressions the industry-targeting dummy and share of value added as well as country, industry, and time dummies. The estimates in column (1) imply 19% extra

[31] For a survey on industrial promotion practices see Pack and Saggi (2006).

FDI in targeted industries. Column (2) adds lagged FDI values, there being evidence that FDI tends to be self-enforcing. Column (3) adds a full set of interacted dummies, column (4) an additional control variable revealed to be comparative advantage in industry *i* in country *c*, $(x_{ic}/x_c)/(x_i/y)$, where *y* represents total output (size). The similar results reported in the last column were obtained using number of foreign firms as a proxy for FDI activity.[32]

Evidence of strong effects of industry targeting notwithstanding, these estimates should be interpreted with caution. Testing the effectiveness of investment promotion in international data has been an elusive empirical problem. Given the myriad factors that determine the size of any nations' foreign direct investment flows, it is difficult to isolate the effect of a single (endogenous) policy variable for which there are few natural instruments. First, investment promotion might be correlated with imperfectly observed country attributes, potentially introducing bias into cross-sectional studies. We include time-varying industry covariates and time interacted dummies to address some of these concerns. However, even the availability of panel data is unable to mitigate this endogeneity if the unobserved county attributes are time-varying (e.g., other policy changes introduced concurrently with FDI promotion; countries that actively promote foreign investment might be doing so, for example, as part of a broader economic reform agenda). An additional concern that emerges from Table 5 is the correlation between targeted sectors and growth. One might worry that some other factor correlated with growth might also affect the industry-targeting variable. If, for example, the variable used to proxy for investment promotion (e.g., the establishment of a foreign investment office) is a consequence rather than a cause of increased bilateral FDI flows, the estimates might be subject to reverse causation. As a first cut, we regressed average growth rates over (pre-sample period) on industrial targeting in sample period. There is a non-significant effect of pre-sample growth on the subsequent 5 years of targeting (see column 1 in Table C1). Recognizing that industry targeting is a choice rather than a natural policy experiment, we also use propensity score matching to ensure the validity of our control group.[33] As explained in Appendix C, we conduct a matching exercise following Rosenbaum and Rubin (1983) to ensure that we have a valid control group for which the distribution of the variables affecting the outcome is as similar as possible to the distribution of these variables for targeted industries.

Industry targeting is also correlated with FDI quality. There is considerable evidence that IPAs hold preferences for particular characteristics of FDI projects. Several IPAs, for example, use models that calculate rates of "economic and social" return based on the contributions of proposed FDI projects to employment, exports, and skills.[34] Further evidence that industry targeting is associated with changes in the quality of FDI is provided by OIR, a firm that sells to national investment promotion agencies data about

[32] Using data on US FDI abroad from the Bureau of Economic Analysis and IMF FDI data, Harding and Javorcik (2007) find that investment promotion appears to increase FDI inflows to developing countries. See also Morrisset, J. and K. Andrews-Johnson (2004).

[33] That is, there is the possibility that policy makers might have targeted certain sectors in anticipation of favorable economic outcomes. The notion that they anticipated future growth, however, gives considerable credit to policy makers.

[34] IDA (2004) "Annual Report."

firms intending to invest overseas. We noted earlier that OIR clients can purchase data in several categories. By mode of entry, 100% of OIR's clients choose to receive data on greenfield projects; 30% data on M&A projects. By functional category, 100% choose to purchase data on production facilities and R&D centers; fewer than 70% data on back office functions, and fewer than 50% data on marketing/sales facilities.

One concern with this line of reasoning is that some IPAs are widely seen to be ineffective, thus, their efforts might not produce observable results along the metric of either quantity or quality of FDI. Many such IPAs consist of little more than a website and a handful of staff whose impact on investment flows is likely to be minimal. There are, nevertheless, also examples of IPAs that are credited with being effective, among them, the Irish IPA, the Industrial Development Agency, the Czech IPA CzechInvest, and the Costa Rican IPA, CINDE. A key finding of the IPA survey, however, was that the target industries named by IPAs were determined centrally by other government agencies, most commonly the ministry of finance. Thus, in some cases, our observations of targeted industries might reflect a broader government effort to attract an industry that is merely being signaled by the IPA.

5.2 Two Stage Least Square Estimates

Table 7 presents two-stage least square (2SLS) estimates of equation (1). The FDI flows variable is treated as endogeneous and modeled as in equation (2). This identification strategy is valid as long as the *Industry Targeting* variable is uncorrelated with ε_{ict}. The exclusion restriction is that the targeting variable does not appear in (1) as discussed below.

Panel A of Table 7 presents the 2SLS estimates of equation (1). Panel B reports the associated first-stage regressions. We find a strong first-stage relationship between industry targeting and industry FDI flows. As shown in column (1) of panel A, average FDI flows, where they are instrumented by the industry-targeting variable, have a causal effect on growth. The first-stage regression shows the effect of the industry-targeting variable on FDI flows to be significant. The first-stage regression also shows the significant effect of targeting on FDI flows with an R^2 of 0.8. The estimated coefficient is higher than the OLS counterpart shown in Table 3 because the IV regression corrects for both endogeneity and the attenuation bias caused by the measurement error in the balance of payments FDI data. In fact, the results suggest that measurement error is a more serious concern than reverse causality.

A sense of the magnitude of the effect of FDI inflows on growth is provided by the results reported in column (1): if we move up from the 25^{th} percentile to the 75^{th} percentile in the distribution of the flows, we have, on average, 4.5% more growth. This represents an almost 63% increase in growth over the sample mean. This result warrants careful interpretation. Given the causal effect, these results imply an impressively large effect of foreign investment flows on growth. Note that the quantitative effect obtained from the IV regression is much larger than the one obtained from the OLS regression due to the attenuation bias in the latter.

How should we interpret the IV estimate being larger than the OLS estimate? According to our theory, investment promotion agencies identify and attempt to attract specific foreign investors they believe will benefit their country.[35] Surveys of investment promotion agencies indicate that they are interested in particular types of projects such as high tech, export, and greenfield projects, and joint ventures. According to UNCTAD, industry targeting should be explicitly linked to an increase in the quality of FDI projects.[36] Thus an increase in industry-specific promotion will be associated with an increase in the quantity and quality of FDI flows. Industry targeting is focused particularly on "good quality" FDI sought and facilitated by investment promotion agencies. Hence, targeting is correlated with good FDI leading to an increase in the effect of FDI (instrumented by the targeting variable). Targeting is therefore a relevant instrument for identifying the good aspect of FDI, provided our results are interpreted with caution. One concern is that our results do not necessarily mean that the relation is causal; the causation might be reversed, that is, when IPAs think there is going to be an increase in FDI they target that sector.

The first stage of our 2SLS estimates the coefficient β_{FDI} on the targeting dummy. This coefficient represents the increase in industry FDI that occurs simultaneously with the IPA targeting an industry. The predicted value from the first stage, FDI_{ict}, is a linear combination of the estimated coefficient on the targeting dummy and the other first stage controls. In the second stage, the raw FDI variable (measured by the balance of payments system) is replaced by this predicted value, which reflects, specifically, the increase in FDI consequent to targeting. As noted above, FDI is not homogeneous (given the distinction made by IPAs). The increase in predicted FDI associated with targeting is an increase in a particular kind of FDI, the kind IPAs want to attract. Hence, the predicted values from the first stage of our 2SLS specification focus on quality FDI, and our instruments will have two upward effects on the IV coefficient on FDI, which first reduces measurement errors and, second, focuses on more growth-enhancing FDI.

Are our instruments relevant? One way to check for weak instruments when there is a single endogenous regressor is to compute F-statistic testing the hypothesis that the coefficient on the instruments are all zero in the first stage of 2SLS. As seen in Panel C of Table 7, the F statistics are all greater than 10, the simple rule of thumb-value proposed by Staiger and Stock (1997) as validation of relevance.[37]

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[35] Launching a strategy document for Britain's IPA, UK Trade & Investment (UKTI), Trade and Industry Secretary Alistair Darling described the role of UKTI to "increase further the value added to the UK from inward investment through more intensive relationships with high value overseas owned companies" See Speech by Alistair Darling on 20 July 2006. Similarly, one of the performance metrics of the Irish Industrial Development Agency is the average salary offered in the investment projects they have facilitated as well as the number of "Approved Innovation Projects" by their client foreign investors. See IDA Annual report 2006.

[36] The success of FDI targeting lies in devising and implementing a cohesive and coherent strategy based on extensive feedback from potential investors, outside and within the country, on the type of conditions that need to be created, and facilities provided, to ensure that a substantial flow of quality FDI is generated in the targeted sector. See UNCTAD (2003).

[37] Our instruments also passed another simple rule of thumb such as the first stage R^2 being greater than 0.3. We also undertook Anderson canonical correlations likelihood ratio tests for the relevance of instruments. A rejection of the null indicates that the model is identified and that the instruments are relevant (Hall, Rudebusch and Wilcox, 1996). We obtained similar results further suggestion that our instruments are not weak.

Another important concern is whether our instruments are uncorrelated with the error term. We use overidentification tests to determine whether there is a direct relationship between FDI targeting and industry growth, and investigate the validity of our approach. To implement this test we introduce the lag of FDI as a second instrument.[38] According to our theory, the decision to target an industry is associated with an increase in foreign investment, specifically, an increase in the kind of foreign investment the IPA is trying to attract. Our instrumental variable regression implies an exclusion restriction that, conditional on the controls, the industry-targeting policy exert no effect on industry growth other than through an increase in FDI. The overidentification test presumes the other instruments (for example, lag FDI) to be truly exogenous, and tests for the exogeneity of investment promotion.[39]

The results of the overidentification tests, and related results, are reported in Appendix Table D1. Panel A reports the 2SLS estimates of the effect of FDI on growth using a variety of instruments other than investment promotion. Panel B gives the corresponding first stages and panel C reports the p-value from the appropriate $\chi 2$ overidentification test (Sargan test) as well as additional diagnostic tests of the relevance of our instruments. Subject to the usual problems of power, the overidentification tests show the instruments to be valid. These estimates are in every case quite close to those reported in Table 6. This gives us additional confidence that investment promotion is a valid instrument, and that we are estimating the effect of FDI on growth with our instrumental variable strategy. In column (1), we use the industrial targeting variable as the only instrument for FDI, in column (2) the lagged value of FDI. The result in this case is an estimated effect of 1.379 (with standard error 0.229), as compared to our baseline estimate of 1.35. Using, in column (3), data from the WorldBase database on the number of foreign firms in each sector yields similar results. Finally, column (4) reports the results of an easy-to-interpret test for validity and excludability of the instrument that follows Acemoglu, Johnson, and Robinson (2001). The test adds the investment promotion as an exogenous regressor in panel A. If investment promotion had a direct effect on growth, we would expect this variable to be positive and significant. The effect, however, as seen in the table, is small and statistically insignificant.

As discussed above, one concern with our strategy is that some other factor correlated with growth might also affect the industry-targeting variable. Investment promotion agencies' industry-targeting practices are not random experiments, but rather conscious decisions by policy makers. We have to be concerned that countries choose target industries in which they believe they have some future comparative

[38] Among the few consistently significant determinants of FDI are lagged FDI and real exchange and institutional quality. Wheeler and Mody (1992) provide evidence that existing stock of foreign investment is a significant determinant of current investment decisions. That real exchange rates, by altering either relative costs or relative wealth, affect the foreign investment decisions of multinational firms is suggested in theoretical work by Froot and Stein (1991) and Blonigen (1997). In the empirical literature, Klein and Rosengren (1994) offer supporting evidence that the real exchange rate is a significant determinant of FDI. Finally, Alfaro, Kalemli-Ozcan and Volosovych (2006) find institutional variables to be an important determinant of equity (FDI and portfolio investment). Of these variables, only lagged FDI varies at the sectoral level.

[39] As noted by Acemoglu, Johnson, and Robinson (2001), "This approach is useful since it is a direct test of our exclusion restriction. However, such tests may not lead to a rejection if both instruments are invalid, but still highly correlated with each other. Therefore, the results have to be interpreted with caution."

advantage. If foreign investors have similar views about future industry prospects, the evolution of industry comparative advantage could explain both growth and promotion. As a first cut, we do not find significant evidence that lagged growth rates are associated with current targeting practices. We further resolve this issue in two ways, (1) by including time-varying industry covariates that capture changes in comparative advantage, and (2) by conducting a matching exercise to ensure that we have a valid control group for which the distribution of the variables affecting the outcome is as similar as possible to the distribution of these variables for targeted industries. We use the propensity score matching method and, as explained in Appendix B, our main results remain robust to this analysis.

5.3 IV Results: Robustness

Overall, the results in Tables 3 and 4 show FDI flows and value added growth, when we consider industry characteristics, to be strongly correlated. An appealing feature of industry analysis is that it mitigates some of the effects of unobserved heterogeneity and model misspecification, which are difficult to control at the national level. Analyzing a cross-section of industries within a cross-section of countries enables us to include a full set of industry and country dummy variables, which control for time invariant unobserved industry and country heterogeneity.[40] There are nevertheless a number of important reasons why the relation should not be interpreted as causal. An important concern with FDI growth regression is that fast growing countries are likely to attract more FDI. In addition to reverse causality, many omitted time variant determinants of growth might be correlated with FDI flows. If this is the case, the coefficients on estimates are likely to overstate the positive impact of foreign investment. As a result, one could find evidence of positive growth effects of foreign investment even in the absence of such benefits. An instrument of FDI flows at the industry level can address these issues. Such an instrument must account for the variation observed in FDI flows, but have no direct effect on economic growth. The discussion in the previous section suggested that industry targeting is a plausible candidate for such an instrument. The previous section discusses the validity of the instruments.

We performed a series of robustness and sensitivity tests, the results of some of which are reported in Table 8. Column (1) shows the robustness of the results to including a measure of comparative advantage. Panel A reports the two least square results, panel B the second-stage regression, and panel D the corresponding OLS results. The diagnostic tests are reported in panel D. In column (2), we add the log of gross capital flows to the list of independent variables yielding some interesting results. The coefficient and significance of the FDI term increase across the different specifications, suggesting that FDI might have positive effects over and above its direct role in capital accumulation. In column (3) we restrict the sample to the period 1995-2000. In column (4) we use FDI to the capital stock as the proxy for foreign activity.

[40] Since unobserved country heterogeneity might be correlated with FDI and growth, cross-sectional studies fail to establish causality and are likely to generate biased coefficients. For example, at the micro level, foreign firms might be located in high productivity industries as opposed to causing productivity externalities. At the macro level, high growth countries might attract more FDI as opposed to FDI causing this high growth.

Table 9 shows our results to be robust to using three-year growth rate averages. Appendix Table C1 shows in column (1) the results of using the matched observations, and in column (2) the results of using the number of foreign firms as a proxy for foreign activity; both yield similar results. We analyze whether the complementarity that results between FDI and finance and skills is robust as well to our instrumentation strategy. Table 10, panel A reports the IV results, panel B the corresponding OLS results. In this case, we find higher effects for industries dependent on external finance and those reliant on highly skilled labor.[41] Finally, we also examined the robustness of the results of using whether FDI has an effect on total factor productivity (not shown).[42] In this case, our results imply an almost 43% increase of TFP over the sample mean which is consistent with our previous findings.

6 Conclusions

This paper exploits a comprehensive, industry level data set for the period 1985-2000 that encompasses 29 countries to examine the various links between different "types" of FDI and growth. An appealing feature of industry analysis is that it mitigates some of the effects of unobserved heterogeneity and model misspecification, which are difficult to control at the national level. We also use as an instrument a new industry-level data set on industry targeting. We find FDI at the industry level to be associated with higher growth in value added. The relation is stronger for industries with higher skill requirements and for industries more reliant on external capital. We also use the new data set on industry targeting and two-stage least squares methodology to identify quality FDI as determined by the host countries. FDI quality is also associated with positive and economically significant growth effects.

We acknowledge our investigation to be constrained by data limitations and our results to therefore be preliminary. Although the OECD dataset does not include sufficient variation in key national characteristics such as education and financial development, our results suggest that, even within OECD countries, financial development and availability of human capital are important channels through which FDI can affect growth.

Understanding the effect of FDI on economic growth is important for a number of reasons. It has implications for the effect of rapidly growing investment flows on the process of economic development. It also informs foreign investment policy. In 1999 alone, there were 140 changes to state or national laws related to foreign direct investment. More than 90% of these changes liberalized foreign investment policy. One fifth introduced new incentives for foreign investors including tax concessions, financial incentives, import duty exceptions, and infrastructure and training subsidies (UNCTAD (2000)). Such policies however do not guarantee realization of the potential benefits of FDI that go beyond the "capital" FDI transfers to the host country. If FDI does not exert a robust positive influence on growth, these pecuniary incentives and the

[41] Note that the F statistic for low external finance industries in column (1) is below 10. Although this is in part due to the reduced sample size, it can also indicate that for such industries, FDI targeting is not a great predictor, which is consistent with our argument.

[42] As mentioned in section 3, missing capital stock data reduced considerably our sample size with further limited the IV analysis. However, even with the limited number of observations we obtain consistent results.

active international competition for investment should be reconsidered.[43] Local conditions in the recipient country can pose binding constraints on such spillovers. Our analysis, due to data limitation, has been restricted to OECD countries, which arguably have the local conditions to take advantage of FDI effects. More generally, studying the costs and benefits of FDI promotion are beyond the scope of this paper. More research on the consequences of FDI is warranted before advocating FDI promotion.

Appendix A. Data Description

FDI Inflows and Stocks: Annual data for the period 1985-2000 on FDI inflows and stocks at the industry level. From the OECD's International Direct Investment database.

Industry Growth: Growth in real value added in each industry in each country for three- and five-year periods. From the *Industrial Statistics Yearbook* of the United Nations Statistical Division.

Share of Value Added*:* Share of value added in industry *i* in country *c* to the country's value added. From *Industrial Statistics Yearbook* of the United Nations Statistical Division.

Number of Foreign Firms*:* From the WorldBase compiled by Dun & Bradstreet.

Comparative Advantage (Size): Exports in industry *i* in country *c* to total exports in the country relative to industry output (size), $(x_{ic}/x_c)/(x_i/y)$, where *x* is exports and *y* is output.

Dependence on External Finance (Equity): Constructed by the authors for 1987-1996 following Rajan and Zingales (1998). An industry's external financial dependence is obtained by calculating the external financing of U.S. companies. Rajan and Zingales (1998) identify an industry's need for external finance (the difference between investment and cash generated from operations) under two assumptions, (a) that U.S. capital markets, especially for the large, listed firms they analyze, are relatively frictionless, enabling us to identify an industry's technological demand for external finance, and (b) that such technological demands carry over to other countries. Following their methodology, we constructed similar data for the period 1987-1996 for all sectors for which Compustat had data, as explained in the Data Appendix. Using data from Compustat, a firm's dependence on external finance is defined as: (Capex-Cashflow)/Capex, where Capex is capital expenditures and Cashflow cash flow from operations. Industries with negative external finance measures have cash flows that are higher than their capital expenditures.

Skill Intensity Measure*:* Ratio of high skilled workers to other workers in German industries, following Carlin and Mayer (2003). The occupational data are based on the new version of the International Standard Classification of Occupations of the International Labour Office, ISCO 88. The following categories and subcategories are defined. White-collar high-skill (WCHS) includes legislators, senior officials, and managers (Group 1), professionals (Group 2), technicians and associate professionals (Group 3); white-collar low-skill (WCLS) includes clerks and service workers (Group 4) and shop and sales workers (Group 5); blue-collar high-skill (BCHS) includes skilled agricultural and fishery workers (Group 6) and craft and

[43] See Hanson (2001) for a discussion of the merits of foreign direct investment attraction policies. See Charlton (2003) for a discussion of the extent and effects of incentive competition for foreign direct investment.

related trade workers (Group 7); blue-collar low-skill (BCLS) includes plant and machine operators and assemblers (Group 8) and elementary occupations (Group 9).

Total Factor Productivity (TFP): We calculate $TFP=Y/(K^{\beta}L^{(1-\beta)})$ where Y is the value added of the business sector, K the stock of the business sector capital, and L the employment in the business sector. Given the limited availability of data, TFP growth is calculated on a yearly basis. Total factor productivity growth was estimated from a constant returns to scale Cobb-Douglas production function with the capital share set at 1/3 and the labor share set at 2/3.

List of Countries: Australia, Austria, Belgium, Canada, Switzerland, Czech Republic, Germany, Denmark, Spain, Finland, France, United Kingdom, Greece, Hungary, Ireland, Iceland, Italy, Japan, Korea, Luxembourg, Mexico, Netherlands, Norway, New Zealand, Poland, Portugal, Sweden, Turkey, USA.

Appendix B. Robustness OLS

We performed additional robustness checks on the regressions results in (1). Our main results remain robust to these different specifications. Column (1) of Table B1 shows the results of restricting the sample to the manufacturing sector only. Column (2) includes a measure of FDI based on international firm level data from Dun and Bradstreet. Column (3) shows the results of using three year averages of the growth in value added. Finally, column (4) shows an alternative specification with industry TFP growth as the dependent variable and the ratio of FDI to the industry capital stock as the main regressor. Missing data for the industry-level capital stock for many countries significantly reduced the number of observations available to us.

Appendix C. Matching

Following Charlton and Davis (2006), we identify the probability that industry j is targeted by country i in time t using a logit model.

$$P(\Pr ob_{ij}=1)=F\left(Z_{ijt},D_{ijt}\right)$$

where F is the normal cumulative distribution function and D_{ijt} is a full set of country, industry, and time dummies. We use the predicted probability, P_{ijt}, as a monotone function to select comparison non-targeted observations for each targeted observation. The nearest neighbor, k, to each targeted observation is selected such that

$$\left|P_{ijt}-P_{ikt}\right|=\min\left\{P_{ijt}-P_{ikt}\right\}$$

over all k in the set of non-targeted industries. Matches are only accepted if $\min\left\{P_{ijt}-P_{ikt}\right\}$ is less than a caliper which we vary between 0.005 and 0.001.

The success of matching techniques rests on our ability to predict the probability than an industry will be targeted. A good predictive model helps to support the conditional independence assumption implicit in propensity score matching. The industry-targeting survey contained questions covering the reasons for targeting and the reasons for adopting or dropping target industries. The three highest responses were industries in which the country had some comparative advantage, a large volume of FDI, and high export propensity.

Appendix Table C1 presents the probit model of industry targeting. The dependent variable takes the value of one if industry *j* was targeted for the first time by country *i* in time *t*. We control for factors that might affect the desirability of the industry as a target for investment promotion such as the global volume of FDI in the industry (OECD countries) and measures of the country's comparative advantage. Differences between targeted and non-targeted sectors are reduced when the target group is compared with the matched counterparts. The predicted model gives us a propensity score. Nearest neighbor matching means that we can use only a subset of a sample. We matched the 85 targeting observations to the nearest four non-targeting observations and applied a caliper of 0.01. Table C2 presents results of the change in growth rate of FDI for the matched subsample.

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Table 1: Descriptive Statistics (1985-2000)

Industry	Code	Targeted by # Countries	Growth in Value Added	FDI/Value Added	Share of Value Added	Dep. External Finance	White High Skill	Blue and White High Skill
Agriculture and Fishing	1	4	2.617	0.001	0.055	-0.297	0.040	0.707
Mining of Metals	2	2	3.309	0.000	0.015	0.455	0.168	0.687
Extraction of Petrochemicals	3	5	1.473	0.009	0.012	0.318	0.341	0.674
Food Products	4	5	5.314	0.013	0.041	-1.717	0.074	0.427
Textile and Wood Activities	5	5	3.362	0.015	0.026	-0.946	0.145	0.594
Petroleum, Chemical, Rubber, Plastic Products	6	9	5.755	0.033	0.043	0.285	0.397	0.546
Metal and Mechanical Products	7	3	5.104	0.024	0.037	-0.796	0.181	0.615
Machinery, Computers, RTV, Communication	8	10	5.821	0.013	0.051	-0.692	0.352	0.619
Vehicles and Other Transport Equipments	9	11	5.999	0.032	0.022	-0.664	0.357	0.644
Electricity, Gas and Water	10	3	4.471	0.004	0.038	-0.359	0.257	0.599
Construction	11	0	6.563	0.001	0.087	-0.919	0.071	0.711
Trade and Repairs	12	1	6.004	0.010	0.163	-0.416	0.151	0.262
Hotels and Restaurants	13	5	7.518	0.003	0.031	-0.100	0.062	0.349
Land, Sea and Air Transport	14	1	5.733	0.002	0.071	-0.150	0.055	0.140
Telecommunications	15	12	6.762	0.007	0.031	-0.119	0.033	0.190
Monetary Intermediation	16	1	5.071	0.030	0.053	-2.445	0.820	0.827
Other Financial Intermediation	17	1	9.184	0.050	0.006	-3.613	0.714	0.737
Insurance	18	1	5.974	0.050	0.013	-3.586	0.761	0.773
Real Estate and Business Activities	19	11	8.741	0.008	0.210	-0.173	0.564	0.612

Notes: Number of industries corresponds to the 3 digit ISIC Rev. 3. FDI corresponds to Foreign Direct Investment Flows from OECD International Direct Investment Database. Dependence on external finance is the difference between investment and cash generated from operations in the U.S. following Rajan and Zingales (1998). Skill data is the ratio of high skilled workers to other workers in German Industries. Skilled workers include: White-collar high-skill (WCHS): Legislators, senior officials and managers (Group 1), Professionals (Group 2), Technicians and associate professionals (Group 3). White-collar low-skill (WCLS): Clerks, service workers (Group 4), shop & sales workers (Group 5). Blue-collar high-skill (BCHS): Skilled agricultural and fishery workers (Group 6), Craft & related trade workers (Group 7). Blue-collar low-skill (BCLS): Plant & machine operators and assemblers (Group 8), Elementary occupations (Group 9). See Appendix A for detailed explanation of all variables and sources.

Table 2: Correlation—Main Variables

	Growth in Value added	Log FDI	FDI/Value Added	Log Value Added	Share of Value Added
Growth in Value Added	1.0000				
Log FDI	-0.0478	1.0000			
FDI/Value Added	0.0029	0.1333	1.0000		
Log Value Added	-0.1645	0.2671	-0.0770	1.0000	
Share of Value Added	0.0922	0.0662	-0.0433	0.4041	1.0000

Notes: See Appendix A for detailed data description.

Table 3: OLS Regression of Growth Value Added and FDI—Industry Data
Dependent Variable is 5-Year Average Industry Growth in Value Added, 1985-2000.

	(1)	(2)	(3)	(4)
Log FDI	0.146	0.329	0.323	0.454
	[0.157]	[0.170]*	[0.147]**	[0.148]***
Log Value Added		-7.462	-2.066	-1.603
		[0.465]***	[0.557]***	[0.557]***
Share Value Added		75.795	7.649	4.235
		[7.984]***	[8.682]	[8.564]
Country Dummies	Y	Y	Y	Y
Industry Dummies		Y	Y	Y
Time Dummies		Y	Y	Y
Country x Time Dummies			Y	Y
Industry x Time Dummies				Y
R^2	0.49	0.72	0.83	0.85
# Observations	674	674	674	674

Notes: All regression are estimated by White's correction of heteroskedasticity. Standard errors are in parenthesis denoting *** 1%, ** 5%, * 10%. The dependent variable is the growth in industry value added (5 year averges). FDI corresponds to Foreign Direct Investment Flows from OECD International Direct Investment Database. Log Value Added and Share of Value added correspond to the beginning of the period and are from the U.N. Industrial Statistics Yearbook. See Appendix A for detailed explanation of all variables and sources.

Table 4: OLS Regression of Growth Value Added and FDI—Financial Dependence and Skill Intensity
Dependent Variable is 5-Year Industry Growth in Value Added, 1985-2000.

	FDI and Finance					FDI and Skills				
			Only Manuf.	Low Financ. Dep.	High Financ. Dep.			Only Manuf.	Low Skill	High Skill.
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Log FDI	0.270	0.278	0.456	0.271	0.409	0.296	0.411	0.303	0.168	0.363
	[0.054]***	[0.046]***	[0.093]***	[0.072]***	[0.075]***	[0.069]***	[0.044]***	[0.107]***	[0.071]**	[0.072]***
Log Value Added	-7.216	-1.877	-9.559	-5.550	-8.790	-7.218	-2.099	-8.319	-7.817	-7.381
	[0.153]***	[0.182]***	[0.216]***	[0.239]***	[0.188]***	[0.153]***	[0.147]***	[0.221]***	[0.231]***	[0.200]***
Share Value Added	68.958	1.682	119.230	55.783	76.033	69.685	26.212	134.950	60.168	76.535
	[2.531]***	[2.719]	[4.787]***	[3.659]***	[3.612]***	[2.537]***	[1.982]***	[5.012]***	[3.670]***	[3.445]***
Log FDI x Fin.Dep.	0.055	0.055	0.089							
	[0.021]***	[0.017]***	[0.035]**							
Log FDI x Skills						0.019	0.199	1.372		
						[0.175]	[0.055]***	[0.145]***		
Country Dummies	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Industry Dummies	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Time Dummies	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Country x Time Dummies		Y					Y			
R^2	0.70	0.81	0.82	0.64	0.79	0.70	0.76	0.79	0.77	0.70
# Observations	674	674	271	299	375	674	674	271	263	411

Notes: All regression are estimated by White's correction of heteroskedasticity. Standard errors are in parenthesis denoting *** 1%, ** 5%, * 10%. See Data Appendix for detailed explanation of all variables and sources. Industries are divided in (4) - (5) into low in and high external finance as defined by Rajan and Zingales (1998); and in (9) and (10) into low (blue collar) and high skills (white collar).

Table 5: OLS Regression of Growth Value Added and FDI—Targeted Industries
Dependent Variable is 5-Year Industry Growth in Value Added, 1985-2000.

	(1)	(2)
Log FDI	1.838	1.687
	[0.666]**	[0.480]***
Log Value Added	-8.495	-5.019
	[3.330]**	[2.485]*
Share Value Added	40.503	24.112
	[35.880]	[25.899]
Country Dummies	Y	Y
Industry Dummies	Y	Y
Time Dummies	Y	Y
Country x Time Dummies		Y
Industry x Time Dummies		Y
R^2	0.90	0.95
# Observations	58	58

Notes: All regression are estimated by White's correction of heteroskedasticity. Standard errors are in parenthesis denoting *** 1%, ** 5%, * 10%. The dependent variable is the growth in industry value added (5 year averges). FDI corresponds to Foreign Direct Investment Flows from OECD International Direct Investment Database. Log Value Added and Share of Value added correspond to the beginning of the period and are from the U.N. Industrial Statistics Yearbook. See Appendix A for detailed explanation of all variables and sources.

Table 6: Determinants of FDI—Industry Data (OLS Regression)
Dependent Variable: FDI Activity, 1985-2000.

	(1)	(2)	(3)	(4)	(5)
Dependent Variable	Log of FDI Flows				Log # Foreign Firms
Industry Targeting	0.179	0.363	0.426	0.154	0.277
	[0.065]***	[0.062]***	[0.062]***	[0.063]**	[0.131]**
Log Value Added	0.363	0.177	0.108	0.003	0.194
	[0.037]***	[0.040]***	[0.039]***	[0.042]	[0.060]***
Log FDI $_{-1}$		0.307	0.318		
		[0.015]***	[0.015]***		
Comparative Advantage (Size)				0.994	
				[0.059]***	
Country Dummies	Y	Y	Y	Y	Y
Industry Dummies	Y	Y	Y	Y	Y
Time Dummies	Y	Y	Y	Y	Y
Country x Time Dummies			Y		
Industry x Time Dummies			Y		
R^2	0.68	0.78	0.82	0.70	0.82
# Observations	530	355	355	530	767

Notes: All regression are estimated by White's correction of heteroskedasticity. Standard errors are in parenthesis denoting *** 1%, ** 5%, * 10%. The dependent variable is the growth in industry value added (5 year averges). The independent variable in (1)-(5) is the log of FDI flows which corresponds to Foreign Direct Investment Flows from OECD International Direct Investment Database; in (6) the log of the number of foreign firms from Dun & Bradstreet. See Appendix A for detailed explanation of all variables and

Table 7: IV Regression of 5-Year Growth Value Added and FDI—Industry Data

	(1)	(2)	(3)	(4)
	Panel A: Two-Stage Least Squares			
Log FDI	1.052	1.284	1.660	1.468
	[0.283]***	[0.196]***	[0.668]**	[0.595]**
Log Value Added		-2.399	-3.167	-2.771
		[0.296]***	[0.871]***	[0.864]***
Share Value Added		8.126	17.601	13.104
		[3.995]**	[12.535]	[12.051]
Country Dummies	Y	Y	Y	Y
Industry Dummies		Y	Y	Y
Time Dummies		Y	Y	Y
Industry x Time dummies			Y	Y
Country x Time dummies				Y
				Y
R^2	0.55	0.72	0.68	0.74
# Observations	483	483	483	483
	Panel B: First Stage for Log FDI			
Industry Targeting	0.937	0.424	0.357	0.428
	[0.21]***	[0.062]***	[0.212]*	[0.210]**
Log Value Added		0.234	0.276	0.328
		[0.060]***	[0.191]	[0.204]
Share Value Added		-2.164	-2.735	-2.590
		[0.888]**	[2.996]	[2.99]
Log FDI $_{-1}$	0.593	0.313	0.314	0.288
	[0.041]***	[0.014]***	[0.050]***	[0.050]***
R^2	0.68	0.81	0.79	0.83
	Panel C: Diagnostic Tests			
F test of excl. inst.	120.00	268.12	20.11	23.45
Sargan overid P-Value	0.77	0.22	0.89	0.73

Notes: Panel A reports the two-stage least square estimates, instrumenting foreign direct investment flows using the industry targeting variable and other controls. The dependent variable is the growth in industry value added (5 year averges). Panel B reports the corresponding first stage. Panel C resports the diagnostic tests. All regression are estimated by White's correction of heteroskedasticity. Standard errors are in parenthesis denoting *** 1%, ** 5%, * 10%. See Appendix A for detailed explanation of all variables and sources.

Table 8: Robustness I: Regression of Growth Value Added and FDI - Industry Data
Dependent Variable is 5-Year Industry Growth in Value Added , 1985-2000

	Comp. Adv. (1)	Gross Capital (2)	1995-2000 (3)	FDI/Capital (4)
	Panel A: Two-Stage Least Squares			
Log FDI	1.279	1.078	1.716	
	[0.212]***	[0.349]***	[0.137]***	
Log Value Added	-4.926	-0.584	-3.505	0.908
	[0.377]***	[0.823]	[0.300]	[0.642]
Share Value Added	2.482	-4.417	11.801	-9.131
	[4.061]	[10.155]	[5.08]***	[10.280]
Comparative Advantage (Size)	2.039			
	[0.192]***			
Log Gross Capital		0.070		
		[0.413]		
Log FDI/Capital				1.279
				[0.371]***
Country Dummies	Y	Y	Y	Y
Industry Dummies	Y	Y	Y	Y
Time Dummies	Y	Y	Y	Y
R^2	0.68	0.43	0.88	0.42
# Observations	674	186	313	186
	Panel B: First Stage for Log FDI			
Industry Targeting	0.366	0.466	0.421	0.378
	[0.060]***	[0.077]***	[0.068]***	[0.080]***
Log Value Added	0.686	0.566	0.338	-0.282
	[0.073]***	[0.142]***	[0.081]***	[0.119]**
Share Value Added	-0.842	0.315	-1.340	0.192
	[0.894]	[0.069]***	[1.146]	[1.892]
Log FDI_{-1}	0.307	0.357	0.243	0.343
	[0.015]***	[0.023]***	[0.018]***	[0.024]***
Comparative Advantage (Size)	-0.316			
	[0.040]***			
Log Gross Capital		-2.128		
		[1.830]		
R^2	0.79	0.74	0.90	0.80
	Panel C: Diagnostic Tests			
F test of excl. inst.	230.35	130.42	101.39	107.56
	Panel D: OLS Regressions			
Log FDI	0.285	0.877	0.562	
	[0.163]*	[0.372]**	[0.208]***	
Log Value Added	-8.824	0.331	-3.320	1.268
	[0.482]***	[2.226]	[1.034]***	[1.700]
Share Value Added	33.964	-12.882	42.815	-16.924
	[9.486]***	[30.078]	[11.543]***	[29.380]
Comparative Advantage (Size)	2.837			
	[0.380]***			
Log Gross Capital		-0.168		
		[1.067]		
Log FDI/Capital				0.824
				[0.363]**
R^2	0.75	0.32	0.55	0.32

Notes: Panel A reports the two-stage least square estimates, instrumenting foreign direct investment flows using the industry targeting variable. Dependent variable is the growth in industry value added (5 year averges). Panel B reports the corresponding first stage. Panel C resports the diagnostic tests. All regression are estimated by White's correction of heteroskedasticity. Standard errors are in parenthesis denoting *** 1%, ** 5%, * 10%. See Appendix A for detailed explanation of all variables and sources.

Table 9: Robustness II: Regression of Growth Value Added and FDI—Industry Data
Dependent Variable is 3-Year Industry Growth in Value Added, 1985-2000

	(1)	(2)	(3)	(4)	(5)
	Panel A: Two-Stage Least Squares				
Log FDI	4.441	1.642	1.296	1.980	1.468
	[1.538]***	[0.272]***	[0.219]***	[0.738]***	[0.595]**
Log Value Added	-4.893	-3.203	-2.128	-2.873	-2.771
	[0.642]***	[0.289]***	[0.300]***	[0.812]***	[0.864]***
Share Value Added	18.585	16.010	4.206	19.376	13.104
	[6.197]***	[3.910]***	[3.658]	[12.222]	[12.051]
Country Dummies	Y	Y	Y	Y	Y
Industry Dummies	Y	Y	Y	Y	Y
Time Dummies	Y	Y	Y	Y	Y
Industry x Time dummies				Y	Y
Country x Time dummies					Y
R^2	0.20	0.51	0.63	0.56	0.63
# Observations	895	743	675	675	675
	Panel B: First Stage for Log FDI				
Industry Targeting	0.294		0.091	0.078	0.058
	[0.065]***		[0.068]	[0.225]	[0.021]**
Log FDI $_{-1}$		0.220	0.247	0.270	0.324
		[0.011]***	[0.011]***	[0.039]***	[0.025]***
Log Value Added	0.369	0.406	0.551	0.279	0.644
	[0.039]***	[0.046]***	[0.051]***	[0.147]*	[0.170]***
Share Value Added	2.992	0.392	-1.248	1.207	-1.643
	[0.634]***	[0.704]	[0.713]*	[2.345]	[2.112]
R^2	0.69	0.73	0.77	0.76	0.76
	Panel C: Diagnostic Tests				
F test of excl. inst.	20.16	413.96	275.20	24.56	22.68
Sargan overid P-Value			0.69	0.52	0.88

Notes: Panel A reports the two-stage least square estimates, instrumenting foreign direct investment flows using the industry targeting variable and other controls. The dependent variable is the growth in industry value added (5 year averges). Panel B reports the corresponding first stage. Panel C resports the diagnostic tests. All regression are estimated by White's correction of heteroskedasticity. Standard errors are in parenthesis denoting *** 1%, ** 5%, * 10%. See Appendix A for detailed explanation of all variables and sources.

Table 10: IV Regression of Growth Value Added and FDI—External Finance and Skill Dependence
Dependent Variable is 5-Year Industry Growth in Value Added, 1985-2000.

	Low Financ. Dep. (1)	High Financ. Dep. (2)	Low Skill (1)	High Skill. (2)
	Panel A: Two-Stage Least Squares			
Log FDI	1.342	2.437	0.202	4.545
	[1.189]	[0.914]***	[0.181]	[0.815]***
Log Value Added	-2.367	-5.091	-0.863	-7.486
	[1.471]	[1.221]***	[0.256]***	[0.901]***
Share Value Added	-4.155	33.256	-5.786	85.170
	[20.245]	[19.675]*	[3.124]*	[14.528]***
Country Dummies	Y	Y	Y	Y
Industry Dummies	Y	Y	Y	Y
Time Dummies	Y	Y	Y	Y
R^2	0.68	0.69	0.82	0.43
# Observations	144	202	430	418
	Panel B: First Stage for Log FDI			
Log Value Added	0.397	0.487	0.331	0.530
	[0.342]	[0.240]**	[0.080]***	[0.099]***
Share Value Added	-1.944	-3.657	-0.161	-6.046
	[5.353]	[4.282]	[1.028]	[1.960]***
Industry Targeting	0.313	0.488	0.405	0.397
	[0.345]	[0.278]*	[0.068]***	[0.121]***
Log FDI_{-1}	0.274	0.291	0.283	0.248
	[0.087]***	[0.067]***	[0.018]***	[0.031]***
R^2	0.64	0.63	0.80	0.79
	Panel C: Diagnostic Tests			
F test of excl. inst.	5.11	12.17	141.73	39.31
	Panel D: OLS Regressions			
Log FDI	0.279	0.473	0.168	0.363
	[0.241]	[0.244]*	[0.071]**	[0.072]***
Log Value Added	-5.774	-8.95	-7.817	-7.381
	[0.761]***	[0.578]***	[0.231]***	[0.200]***
Share Value Added	61.443	82.535	60.168	76.535
	[12.456]***	[11.399]***	[3.670]***	[3.445]***
R^2	0.64	0.81	0.77	0.70

Notes: Panel A reports the two-stage least square estimates, instrumenting foreign direct investment flows using the industry targeting variable. Dependent variable is the growth in industry value added (5 year averges). Panel B reports the corresponding first stage. Panel C resports the diagnostic tests. Panel D reports the OLS regression. Industries are divided in (1) and (2) into low in and high external finance as defined by Rajan and Zingales (1998); and in (3) and (4) into low (blue collar) and high skills (white collar). All regression are estimated by White's correction of heteroskedasticity. Standard errors are in parenthesis denoting *** 1%, ** 5%, * 10%. See Appendix A for detailed explanation of all variables and sources.

Table B1: Robustness I: OLS Regression of Growth Value Added and FDI—Industry Data

	Dependent Variable:			
	Growth Value Added Manuf	Growth Value Added 5 years	Growth Value Added 3 Years	Annual TFP
	(2)	(3)	(1)	(4)
Log FDI	0.620		0.331	
	[0.219]***		[0.173]*	
Log # of Foreign Firms		1.776		
		[0.242]***		
Log Value Added	-4.204	-13.406	-3.848	0.055
	[1.379]***	[0.496]***	[0.604]***	[0.005]***
Share Value Added	117.227	66.099	33.866	-0.169
	[36.712]***	[5.619]***	[10.622]***	[0.058]***
FDI/Capital				0.055
				[0.027]**
Country Dummies	Y	Y	Y	Y
Industry Dummies	Y	Y	Y	Y
Time Dummies	Y	Y	Y	Y
R^2	0.74	0.73	0.55	0.82
Observations	230	1053	958	216

Notes: All regression are estimated by White's correction of heteroskedasticity. Standard errors are in parenthesis denoting *** 1%, ** 5%, * 10%. The dependent variable is the growth in industry value added (5 year averges). FDI corresponds to Foreign Direct Investment Flows from OECD International Direct Investment Database. Log Value Added and Share of Value added correspond to the beginning of the period and are from the U.N. Industrial Statistics Yearbook. Log of # of Foreign firms is from Dun & Bradstreet. See Appendix A for detailed explanation of all variables and sources.

Table C1: Logit Model of Industry Target Choice— Industry Data
Dependent Variable: Industry Targeting, 1990-2000

	(1)	(2)	(3)
Log Global Industry Flows		0.585	0.494
		[0.238]**	[0.129]***
Log FDI $_{-1}$		-0.292	-0.193
		[0.164]*	[0.098]**
Comparative Advantage (Size)		1.511	0.91
		[0.544]***	[0.330]***
Growth Real Value Added$_{-1}$(%)	0.019	0.037	0.028
	[0.019]	[0.026]	[0.018]
Growth Real Value Added (%)		-0.088	-0.001
		[0.075]	[0.037]
Skills			-0.609
			[0.856]
Financial Dependence			0.219
			[0.122]*
Country Dummies	Y	Y	Y
Industry Dummies	Y	Y	
Time Dummies	Y	Y	Y
Country x Time Dummies	Y	Y	Y
Industry x Time Dummies	Y	Y	
R^2	0.22	0.39	0.33
Observations	443	376	378

Notes: Logit estimation. Standard errors are in parenthesis denoting *** 1%, ** 5%, * 10%. Dependent variable takes the value of one if the country *i* targeted industry *j* for the first time in year *t*. FDI corresponds to Foreign Direct Investment Flows from OECD International Direct Investment Database. Log Value Added and Share of Value added correspond to the beginning of the period. See Appendix A for detailed explanation of all variables and sources.

Table C2: Regression of Growth Value Added and Number of Foreign Firms
Dependent Variable is 5-Year Industry Growth in Value Added , 1985-2000

	Matched Observations (1)	Number of Firms (2)
	Panel A: Two-Stage Least Squares	
Log FDI	1.953	
	[0.333]***	
Log Value Added	-2.181	
	[0.652]***	
Share Value Added	-8.907	
	[5.504]	2.087
Log # of Foreign Firms		[0.699]***
		-1.478
Log # of all Firms (Start of Period)		[0.557]***
Country Dummies	Y	Y
Industry Dummies	Y	Y
Time Dummies	Y	Y
R^2	0.80	0.68
# Observations	149	793
	Panel B: First Stage for Log FDI	
Industry Targeting	0.369	0.107
	[0.067]***	[0.054]***
Log Value Added	1.231	
	[0.120]***	
Share Value Added	-4.100	1.658
	[1.471]***	[0.418]***
Log FDI_{-1}	0.220	
	[0.022]***	
Log # of Foreign $Firms_{-1}$		0.113
		[0.008]***
Or Log # of all Firms (Start of Period)		0.723
		[0.012]***
R^2	0.81	0.64
	Panel C: Diagnostic Test	
F test of excl. inst.	58.37	83.39
	Panel D: OLS Regression	
Log FDI	0.601	
	[0.331]*	
Log Value Added	0.283	
	[1.538]	
Share Value Added	-19.452	
	[19.583]	
Log # of Foreign $Firms_{-1}$		0.324
		[0.219]
Or Log # of all Firms (Start of Period)		-0.719
		[0.254]***
R^2	0.81	0.53

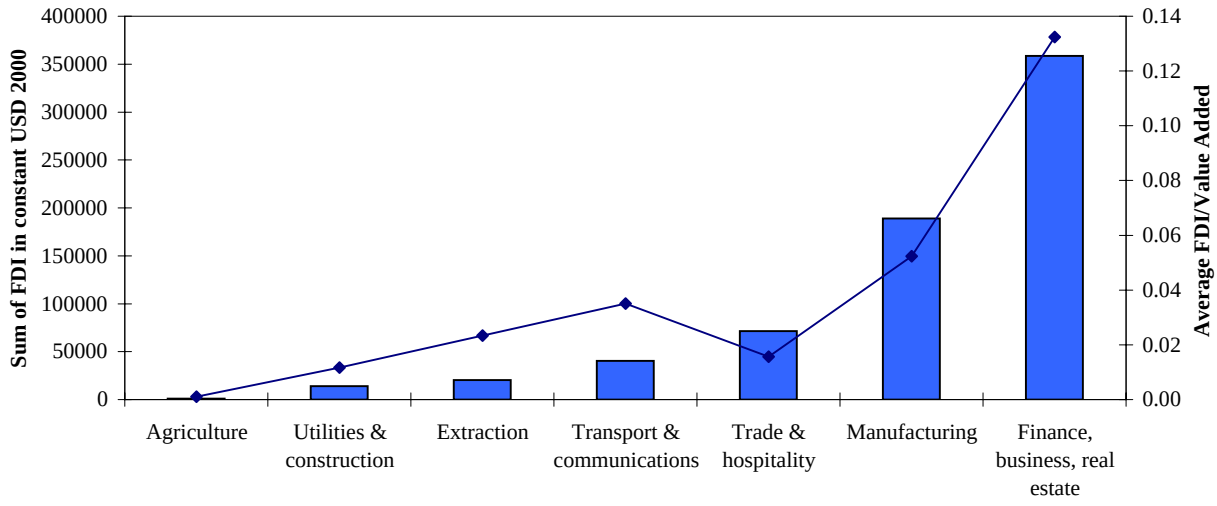
Notes: All regression are estimated by White's correction of heteroskedasticity. Standard errors are in parenthesis denoting *** 1%, ** 5%, * 10%. The dependent variable is the growth in industry value added (5 year averges). Column (1) shows matched results; column (2) uses as independent variable the number of foreign firms from Dun & Bradstreet. See Appendix A for detailed explanation of all variables and sources.

Table D1: Robustness Instrument Stragegy
Regression of 5-Year Growth Value Added and FDI—Industry Data

	(1)	(2)	(3)	(4)
	Panel A: Two-Stage Least Squares			
Log FDI	1.871	1.379	1.307	1.100
	[1.034]*	[0.229]***	[0.221]***	[0.288]***
Log Value Added	-2.166	-2.726	-4.943	-3.050
	[0.680]***	[0.297]***	[0.379]***	[0.378]***
Share Value Added	-1.036	12.612	2.433	11.616
	[3.514]	[4.074]***	[4.068]	[5.011]**
Industry Targeting			-0.128	
			[0.282]	
Country Dummies	Y	Y	Y	Y
Industry Dummies	Y	Y	Y	Y
Time Dummies	Y	Y	Y	Y
R^2	0.62	0.66	0.68	0.72
# Observations	601	523	354	330
	Panel B: First Stage for Log FDI			
Industry Targeting	0.169		0.366	0.464
	[0.064]***		[0.059]***	[0.071]***
Log Value Added	0.522	0.313	0.307	
	[0.056]***	[0.059]***	[0.0148]***	
Share Value Added	-3.238	-2.662	-0.841	
	[0.850]***	[0.901]***	[0.894]***	
Log FDI $_{-1}$		0.308	0.686	0.280
		[0.015]***	[0.073]***	[0.020]***
Foreign/Domestic Firms				0.002
				[0.001]***
R^2	0.71	0.80	0.81	0.73
	Panel C: Diagnostic Tests			
F test of excl. inst.	12.22	401.37	425.29	71.70
Sargan overid PV				0.14

Notes: Panel A reports the two-stage least square estimates, instrumenting foreign direct investment flows using the industry targeting variable and other controls. The dependent variable is the growth in industry value added (5 year averges). Panel B reports the corresponding first stage. Panel C resports the diagnostic tests. All regression are estimated by White's correction of heteroskedasticity. Standard errors are in parenthesis denoting *** 1%, ** 5%, * 10%. Column (3) add investment promotion as an exogenous regressor. See Appendix A for detailed explanation of all variables and sources.

Figure 1: Foreign Direct Investment by Sector (1985-2000)



Source: OECD's International Direct Investment database.