Is Foreign Direct Investment Good for Growth?

Evidence from Sectoral Analysis of China and Vietnam

September, 2006

Tam Bang Vu
College of Business and Economics
University of Hawaii-Hilo
tamv@hawaii.edu

Byron Gangnes
Department of Economics
University of Hawaii-Manoa
gangnes@hawaii.edu

Ilan Noy*
Department of Economics
University of Hawaii-Manoa
noy@hawaii.edu

*Corresponding author: Ilan Noy, Saunders Hall 542, 2424 Maile Way, Honolulu, HI 96822. noy@hawaii.edu

Is Foreign Direct Investment Good for Growth?

Evidence from Sectoral Analysis of China and Vietnam

Abstract

We estimate the impact of FDI on growth using sectoral data for FDI inflows to China and Vietnam. Previous empirical studies, using either cross-country growth regressions or firm-level micro-econometric analysis, fail to reach a consensus. Our paper is the first to use sectoral FDI inflow data to evaluate the sector-specific impact of FDI on growth. Our results show for the two developing-transition economies we examine FDI has a statistically significant positive effects on economic growth operating directly and through labor productivity. Intriguingly, we find the effect to be very different across economic sectors, with almost all the beneficial impact limited to manufacturing. Other sectors appear to gain very little growth benefit from sector-specific FDI.

Keywords: Foreign direct investment, growth, China, Vietnam.

JEL Classification: F21, F23.

1. Introduction

During the past two decades, foreign direct investment (FDI) has become increasingly important in the developing world, with a growing number of developing countries succeeding in attracting substantial and rising amounts of inward FDI. The theoretical literature in economics identifies a number of channels through which FDI inflows may be beneficial to the receiving economy. Yet, the empirical literature has lagged behind and has had more trouble identifying these advantages in practice. Most prominently, a large number of applied papers have looked at the FDI-growth nexus, but their results have been far from conclusive.[1] Notwithstanding the absence of any robust conclusions, most countries continue to vigorously pursue policies aimed at encouraging more FDI inflows.[2]

Table 1 presents recent trends in FDI inflows both as a percent of output and as a percent of fixed capital formation. Apparent is the worldwide trend increase in the importance of FDI (using both measures), with FDI inflows during the past decade increasing to 4-5 times the level experienced during the 1980s. While there was a doubling of foreign investment into East Asia during this time period, the Asian FDI inflow period peaked in 1995-1999 and current levels are still below that peak.

A closer look at these measures for China (including Hong Kong) and Vietnam reveals a similar trend, with both experiencing almost no inflows during the 1980s and a very dramatic increase throughout the 1990s. Relative to the size of their economies FDI

[1] With the availability of better data, the last few years have seen an especially large number of empirical papers devoted to this question (e.g., Alfaro et al., 2004; Bengoa and Sanchez-Robles, 2003; Durham, 2004; Hsiao and Shen, 2003; and Li and Liu, 2005).

[2] For a critical look at these domestic tax/subsidy policies, see Hanson (2001) and Mooij and Ederveen (2003). Gastanaga et al. (1998) analyze other host-country policies that aim to encourage FDI inflows.

flows into Vietnam are almost twice as large as those flowing into China. Neither country's experience appears unique in the region; their FDI inflows show the same magnitudes and temporal dynamics as other countries in East Asia.

FDI inflows are not uniformly distributed across production sectors, nor is their sectoral composition (Tables 2 and 3) the same for the two countries. For China, the dominant sector, manufacturing, accounts for 82.9% of total inflows out of five sectors for which we have complete data. For Vietnam, the two dominate sectors, manufacturing (27.6%) and oil and gas (16.5%) account for less than 45% of total inflows out of nine sectors for which data is available.

It may be possible to gain insight into the FDI-growth nexus by examining FDI impacts at the sectoral level. And the dramatic but uneven opening of these two economies provides a promising environment in which to look for industry-differences.

The opening up of China and Vietnam to foreign investments began in 1979 and 1987, respectively. Since then, the legal regimes governing foreign investments have been progressively liberalized with important modifications to the laws governing such investments made in recent years.[3]

At the same time, liberalization is far from complete in both countries, and customary rules may often be in conflict with the formal legal code. These customary rules, which have been derived from a mix of Neo-Confucianism, Daoism, and Animism, require an individual to obey local rules drafted by community leaders over and above the governments' laws. Any effort by central governments to contact the individual directly will be met with "bamboo fences." The system values community benefits above private

[3] Details for Vietnam can be found at http://www.vietnamlaws.com/legal_updates.aspx. There are numerous sources for China. See, for example, http://www.chinatoday.com/law/a0.htm.

ones. Local leaders protect an agent who synchronizes his own interests with those of his community. These customary rules create a patronage system that invites corruption among government officials at the intermediate levels. It also encourages nepotism among relatives, friends, and neighbors.[4]

In a 2006 ranking of property rights from the Heritage Foundation, both China and Vietnam rank very low, with China ranking a 4 and Vietnam a 5 (for an index 1-5 with low scores implying better property rights protection).[5] All these characteristics make China's and Vietnam's governance exceptionally weak and inconsistent and make it more difficult to maintain an environment friendly to foreign investors. These barriers are likely to be more important in some sectors than in others, potentially affecting the growth effects deriving from FDI in particular sectors.

In this paper, we use an endogenous growth framework to estimate the impact of FDI on growth using sectoral data for Vietnam and China (including Hong Kong). Using a time-varying coefficient in an augmented production function, we let FDI indirectly affect GDP growth through labor productivity. This approach creates heteroscedasticity, and so feasible generalized least squares (FGLS) is employed. The results show that FDI in both countries has a positive and statistically significant effect on economic growth operating directly and through labor productivity. Interestingly, the effect is not equally distributed across economic sectors. FDI only has a consistently positive effect on growth in the manufacturing sector; its effect on other sectors is usually statistically insignificant, in some cases even negative.

---

[4] See, for example, Tran (1997), Walter (1979) and Do (1993).

[5] Few countries received a 5. Examples for these are Zimbabwe, Turkmenistan, Sierra Leone, Libya, and North Korea. For details see: http://www.heritage.org/research/features/index/downloads.cfm#scores.

Our paper contributes insights on the FDI-growth nexus in several important ways. First, we employ a case study (single-country) regression-based approach that enables us to disregard variables that measure the institutional, legal and cultural environment in which FDI projects are implemented and which may have an important impact on their growth consequences. The difficulty measuring these institutional characteristics hinders easy identification in cross-country approaches.[6]

Second, to the best of our knowledge, our paper is the first to use data from different sectors to examine the sectoral differences in the impact of FDI on economic growth. This is potentially important since much of the recent theoretical and empirical micro-econometric literature concludes that FDI spillovers, if they exist, are found in intra-industry rather than in inter-industry settings.[7] This finding further justifies our attempt to ask whether the impact of FDI on growth might be different for different sectors and to begin to investigate whether particular sectoral characteristics are conducive to a positive impact of FDI.

Third, we are the first to use a time-varying coefficient estimation methodology in this context. We believe this methodology is more appropriate for highly dynamic and volatile emerging economies like those of South-East Asia or Eastern Europe since in such macroeconomic environments the *Lucas critique* is bound to be very important.

Finally, we believe that the experience of China and Vietnam may be similar to the development path taken by a significant number of other countries, especially those that have recently opened up their economies after years of economic repression and that

[6] See Mukand and Rodrik (2005) for insights into this problem that are relevant to the policy-applicability of estimation results.
[7] For a recent survey of the issue of inter- vs. intra-industry spillovers from FDI see Lipsey and Sjöholm (2005).

have experienced rapid rise in trade, FDI and incomes. This last point, of course, opens up a new comparative research agenda that we intend to pursue in future work.

A number of hypotheses have been offered regarding the interaction of foreign investment and growth. Singer (1950) argued that FDI will "crowd out" domestic investment since foreign firms often have greater access, at better terms, to international capital markets and will use the cheaper credit to drive out otherwise productive firms. This makes the foreign firms superior to the domestic ones in financing large projects and in taking advantage of changes in comparative costs, consumers' tastes, and market conditions. Findlay (1978) models this channel explicitly using an augmented Solow model. Assuming that domestic technology is an increasing function of FDI, he finds that the growth effect of FDI is ambiguous; an increase in the technology level might be offset by an increase in the dependency on foreign capital.[8]

Romer (1990) looks at technology as a non-rival input and at foreign direct investment as a source of technological advance. In this case, the FDI effect is unequivocally positive. Bhagwati (1978, 1985) on the other hand, suggests that the growth effects of FDI might be positive for export promoting (EP) countries but negative for import substituting (IS) ones; the reduction of foreign import goods in the domestic market reduces competition and efforts to improve efficiency among the domestic firms.

Reis (2001) uses an endogenous growth model to evaluate the growth effects of FDI when the investing firm's profits may be repatriated. She finds that, in equilibrium, foreign firms replace all domestic firms in the R&D sector. In this model, FDI only adds a positive effect to growth if the world interest rate is lower than the home interest rate.

[8] A related channel is the 'creative destruction' hypothesis raised by Aghion and Howitt (1992). If the competition from the foreign investors results in the destruction of inefficient firms, the FDI effect will turn out to be positive.

These hypotheses guide, to a large extent, all the empirical research that is described in the following section. Section 2 provides a brief survey on the state of current empirical work on the growth effects of FDI. Section 3 presents our model and the data we use. Section 4 analyzes the empirical results, and Section 5 concludes.

2. Existing Empirical Literature

In light of the conflicting results in the theoretical literature, the FDI-growth problem remains mainly an empirical one. In this section, we describe the current state of empirical research on the FDI-growth nexus through cross-country studies, intra-regional comparisons, and specific case studies.

2.1 Cross-Country Studies

The early empirical work on the FDI-growth nexus modified the growth accounting method introduced by Solow (1957). This approach defined an augmented Solow model with technology, capital, labor, inward FDI, and a vector of ancillary variables such as imports, exports, etc. Taking the logs and time derivatives of the explanatory variables yields an equation in growth rates for all variables with a "Solow residual" measuring total factor productivity (TFP) growth. Using this method and annual panel data for 46 developing countries, Balasubramanyam et al. (1996) find support for Bhagwati's hypothesis (1978, 1985) that the growth effect of FDI is positive for export promoting countries and might be negative for import substituting ones.

However, the growth rate of capital in growth accounting equations might be correlated with the growth rate of technology. Hence, there might be endogeneity biases

involved in their estimation. Another empirical problem of the Solow-Swan model lies in its fast convergence. Mankiw et al. (1992) test their theoretical model of endogenous growth and find that, with human capital added to physical capital, the rate of convergence is much slower.

Influenced by this approach, most empirical models add education to the augmented equation as a proxy for human capital. Blomstrom et al. (1994) and Coe et al. (1995) find that, for FDI to have positive impacts on growth, the host country must have attained a level of development that helps it reap the benefits of higher productivity. In contrast, De Mello (1996) finds that the correlation between FDI and domestic investment is negative in developed countries. Li and Liu (2005) find that FDI not only affects growth directly but also indirectly through its interaction with human capital.

Using a larger sample, Borensztein et al. (1998) find that inward FDI has positive effects on growth with the strongest impact through the interaction between FDI and human capital. De Mello (1999) finds positive effects of FDI on economic growth in both developing and developed countries. He finds that long-term growth in host countries is determined by the spillovers of technology and knowledge from the investing countries to host countries. In more recent work, Carkovic and Levine (2005) argue that the positive results described above are due to a biased estimation methodology. When employing a different estimation technique (Arellano-Bond GMM) they find no robust relationship between FDI inflows and domestic growth.

Alfaro et al. (2004) and Durham (2004) focus on the ways in which the FDI effect depends on the strength of the domestic financial markets of the host country. Alfaro et al. (2004) use annual data for 1975-1995 for a large cross section of countries, and they

find that only countries with well-developed banking and financial institutions gain from FDI. Durham (2004) finds similar results; FDI only has a positive effect on growth in countries with strong financial systems. Additionally, he finds that only countries with high quality governance, as evidenced by strong institutional development and investor-friendly legal environment, enjoy positive effects of FDI on growth. Also using data on developing countries, Hsiao and Shen (2003) find that institutional strength and high levels of urbanization are conditions for positive effects of FDI on growth.

Blonigen and Wang (2005) argue that mixing wealthy and poor countries is inappropriate in empirical FDI studies. Organizing the aggregate data for developed countries into six groups and developing ones into nine, they note three results. First, the factors that affect FDI inflows are different across the groups. Second, the growth impact of FDI is only supported for developing countries in the aggregate data, not developed ones. Third, the crowding out effect of FDI on domestic investment is only significant for developed countries.

2.2 Regional and Country-Specific Empirical Studies

Mortimore (1995) finds that there is a positive correlation between FDI and capital accumulation for Latin American countries. Bengoa and Sanchez-Robles (2003) use data for eighteen Latin American countries from 1970 to 1999. Following Barro and Sala-i-Martin (2004), they average the data over five year periods instead of employing yearly observations. They also use a composite variable for economic freedom that includes financial and trade openness. They find that only countries with a higher level of economic freedom enjoy a positive growth effect from FDI. Bende-Nabende (2001)

conducts a cross-country study on Asian countries, using annual data for 1970-1996 for the ASEAN-5. Results show that FDI has a positive effect on GDP growth in Indonesia, Malaysia, and Philippines, but a negative impact in Singapore and Thailand.

Using Thai annual macroeconomic data for the 1970-1999 period and adding export openness, Kohpaiboon (2003) shows that FDI is positively correlated with GDP growth in Thailand. Similarly, Marwah and Tavakoli (2004) examine Indonesia, Malaysia, Philippines, and Thailand separately. Their results show that FDI has a positive impact on GDP growth for all four countries. In contrast, Chakraborty and Basu (2002) find that GDP growth in India is not influenced by FDI. Instead, the causality they find is from GDP growth to FDI, with trade liberalization weakly increasing the flows of inward FDI.

Several papers examine the growth effect of FDI in China. Chen et al. (1995) use data for selected cities and provinces during the 1979-1991 period. They regress the log of GNP on FDI and find a positive growth effect. Zhang (2001) uses data from 1984 to 1998 for 28 provinces and finds that, generally, FDI has positive effect on economic growth in China through its interaction with human capital. Wen (2003) shows that FDI only has positive effects on economic growth in China's coastal provinces, which have more open policies toward foreign investors than the inland provinces. By separating the Chinese economy into an FDI and a non-FDI sector, Whalley and Xin (2006) conclude that the contribution of FDI to Chinese growth is quite substantial (on the order of 3-4 percentage points per year). None of these papers distinguishes direct investment projects by sectors.

Regarding Vietnam, very little detailed analysis on growth effects of FDI has been conducted. Two papers by Kokko and Zejan (1996) and Kokko et al. (2003) discuss reasons for success or failure of specific FDI projects in Vietnam. Two other papers by Schaumburg-Muller (2003) and Ngoc and Ramstetter (2004) investigate the performance of foreign multinationals versus local firms in Vietnam. Pham (2002) analyzes FDI and regional development using microeconomic data on approval values of FDI for sixty-four provinces in Vietnam. He finds that although FDI contributes to regional development by increasing industrial output, FDI flows are unequally distributed among the provinces due to poor infrastructure in remote areas. However, Kokko et al. (2003) find that the data set for approval values is only weakly correlated with the data set for actual values, which casts doubt on the robustness of the Pham (2002) results.

In summary, results on growth effects of FDI are controversial. Several authors argue that only developed countries with high-quality governance and robust financial systems benefit from FDI. Others suggest that developing countries are more likely to enjoy a growth impetus from FDI and are less likely to suffer from crowding out effects. Our data and methodology permit us to avoid some of the key problems that plague this literature. Furthermore, by implementing the same methodology for two different country-specific datasets, we are able to provide some evidence on the generality of our results.

3. Methodology and Data

3.1. Methodology

We use the conventional augmented Cobb-Douglas production function with endogenous growth:

$$Y_{it} = AL_{it}^{\alpha_i} K_{it}^{\delta_i} H_t^{\gamma_i} \prod_{j=1}^{n} C_{ijt}^{\phi_{ij}} e^{v_i} e^{\varepsilon_{it}} \qquad (1)$$

where Y, L, K, and H are real GDP, labor, physical capital (henceforth simply capital) and human capital, respectively; C is a vector of control variables such as exports, imports, infrastructure, etc. The subscripts are for sector *i*, variable *j*, and time *t*; α, δ, γ, and φ are parameters; v_i is the sector-specific disturbance and ε_{it} the general disturbance.

Taking natural logarithms of Equation (1) yields the linear form:

$$\ln Y_{it} = \ln A + \alpha_i \ln L_{it} + \delta_i \ln K_{it} + \gamma_i \ln H_t + \sum_{j=1}^{n} \phi_{ij} \ln C_{ijt} + v_i + \varepsilon_{it}. \qquad (2)$$

During the high growth phase of economic development, we expect that the productivity of labor and capital will evolve over time; we therefore allow the labor and capital coefficients to change over time:

$$\alpha_{it} = \alpha_1 + \alpha_2 F_{it} + u_{it}, \qquad (3)$$

where F_{it} are u_{it} are the inflow of FDI and the disturbance for sector *i* at time *t*.[9] We follow the conventional literature on economic growth and write the capital coefficient as a linear function of the interest rate:[10]

$$\delta_{it} = \delta_1 + \delta_2 r_t + e_{it}, \qquad (4)$$

where r_t is the official real interest rate; e_{it} is the disturbance. Substituting Equations (3) and (4) into Equation (2) yields:

---

[9] In Vu (2006), the accumulated stock of FDI is used instead of the inflow of FDI. For a discussion of time-varying coefficient models, see Griffiths, Hill, and Judge (1993), pp. 412-413, and Greene (2003), pp. 132-133.

[10] See, for example, Bagnoli (1996), Bosworth et al. (1995), and Romer (1994).

$$\ln Y_{it} = \ln A + \alpha_1 \ln L_{it} + \alpha_2 F_{it} \ln L_{it} + \delta_1 \ln K_{it} + \delta_2 r_{it} \ln K_{it} + \gamma_i \ln H_t + \sum_{j=1}^{n} \phi_{ij} \ln C_{ijt} + v_i + w_{it}, \quad (5)$$

where $w_{it} = u_{it} \ln L_{it} + e_{it} \ln K_{it} + \varepsilon_{it}$ is a composite disturbance for sector *i* at time *t*. There are two sources of heteroscedasticity in this model: one through *L* and the other through *K*, as these two variables vary across sectors and change over time. The variance of the composite disturbance can be written as:

$$\sigma_{w_{it}}^2 = \sigma_{u_{it}}^2 \left(\ln L_{it}\right)^2 + \sigma_{e_{it}}^2 \left(\ln K_{it}\right)^2 + \sigma_{\varepsilon_{it}}^2 . \quad (6)$$

The specific form of heteroscedasticity predicted by the model can be accounted for using an appropriate feasible generalized least squares (FGLS) estimator. The estimable form of Equation (5) is:

$$GDP_{it} = \beta_1 + \beta_2 FDI_{it} + \beta_3 FDI_{it} \cdot LAB_{it} + \beta_4 LAB_{it} + \beta_5 CAP_{it} + \beta_6 HUM_t + \sum_{j=1}^{n} \beta_j CON_{jt} + v_i + w_{it}, \quad (7)$$

where GDP is the log of output; LAB is the log of labor; CAP is the log of capital; HUM is the log of human capital; and CON is the log of the other control variables. Note that we allow for FDI to affect growth directly as well as through its interaction with labor.

We first estimate Equation (7) using least squares with dummy variables (LSDV) to eliminate sector specific effects.[11] We include a standard White correction for any heteroscedasticity not related to the dynamics of *lnL* and *lnK* (robust least squares with dummy variables, LSDVR). Obtaining the residual p_t from this estimation, its squared term, p_t^2 , can be generated as the estimated value of σ^2.

[11] For a detailed discussion of LSDV and FGLS estimation see Greene, 2003, pp. 287-295.

From Equation (6), p_t^2 depends on $ln\mathrm{L}_{it}$ and $ln\mathrm{K}_{it}$. Hence, we estimate equation (6), using LSDVR once more, and obtain estimated value q_t, which is a feasible substitute for the elements of the matrix of the variance of the composite disturbance. Finally, we scale all terms in Equation (7) by the square root of q_t to obtain the homoscedasticity needed for the regression. Details are given in Appendix A.

3.2. Data

Neither a single source of Vietnamese nor Chinese data has all information necessary to conduct a study on growth effects of inward FDI; we therefore use several sources as detailed below.

The *General Statistical Office of Vietnam* (GSOV) only provides FDI inflows data for approved amounts. Data on actual FDI projects implemented for eleven economic sectors from 1988 to 2002 is available from the International Monetary Fund (IMF) appendices to its *Annual Report for Vietnam*. The data are originally provided by the Vietnamese authorities, and then adjusted by IMF staff.

Vietnamese data for GDP of ten different sectors from 1990 to 2002 are available from the GSOV. However, several sectors lack data for most of the time period, leaving only seven sectors for estimation: manufacturing, oil and gas, construction, transportation and communication, hotels and tourism, other real estate (office and residential), and agriculture-fishery-forestry (henceforth agriculture).[12] The *Vietnam Statistical Yearbook*

[12] The GDP data from 1990 to 1994 in the *Vietnam Statistical Yearbooks* (VSY) incorporate oil and gas into industrial production. For this period, we use data for oil and gas from the industrial production sector, and then subtract these data from the general industrial production to obtain the industrial data without oil and gas. Data for agriculture, fishery, and forestry are provided separately in the SY but are combined here

(VSY) provides data for the labor force from 1990 to 2001.[13] We obtained data for investment—increase in fixed assets—for the whole period (1990-2002) for ten sectors from the VSY, seven of which match the data for FDI.

The *China Statistical Yearbook*, *Chinese Provincial Yearbook*, and the *Comprehensive Statistical Data and Materials on 50 Years of New China* all provide data on actually utilized values of FDI. We average the three sources when there are discrepancies. Data from 1996 to 2002 are for 19 sectors. Data for 1985 to 1993 are ascribed to 21 ministries. We match these ministries to the sectors of the later period. Sectoral data for 1986, 1994 and 1995 are missing.

Chinese data for GDP are available for five sectors: agriculture, manufacturing, construction, transportation-post-and-telecommunications, and trade-and-catering-services. The *China Statistical Yearbook* provides data for labor force from 1985 to 2002. For investment, the only series that is available for the whole period (1985-2002) is investment in capital construction. We use this as a proxy for investment.

In calculating education as a proxy for human capital, we sum up data from the two Statistical Yearbooks for enrollments in secondary schools, technical schools (vocational schools in the case of China), worker training schools, and four-year colleges.[14]

For a list of variables that might explain economic growth, we consult Barro and Sala-i-Martin (2004) and Romer (2001). We use the three-month household saving rate

---

to match the IMF's data set for FDI. GDP data on the real estate sector are only available for the period 1994-2002.

[13] The IMF's *Annual Report on Vietnam* gives an estimate of labor force for 2002.

[14] This is a more accurate expression of Vietnamese and Chinese educational systems than just secondary school enrollments. The secondary schools have to follow nationally drafted curricula, which focus heavily on political doctrine and abstract sciences. This leaves the vocational, technical schools or worker training schools the responsibility of providing technologically skilled labor.

from the IMF *International Finance Statistics*, and data on exports and imports, the number of telephones as a proxy for telecommunication capacity, and the volume of freight traffic as a proxy for transportation infrastructure. In summary, we have a Vietnam dataset for seven sectors for 1990-2002 and a China counterpart for five sectors for 1985-2002. Binary dummies are created to control for missing observations; 91 observations for Vietnam and 90 observations for China are obtained for estimation.

4. Results

4.1. Specification Tests

We carry out a downward piece-wise specification search in order to avoid omitted variable bias. We start with all available variables that may explain economic growth based on past research. The variables are then eliminated gradually, using multicolinearity tests. Gathering all available data, we start with a total of nine explanatory variables: FDI, labor, their interaction, capital, the real interest rate, education, exports, imports, telecommunication, and infrastructure. The model is initially estimated without interaction terms. As a preliminary step, we use robust OLS to control for heteroscedasticity rather than simple fixed effects estimation to preserve information that might be lost once the time-invariant effects are included.

We carry out multi-colinearity tests using the Variance Inflation Factors (VIF) approach (Kennedy, 2003). When an independent variable, X_i, is regressed on k other independent variables, the covariance matrix is: $Cov\hat{\beta}_i = \sigma_\varepsilon^2 (X_i' M_k X_i)^{-1}$. The inverse of this correlation matrix is used in detecting multicolinearity. The diagonal elements of this matrix (the variance inflation factors) are given by $VIF_i = (1 - R_{ik}^2)^{-1}$, where R_{ik}^2 is the R^2

from regressing X_i on the k other variables. When there is perfect multicolinearity, R^2 equals one, and VIF approaches infinity. Kennedy (2003) recommends elimination of any variable with VIF greater than ten. After five regressions with step-wise elimination, we are left with five explanatory variables: capital, labor, FDI interacted with labor, the real interest rate, and education. Hence, the estimated equation is:

(8)

There is the potential for important endogeneity between several of the right-hand variables and real GDP. We carry out endogeneity t-tests for each right-hand-side variable, in each case including six sectoral dummies to eliminate sector-specific effects (year dummies are not found to be significant).[15] The estimation results, reported in Table 4, do not indicate significant endogeneity, and so a two-stage least squares method is not suggested.[16]

4.2. Growth Effects of FDI

We begin by examining aggregate effects of FDI. The results of FGLS estimation for Vietnam are given in Table 5. Column 5.1 presents estimation of the benchmark empirical model including only the control variables, labor, human capital, physical capital, the interest rate, and the interest rate-capital interaction term. The signs of the coefficient estimates generally fit our priors, but only the coefficients on the interest rate

[15] The endogeneity t-test is a form of the Hausmann (1978) specification test. A right-hand side variable is treated as the instrument in a first-stage regression, and the resulting error is introduced as a regressor in the second-stage regression. If the coefficient on this error term is significantly different from zero, this is taken as evidence of the existence of endogeneity.

[16] We have also performed Granger causality tests as described in Geweke et al. (1983). We regress the FDILAB variable on its own lags, GDP lags, and other variables, using the FGLS estimation, and then test the significance of GDP lags. The t statistics for individual lagged GDPs and p values of the F-statistic for jointly lagged GDPs are all insignificant. We fail to reject the null hypothesis of no reverse causality.

and human capital are significantly different from zero at the 10% level. In column 5.2 we add the FDI measure described above. The term enters with a positive and significant effect (at the 10% level). With FDI inflows included, the positive coefficient on labor also becomes statistically significant; suggesting the interaction between FDI and labor is of empirical importance.

An interaction of FDI with labor (5.3) also yields positive and significant FDI effects, working indirectly through interaction with labor productivity. Including both the level of FDI and the interaction term (5.4) does not markedly change the magnitudes of estimated coefficients, but the FDI terms are no longer statistically different from zero at the 10% level.

Table 6 presents equivalent results for the China data set. Qualitatively, the results are very similar to those for Vietnam, although the estimated parameters on labor, capital and human capital are consistently lower. For China, the estimated direct effect of FDI on growth is very small, with a strongly significant impact coming through the interaction with labor. When both the interaction term and the level of FDI are included (6.4), the level of FDI variable is no longer significantly different from zero.

The impact we identified for aggregate FDI was statistically significant and positive. It is possible that the aggregate results mask important differences in the effect of FDI on economic performance across individual sectors. In Tables 7 and 8 we report FGLS estimation results for regressions that include all of the previously discussed control variables and that also allow for sector-specific effects of FDI on growth by including sectoral slope dummies.[17] The manufacturing sector is our baseline.

[17] See Greene, W., Econometric Analysis, fifth edition, Pearson Education, 2003, pp. 689-702.

Consistent with our aggregate results, we find that the effect of FDI on growth is significant for the manufacturing sector in both countries (7.1 and 8.1).

Importantly, in both countries we also find strong evidence that the impact of FDI on growth varies considerably across sectors. In particular, each of the non-manufacturing sectors exhibits a significantly smaller sensitivity to sectoral FDI inflows than that of the manufacturing sector. In most cases, the FDI effects for these non-manufacturing sectors are not significantly different from zero. An exception is the oil and gas sector in Vietnam, where FDI inflows have a positive effect similar in magnitude to that for manufacturing.[18]

The specifications in 7.1 and 8.1 do not control for differences in sectoral growth rates that are not attributable to the impact of FDI inflows. Since we do observe different average growth rates for different sectors, we include in columns 7.2 and 8.2 sectoral fixed effects. The results are not markedly different, although for Vietnam, the point estimates of FDI effect on manufacturing and oil and gas increase. For China, the FDI effect on transporation, post and telecommunication is no longer statistically smaller than that of manufacturing.

Columns 7.3 and 8.3 present regression results with sectoral dummies and sector-specific FDI-Labor interaction terms. The results are very similar to those where FDI enters in levels, suggesting that indirect effects on FDI on growth via labor productivity also differ across sectors. For China, in this specification, FDI effects on construction growth become positive and insignificantly different from manufacturing, while transporation, trade and catering become strongly negative.

[18] For other sectors, the effect is almost always insignificantly different from zero. Exceptions are column 7.2 for the hotel-tourism sector, and column 7.3 for construction in Vietnam and column 8.1 for construction in China. Even for these cases, the effect is significantly smaller than for manufacturing.

In regressions not reported here, we also ran the benchmark specifications for China using 1985-1997 data so as to exclude the Hong Kong FDI inflow data from our specifications. Results remain qualitatively the same and quantitatively very similar.

In sum, for both countries we find that the manufacturing sector shows consistently strong evidence of a positive FDI effect on growth. With the exception of Vietnam's oil and gas sector, non-manufacturing sectors show consistently weaker effects than manufacturing, in most cases not statistically different from zero.

These results are not entirely surprising. First, we may expect capital-intensive sectors and ones in which technology plays a major role to exhibit a more positive impact of FDI inflows on factor productivity. In addition, it may be much easier for firms in these externally-oriented and perhaps more well-established sectors to overcome the peculiar institutional rigidities that we discussed above and therefore take advantage of the benefits of FDI inflows on economic growth.

5. Conclusion

While most economists seem to agree that FDI is beneficial (if perhaps doubting the wisdom of government subsidies for investing multinationals), many policymakers and to a larger extent NGOs appear much less sanguine. In this work, we have estimated the impact of FDI on growth in different economic sectors using data from China and Vietnam. Using an augmented production function, we allow FDI to directly affect GDP growth and also to indirectly affect growth by enhancing labor productivity. The influence of FDI on productivity is permitted to vary over time, requiring a particular FGLS estimation procedure. The results reveal that FDI has a significant and positive

effect on economic growth through labor productivity in both countries. However, the effect is not equally distributed across sectors. In both countries, manufacturing seems to be the only sector to significantly benefit from FDI inflows (with an additional positive impact for FDI on the oil & gas sector in Vietnam).

From a policy perspective, two observations appear to follow from these results. First, governments who want to subsidize FDI inflows may want to direct scarce resources to manufacturing and energy extraction sectors. FDI into other sectors does not seem to yield any statistically identifiable benefit. At the same time, more resources should be directed toward understating why other sectors do not appear to benefit from FDI inflows. Is this fundamental to industry types, or is it a result of institutional barriers to effective absorption of FDI. Are there government policies that might improve the ability of non-manufacturing sectors to benefit from FDI inflows?

The relatively small available data samples and the existence of discrepancies among data sources suggest caution in interpreting these results. More and better data, and comparative work with sectoral data from other countries are plainly needed. Also, we have focused on the growth effect of FDI financial inflows. It would be useful to explore whether other types of capital inflows—equity and foreign loans—also have differential growth effects across sectors, and whether they too show both direct and indirect effects on economic growth.

References:

Alfaro, L., Chanda, A., Kalemli-Ozcan, S. and S. Sayek. (2004). "FDI and Economic Growth: The Role of Local Financial Markets," *Journal of International Economics* 64(1), 89-112.

Balasubramanyam, V., Salisu, M. and D. Sapsford, 1996, "FDI and Growth in EP and IS Countries," *The Economic Journal* 106(434), 92-105.

Barro, R., and Sala-i-Martin, X., 2004, *Economic Growth.* MIT Press, Cambridge, MA.

Bende-Nabebde, A., 2001, "FDI, Regional Economic Integration and Endogenous Growth, Some evidence from Southeast Asia," *Pacific Economic Review*, 6(3), 383-399.

Bengoa, M., and Sanchez-Robles, 2003, "FDI, Economic Freedom, and Growth: New Evidence from Latin America," *European Journal of Political Economy* 19, 529-545.

Blonigen, B., and M. G. Wang, 2005. Inappropriate Pooling of Wealthy and Poor Countries in Empirical FDI Studies." In: Moran, T. H., E. M. Graham and M. Blomström. *Does Foreign Direct Investment Promote Development?* Institute of International Economics Press, Washington DC.

Borensztein, E., de Gregorio, J., and J-W Lee, 1998, "How does foreign direct investment affect economic growth?" *Journal of international Economics* 45, 115-135.

Carkovic, M., and R Levine, 2005. "Does Foreign Direct Investment Accelerate Economic Growth?" In: Moran, T. H., E. M. Graham and M. Blomström. *Does Foreign Direct Investment Promote Development?* Institute of International Economics, Washington DC.

Chen, C., Chang, L. and Y. Zhang, 1995. The Role of FDI in China's Post 1978 Economic Development. *World Development* 23(4), 691-703.

De Mello, Jr., L.R., 1997, "FDI in Developing Countries and Growth: A Selective Survey," *The Journal of Development Studies* 34, 1, 1-34.

De Mello, Jr., L.R., 1999, "FDI-led growth: evidence from time series and panel data," *Oxford Economic Papers* 51, 133-151.

Dodsworth, J.,1996, "Vietnam Transition to a Market Economy," IMF Occasional Paper, 1-58.

Durham, B., 2004, "Absorptive capacity and the effects of FDI and equity foreign portfolio investment on economic growth." *European Economic Review,* 48, 285-306.

Findlay, R., 1978, " Relative Backwardness, Direct Foreign Investment, and the Transfer of Technology: A Simple Dynamic Model," *The Quarterly Journal of Economics* 92(1)., 1-16.

General Statistical Office, 1990-2004, *Statistical Yearbooks.* Statistical Publishing House, Hanoi, Vietnam.

Greene, W., 2003, *Econometric Analysis*, Fifth Edition, Pearson/Wesley, Princeton, NJ.

Griffifth, W., Hill, C., and G. Judge, 1993, *Learning and Practicing Econometrics,* John Wiley & Sons, Inc. Danvers, MA.

Grossman, G., and Helpman, E, 1991, *Innovation and Growth in the Global Economy.* MIT Press, MA.

Hausman, Jerry A. 1978. "Specification Tests in Econometrics." *Econometrica* 46(6):1251–71.

Hsiao, C., and Y. Shen, 2003. Foreign direct investment and economic growth: the importance of institutions and urbanization. *Economic Development and Cultural Change,* 51(4), 883-896.

Kennedy, P., 2003, *A Guide to Econometrics,* Fifth Edition, MIT Press, MA.

Kohpaiboon, A., 2003, "Foreign Trade Regimes and the FDI-Growth Nexus: A case Study of Thailand," *The Journal of Development Studies* Vol. 40, No. 2, 55-69.

Kokko, A., and Zejan, M. 1996. Planned and Failed Foreign Direct Investment in Vietnam. *Asia-Pacific Development Journal* 3(1), 37-53.

Kokko, A., Kotoglou, K., and A. Krohwinkel (2003). Characteristics of failed FDI projects in Vietnam. *Transnational Corporations,* 12(3), 41-77.

Li, X., and Liu, X. (2005). Foreign Direct Investment and Economic Growth: An Increasingly Endogenous Relationship. *World Development* 33(3), 393-407.

Lipsey, R. E., and F. Sjöholm, 2005. "The Impact of Inward FDI on Host Countries: Why Such Different Answers?" In: Moran, T. H., E. M. Graham and M. Blomström. *Does Foreign Direct Investment Promote Development?* Institute of International Economics Press, Washington DC.

Mankiw, G., Romer, D., and N. Weil, 1992, "A Contribution to the Empirics of Economic Growth," *Quarterly Journal of Economics,* 107, 407-437.

Marwah, K., and Tavakoli, A., 2004, "The Effects of Foreign Capital and Imports on Economic Growth," *Journal of Asian Economics*, 15, 399-413.

Ministry of Planning and Investment, 2004-2005, "The FDI Project Listings," *Hanoi, Vietnam,* MPI website.

Ngoc, P.M., and E.D. Ramstetter, "Foreign Multinationals and Local Firms in Vietnam's Economic Transition," *Asian Economic Journal,* 18(4), 371-404.

Nguyen, T.X., 1997, "The Attraction of FDI: Vietnam and Other ASEAN Countries," Institute of economics, 1996, *Vietnam's Socio-Economic Development,* 11, 63-69.

Reis, A., 2001, "On the Welfare Effects of Foreign Investment," *Journal of International Economics* 54, 411-427.

Romer, P.M., 1994, "The Origins of Endogenous Growth," *Journal of Economic Perspectives,* 8(1), 3-22.

Romer, D., 2001, *Advanced Macroeconomics,* McGraw-Hill/Irwin Publication, NY.

Schaumburg-Muller, H., 2003, "Rise and fall of foreign direct investment in Vietnam and its impact on local manufacturing upgrading, *European Journal of Development Research,* 15(2), 44-66.

Singer, H.W, 1950, "The Distribution of Gains Between Investing and Borrowing Countries," *American Economic Review,* 473-485.

Solow, R., 1957, "Technical Change and Aggregate production Function," *The Review of Economics and Statistics* 39, 312-320.

Tho, T.V., Duc, N.N., Chinh, N.V., and N. Quan, 2000, *Kinh te Viet Nam 1995-2000: New Computations, New Analysis.* Statistical Publishing House, Hanoi, Vietnam, 2000.

Tran, N.T., 1997, *Tim ve ban chat van hoa Viet Nam*, Hanoi: Literature Publishing House.

Walter, O., 1979, "Assertions of Cultural Well-being in Vietnam," *Journal of Southeast Asian Study,* 10, 435-443.

Whalley, John and Xian Xin, 2006. China's FDI And Non-FDI Economies and the Sustainability of Future High Chinese Growth. NBER Working Paper 12249.

Unterobertdoerster et al, 2003, "Vietnam: Selected Issues," *the IMF country Report No. 03/381*.

Vu, T. B., 2006. FDI and Endogenous Growth in Vietnam. *Applied Economics,* forthcoming.

Wen, M, 2003. FDI, Regional Geographical and Market Conditions, and Regional Development: A Panel Study on China. *Division of Economics, RSPAS, ANU*, 1-28.

Zhang, K., 2001, "How Does FDI Affect Economic Growth in China?" *Economics of Transition* 9(3), 679-693.

Appendix A. FGLS Estimation

After a fixed effect estimation of Equation (5), the sectoral disturbance, v_i, is eliminated, and (5) can be written as:

$y = X\beta + w$, where X is of dimension (T x K),

$E[w] = 0, \quad \text{cov}[w] = E[ww'] = W, \quad W \neq \sigma^2 I_T,$

where W is the covariance matrix. Since Equation (6) involves $\ln L_{it}$ and $\ln K_{it}$, which vary across sectors, another fixed effect estimation is needed. After the sectoral effects are eliminated once more, we can factor a constant out of the matrix W and write it in the alternative form $W = \sigma^2 Q,$ where the diagonal elements of Q are $q_t = \{q_1, q_2,...,q_T\}$. The transformed error term is: $w^* = [(w_1 / q_1^{1/2}), (w_2 / q_2^{1/2}), ..., (w / q_t^{1/2})]$. The heteroscedasticity is then corrected by transforming the original model to:

$y^* = Py = X^*\beta + w^* = PX\beta + Pw, \quad P'P = Q^{-1}.$

The general least square estimator is the minimum variance linear unbiased estimator under any general error covariance specification that could reflect heteroscedasticity or autocorrelation or both:

$$\hat{\beta} = (X'W^{-1}X)^{-1}X'W^{-1}y$$

In reality, since W is unknown, the feasible general least square estimator (FGLS) is $\tilde{\beta} = (X'\hat{W}^{-1}X)^{-1}X'\hat{W}^{-1}y$, which is not best linear unbiased but consistent. Its approximate large sample properties are the same as those of the GLS estimator.

Appendix B. Data Definitions and Sources: Vietnam

Code	Definition of Variable	Source
FDI	Actual FDI inflows per sector	IMF Annual Reports on Vietnam. Dodsworth (1996)
GDP	Gross domestic product per sector	Vietnam Government Statistical Office website and Vietnam Statistical Yearbook
INV	Investment in fixed assets per sector	Vietnam Government Statistical Office website and Vietnam Statistical Yearbook
LAB	Labor per sector	IMF-Vietnam Statistical Yearbook
CAP	Accumulated investment in fixed assets per sector	Calculated from investment in fixed assets per sector
INT	3-mts. household saving rate	IMF-Vietnam Statistical Yearbook
HUM	School enrollments	Vietnam Government Statistical Office website and Vietnam Statistical Yearbook
EXP/IM	Exports and imports	IMF-Tho *at al.* (2000)
COM	Number of telephones	Vietnam Statistical Yearbook
TRANS	Volume of freight traffic	Vietnam Statistical Year book

Appendix C. Data Definitions and Sources: China

Code	Definition of Variable	Source
FDI	Actual FDI inflows per sector	China Statistical Yearbook, China provincial yearbooks, and Comprehensive Statistical Data and Materials on 50 Years of new China
GDP	Gross domestic product per sector	China Statistical Yearbook
INV	Investment in capital construction per sector	China Statistical Yearbook
LAB	Labor per sector	China Statistical Yearbook
CAP	Accumulated investment in capital construction per sector	Calculated from investment in capital construction per sector
INT	3-mts. household saving rate	International Financial Statistics (IFS)-China Statistical Yearbook
HUM	School enrollments	China Statistical Yearbook

Table 1. World Distribution of FDI

	FDI net inflows (% of GDP)				FDI net inflows (% of Fixed Capital Formation)			
	1980-1989	1990-1994	1995-1999	2000-2003	1980-1989	1990-1994	1995-1999	2000-2003
World	1.12	2.00	3.97	5.05	4.60	8.86	15.33	24.72
East Asia	2.61	4.60	6.10	5.26	10.28	19.05	22.66	20.84
South-East Asia	2.70	4.19	5.51	3.27	7.88	16.35	21.22	12.75
China	.58	3.48	4.70	3.83	1.60	8.67	12.11	9.71
Vietnam	0.02	6.09	7.53	4.04	0.15	30.22	26.87	13.09

Source: World Bank's *World Development Indicators 2004*: BX.KLT.DINV.DT.GD.ZS and BX.KLT.DINV.DT.GI.ZS.

Table 2. FDI in Vietnam by Sector – Descriptive Statistics

Sector	1990-1994	1995-1998	1999-2002	1990-2002 (% of total flows)
Manufacturing	293.5	3341.9	7969.6	27.6
Heavy Industry	133.2	1421.3	4012.1	13.2
Processing zones	13.1	301.5	387.4	1.7
Light Industry	98.4	1027.6	2309.2	8.2
Food	48.8	591.5	1260.9	4.5
Oil and Gas	410.2	2301.2	4218.3	16.5
Construction	28.5	720.7	1768.6	6.0
Transportation	72.3	458.7	1268.2	4.3
Hotel & Tourism	127.0	1014.8	1830.2	7.1
Other Real Estates	44.5	632.6	1532.5	5.3
Agriculture	46.6	445.7	1268.4	4.2
Services	8.6	135.0	512.8	1.6

Source: IMF country report and *Vietnam Statistical Yearbooks*.
Note: Actual disbursed amounts converted to constant 1994 US dollars using the GDP implicit price deflator.

Table 3. FDI in China by Sector – Descriptive Statistics

Sector	1985-1989	1990-1994	1995-1998	1999-2002	1985-2002 (% of 5 sectors)
Farming, forestry, and fishery	50.5	1150.0	2621.6	4092.0	2.6%
Manufacturing	133.5	24068.6	99620.9	132042.2	82.9%
Construction	81.7	3885.5	6236.7	3770.5	4.5%
Transport, post, and telecommunication	1504.9	4958.6	6407.0	4942.2	5.8%
Whole Sale, Retail Trade and Catering services	289.3	3020.0	5108.2	4446.0	4.2%

Source: *China Statistical Yearbooks*.
Note: Actual disbursed amounts converted to constant 1994 US$ using the GDP implicit price deflator.

Table 4. Endogeneity t-Tests

	Vietnam		China	
	t-statistic	Adjusted R^2	t-statistic	Adjusted R^2
FDI*LAB	.99	.9780	-.44	.9654
CAP	.97	.9682	.67	.9476
LAB	.95	.9812	.44	.9762
INT*CAP	.97	.9793	.44	.9874
INT	-.97	.9802	-.44	.9776
EDU	.97	.9702	-.44	.9813
FDI	-.90	.9819	.13	.9798

Notes: Null hypothesis is that no significant endogeneity exists. See footnote 15. Critical value for the ninety-five percent confidence level is 1.99.

Table 5. Aggregate Effects of FDI on Growth for Vietnam
Dependent Variable: Log of GDP

	5.1	*5.2*	*5.3*	*5.4*
FDI		.44151**		.32735
		(.18798)		(.27782)
FDILAB			.1664**	.0695
			(.0850)	(.1240)
LAB	1.7808)*	2.3140**	3.0358***	2.8293**
	(.95947)	(.95351)	(1.2242)	(1.3280)
CAP	(.26063)	.18044	.66801	.38949
	(.46922)	(.46575)	(.50576)	(.59853)
INTCAP	.09305	.08996	.13855	.10831
	(.09107)	(.08734)	(.09237)	(.09369)
INT	-1.1176	-1.0116	-1.5749	-1.2114
	(1.0017)	(.96139)	(1.0106)	(1.0299)
HUM	3.5358***	3.4444***	3.3790***	3.3695**
	(1.1753)	(1.1305)	(1.1561)	(1.1441)
Observations	85	85	85	85
Adjusted R^2	.9677	.9396	.9581	.9789
Prob > F	.0000	.0000	.0000	.0000
Root MSE	1.0337	.9656	.9756	.9557

Notes: Specification is given in equation (8), estimated by feasible GLS as described on pages 12-13. Standard errors are in parentheses. Significance levels are *10 percent level, **5 percent level, ***1 percent level.

Table 6. Aggregate Effects of FDI for China
Dependent Variable: Log of GDP

	6 .1	6.2	6.3	6.4
FDI		.02061***		.00340
		(.00750)		(.00626)
FDILAB			.2140***	.2080***
			(.0262)	(.0284)
LAB	1.10711***	1.0128***	1.2549***	1.2354***
	(.14572)	(.14423)	(.09167)	(.11572)
CAP	.19959	.20464	.31563**	.31333**
	(.18371)	(.17665)	(.13689)	(.13757)
INTCAP	-.00003	-.00051	-.00109	-.00114
	(.00182)	(.00176)	(.00135)	(.00136)
INT	-.27706	-.50750	.31932	.26524
	(1.5188)	(1.4626)	(1.1278)	(1.1373)
HUM	1.0844***	1.1265***	.75251***	.76840***
	(.15359)	(.14844)	(.12085)	(.12488)
Observations	90	90	90	90
Adjusted R^2	.9403	.9648	.9813	.9744
Prob > F	.0000	.0000	.0000	.0000
Root MSE	1.1984	1.1521	.8880	.8920

Notes: Specification is given in equation (8), estimated by feasible GLS as described on pages 12-13. Standard errors are in parentheses. Significance levels are *10 percent level, **5 percent level, ***1 percent level.

Table 7. Sectoral Effects of FDI in Vietnam
Dependent Variable: Log of GDP

	7.1 $FDIxD_i$	7.2 $FDIxD_i + D_i$	7.3 $FDIxLABxD_i + D_i$
Manufacturing	1.0221***	1.30168***	.40501***
	(.30819)	(.24522)	(.08802)
Oil & Gas	.15616	.36395	-.09281
	(.15840)	(.34319)	(-.09782)
Construction	-.69937**	-1.3622***	-.39291***
	(.34288)	(.27665)	(-.08876)
Transportation	-.77750***	-1.45835***	-.41477***
	(.21726)	(.42858)	(.09061)
Hotels & Tourism	-.58265**	-1.6522***	-.44139***
	(.23467)	(.30786)	(.09104)
Other Real Estate	-.85613***	-1.65063***	-.42151***
	(.19159)	(.28120)	(.08896)
Agriculture	-1.3685**	-1.6567***	-.38322***
	(.61092)	(.43798)	(.09511)
LAB	2.2935***	1.9132*	2.0123**
	(.33692)	(1.1112)	(.72206)
CAP	-.17089	.40703	.38801
	(.29122)	(.38814)	(.36894)
INTCAP	-.02021	.00806	.01645
	(.09486)	(.00749)	(.08485)
INT	7.2465	-4.9513**	-6.5399***
	(106.16)	(2.3943)	(1.9961)
HUM	2.8885**	1.5688*	2.0251**
	(1.2303)	(.91296)	(.89439)
Observations	85	85	85
Adjusted R^2	.9601	.9466	.9329
Prob > F	.0000	.0000	.0000
Root MSE	1.0107	.68924	.76515

Notes: Specification is given in equation (8), estimated by feasible GLS as described on pages 12-13. The coefficient reported for manufacturing is the slope coefficient on FDI or FDIxLAB; manufacturing is the omitted sectoral dummy. Coefficients on pure industry fixed effects (7.2 and 7.3) are not reported. Standard errors are in parentheses. Significance levels are *10 percent level, **5 percent level, ***1 percent level.

Table 8. Sectoral Effects of FDI in China
Dependent Variable: Log of GDP

	8.1 $FDIxD_i$	8.2 $FDIxD_i + D_i$	8.3 $FDIxLABxD_i + D_i$
Manufacturing	.10781***	.04952***	.1950***
	(.01194)	(.00981)	(.0234)
Construction	-.12020***	-.03794**	.8110
	(.01601)	(.01519)	(.5770)
Transportation,	-.06247***	-.02673	-1.980***
Post- and Tele-	(.01934)	(01707)	(.6920)
Communication			
Trade and	-.13015***	-.06981***	-3.180***
Catering Services	(.01437)	(.01829)	(.7800)
Agriculture	-.19261***	-.05664***	-1.740*
	(.01511)	(.01666)	(.9510)
LAB	1.0124***	1.1248***	1.2307***
	(.10171)	(.13164)	(.11149)
CAP	.62495**	.30751*	.38889***
	(.27441)	(.18192)	(.12589)
INTCAP	-.00393	-.00129	-.00168
	(.00268)	(.00179)	(.00125)
INT	2.8705	.36561	.85976
	(2.2514)	(1.1755)	(1.0122)
HUM	.75928***	1.0051***	.83805***
	(.17370)	(.13884)	(.10741)
Observations	90	90	90
Adjusted R^2	.9602	.9731	.9799
Prob > F	.0000	.0000	.0000
Root MSE	1.6282	1.0345	.7127

Notes: Specification is given in equation (8), estimated by feasible GLS as described on pages 12-13. The coefficient reported for manufacturing is the slope coefficient on FDI or FDIxLAB; manufacturing is the omitted sectoral dummy. Coefficients on pure industry fixed effects (8.2 and 8.3) are not reported. Standard errors are in parentheses. Significance levels are *10 percent level, **5 percent level, ***1 percent level.