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FDI and human capital in the USA: is FDI in different industries created equal?

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Abstract

We use data in the USA to study the effect of inward Foreign Direct Investment (FDI) in different sectors/industries on the state-level human capital, measured by the average years of tertiary schooling. We find that inward manufacturing FDI tends to lower the tertiary schooling in a host state while information FDI increases the tertiary schooling in a host state.

I. Introduction

The USA has been the single largest recipient country of Foreign Direct Investment (FDI) in the world for decades. According to the Bureau of Economic Analysis (BEA), the inward FDI stock in the USA was $2384 billion in 2006, up from $430 billion in 1990. Foreign firms have a direct investment presence in every single state in the USA, and they are often sought after by state and local governments for creating additional jobs

in their localities. For instance, the state of Alabama provided $300 million as incentives to attract Mercedes-Benz AG in the early 1990s. In 2003 the state government of Mississippi offered an incentive package of $363 million to Nissan Motor Company for opening an automotive manufacturing plant in Canton, Mississippi (Canagaretna, 2004).

The unprecedented magnitude of FDI has generated substantial work on why such investment comes to the USA as well as on how foreign firms choose their locations. Curiously, the literature on the effects of inward FDI in different states/regions in the USA is still sparse, though bidding wars often occur among state governments to 'win' foreign firms.[1] Little evidence exists on the impact of FDI on local communities. Exceptions include Blonigen and Figlio (2000), Greenstone and Moretti (2003) and Ford *et al*. (2008). Blonigen and Figlio (2000) use South Carolina country-level data and discover that foreign presence leads to an increase in local wages, but a decline in per capita public education expenditures. Greenstone and Moretti (2003) use country-level data to study the effect of FDI on local labour earnings, property values and public finance. The authors do not find any evidence indicating that local governments' subsidies to foreign firms will reduce residents' welfare. Ford *et al*. (2008) investigate the growth effect of inward FDI at the state level and argue that an individual state needs to reach a certain threshold level of college education to benefit from FDI.

Complementing the existing studies, we examine the impact of sectoral FDI on the human capital level in each state in the USA, measured by average years of tertiary schooling (college and above). Barba Navaretti and Venables (2004) find that foreign affiliates in the USA are larger and tend to be more productive than US domestic firms. Similarly, Blomstrom and Kokko (2003) point out that multinational corporations can provide 'attractive employment opportunities to highly skilled graduates … which may be an incentive for gifted students to complete tertiary training' (p. 12). Foreign firms may have a different impact on communities than domestic firms. In addition, inward FDI is likely to affect the skill-bias of labour demand and provide incentives for individuals to receive higher education.

We use annual data at the state level over the time period of 1997–2004. Interestingly, our results suggest that manufacturing FDI tends to decrease average level of human capital in a state. In contrast, FDI in information industries leads to an increase in state human capital. FDI in other industries does not seem to have a significant impact on state-level human capital.

The rest of our article proceeds as follows: Section II presents data and variables. We discuss empirical results in Section III and conclude in Section IV.

II. Empirical Model and Data

We estimate a reduced form regression as follows:

$$H_{it} = \beta_0 + \sum_{j=1}^{8} \beta_j FDI_{ijt} + \gamma' Z_{it} + \varepsilon_{it} \qquad (1)$$

where subscripts *i*, *j* and *t* represent state, industry and year, respectively; *H* is human capital measured by average years of tertiary schooling; *FDI* represents inward FDI; *Z* is a vector of other control variables.

Human capital is calculated based on data from the monthly Current Population Survey (CPS) from the US Census Bureau. We focus on responses regarding *the highest degree/education obtained* by adult individuals in the household. Possible responses range from *less than 1st grade* to *doctorate degree*. The census also provides an estimate of the total adult population providing each response. We then calculate the annual average years of schooling for each different state. As most state laws mandate secondary school attendance until graduation, we focus on tertiary schooling, which is not compulsory. In our sample, the mean of average tertiary schooling is 1.41 years.

We measure FDI by employment in majority-owned non-bank foreign-affiliates in sector *j* in state *i* as a share of total employment in state *i*. Comparing different measures of inward FDI in the USA, Graham and Krugman (1995) assert that the share of US work force employed by foreign firms is 'an arguably better measure of actual foreign control of the US economy' (p. 16). In addition, there are no publicly available data on FDI which include disaggregated information by both sector and state except the employment data. Foreign affiliates employment data are obtained from *Survey of Current Business*, published by the BEA, and are available in eight sectors/industries: *manufacturing*; *wholesale* trade; *retail* trade; *information*; *finance* an d insurance; *real estate* and rental and leasing; *professional, scientific and technical* services; and *other* industries.

We also control for income, government spending on education, poverty, metro population and unemployment in our analysis. *Income* is obtained from BEA and measured as logged per capita real gross state product. State/local governments' share of spending on elementary and secondary education and on higher education are from the *Annual Survey of State and Local Government Finances and Census of Governments*, provided by the US Census Bureau. *Poverty* is the percentage of population in the state below the poverty line. *Metro* population measures the percentage of state population in metropolitan areas. *Unemployment* is the state unemployment rate. *Metro, poverty* and *unemployment* are obtained from the Bureau of Labor Statistics.

To control for other population characteristics, we include the percentage of African-American population (*Black*), percentage of Hispanic population (*Hispanic*) and percentage of population who are between 25 and 64 (*Age*). Corresponding data come from the Census Bureau. Our final sample covers the time span of 1997–2004.

III. Empirical Results

We estimate the model using dynamic panel generalized methods of moments, which controls for potential endogeneity in the model. Table 1 reports results of different specifications. The coefficients on manufacturing FDI in all tertiary schooling regressions are negative and significant, which indicates that manufacturing FDI decreases the state human capital level. In contrast, FDI in information sector has a positive and significant effect on tertiary schooling in all different specifications.

Table 1. Generalized methods of moments results for human capital

	1.1	**1.2**	**1.3**	**1.4**
Manufacturing	−0.00917***	−0.07516**	−0.07958*	−0.07549*
	[0.02941]	[0.02836]	[0.04254]	[0.04427]
Wholesale	−0.10178	−0.27022*	−0.05623	−0.14927
	[0.12467]	[0.14666]	[0.19324]	[0.20086]
Retail	0.09848*	0.01634	0.09621	0.04754
	[0.05428]	0.07417	[0.07819]	[0.06394]
Information	0.51225***	0.39259**	0.52790**	0.49055*
	[0.17518]	[0.18127]	[0.21191]	[0.24754]
Finance	−0.28674	−0.37985	−0.29326	−0.25564
	[0.24229]	[0.22885]	[0.22939]	[0.23207]
Real estate	−0.32594	−0.05346	−0.23465	−0.00139
	[0.37956]	[0.33613]	[0.42915]	[0.43851]
Professional, scientific and technical	−0.07022	−0.10036	−0.10779	−0.08753
	[0.20902]	[0.22822]	[0.18633]	[0.22518]
Other	−0.01637	−0.00281	−0.01419	−0.00556
	[0.04517]	[0.03496]	[0.04199]	[0.04059]
Income	0.68077***	0.82351***	0.77407***	0.77458***
	[0.17388]	[0.15358]	[0.23581]	[0.19699]
Poverty	−0.01200*	−0.01617**	−0.01033*	−0.0101
	[0.00694]	[0.00696]	[0.00658]	[0.00745]
Age	2.78856	2.07031	0.01709	1.72539
	[2.17253]	[2.01342]	[0.03331]	[2.77156]
Black	0.41051	−0.14908	0.37675	0.04229
	[0.27560]	[0.53012]	[0.27792]	[0.47196]
Hispanic	−0.18681	−1.35544*	−0.00408	−0.7252
	[0.59316]	[0.77602]	[0.00779]	[0.69715]

Elementary and secondary education spending	−0.51569	−0.26284	−0.00471	−0.38028
	[0.32371]	[0.25796]	[0.00343]	[0.33561]
Higher education spending	0.69407*	0.91267**	0.00709**	0.65235
	[0.35166]	[0.36953]	[0.00339]	[0.39488]
Metro		0.60564		0.26044
		[0.51408]		[0.48811]
Unemployment			0.00237	0.00162
			[0.01816]	[0.01713]
F-stat (prob > *F*)	24.7(0.000)	45.16(0.000)	20.24 (0.000)	21.28(0.000)
Number of observations	290	290	290	290

Notes: Robust SEs in brackets.
***, ** and * denote significance at 1, 5 and 10% levels, respectively.

To be more specific, based on our estimates, a 0.85% (one standard deviation) increase in foreign affiliates' manufacturing employment as a share of total employment tends to decrease the average tertiary schooling in a state by 0.069 years (average across different specifications). Given a sample average of 1.412 years for tertiary education, such a change is equivalent to 4.8% of the sample mean. On the other hand, a 0.156% (one standard deviation) increase in information FDI in a state increases the average years of tertiary schooling by 0.082 years, which is equivalent to 5.8% of the sample average. FDI in other sectors/industries does not have a significant impact on the human capital level in a state.

In addition, the coefficient on log income is positive and significant in all regressions. The magnitude of the income coefficient suggests an income elasticity of tertiary education between 0.482 and 0.583, other things constant.[3] In other words, a 1% rise in average individual income leads to an increase in quantity demanded for tertiary schooling by 0.482–0.583%. The value of the income elasticity of tertiary schooling also suggests that tertiary schooling is a normal good.

For the purpose of comparison, we also estimate secondary schooling regressions. The secondary schooling measure includes information on people who *only* complete 9–12 grades without proceeding to college.[4] The results are not reported, but available upon request. It is interesting to note that manufacturing FDI has a positive and significant coefficient in secondary schooling regressions. It seems that manufacturing FDI increases the share of state population that *at most* obtains a secondary education. This is indeed consistent with the negative coefficient on manufacturing FDI in our tertiary schooling regressions. Income has a negative and significant coefficient in all secondary schooling regressions. The income elasticity of secondary education (*as the highest level of education*) is around –0.2. Intuitively, when state income rises, more people will

choose not to have secondary education as their highest level of formal education. Instead, they will continue with college education or higher, which is also shown in our tertiary regressions.

IV. Conclusions

This article examines the effect of inward FDI on state-level human capital. Using state-level data over the period of 1997–2004, our estimates find that manufacturing FDI decreases average years of tertiary schooling in the state receiving the investment. In contrast, FDI in information industries increases the human capital level measured by tertiary education in the state receiving the investment.

Our results help to extend the current understanding of the state-level welfare effect of inward FDI. However, the results from our study do not necessarily indicate that manufacturing FDI will hurt the welfare in a state while information FDI has a net favourable impact on the welfare in a state. Given that inward FDI can cause many changes in a state, including changes in employment and state tax revenues, more needs to be done in the future to explore the overall effects of inward FDI.

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Notes

[1]A recent Toyota plant was sought by 25 states and finally was located in Mississippi in 2007 (Arizona Daily Star, 28 February 2008).

[2]There are seven different answers involving tertiary education to the CPS questions. We assign number of years needed (beyond high school) to obtain the corresponding level of tertiary education as follows: *some college but no degree* (1 year of tertiary education), *associate degree in college, occupational/vocational program* (2 years), *associate degree in college, academic programme* (2 years), *bachelor's degree* (4 years), *master's degree* (6 years), *professional school degree* (8 years) and *doctorate degree* (9 years). Suppose we have a state, which has 1% of its adult population receiving some college education, but no degree, 1% of its adult population receiving an associate degree and so on. Then the average years of tertiary schooling in this state is calculated as 1% * 1 + 1% * 2 + … = …. The number of years assigned to each category is based on

conventional wisdom, and our final results are not sensitive to it. For instance, changing the time to obtain a doctorate degree (beyond high school) from 9 to 10 years or to 8 years does not affect our final estimates qualitatively.

[3]The elasticity is calculated as β_{income}*(1/schooling) and evaluated at the sample mean.

[4]The mean of the average years of secondary schooling is 1.59 years.

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