LABOR COST AND LOCATION OF FOREIGN-OWNED FIRMS IN THE U.S.A.: AN EXPLORATORY STUDY

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As direct foreign investment has increased in the U.S.A., several geographic and economic questions can be raised, especially at the state level. Among these questions are:

- What factors attract foreign investors to particular states?
- Are there particular locational characteristics that benefit some states over others?
- Are there differences between the location of manufacturing and nonmanufacturing facilities?
- What can state governments do to entice direct foreign investment?

This paper focuses on the first three questions. In particular, three hypotheses are addressed. First, do labor costs matter in the decisions of foreign investors to locate in particular states of the U.S.A.? Second, do border states (states bordering Canada or Mexico) or states with coastlines have an advantage over other states? Third, do nonmanufacturing facilities and manufacturing facilities go hand-in-hand, or do they vary in relative numbers among the states?

If the first hypothesis is true, then low wage states should be in a better position to attract direct foreign investment than other states. The former states' governments can use this as a marketing tool. If the second hypotheses are true, then those respective states would enjoy a locational advantage over other states. The former set of states could partake of investment and employment booms brought by direct foreign investment. If the third hypothesis is true, then states could employ different strategies to attract particular types of direct foreign investment (warehouses versus plants, for example). Should all three hypotheses be false, however, then state governments and economic development agencies would be playing on a more level field.

The U.S. Commerce Department collects data on *U.S. affiliates of foreign companies* as measures of direct foreign investment, where such affiliates are defined to be firms with at least 10 percent foreign ownership (Bezirganian, 1991). Data are collected for both employment and value of plant and equipment. This study and several of the studies discussed below use the Department of Commerce data.

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Collecting appropriate data on wages depends in part on what industries are being studied. Previous studies have focused largely on manufacturing. (One exception is Kozlowski and Weekly, 1990.) Because this study looks at all (nonfarm) industries in each state, per capita personal income is used as a measure of labor costs. These data come from the *Survey of Current Business* (1991).

At the outset, it should be noted that the relatively new U.S.—Canadian free trade agreement and the North American Free Trade Agreement may change the picture, especially for border states. The impact of the 1987 U.S.—Canadian pact, however, may not show itself in direct foreign investment terms for several more years. The same caveat would apply to Mexico.

Previous Studies

Several studies have been published that focus on regional direct foreign investment. Two studies of note are those of Swamidass (1990) and Glickman and Woodward (1988). Swamidass, using data from 1973 to 1983 for the 48 contiguous states, compares U.S. manufacturing firm location decisions with those of foreign-owned manufacturing firms locating in the U.S. He finds that foreign firm location decisions can be explained by agglomeration economies (proxied by the total number of manufacturing establishments in a state) and by the level of union membership (a negative relationship). The statistical results for domestic firms are weaker. Swamidass feels that the results are due partially to the fact that many domestic manufacturing firms have multiple locations (and thus new locations are to fill existing geographic gaps), while foreign firms have few, if any, existing locations and thus are more likely to scan the entire U.S.

Glickman and Woodward's study includes a discussion of prior studies of direct foreign investment determinants in the U.S. These previous studies (by different authors) conclude that factors that explain direct foreign investment location decisions include transportation costs, port facilities, wage differentials, labor attitudes, proximity to markets, government aid, and other factors. In their study of direct foreign investment in the 48 states from 1974 to 1983, Glickman and Woodward find that the Rocky Mountain states had the highest annual growth rate in manufacturing direct foreign investment (30.5 percent), followed by the Southwestern states (27.3 percent); the Great Lakes states had the lowest (17.3 percent). In 1983, on the other hand, the Southeastern states had the largest share of employees of foreign-owned manufacturing establishments (32.4 percent), followed by the Mideastern states (17.4 percent).

Glickman and Woodward find results in their statistical analysis similar to those of Swamidass; agglomeration economies and labor market conditions seem to explain direct foreign investment location decisions; transportation factors are not as statistically significant. Finally, Glickman and Woodward note that toward the end of their study period that direct foreign investment seemed to shift toward the Mideastern and Great Lakes states (the Rust Belt). Smith (1989) notes that tax and other direct financial incentives have a minor impact on firms' location decisions.

Unlike the two studies above, Kozlowski and Weekly (1990) look at employment in all direct foreign investment facilities, not just manufacturing. Their study (using data from 1977 to 1985) finds that state population, business costs, state economic growth, and state funding of programs to attract direct foreign investment are significant explanators of variation in direct foreign investment among states. Similar conclusions (for manufacturing only) are drawn by Friedman *et al.* (1992).

Other studies have focused on particular industries or locations. For instance, Hultman and McGee (1990) look at the location of Japanese banking offices in the U.S. in the 1980s, finding that these offices are concentrated in New York and California. Solocha *et al.* (1989) examine the impact of U.S./Canadian exchange rate fluctuations on Canadian investment in upstate New York. Kenney and Florida (1992) in a study of Japanese transplants in the automotive, steel, rubber, and other industries find that Japanese firms' just-in-time inventory policies dictate firm location, leading to geographic concentration of Japanese direct foreign investment in the U.S.A. OhUllachain (1989) in a review article surveys other recent literature on Japanese direct foreign investment in the U.S., noting among other findings that Japanese auto makers prefer nonunion nonmetropolitan Midwestern and Southern states.

Model Specification

The following equations are specified to capture the geographic dimension of the location of direct foreign investment and the split between manufacturing and nonmanufacturing facilities:

$$(1)\ FEMP = a_0 + a_1 LAB$$

$$(2)\ FEMP = b_0 + b_1 CT + b_2 BR + b_3 GL + b_4 LAB + b_5 SINC$$

$$(3)\ FMAN = c_0 + c_1 CT + c_2 BR + c_3 GL + c_4 LAB + c_5 SINC$$

$$(4)\ FNMN = d_0 + d_1 CT + d_2 BR + d_3 GL + d_4 LAB + d_5 SINC + d_6 FMAN$$

where:

FEMP = 1989 state employment of nonbank U.S. affiliates of foreign enterprises as a proportion of total state nonfarm employment;

FMAN = 1989 state employment in U.S. manufacturing affiliates of foreign enterprises as a proportion of total state nonfarm employment;

FNMN = FEMP – FMAN (that is, all other employment in direct foreign investment facilities, as a proportion of total state nonfarm employment);

CT = A dummy variable equal to 1 if the state has a coastline along the Atlantic, Pacific or Gulf of Mexico, zero otherwise;

BR = A dummy variable equal to 1 if the state has a land or river border with Canada or Mexico, zero otherwise;

GL = A dummy variable equal to 1 if the state has a shoreline along the Great Lakes, zero otherwise;

LAB = 1989 state per capita personal income, a proxy for labor costs; and

SINC = 1989 total state personal income.

Data for FEMP and FMAN came from the *Survey of Current Business* (Bezirganian, 1991, Table 5) and the *Monthly Labor Review* (U.S. Department of Labor, 1990). Employment data are for 1989, with total state employment taken as the July (midyear) value. State FEMP values (expressed as percentages) are given in Table 1. The three states with the highest percentages are the coastal states of Delaware, South Carolina, and Hawaii; the three states with the lowest FEMP values are South Dakota, North Dakota, and Montana (the latter two states border Canada). Great Lakes states are differentiated from coastal states because of winter navigation shutdowns in the former. It is hypothesized that the coefficients of CT, BR, and GL should be positive: that is, being a coastal, border, or Great Lakes state should give those states a locational advantage in terms of attracting direct foreign investment. The LAB coefficient is presumed to be negative; higher labor costs should discourage investment in those states.

As noted above, data on LAB and SINC come from the *Survey of Current Business* (1991). States with the highest per capita income include the northeastern states of Connecticut, New Jersey, and Massachusetts. The states with the lowest income levels are Mississippi, Utah, and Arkansas.

This model differs from the Swamidass and Glickman and Woodward models in several important respects. First, both previous studies use measures of capital investment, while this study uses employment. Although employment is cyclical (1989 was the last full year of the Reagan expansion) and probably more volatile than capital stock numbers, it is still an important dimension to direct foreign investment, especially on the political side. Second, both previous studies confine their analysis to the manufacturing sector, while this study looks at total employment, e.g., including the service sector. In 1989 only 41.3 percent of direct foreign investment employment was in manufacturing nationally. This study uses per capita personal income therefore, rather than manufacturing compensation. Although personal income includes both earned and unearned income (the latter including interest, transfer payments, etc.), it covers all industries and thus should reflect overall labor market conditions in each state. (As noted by Coughlin *et al.* (1991), however, LAB also can be interpreted as a demand variable.) Third, neither of these two studies nor Kozlowski and Weekly look at nonmanufacturing direct foreign investment directly. Fourth, this study includes some specific geographic measures, reflected in the three dummy variables; the other three studies do not include such measures. Finally, a relatively minor point, this study includes all 50 states, while Glickman and Woodward and Swamidass exclude Hawaii and Alaska.

Just as Kozlowski and Weekly use total population as a variable reflecting state size, SINC is used to see if larger states *ceteris paribus* attract relatively more direct foreign investment. Equation (4) includes FMAN as an independent variable to see whether it significantly explains the location of nonmanufacturing employment.

Results

Equations (1) and (2) are estimated by ordinary least squares (OLS) using SAS. Results are given in Table 2. Because the dependent variable is a proportion and thus is restricted to the [0,1] interval, it could be argued that a nonlinear specification may be more appropriate. As such, equations (1) and (2) are reestimated with the dependent variable transformed as follows:

LFEMP = ln (FEMP/(1-FEMP))

This respecifies the equations as logit equations. Because FEMPs are proportions and not binary observations, OLS can be used to estimate these equations. Table 3 presents these equations as equations (1a) and (2a), respectively.

Table 2's results show that the LAB coefficient in equations (1) and (1a) is (perversely) positive and has a high t-statistic, which could support Coughlin *et al.'s* argument that LAB is a demand variable. Equations (2) and (2a) are significant. In both equations, however, only the CT coefficient is significantly different from zero. The BR coefficient is insignificantly negative, while the GL coefficient is insignificantly positive. Thus, coastal states appear to have a locational advantage in attracting direct foreign investment, while border and Great Lakes states do not. The LAB coefficient is insignificantly positive. Contrary to Kozlowski and Weekly's results, size (reflected in SINC) does not seem to influence the relative size of direct foreign investment in a state. The logit transformations of both equations have the highest coefficients of variation and, thus, the best fits. Furthermore, the LAB coefficient is not significantly different from zero in equations (2) and (2a), while it is significantly different from zero in equation (1). The correlation between LAB and CT is 0.3278; that is, there is a positive (albeit weak) association between income and coastal location. These results may be (weak) evidence of the bicoastal economy, as well as (weak) evidence that locational characteristics swamp labor costs in direct foreign investment location decision-making.

This result is somewhat at odds with Glickman and Woodward, who conclude that the "distribution by state of inward foreign investment and domestic manufacturing is becoming more balanced" (p. 151), as well as at odds with Swamidass and Glickman and Woodward, who show that labor cost measures are significant. The difference between this study and the earlier two may be due to this study including all nonfarm employment, while the latter two focus only on manufacturing. As noted above, manufacturing accounts for less than 42 percent of direct foreign investment employment. Still, equation (2a) explains only 31 percent of the variance in direct foreign investment employment. Other factors as noted in Glickman and Woodward and OhUllachain, such as agglomeration economies, may be important in attracting direct foreign investment. Thus, inland states should not be at a major disadvantage in attracting direct foreign investment. Smith (1989) argues that knowledge of "interior regions of the United States ... may be more difficult to obtain abroad than information about coastal regions, where there are larger numbers of foreign investors" (p. 30), and he advises states to provide information to potential foreign investors.

In order to test whether the insignificant border influence is true for both frontiers, in equations (2) and (2a) the BR variable is replaced with two binary variables: MEX (equal to 1 if the state borders Mexico and zero otherwise) and CDN (equal to 1 if the state borders Canada and zero otherwise). The two equations, redubbed (2b) and (2c), appear in Table 3. Aside from the constant terms, there is no sign reversal between Table 2 and Table 3 respective entries; CT remains significant. The Canadian border dummy is significantly negative in (2b) and (2c), however, the former at the 10 percent level. One explanation may be that a number of northern tier states are small (in terms of income and population) and, thus, unattractive to foreign investors.

Equations (3) and (4) test for differences in locational characteristics of manufacturing versus nonmanufacturing direct foreign investment, where the latter can include warehousing, retailing, and other types of establishments. In both cases the logistic transformation performs the best, defined as follows (where LMAN is the transformation of the manufacturing variable and LNMN the transformation of the nonmanufacturing measure):

$$LMAN = \ln(FMAN/(1-FMAN))$$

$$LNMN = \ln(FNMN/(1-FNMN))$$

Their respective equations are denoted as (3a) and (4a) in Table 4. BR is replaced with MEX and CDN in Equation (4b). (Equation (3a) using MEX and CDN had an insignificant F-statistic.)

The results of Table 4 differ radically from those of previous equations. Not only is CT significant in the manufacturing equation (3a), but so is GL, the Great Lakes coefficient, indicating that direct foreign investment is attracted to the unionized Rust Belt (a conclusion in line with Glickman and Woodward). The border coefficient (BR) is significantly negative at 10 percent, indicating that manufacturing direct foreign investment is not attracted to northern or southern tier states. The LAB term is significantly positive in both the nonmanufacturing equations, again an indication that it is probably more a demand than a cost variable and that nonmanufacturing facilities are attracted to wealthier customers. MEX is significantly positive at 10 percent in equation (4b), possibly reflecting warehousing and other investments that complement the maquilladora program in Mexico.

Future Research

As an exploratory study, this paper points to several avenues of additional research, particularly regarding nonmanufacturing direct foreign investment. First, is nonmanufacturing direct foreign investment more sensitive to labor costs than manufacturing direct foreign investment? The use of LAB in this study could not answer this question adequately. Second, is nonmanufacturing direct foreign investment more sensitive to state income levels than manufacturing direct foreign investment? The answer appears from this paper to be "yes". This may be a logical answer if much direct foreign investment is in retailing (such as Germany's Tengelmann or Canada's Campeau investments in the U.S.A. would illustrate). This question needs further study, possibly looking at a breakdown of the nonmanufacturing sector. Third, to what extent do manufacturing and nonmanufacturing direct foreign investment go hand-in-hand? The results here suggest not always (based on differences in significant coefficients in Table 4), but again a more detailed study is needed. Finally, an interesting policy question is whether states want to court nonmanufacturing direct foreign investment, especially if it competes with domestically owned companies (especially in the retail sector).

As noted at the beginning of the paper, it may be premature to conclude that border state location has no advantage. This paper's hypotheses should be retested in several years to see if the Canadian (and possibly Mexican) free trade agreement has had any impact on location decisions. As noted in Solocha *et al.* (1989), small and mid-size Canadian firms seem to locate more readily in U.S. border states than do larger firms. Similarly, it will be of interest to test over the years whether coastal and Great Lakes states maintain whatever locational advantage they enjoyed in 1989.

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Table 1—Employment in Foreign-Owned Facilities as a Percent of Total Nonfarm Employment, 1989, and State Per Capital Personal Income, 1989

State	Employment Percent	Per Capita Income $ thousands	State	Employment Percent	Per Capita Income $ thousands
CT/c	5.2	24.5	FL/c	3.6	17.8
ME/bc	4.9	16.5	GA/c	5.4	16.2
MA/c	4.1	21.8	KY	3.9	14.0
NH/bc	4.9	20.4	LA/c	4.3	13.4
RI/c	2.9	18.1	MS/c	2.5	12.1
VT/b	3.2	16.9	NC/c	5.7	15.5
DE/c	12.1	19.3	SC/c	6.7	14.0
MD/c	3.2	20.8	TN	5.2	15.0
NJ/c	5.9	23.7	VA/c	3.7	18.9
PA/cg	3.9	17.6	WV	4.9	12.8
IL/g	4.6	19.3	AZ/b	3.8	15.4
IN/g	3.9	16.1	NM/b	2.8	13.5
MI/bg	3.6	17.6	OK	3.6	14.5
OH/g	4.3	16.6	TX/cb	3.9	15.7
WI/g	3.4	16.7	CO	2.7	17.8
IA	2.6	16.2	ID/b	2.2	14.2
KS	2.8	17.0	MT/b	1.4	14.4
MN/bg	3.9	17.8	UT	2.3	13.1
MO	3.1	16.7	WY	2.1	14.9
NE	1.9	16.4	CA/cb	4.0	19.7
ND/b	1.2	14.0	NV	3.2	18.4
SD	1.1	14.4	OR/c	2.4	16.3
AL/c	3.5	14.1	WA/bc	3.3	17.8
AR	3.6	13.3	AK/bc	3.2	20.6
NY/bcg	4.5	20.8	HI/c	8.4	18.7

b = international border state; c = coastal state; g = Great Lakes state

Sources: based on data in Bezirganian (1991), U.S. Department of Commerce (1991), U.S. Department of Labor (1990)

Table 2—OLS Estimates of Equations (1) and (2)

	Equation (1)	Equation (2)	Equation (1a)	Equation (2a)
	Dependent Variable			
	FEMP	FEMP	LFEMP	LFEMP
Constant	0.00278 (0.185)	0.01491 (0.965)	-4.34043* (-11.674)	-3.94350* (-10.512)
LAB	0.00214* (2.420)	0.00114 (1.150)	0.06157* (2.824)	0.02812 (1.166)
CT		0.01485* (2.592)		0.38161* (2.744)
BR		-0.00661 (-1.277)		-0.17753 (-1.413)
GL		0.00711 (0.959)		0.24264 (1.349)
SINC		-0.00002 (-0.706)		-0.00003 (-0.048)
R^2	0.1087	0.2589	0.1425	0.3111
F	5.857	3.074	7.976	3.974

t-ratios in parentheses; starred coefficients are significant at 5 percent

Table 3—OLS Estimates of Equation (2) With Border Dummies

	Equation (2b)	Equation (2c)
	Dependent Variable	
	FEMP	LFEMP
Constant	0.01145 (0.726)	-4.04710 (-10.674)*
LAB	0.00137 (1.352)	0.03508 (1.438)
CT	0.01606* (2.774)	0.41730* (3.000)
GL	0.00942 (1.181)	0.31422 (1.640)
MEX	0.00340 (0.323)	0.11952 (0.472)
CDN	-0.00994** (-1.683)	-0.28147* (-1.983)
SINC	-0.00004 (-1.153)	-0.00059 (-0.075)
R^2	0.2820	0.3454
F	2.814	3.784

t-ratios are in parentheses
* Significant at 5 percent
** Significant at 10 percent

Table 4—OLS Estimates of Equations (3) and (4)

	Equation 3(a)	Equation 4(a) Dependent Variable	Equation 4(b)
	LMAN	LNMN	LNMN
Constant	-4.12530 (-7.449)	-4.74812* (-7.309)	-4.89368* (-7.745)
CT	0.41195* (2.007)	0.33464* (2.000)	0.38296* (2.334)
GL	0.54055* (2.035)	-0.00006 (-0.000)	0.14841 (0.665)
LAB	-0.02510 (-0.705)	0.06078* (2.175)	0.07287* (2.620)
BR	-0.33833 (-1.824)*	0.02229 (0.149)	
MEX			0.48007** (1.648)
CDN			-0.14120 (-0.858)
SINC	0.00052 (0.523)	-0.00016 (-0.211)	-0.00109 (-1.210)
LMAN		0.06907 (0.587)	0.07546 (0.662)
R^2	0.2202	0.3153	0.3717
F	2.484	3.301	3.550

t-ratios are in parentheses
* Significant at 5 percent
** Significant at 10 percent