Inward Foreign Direct Investment: Employment and Location Issues

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ABSTRACT. Different studies have arrived at different conclusions as to whether foreign direct investors in the United States prefer urban or rural locations. Location in "exurban" areas may explain this inconsistency. Using employment per square mile as a measure of urbanization, this study uses 2002 data to investigate how employment in foreign-owned facilities varies across the states. Using OLS estimates, it is concluded that foreign investors prefer more urbanized states, possibly reflecting exurban preferences. However, the estimates also suggest that foreign investors prefer less-skilled labor (R12, F21, J23).

I. Introduction

Various recent studies have looked at where foreign-owned facilities are located in the United States, and why certain locations (say, states) are more attractive to inward foreign direct investment (FDI) that others. Axarloglou (2004) determined that foreign investors preferred states with high labor productivity. Luker (1998) determined that foreign investors preferred rural over urban locations; Jelavich (2004) found a similar result, although labor productivity appeared to be a more significant locational determinant than "ruralness." Essletzbachler (2004) has documented a shift in U.S. manufacturing employment (in both domestically and foreign-owned plants) from urban to rural locations in the 1982-1997 period. In contrast, Coughlin and Segev (2000) concluded that foreign investors preferred urban over rural locations.

At the same time, population growth has been relatively strong in "exurban" counties (Richardson and Gordon (2004)), that is, counties abutting larger metropolitan areas. Millward (2005) found similar results for Nova Scotia. While exurban counties are often counted as rural jurisdictions, they are benefiting from urban area growth. "Isolated" rural areas, in contrast, may not reap such rewards. This particular study looks at urban-rural location decisions by multinational firms operating in the

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United States, using employment per square mile as a measure of the urban-exurban-rural continuum.

II. Theory

Theoretically, three models can be used to explain these (somewhat contradictory) observations. Markusen (2002, chap. 9) has developed a model of FDI location that is based in part on differentiating between the need for unskilled compared to skilled workers. Thus, foreign owned plants that need skilled workers will locate in areas where such workers are available. This reflects in part Markusen's model of the "vertical" multinational firm (MNF) that disperses its supply chain (for a particular product) across different countries.

Earlier, Ciccone and Hall (1996) determined that agglomeration economies arising in urban areas increase the marginal product of urban labor over that of rural workers. That is, the interaction of skilled workers with each other in "neighboring" firms raises the productivity of labor in such areas. Thus, MNFs seeking highly productive labor forces will look to urban areas in which to locate their facilities.

Recently, Cohen and Paul (2005) looked at location patterns of the American food manufacturing industry. The authors noted that geographically the supply chain for this industry runs from rural farmers to mostly metropolitan consumers. Using state level data, they concluded that agglomeration ("thick market") economies led that industry to some degree of geographic concentration, rather than being scattered across "heavily agricultural" states.

Obviously, much will depend on whether a particular MNF needs skilled or unskilled workers. The Ciccone and Hall model suggests that if a MNF needs skilled workers, it should be looking at metropolitan areas. Alternatively, if it needs unskilled workers, rural regions might be more attractive to such an employer.

One recent study that examined Japanese MNFs in the United States concluded, somewhat contrary to "conventional wisdom," that Japanese manufacturers sought out relatively unskilled labor. Looking at 1977-94 data, Blonigen and Slaughter (2001) found in particular that Japanese "greenfield" investments led to lower, rather than higher demands for skilled labor. ("Greenfields" refer to the construction of new facilities, in contrast to the purchase of existing ones.) This appears to contradict Axarloglou's findings (although they covered all FDI, not just Japanese

firms), and is illustrative of Markusen's results.

This study uses 2002 state level data to estimate how employment in foreign-owned facilities varies among the fifty American states. Educational attainment is used in part to control for skill level, along with a measure of labor productivity. Data for 2002 were the latest information available at the time of this research; furthermore, that year was approximately the "high water mark" for inward FDI in the U.S. China has since surpassed the United States at the largest recipient of inward FDI (Hill (2006, p. 238)).

III. Model Specification

The equations specified are:

$$EFDI = f(LABPROD, AVEPAY, HSG, EMPSQM) \quad (1)$$

$$EFDI = g(LABPROD, AVEPAY, BSG, EMPSQM) \quad (2)$$

Where EFDI is the ratio of employment in foreign-owned facilities divided by total state employment; LABPROD is the ratio of a state's Gross State Product (GSP) divided by total state employment, as a measure of average labor productivity; AVEPAY is a state's average annual earnings per employee; HSG is the percentage of the state's population having a high school diploma (as a measure of human capital); BSG is the percentage of the state's population that has a bachelor's degree; and EMPSQM is total employment per square mile in a state, as a measure of urbanization. Data are for all fifty states. Summary measures of the variables are presented in Table 1.

EMPSQM is assumed to be higher, the more urbanized a state is; states that are more "rural" should have lower values. EMPSQM might be an improvement over the metropolitan/nonmetropolitan designations found in the Federal data, where nonmetropolitan (rural) counties include some of the exurban counties discussed above. Growth in exurban counties should raise the EMPSQM values, assuming that the state in question also has an increase in its population (e.g., due to migration).

TABLE 1–Means and Standard Deviations of Variables

Variable	Mean	Standard Dev.	Maximum	Minimum
EFDI	0.040184	0.014207	0.070519	0.013801
LABPROD	0.072092 (per million workers)	0.012244	0.116420	0.053785
HSG	85.558%	4.006071	92.20000	78.10000
BSG	25.998%	4.519594	37.60000	15.90000
AVEPAY	$ 33.87726 (thousand)	5.277831	46.8520	26.0010
EMPSQM	89.99011	125.4117	554.5369	0.521024

In both equations, it is assumed that increasing labor productivity (as measured by LABPROD) will increase MNF employment in that state. Similarly, the higher the HSG and BSG percentages, the (presumably) better skilled will be a state's labor force, and thus more attractive to foreign-based employers. However, as compensation increases (measured by AVEPAY), the demand for labor by MNFs should decrease. The "wild card" is the EMPSQM variable: if MNFs prefer urban areas, its coefficient should be positive; if the same firms prefer rural areas, the coefficient should be negative.

IV. Model Estimation

The regressions were estimated via OLS, with the White heteroskedasticity correlation method using eViews. In each case, all the variables were transformed to their natural logarithmic values.

Equation (1a) in Table 2 reports the results for the first equation's estimation. Only two of the independent variables are significant: LABPROD and EMPSQM. AVEPAY's coefficient has the a priori correct (negative) sign, but is insignificant. HSG's coefficient is counterintuitive, but insignificant. The labor productivity measure (LABPROD) has a significantly positive coefficient, as expected. The significantly positive sign of EMPSQM appears to contradict the

conclusions in Jelavich, i.e., FDI seems to locate in denser (more urban) locations; however, this could possibly be explained by the presence of exurban counties. Again, however, labor productivity appears to be very significant in determining FDI location.

TABLE 2–OLS Estimates of Equation 1: 1n(EFDI)
Dependent Variable (** =significant at 5 %)

Variable	Equation (1a) Coefficient (t-statistic)	Equation (1b) Coefficient (t-statistic)
Constant	0.610559 (0.124733)	0.716435 (0.200341)
Ln(LABPROD)	1.230596 (2.122971)**	1.232123 (2.143187)**
Ln(AVEPAY)	-0.350198 (-0.518892)	-0.367617 (-0.569667)
Ln(HSG)	-0.099707 (-0.108776)	
Ln(EMPSQM)	0.146628 (2.961674)**	0.148744 (3.350019)**
R-squared	0.576766	0.576650
F	15.33103**	20.88572**

To control for any possible multicollinearity between HSG and LABPROD, the former variable was dropped in Equation (1b)'s estimation. The resulting respecification resulted in very little change in the coefficients and the R-squared.

Estimation of Equation (2) produced the following estimates, given in Table 3. Equation (2)'s coefficient of determination (R-squared) is slightly higher than for Equation (1)'s. Both LABPROD and EMPSQM continue to be significantly positive. The AVEPAY coefficient is of the a priori wrong sign, but insignificant. (A related labor market conclusion is that inclusion of a "right-to-work state" dummy variable resulted in an insignificant coefficient for that variable in both Equations (1) and (2).)

The college education variable (BSG) is significantly negative. This appears obviously counterintuitive. One possible explanation is multicollinearity, namely a somewhat high correlation between LABPROD and BSG (0.47); however, this is below the 0.7 threshold for multicollinearity used by some economists (Keat and Young (2006), p. 139).

TABLE 3–OLS Estimates of Equation 2: ln(EFDI) Dependent Variable
(* =significant at 10%; **=significant at 5 %)

Variable	Coefficient
Constant	0.139875 (0.040197)
Ln(LABPROD)	1.107606 (2.006889)**
Ln(AVEPAY)	0.081244 (0.115474)
Ln(BSG)	-0.405112 (-1.817099)*
Ln(EMPSQM)	0.144756 (3.364112)**
R-squared	0.594483
F	16.49236**

Comparing Equation (1b) with Equation (2), the LABPROD and EMPSQM coefficients remain significant and of the same signs. A more disturbing conclusion is that Blonigen and Slaughter's results might extend to beyond just Japanese-based employers.

Estimation of Equations (1a) and (2) using untransformed variables resulted in lower R-squareds than reported above (0.438855 and 0.438870, respectively). Thus the "logged" specification gave better fits.

V. Conclusions

The positive coefficients of EMPSQM suggest that multinational firms operating in the United States prefer urban over rural locations. To the

extent that exurban counties' EMPSQM values lie in-between urban and rural values, the results may suggest that FDI is attracted also to exurban locations (or at least exurban may be overall preferable to rural locations). Thus the conclusions of some other analysts (e.g., Jelavich) may reflect exurban and other rural areas being "added" together. Even so, the results in this paper suggest that rural, nonexurban locations will find it to difficult to attract foreign investors.

More disturbing is the sign of BSG in the second equation's estimation. This suggests that foreign investors are less interested in employing skilled U.S. labor than otherwise assumed. This may reflect the availability of similar skilled labor pools in other parts of the world.

VI. Data Sources

Data on Gross State Product (used to compute LABPROD) was obtained from the Bureau of Economic Analysis' web site (www.bea.gov); total employment by state, also used to compute LABPROD, came from the 2002 *Statistical Abstract of the United States (SAUS),* Table 592. HSG and BSG percentages came from the 2002 *SAUS,* Table 231. State square mileage (used to compute EMPSQM) came also from the 2002 *SAUS,* Table 359 (land area estimates). AVEPAY data were downloaded from the Bureau of Labor Statistics web site (www.bls.gov). "Employment of U.S. Nonbank Affliliates" (used to compute EFDI) came from the BEA web site; for two states, Louisiana and Mississippi, data were reported as interval estimates, and in these two cases, the midpoint of each interval was used to estimate EFDI.

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