STATE LABOR MARKETS: THE IMPACTS OF EXPORTS, TRANSPORT COST AND EDUCATION

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ABSTRACT

This paper examines the impact of international exports on state employment and wage levels, using 2000 data. OLS estimations reveal that exports have a significant but small impact on each. Results seem to confirm the "Leontieff paradox." Transportation costs do not appear to effect significantly total employment, while educational attainment does impact wages. Some policy conclusions for state governance are drawn from these results.

INTRODUCTION

State economies in the United States do not move in "lock step" formation with each other. Several recent studies, such as Partridge and Rickman (2005) and Hanson and Slaughter (2002), have analyzed the extent to which state economies are "synchronized" with the national one. Partridge and Rickman in particular found less synchronization after the 1980s. One possible explanation for this might be economic globalization, and the extent to which individual state economies are more dependent on international trade than others. Blakely and Bradshaw (2002) write that "[i]n many instances, as in the cases of Los Angeles, New York, San Francisco, and Miami, regional ties to the international economy are more significant than their ties to the domestic economy" (p. 47).

Furthermore, researchers have established that US exporters tend to pay above average wages, and exporting firms appear to have above-average employment growth (see, e.g., Bernard and Jensen (1999)). These findings suggest that states that are more "export oriented" should be economically better off than other jurisdictions.

Being able to export in turn depends in part on having a supporting transportation system to move goods from any given state to international locations. Given the variety of modes (rail, truck, water and air) that can be used to haul goods, calculating an "overall" measure of transportation costs can be tricky. However, Anderson and van Wincoop (2004) have developed an index of transportation costs for movements in and out of each state, based on 2000 data. These are used in the estimations presented below.

Beyond exports, state income should also be influenced by the skill mix of its labor force. Data for 2003 show that, nationally, four-year (BA/BS) college graduates had average incomes of $ 51,206, compared to high school graduates with average incomes of $ 27,915 (*Statistical Abstract of the United States* (2006), Table 217). Thus, states with relatively high numbers of college graduates should, ceteris paribus, have above average incomes. Furthermore, "competitive advantage" models, such as the Porter Diamond model, stress the need for countries to have skilled labor pools in order to be successful exporters (see, e.g., Czinkota et al. (2004), pp. 156-57).

This study consists of two empirical parts. The first part estimates a relationship between total state employment and state exports (among other variables); the second part estimates a relationship between average workers' pay in a state, on the one hand, and education level, productivity, unionization and urbanization on the other.

EMPLOYMENT AND EXPORTS

The demand for workers in a state's economy could be modeled as an extension of marginal productivity theory, i.e., labor demand becomes of function of a state's total production, its "average wage," as well as of other variables. Thus the following equation can be specified:

$$TOTEMP = f(GSP, SEXP/GSP, AVEPAY, TRCOST, CANBOR, MEXBOR) \quad (1)$$

Where:

TOTEMP = total employment in a state, in thousands of workers;
GSP = Gross State Product (GSP), in billions of dollars;
SEXP/GSP = ratio of a state's manufacturing exports to its GSP;
AVEPAY = average earnings per worker in each state, in thousands of dollars;
TRCOST = an index of transportation costs for each state;
COAST = dummy variable, equal to 1 if the state borders the Atlantic, Pacific or Gulf of Mexico, zero otherwise;
CANBOR = dummy variable, equal to 1 if the state borders Canada, zero otherwise; and
MEXBOR = dummy variable, equal to 1 if the state borders Mexico, zero otherwise.

Data are for 2000; the appendix identifies data sources. Means and standard deviations for each of the variables are presented in Table 1.

TABLE 1. SUMMARY STATISTICS OF REGRESSION VARIABLES

VARIABLE	MEAN	STAND. DEVIATION
TOTEMP (thous. Workers)	2625.120	2752.386
GSP (billion dollars)	197.6360	239.2877
SEXP/GSP	0.059925	0.036048
AVEPAY (thous. Dollars)	32.20800	5.420100
TRCOST	1.431200	0.069975
LABPROD (mill.$/worker)	0.071001	0.010782
COAST	0.450000	0.503457
CANBOR	0.220000	0.418452
MEXBOR	0.080000	0.274048
BSG (percent)	24.93200	4.312319
UNION (percent)	12.32400	5.681964
RURAL (percent)	32.09600	20.58499

As total production in a state rises, as measured by GSP, so should employment. Increased labor costs, measured by AVEPAY, should depress employment; similarly, high transportation costs, captured in TRCOST, should make a state a less desirable

production location, and so decrease employment. The sign of SEXP/ GSP is not obvious, however; if exports are more capital intensive than other products produced in a state, then the coefficient of that variable should be negative. The COAST dummy variable is included to capture the presence of harbors; it is assumed that its coefficient sign should be positive, reflecting waterborne transport advantages. The signs of the MEXBOR and CANBOR coefficients are expected to be positive, to the extent that the North American Free Trade Agreement (NAFTA) creates an incentive to locate warehousing and production facilities close to international boundaries.

The ratio SEXP/GSP measures only manufacturing exports (to other countries, not to other states in the U.S.). As such, other exports, e.g., farm, mining and service exports, are excluded. This might bias the results for some states.

Equation 1 was estimated by ordinary least squares, using eViews, and using the White heteroskedasticity correction method. The variables were transformed into their natural logarithmic values. Estimates are given in Table 2.

TABLE 2. TOTAL STATE EMPLOYMENT OLS ESTIMATION
Dependent variable: ln(TOTEMP)

VARIABLES	Equation 1 (a)	Equation 1(b)	Equation 1(c)	Equation 1(d)
Constant	6.469424 (20.50916)**	6.175659 (18.39862)**	6.052572 (18.85836)**	6.054731 (18.37766)**
Ln(GSP)	1.021663 (62.99794)**	1.021325 (67.30528)**	1.035407 (73.80097)**	1.035131 (69.52529)**
Ln(SEXP/GSP)	0.068031 (3.513535)**	0.060102 (2.717180)**	0.055728 (2.665592)**	0.055941 (2.569459)**
Ln(AVEPAY)	-1.042609 (-11.29678)**	-0.954349 (-10.08292)**	-0.957878 (-10.62806)**	-0.957598 (-10.45793)**
Ln(TRCOST)	-0.296009 (-1.306808)	-0.325313 (-1.474606)	-0.147727 (-0.707086)	-0.150579 (-0.635437)
COAST		-0.050549 (-2.500107)**	-0.052615 (-2.677951)**	-0.052587 (-2.671210)**
CANBOR				-0.000796 (-0.030524)
MEXBOR			-0.089712 (-3.324808)**	-0.089646 (-3.282349)**
R-Squared	0.996342	0.996805	0.997300	0.997300
F-statistic	3064.388**	2745.488	2646.964**	2216.121**

** = significant at 5%.

Equation 1(d) includes all of the specified variables. The GSP and AVEPAY coefficients have their expected signs, and both are significantly different from zero. The TRCOST coefficient has the correct sign, but is insignificant. The SEXP/GSP coefficient is positive and significant, that is, as exports increase in a state as percent of its GSP, so should that state's employment. Furthermore, the positive sign might indicate that exports are on the whole labor-intensive, thus validating the "Leontieff paradox." The COAST coefficient, contrary to expectations, is significantly negative; this may reflect the fact that coastal states are generally high labor cost states (the correlation between AVEPAY and COAST is 0.537), which may make them unattractive to firms. The CANBOR coefficient is not significant. The MEXBOR coefficient is unexpectedly negative and significant, suggesting that NAFTA may not

have that much of an employment impact in the border states. The negative border influence was also uncovered in an earlier study (Jelavich (1993)).

Equation estimations 1(a), 1(b) and 1(c) drop one or more of the dummy variables. No sign changes result in these reestimations, which may indicate that multicollinearity is not a serious problem (the highest correlation is between GSP and TRCOST, at -0.643). Looking at all four estimated regressions, and noting that the entered data are logarithmic (excluding the dummies), the coefficients can be interpreted as elasticities. Thus employment appears to be unit-elastic with respect to both production (GSP) and wages (AVEPAY). While national estimates of the wage elasticity of demand are around -0.3 (Kaufman and Hotchkiss (2006), p.196), the more elastic estimate in this paper may reflect competition among locations (states) for employers.

WAGE EQUATION

Wages, as measured by AVEPAY, also vary among the states. Neoclassical economic theory would say that wages are tied to productivity. In addition, human capital (improving average and marginal labor productivities) and unionization (improving labor bargaining power) should raise compensation.

Ciccone and Hall (1996) argued that wages should also be higher in urbanized areas, because of agglomeration economies that improve labor productivity. Other studies (e.g., Jelavich (2004)) indicate that the urban/rural issue is significant in firm location decisions. Similarly, the larger a state's export market, the greater its workers' compensation should be, based on research cited in Bernard and Jensen (1999).

The following Equation 2 is specified as:

AVEPAY=g(LABPROD, BSG, UNION, RURAL, SEXP/GSP, COAST, CANBOR, MEXBOR) (2)

Where:

LABPROD = Gross state product (GSP) divided by total employment;
UNION = percent of the state's employees who are unionized;
BSG = percent of the state's population that has a bachelor's degree; and
RURAL = percent of the state's population living outside of Statistical Metropolitan Areas (SMAs).

The other variables were previously defined. Table 1 again gives means and standard deviations.

As LABPROD, a measure of the average product of labor, rises, so should AVEPAY. Similarly, human capital, as measured by BSG, and union power, as measured by UNION, should increase average compensation. The more rural a state's population, however, the lower compensation should be, based on Ciccone and Hall's model. Finally, following Czinkota et al. (2005), greater exports, reflected in SEXP/GSP, should raise AVEPAY. A priori, it is expected that the COAST coefficient will be positive, given harbor advantages, plus the discussion above concerning coastal states and wages. If locations near the Mexican or Canadian borders are attractive to employers, given NAFTA, then the respective dummy

variable coefficients should be positive as such firms demand more workers than otherwise.

Equation 2 was estimated by OLS, again with the White heteroskedasticity correction method. As before, natural logarithms of the variables were used. The results are given in Table 3. One state, New Jersey, had no rural population in 2000, and so the logarithm of RURAL is not measurable; this dropped the data set to 49 observations.

TABLE 3. AVEPAY OLS REGRESSION

Dependent variable: ln(AVEPAY)

VARIABLE	Equation 2(a)	Equation 2(b)	Equation 2(c)	Equation 2(d)
Constant	4.746201 (17.43596)**	4.787416 (17.39917)**	4.947596 (16.99843)**	4.925043 (16.88532)**
Ln(LABPROD)	0.510434 (7.586148)**	0.522728 (7.562785)**	0.557151 (7.380361)**	0.557194 (7.351290)**
Ln(BSG)	0.118058 (2.628853)**	0.118041 (2.596247)**	0.109127 (2.434088)**	0.113637 (2.493668)**
Ln(UNION)	0.037346 (2.496485)**	0.035917 (2.432591)**	0.027194 (1.705954)*	0.029583 (1.848203)*
Ln(RURAL)	-0.061967 (-4.671638)**	-0.0627705 (-4.780497)**	-0.067022 (-5.017130)**	-0.064350 (-3.927364)**
Ln(SEXP/GSP)	0.066921 (6.658536)**	0.066828 (6.620166)**	0.066471 (6.259667)**	0.068108 (5.578642)**
COAST		-0.006540 (-0.481085)	-0.013031 (-0.962542)	-0.011844 (-0.833514)
CANBOR				-0.007755 (-0.358744)
MEXBOR			-0.042639 (-2.040980)**	-0.042034 (-1.980532)**
R-squared	0.920449	0.920726	0.925158	0.925423
F-statistic	99.50634**	81.30186**	72.40320**	62.04476**

**=significant at 5 percent; *=significant at 10 percent.

Equation 2(d) includes all the variables, while the remaining equations drop one or more of the dummy variables. As expected, the coefficients of LABPROD, UNION, RURAL and SEXP/GSP have the correct signs, and all are statistically significant. However, the COAST coefficients are negative, albeit insignificant. The CANBOR coefficient in Equation 2(d) is negative but insignificant. Interestingly, the MEXBOR coefficients are negative and significant in both Equations 2(c) and 2(d); this may reflect competition from relatively inexpensive Mexican labor across the border. Multicollinearity does not appear to be a problem; the highest correlation is between BSG and AVEPAY (0.652).

CONCLUSIONS

Total employment in a state appears to be unit elastic with respect to both GSP and AVEPAY, but inelastic with respect to exports (as measured by SEXP/GSP). The latter's numerically small coefficient in Equation 1 suggests that exports are not a major cause of any lack of "synchronization" among the states. Transportation costs do not seem to impact employment significantly. Wages (reflected in AVEPAY) are significantly but modestly impacted by exports and unionization; the latter result suggests that state governments should not be too

concerned by "right-to-work" related issues. States should focus on improving access to higher education, given the significance of the BSG variable; this may be reinforced by the conclusion that exports are labor-intensive. Finally, the insignificance of the TRCOST coefficient should not be interpreted as a recommendation to reduce transportation infrastructure spending; states that do such may eventually find that such costs do matter.

DATA APPENDIX

Data on GSP (used in calculating SEXP and LABPROD) came from the Bureau of Economic Analysis' web site (www.bea.gov). Total employment (used to calculate LABPROD) came from the *Statistical Abstract of the United States (SAUS)*, 2001 edition, Table 608. *SAUS* is accessible at www.census.gov. AVEPAY came from the Bureau of Labor Statistics' web site (www.bls.gov) . TRCOST is from Anderson and van Wincoop (2004), page 724. RURPOP came from the 2002 *SAUS*, Table 429. Merchandise export data (used to compute SEXP) came from the International Trade Administration web site (www.ita.doc.gov). UNION came from the 2001 *SAUS*, Table 639.

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