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Authors	Cletus C. Coughlin, and Oliver Fabel
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Federal Reserve Bank of St. Louis, Research Division, P.O. Box 442, St. Louis, MO 63166

MANUFACTURING EXPORT PERFORMANCE AT THE STATE LEVEL, 1963-1980

Cletus C. Coughlin* and Oliver Fabel**

Federal Reserve Bank of St. Louis

87-008

* Senior Economist, Federal Reserve Bank of St. Louis

** University of Hagen, Hagen, West Germany

Abstract

In the 1960s and 1970s international trade was increasingly important for employment and economic growth at the state level; however, scholarly research on the numerous issues concerning international trade and state economic activity is negligible. The present research uses a Heckscher-Ohlin-Vanek framework to examine the international trade performance of all fifty states for selected years between 1963 and 1980. A cross-section analysis generates specific conclusions concerning the determinants of manufacturing export performance at the state level. An extension of the analysis using pooled data generates specific conclusions concerning the determinants of manufacturing export performance and how these determinants changed throughout the period. Physical capital and human capital were statistically significant determinants throughout the period and the importance of these factors changed over time. The importance of physical capital decreased continuously, while the importance of human capital increased continuously.

Manufacturing Export Performance at the State Level, 1963-1980

I. Introduction

In the 1960s and 1970s international trade was increasingly important for employment and economic growth at the state level; however, scholarly research on the numerous issues concerning international trade and economic activity at the state level is negligible. By examining the manufacturing export performance of all fifty states for selected years between 1963 and 1980, the present research addresses some of the neglected issues. A well-known theorem from international trade, the Heckscher-Ohlin-Vanek Theorem, is adapted for use at the state level. The Heckscher-Ohlin-Vanek framework is used to identify the determinants of manufacturing export performance and how these determinants have changed over time.[1/]

Manufacturing export performance is measured by the value of manufactured direct exports from a state, a figure that is reported in the Origin of Exports of the Annual Survey of Manufactures (EX). These exports have assumed increasing importance for economic growth. Between 1963 and 1980 the rate of increase in manufactured exports was four times as fast as the increase in personal income. The information in Table 1 reveals that exports on a state basis increased at a rate double the increase in personal income for forty-three states. Personal income growth exceeded export growth in only Hawaii, Montana, and New Mexico.

The differences in export growth rates have resulted in changes in the distribution of manufactured exports across states. Table 2 contains the export share by state and by Census Region for 1963 and 1980. The reduced export shares of the industrial Midwest and Northeast (e.g., East North Central, Middle Atlantic, and New England) and the increased export shares of states in the South and West are not surprising. These changes simply mirror the changing distribution of manufacturing in the United States.[2/]

By using an international trade model at the state level the present study generates insights concerning both the level and distribution of manufacturing exports. The remainder of the paper is presented in three parts. First, a cross-section model for the years 1963, 1969, 1971, 1976, and 1980 is developed and estimated.[3/] The next section extends the analysis by pooling the data to allow for different intercepts across states and for the incorporation of trend variables. A final section summarizes the results.

II. The Cross-Section Model

In a two factor, two country, two good world, the Heckscher-Ohlin model states that a country should tend to export (import) the good that utilizes relatively intensively the country's relatively abundant (scarce) factor. In a world with more than two productive factors, there is no unique ordering of goods according to relative factor intensity. Nonetheless, the Heckscher-Ohlin model can be restated with reference to the amounts of factor-services embodied in the traded goods. A country relatively abundant in one productive factor will tend to be a net exporter of the services of the factor and a net importer of the services of the relatively scarce factor.

Vanek (1968) generalized the factor-content restatement of Heckscher-Ohlin to allow for more than two factors. In matrix notation the Heckscher-Ohlin-Vanek Theorem relating factor intensities, factor endowments, and trade can be written

$$AT = E - Fw \qquad (1)$$

where:

A = m x n matrix of factor input requirements where the element a_{gh} indicates the amount of factor g used to produce one unit of good h;

T = n x 1 vector of net exports;

E = m x 1 vector of factor endowments;

F = m x 1 vector of factor endowments in the world; and

w = scalar equal to the country's relative share of world gross national product.[4/]

Thus the Heckscher-Ohlin-Vanek Theorem equates the factors embodied in a country's net exports to the country's excess supplies of factor endowments. Assuming A is square (i.e., the number of factors equals the number of goods), pre-multiplication of (1) by A^{-1} yields

$$T = A^{-1}E - C \qquad (2)$$

where C is an n x 1 vector of consumption.[5/] The elements of A^{-1}, known as Rybczynski coefficients, indicate how changing endowments affect net trade.

This idea is modified for use at the state level. An aggregate value of export performance is used. Thus there is only one good and trade is measured by exports rather than net trade. This last change can be viewed with respect to equation (2) as adding a vector of imports to the negative of the consumption vector. This new vector will contain only negative elements.

The present analysis spotlights the role of resources in determining manufactured exports at the state level. Resources determine the relative size of the manufacturing sector within a state and determine the international competitiveness (i.e., exports) of a state.[6/] Physical capital, human capital, and unimproved labor are the three key resources. For regression purposes there are two possible approaches. One approach, termed an absolute endowments approach, uses the absolute endowments of the three factors.[7/] The second approach, termed a relative endowments approach, uses the three factors to generate two relative factor endowment variables.[8/] The latter approach is used in the present study in order to highlight certain dynamic changes. Details concerning this approach are provided below.

A three factor model of physical capital, human capital, and unimproved labor generates two relative endowments. One is the physical capital-labor endowment ratio (KL), which is calculated as the gross book value of depreciable manufacturing assets divided by manufacturing employment for each state.[9/] The absence of a comparable study at the state level and the controversy concerning the role of physical capital as a source of U.S. comparative advantage cause the expected effect of increases in the physical capital-labor endowment on state exports to be uncertain. Studies focusing upon U.S. comparative advantage and using a cross-industry perspective have tended to find physical capital to be a scarce factor; however, Leamer and Bowen (1981) and Aw (1983) have shown the factor abundance (scarcity) inferences are not justified logically.[10/] On the other hand, Bowen's (1983) net export commodity regressions yielded a positive, but not statistically significant, effect for the influence of physical capital in the 1970s. In addition, Bowen provided evidence on endowments that indicates the U.S. is capital abundant. In 1975 the U.S. had the sixth (out of thirty-four) highest capital per worker endowment and had, by far, the largest share of the world's physical capital.

The other relative endowments variable is the human capital-labor endowment ratio (HL). HL is calculated, analogous to Hufbauer (1970), as the capitalized (at 10%) difference between the average annual pay in manufacturing in a state and the median pay of persons with zero to eight years of education. HL is generally viewed as reflecting the skill advantages of U.S. labor and is expected to be related positively to state export performance. All previous research supports the conclusion that human capital is a source of U.S. comparative advantage.

The use of relative endowments requires that state size be incorporated into the model. Obviously, larger states should have greater exports. Two control variables are used. One variable is total state employment (S). It is possible that the impact of this size variable will completely dominate the influence of the other variables because perfect factor mobility would result in identical relative endowments across states. In this case the Heckscher-Ohlin-Vanek approach would be inappropriate and the overall size of a state's economy would be the only explanatory variable. Whether or not the degree of factor immobility is sufficient to use the suggested framework is an empirical question. The second control variable for state size is the ratio of manufacturing employment to total employment (IS). A state's involvement in manufacturing is a reflection of a state's comparative advantage in manufacturing and thus should be related positively to export performance.

The final independent variable attempts to capture the influence of agricultural resources. The ratio of gross farm income to total employment (AS) is the proxy for agricultural resources. Since the U.S. has a comparative advantage in agriculture, it is reasonable to hypothesize that states with a comparative advantage in agriculture will have a comparative advantage in exporting manufactured goods that embody its agricultural production.

The preceding discussion provides the foundation for the estimated model. The model can be represented mathematically as follows:

$$EX_i = f(KL_i, HL_i, S_i, IS_i, AS_i, u_i). \tag{3}$$

The dependent and independent variables have been defined above, u is a disturbance term, and the subscript i refers to the different states.

The model was estimated using ordinary least squares. The fact that the level of exports was the dependent variable necessitated tests for heteroscedasticity. The absolute values of the residuals for the larger states should tend to be larger. Consequently, the absolute values of the residuals should be related positively to a measure of state size. Applying tests suggested by Goldfeld and Quandt (1965) and Glejser (1969) confirmed the presence of heteroscedasticity. One method of adjusting for heteroscedasticity is generalized least squares (GLS), where the weights for the observations are determined by a linear function using S as the determinant of the absolute value of the residuals.

The GLS results for 1963, 1969, 1971, 1976, and 1980 are listed in Table 3.[11/] Since the R^2 for a weighted model is not a useful goodness of fit measure for the unweighted model, only the performance of individual variables is reported (Pindyck and Rubinfeld, 1981). The discussion of the individual variables begins with the relative endowments variables. The coefficient for the physical capital-labor endowment ratio is always positive, but it is statistically significant (using the .1 level for a two-sided test) in only 1963 and 1980. It appears that state export performance is related positively to the physical capital-labor endowment ratio, but this finding is subject to qualification.

The other relative endowments variable, the human capital-labor endowment ratio, performed as expected. The coefficient estimate is always positive and the variable is statistically significant for all years except 1963. Thus states with higher human capital-labor endowment ratios have larger amounts of manufactured exports.

The remaining variables performed as expected. The variables that control for state size, S and IS, are positive and statistically significant for every year. In view of the statistical significance of other variables, it is clear that total state size does not completely dominate the influence of all the variables. The proxy for agricultural resources, AS, always exhibited a positive sign; however, the variable was statistically significant in only 1980.

III. The Pooled Model

A problem with the preceding cross-section analysis is the requirement that each state has the same intercept. Obviously, this is a highly unlikely situation. The discussion in the preceding section suggested that after controlling for endowments, larger states should tend to have intercepts that are negative and larger in absolute value than smaller states. Since this difference is likely related to state size, in the preceding regressions S and IS are likely capturing some of the differences. While S and IS might be sufficient for handling this problem, it is not obvious that this has been the case. In an attempt to confront this problem directly, the data were pooled and a dummy variable (covariance) model was estimated.[12/]

An additional advantage of pooling the data is the possibility of examining the time trends of selected variables. Consequently, insights concerning the dynamics of state export performance are generated. To date there has been limited research attempting to identify the dynamics of U.S. comparative advantage within a Heckscher-Ohlin framework. Research by Stern and Maskus (1981). Maskus (1983), and Bowen (1983) will be highlighted.[13/]

Stern and Maskus (1981) examined the determinants of U.S. trade between 1958 and 1976. Similar to the analysis in the preceding section of this paper, one aspect of their research focused upon a cross-section model for numerous years. Their results indicated the decreasing use of unimproved labor in net exports of U.S. manufactured goods.

Maskus (1983) extended the analysis of Stern and Maskus (1981) by pooling the cross-section data and analyzing the dynamic changes in the factor content of net exports of manufactured goods. Using cumulative sums tests, Maskus found gradual changes beginning in the mid- to late 1960s and continuing through 1976. Specifically, the U.S. became increasingly disadvantaged with respect to unskilled labor and increasingly advantaged with respect to human capital. No trends were identified for physical capital.

Bowen (1983) focused upon the idea that changes in U.S. comparative advantage and, thus, trade patterns should be linked to changes in the endowments of resources in the U.S. and abroad. In a sample of thirty-four countries for five years between 1963 and 1975, Bowen found a significant relationship between endowments and the structure of trade. Bowen found that the structure of U.S. trade was changing toward less physical capital-intensive sectors. This finding is consistent with Bowen's finding of a decline in U.S. abundance of physical capital. As usual, Bowen reinforced the importance of human capital for U.S. trade.

Evidence on the dynamics of state export performance is generated by estimating the following dummy variable (covariance) model:

$$Y_{it} = \sum_{j=1}^{50} \beta_{1j} D_{jt} + \sum_{k=2}^{K} \beta_{kt} X_{kit} + e_{it}, \tag{4}$$

where: (1) i = 1, 2, ... 50 refers to individual states; (2) t = 1963, 1969, 1971, 1976, and 1980 refers to specific pooled years; (3) j = 1, 2, ... 50 refers to individual states; (4) Y_{it} is the export value for the ith state in the tth year; (5) D_{jt} are the dummy variables corresponding to each state and equals one when j = i and zero when j ≠ i; (6) β_{1j} are the fixed intercepts for each state; (7) X_{kit} is an observation on the kth explanatory variable for the ith state in the tth year; (8) β_{kt} are the 2, 3, ... K slope coefficients that are the same for each state, but can vary over time; and (9) e_{it} are independent and identically distributed random variables with zero mean and constant variance.

The dummy variable model was estimated for a number of different combinations of independent variables. The independent variables defined in the previous section (KL, HL, S, IS, and AS) were used in conjunction with two different time trends for the coefficients of these variables. First, a dummy variable was used to distinguish the coefficients for these variables for 1963 and 1969 from 1971, 1976, and 1980. Second, a continuous time trend was estimated for each of the coefficients.

The results for the model using dummy variables to distinguish the coefficients for the variables in the years 1963 and 1969 from the years 1971, 1976, and 1980 are listed in Table 4. Since ordinary least squares estimation revealed heteroscedasticity, the results are based upon generalized least squares. The most striking result is that the use of variable intercepts across states appears appropriate. As expected, the intercept estimate for each state, where the states are denoted by their common two letter abbreviation, is negative. For virtually every state (48 of 50) the estimate of the intercept is statistically significant at the .01 level. Since the magnitude of the intercept should be related positively to measures of state economic activity (e.g., the absolute value of the difference between a state's imports from foreign countries and consumption should be related to state personal income), a rank correlation coefficient between the estimate of the intercept and state personal income was computed and was found to equal .73. This relationship is statistically significant at the .01 level.

An examination of the slope parameters reveals a number of interesting results. Concerning the variables that control for size, S is signed positively and statistically significant; however, IS was not statistically significant and was deleted. The reason is likely due to the use of the variable intercepts. The variable intercepts are capturing some of the influence of differing state sizes and thus eliminate the need for IS.

The control variable for the influence of agricultural resources, AS, is positive and statistically significant. It can be concluded that a state's comparative advantage in agriculture is manifested in state manufactured exports that embody agricultural products.

The results concerning the relative endowments variables are consistent with the previous empirical findings of this paper. Due to the attempt to identify structural shifts, additional notation must be introduced. The estimate of the coefficient of KL (HL) for 1963 and 1969 is represented by KLB (HLB). The change in the estimate of the coefficient of KL (HL) between the years 1963 and 1969 and the years 1971, 1976, and 1980 is KLC (HLC). The results reveal that both the physical capital-labor and the human capital-labor endowment ratios are positive and statistically significant at the .05 level for 1963 and

1969. The estimated structural shifts suggest a declining importance for KL and an increasing importance for HL between the years 1963 and 1969 and the years 1971, 1976, and 1980; however, neither KLC nor HLC was statistically significant.

It is possible that the changes over time are continuous rather than discrete. Table 5 provides additional results relative to changes over time that are modelled as continuous. Comments concerning the overall explanatory power of the model, the use of variable intercepts, S, IS, and AS need not be repeated because they would be virtually identical to the discussion associated with Table 4.[14/]

The most interesting results concern the relative endowments variables. The coefficient for KL was estimated as $a_0 + a_1t$ where t = 1963, 1969, 1971, 1976, and 1980. In Table 4 the parameter estimate for a_0 is associated with KLI, while the parameter estimate for a_1 is associated with KLT. A similar interpretation is in order for HLI and HLT. With respect to both variables, the levels of the variables as well as the time trends are statistically significant. The time trends suggest the decreasing importance of KL and the increasing importance of HL for state export performance.[15/] The fact that a linear time trend was statistically significant is noteworthy. Given the end of the fixed exchange rate system and the oil price shocks of the 1970s, one might have anticipated major structural changes in the export relationship. Similar to Maskus (1983) and Lawrence (1983), the results suggest no major discontinuities.

An examination of the actual magnitudes of the coefficients reveals additional insights. These magnitudes are listed in Table 6. Examining the results for the physical capital-labor endowment ratio one finds that the coefficient for KL has decreased from 16.805 in 1963 to 7.802 in 1980. These figures are consistent with two facts. First, according to evidence provided by Bowen (1983), the U.S. is capital abundant. Second, the capital abundance of the U.S. is eroding. Between 1963 and 1975 Bowen found that the U.S. growth rate of capital per worker was thirty-second out of thirty-four countries. The present results are definitely consistent with the changing international distribution of resources. One should also note, however, that these results are at odds with Maskus' (1983) finding of no changes with respect to physical capital.

On the other hand, the coefficient for the human capital-labor endowment ratio increases from 0.002 in 1963 to 0.011 in 1980. These values are consistent with expectations and recent changes in the international distribution of resources. The conclusion that human capital is a source of U.S. comparative advantage is common knowledge. At the same time Bowen's (1983) figures suggest that U.S. exports are likely to have incorporated relatively more human capital over time. While the U.S. share of the world's skilled labor did decrease from 1963-1975, the decline was relatively small in comparison to the decline in the U.S. world share of capital. In addition, some of this decline was offset by an increase in the U.S. share of semi-skilled labor. Consequently, the finding that U.S. exports are increasingly dependent upon human capital is consistent with changes in the international distribution of resources. In addition, these results corroborate Maskus' (1983) findings concerning the importance of human capital.

IV. Conclusion

The present research adopts the Heckscher-Ohlin-Vanek Theorem for use at the state level. The empirical analysis generates numerous insights concerning the determinants of state export performance and, thus, the sources of state comparative advantage between 1963 and 1980. An attempt has also been made to relate these insights to findings about U.S. comparative advantage. A cross-state approach based on the Heckscher-Ohlin-Vanek Theorem served as the foundation for the cross-section analysis for 1963, 1969, 1971, 1976, and 1980 and for the dummy variable (covariance) model that required pooled data. The empirical analysis suggests that both physical capital and human capital have been sources of state comparative advantage throughout the period. In addition, the analysis suggests two important continuous changes concerning the sources of state comparative advantage that are consistent with Bowen's (1983) findings on changes in the international distribution of resources. The importance of physical capital decreased over time, while the importance of human capital increased over time. Consequently, the evidence suggests that the gradual changes noted by Maskus (1983), which began in the mid-to late 1960s, continued throughout the 1970s.

FOOTNOTES

1. The application of the Heckscher-Ohlin theory to regional issues in the U.S. is rare. Previous studies focus on trade between areas of the United States and on the location of industries in certain areas rather than the export performance of states. Examples of this research include Moroney and Walker (1966), Estle (1967), Klaasen (1973), and Horiba and Kirkpatrick (1981). An exception is research by Coughlin and Cartwright (forthcoming) that focuses upon state export promotion expenditures and state manufactured exports.

2. A recent paper by Crandall (1986) details the recent changes in manufacturing from a geographic perspective.

3. State export data for 1983 is available, but the absence of physical capital data precluded the use of this data.

4. A derivation of the Heckscher-Ohlin-Vanek Theorem, including all essential assumptions, can be found in Leamer and Bowen (1981). For ease of exposition, the present statement also assumes balanced trade.

5. The derivation is straightforward. Begin with the identity that trade (T) is the difference between production (Q) and consumption (C). Thus $T = Q - C$. Full employment of factors requires that $AQ = E$, so $AT = E - AC$. Pre-multiplication by A^{-1} yields equation (2).

6. An illustration of the use of the Heckscher-Ohlin-Vanek Theorem at the regional level can be found in Fieleke (1983). The author highlights the role of skilled technical personnel in manufactured exports from states in the New England region.

7. The absolute endowments approach was used in Coughlin and Cartwright (forthcoming).

8. The data for all the variables excluding the numerator of AS were taken from various issues of the Census of Manufactures and the Annual Survey of Manufactures. The numerator of AS, gross farm income, was taken from various issues of the Statistical Abstract of the United States.

9. Browne et al. (1980) have argued that the use of gross book value of depreciable assets as a measure of physical capital is not ideal because the measure is based on accounting practices rather than economics; however, no alternative measure for all the years under consideration was available. This problem is also mitigated in the sense that the analysis depends on relative productive capacity rather than absolute productive capacity.

10 Examples of studies that utilize a cross-industry perspective are: Baldwin (1971); Weiser and Jay (1972); Branson and Junz (1971); Branson (1971); Morrall (1972); Harkness and Kyle (1975); Branson and Monoyios (1977); Sailors, Thomas, and Luciani (1977); Stern and Maskus (1981); and Maskus (1983).

11. All dollar values are in real (1958 dollars) terms.

12. Additional details on the formulation and estimation of this model can be found in Judge et al (1982).

13. Research by Balassa (1979) has also provided some dynamic insights. In a static, cross-section analysis Balassa showed that larger per capita endowments of physical and human capital were associated with revealed comparative advantage in manufactured goods that were produced by relatively more capital intensive methods.

14. The rank correlation coefficient between the intercept estimates and state personal income was .42, which is statistically significant at the .01 level.

15. Time trends on the other independent variables did not exhibit statistical significance.

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Table 1

Relative Growth Rates of Exports to Personal Income, 1963-1980

State	Exports/Personal Income	State	Exports/Personal Income
Alabama	3.60	Montana	0.38
Alaska	3.23	Nebraska	10.94
Arizona	5.97	Nevada	2.75
Arkansas	4.42	New Hampshire	3.25
California	3.47	New Jersey	1.69
Colorado	3.35	New Mexico	0.37
Connecticut	2.46	New York	5.04
Delaware	5.15	North Carolina	2.85
Florida	1.65	North Dakota	25.29
Georgia	2.72	Ohio	3.53
Hawaii	0.46	Oklahoma	4.35
Idaho	7.77	Oregon	6.24
Illinois	3.58	Pennsylvania	2.63
Indiana	4.35	Rhode Island	4.04
Iowa	6.43	South Carolina	4.86
Kansas	5.51	South Dakota	13.52
Kentucky	3.53	Tennessee	3.38
Louisiana	3.71	Texas	2.62
Maine	2.97	Utah	2.63
Maryland	1.32	Vermont	2.70
Massachusetts	5.35	Virginia	1.80
Michigan	3.12	Washington	9.76
Minnesota	4.38	West Virginia	2.04
Mississippi	2.80	Wisconsin	2.93
Missouri	5.37	Wyoming	2.10

Sources: Annual Survey of Manufactures and Statistical Abstract of the United States.

Table 2

Census Region and State Manufactures Export Share

	1963 Share	1980 Share
East North Central	29.804%	27.721%
Illinois	8.574	6.670
Indiana	3.079	2.985
Michigan	6.780	5.797
Ohio	8.523	6.747
Wisconsin	2.848	2.537
East South Central	4.357	5.110
Alabama	0.892	1.107
Kentucky	1.218	1.358
Mississippi	0.718	0.729
Tennessee	1.529	1.916
Middle Atlantic	21.189	13.650
New Jersey	5.115	2.827
New York	8.640	5.933
Pennsylvania	7.434	4.890
Mountain	1.443	2.465
Arizona	0.304	0.989
Colorado	0.444	0.694
Idaho	0.128	0.334
Montana	0.101	0.036
Nevada	0.038	0.059
New Mexico	0.142	0.056
Utah	0.279	0.287
Wyoming	0.007	0.010
New England	6.832	6.208
Connecticut	2.661	1.885
Maine	0.281	0.248
Massachusetts	3.011	3.104
New Hampshire	0.246	0.396
Rhode Island	0.449	0.382
Vermont	0.194	0.193
Pacific	12.032	18.050
Alaska	0.199	0.393
California	9.446	10.896
Hawaii	0.108	0.047
Oregon	0.569	1.184
Washington	1.710	5.530

Table 2 (Continued)

South Atlantic	11.258	12.125
Delaware	0.200	0.219
Florida	1.535	2.290
Georgia	1.381	1.576
Maryland	1.306	0.793
North Carolina	2.720	2.980
South Carolina	0.764	1.486
Virginia	2.450	2.122
West Virginia	0.902	0.659
West North Central	5.184	6.791
Iowa	1.410	1.875
Kansas	0.753	0.952
Minnesota	1.349	1.703
Missouri	1.359	1.575
Nebraska	0.244	0.493
North Dakota	0.017	0.081
South Dakota	0.052	0.112
West South Central	7.899	10.863
Arkansas	0.567	0.856
Louisiana	1.640	2.406
Oklahoma	0.547	0.908
Texas	5.135	6.693

Source: Annual Survey of Manufactures.

Table 3

State Level of Exports - GLS Parameter Estimates (t-ratios)

Dependent Variable: EX

Independent Variables	Year 1963	1969	1971	1976	1980
"Constant"	-196.248[a]	-379.821[a]	-477.058	-753.194[a]	-1601.274[a]
	(-3.55)	(-3.99)	(-3.23)	(-3.85)	(-3.94)
KL	4.004[b]	3.069	3.658	1.618	17.930[b]
	(2.19)	(1.00)	(0.70)	(0.24)	(2.03)
HL	0.0013	0.0064[a]	0.0083[b]	0.0130[a]	0.0354[a]
	(1.19)	(2.88)	(2.46)	(2.92)	(2.66)
S	0.298[a]	0.342[a]	0.327[a]	0.532[a]	0.525[a]
	(18.60)	(15.75)	(11.19)	(13.50)	(11.76)
IS	295.935[a]	483.095[a]	778.926[b]	1114.644[b]	2395.406[a]
	(2.77)	(2.58)	(2.41)	(2.20)	(3.18)
AS	9.202	22.055	23.394	42.633	105.622[b]
	(1.24)	(1.48)	(0.98)	(1.27)	(2.14)

[a] statistically significant at the .01 level (two-sided)

[b] statistically significant at the .05 level

[c] statistically significant at the .10 level

Table 4

Dummy Variable Model with Structural Shifts

Dependent Variable: EX

Independent Variables	Parameter Estimates	t-ratios	Independent Variables	Parameter Estimates	t-ratios
AL	-863.799a	-6.10	NH	-353.594a	-4.74
AK	-642.159a	-3.22	NJ	-1258.399a	-5.13
AZ	-667.341a	-5.24	NM	-587.399a	-5.56
AR	-581.300a	-4.53	NY	-3316.632a	-5.79
CA	-3099.113a	-5.17	NC	-852.859a	-4.79
CO	-882.621a	-6.04	ND	-828.007a	-3.51
CT	-586.136a	-4.03	OH	-1139.739a	-3.31
DE	-579.704a	-4.47	OK	-806.682a	-5.96
FL	-1416.302a	-6.83	OR	-711.141a	-5.48
GA	-1035.140a	-6.28	PA	-1841.069a	-4.95
HI	-583.845a	-5.34	RI	-362.304a	-4.82
ID	-641.844a	-4.16	SC	-604.438a	-5.17
IL	-1461.072a	-3.85	SD	-751.126a	-3.29
IN	-934.393a	-4.46	TN	-805.403a	-5.39
IA	-868.968a	-3.83	TX	-1788.031a	-5.23
KS	-827.812a	-4.84	UT	-599.304a	-5.52
KY	-733.942a	-5.24	VT	-403.213a	-4.36
LA	-917.178a	-4.50	VA	-872.976a	-5.39
ME	-486.788a	-5.21	WA	-216.647	-1.30
MD	-1085.275a	-6.81	WV	-674.909a	-4.65
MA	-1118.728a	-5.22	WI	-811.303a	-4.48
MI	-631.637b	-2.18	WY	-725.411a	-4.32
MN	-970.000a	-5.48	S	0.740a	11.33
MS	-581.251a	-4.89	KLB	13.823b	2.28
MO	-1091.181a	-5.93	HLB	0.005b	2.11
MT	-807.542a	-4.45	KLC	-3.074	-1.13
NE	-855.471a	-4.31	HLC	0.002	1.60
NV	-598.938a	-4.99	AS	90.120c	1.93

a statistically significant at the .01 level (two-sided)
b statistically significant at the .05 level
c statistically significant at the .10 level

Table 5

Dummy Variable Model with Continuous Trends

Dependent Variable: EX

Independent Variables	Parameter Estimates	t-ratios	Independent Variables	Parameter Estimates	t-ratios
AL	-824.149a	-5.40	NH	-343.155a	-3.95
AK	-626.922a	-2.65	NJ	-1008.024a	-4.02
AZ	-690.793a	-4.88	NM	-651.357a	-5.42
AR	-688.003a	-4.78	NY	-2663.155a	-4.81
CA	-2434.126a	-4.19	NC	-746.950a	-4.16
CO	-901.409a	-5.61	ND	-1225.043a	-4.33
CT	-475.975a	-3.01	OH	-783.242b	-2.28
DE	-610.183a	-4.07	OK	-822.447a	-5.57
FL	-1266.640a	-5.97	OR	-693.061a	-4.82
GA	-945.251a	-5.59	PA	-1439.326a	-3.94
HI	-625.428a	-4.95	RI	-333.286a	-3.82
ID	-837.514a	-4.67	SC	-563.885a	-4.46
IL	-1088.552a	-2.92	SD	-1136.207a	-4.11
IN	-814.271a	-3.73	TN	-716.824a	-4.61
IA	-1091.997a	-4.25	TX	-1492.969a	-4.37
KS	-962.097a	-5.04	UT	-599.594a	-4.83
KY	-716.710a	-4.72	VT	-466.524a	-4.37
LA	-858.029a	-3.69	VA	-756.872a	-4.49
ME	-504.404a	-4.73	WA	-133.123	-0.73
MD	-982.403a	-5.72	WV	-642.504a	-3.81
MA	-896.667a	-4.11	WI	-731.600a	-3.87
MI	-342.529	-1.15	WY	-861.814a	-4.43
MN	-951.856a	-5.08	S	0.643a	9.80
MS	-653.094a	-4.97	KLI	1056.357c	1.94
MO	-996.181a	-5.24	HLI	-1.037a	-3.85
MT	-997.516a	-4.76	KLT	-0.530c	-1.92
NE	-1117.656a	-4.82	HLT	5.29E-04a	3.88
NV	-602.374a	-4.30	AS	182.178a	3.08

a statistically significant at the .01 level (two-sided)
b statistically significant at the .05 level
c statistically significant at the .10 level

Table 6

Coefficient Estimates Over Time

Year	Variable KL	Variable HL
1963	16.805	0.002
1969	13.628	0.005
1971	12.569	0.006
1976	9.921	0.009
1980	7.802	0.011