CORNELL
AGRICULTURAL ECONOMICS
STAFF PAPER

MULTIFACTOR PRODUCTIVITY GROWTH IN U.S. FOOD MANUFACTURING

by

David R. Lee
Leopold Maier
Sarah G. Lynch

July 1987

No. 87-20

Department of Agricultural Economics
Cornell University Agricultural Experiment Station
New York State College of Agriculture and Life Sciences
A Statutory College of the State University
Cornell University, Ithaca, New York, 14853

MULTIFACTOR PRODUCTIVITY GROWTH IN U.S. FOOD MANUFACTURING

by

David R. Lee

Leopold Maier

Sarah G. Lynch

The authors are assistant professor and graduate research assistants, respectively, in the Department of Agricultural Economics, Cornell University.

This paper was prepared for presentation at a Selected Papers session at the American Agricultural Economics Association Annual Meeting, East Lansing, Michigan, August 2-5, 1987.

Multifactor Productivity Growth in U.S. Food Manufacturing

Much evidence has supported the conclusion that in the late 1960's and 1970's productivity growth in the U.S. nonfarm business sector decreased substantially. This has led to major concerns about U.S. industrial competitiveness and the future performance of domestic manufacturing industries. A variety of explanations have been offered for the productivity slowdown (Kendrick; Denison; etc.) including: sharp increases in real fuel and energy prices, beginning in the early 1970's; changes in U.S. labor force composition; and lower real rates of capital investment. As a result, measuring long-term productivity trends, identifying specific periods of productivity growth and decline, and explaining the determinants of productivity changes for particular industries have all received considerable attention by economic researchers in recent years.

While the agricultural production sector has shared in this attention (see studies by Brown, Ball and Capalbo, et. al., for example), the food processing and distribution sector has to a lesser extent. This relative lack of attention is particularly serious in view of the considerably larger size of this industry compared to production agriculture, whether measured in terms of employment, sales, or value-added (Polopolus, 1982; ESCOP). With regard to the food processing sector specifically, productivity-related research has examined several important issues (see studies by Gisser, Kelton, Heien, Grieg, and Polopolus, 1986). However, this research has been characterized by a number of limitations: methodological problems in productivity estimation (Grieg - see Macdonald); the reporting of only partial productivity results (Polopolus); and a high level of industry aggregation which obscures productivity trends specific to food processing (Heien).

This paper attempts to address several of these limitations and to accomplish three major goals. First, theoretically consistent measures (Tornqvist indexes) of multifactor productivity change, incorporating labor, capital, energy and materials inputs, are developed for U.S. food processing industry for the 1958-1982 period. Second, productivity indexes are estimated and reported not only for the industry (SIC 20) as a whole, but for the nine (SIC 201-209) subsectors comprising that industry.[1] Third, formal statistical procedures are used to identify the major periods of productivity growth and decline in these industries. This is important given the sensitivity of productivity growth estimates to the choice of break- and end-points, and the limitations of commonly used informal methods to identify points of productivity change and periods of growth and decline.

Productivity Measurement

The approach to productivity measurement used here involves the estimation of Tornqvist indexes of multifactor productivity change. The Tornqvist index is a discrete approximation to the continuous Divisia index, and can be represented as:

$$\ln(TFP_t/TFP_{t-1}) = 1/2 \sum_{j=1}^{n} (s_{jt} + s_{jt-1}) \ln(q_{jt}/q_{jt-1}) - 1/2 \sum_{i=1}^{m} (r_{it} + r_{it-1}) \ln(x_{it}/x_{it-1}) \qquad (1)$$

where s_{jt} is the share of total revenues associated with the jth output, q_{it}, and r_{it} is the share of total factor payments attributable to the ith input, x_{it}. Equation (1) estimates multifactor productivity change by measuring the weighted difference in growth rates of outputs and inputs. The growth rates are in log ratio form and the weights are revenue and cost shares for outputs and inputs, respectively.

The Tornqvist index has been increasingly used in empirical productivity analysis because it possesses a number of desirable properties. First, unlike the Laspeyres and other fixed weight indexes, it is unbiased with respect to the choice of base year. Second, it is a "superlative" index in that it is exact for the linear homogeneous translog aggregator function (Diewert). This means that the Tornqvist index is an exact representation for a second order local approximation to an arbitrary linear homogeneous function and thus does not impose a highly restrictive structure on the production process (Christensen, Jorgenson, and Lau). Finally, at an empirical level, the Tornqvist index can be applied easily to disaggregate data and can handle many inputs and outputs.

Estimation of Tornqvist productivity indexes for the U.S. food processing industry and its nine subsectors required the construction of output and input indexes for each of these industries. Estimation of <u>output indexes</u> required time series data on revenue shares and real output levels for each of the 47 four-digit SIC industries within food manufacturing. Revenue shares were estimated from data on value of shipments reported in the Census of Manufactures (CM) and the Annual Survey of Manufactures (ASM) for 1958-1982. These data were adjusted for SIC reclassifications over the sample period and for changes in values of finished goods inventories and aggregated at the appropriate three- and two-digit SIC levels. Real output levels were calculated, not through the problematic "double deflation" method,[2] but rather through the deflation of inventory-adjusted output series by deflators derived from Producer Price Indexes for the appropriate food processing sector.[3] The resulting values were then normalized (1972=100).

<u>Input data</u> (input cost shares and real input levels) were constructed for the following inputs: labor (production and non-production workers); capital services (equipment and structures); energy; and non-energy materials. Tornqvist quantity indexes for labor and capital inputs were derived separately for calculation of the final input and productivity indexes.

For the <u>labor inputs</u>, cost share and input series for production workers were derived directly from data on employment and wages reported in CM and ASM.

Annual hours and average wages of non-production workers were estimated following procedures suggested by Hulten and Schwab and used in the cost share and real input calculations. Non-wage payments to labor (fringe benefits, etc.) were not consistently available over the entire time series and thus were not included in the estimation procedure. For energy and non-energy material inputs, cost shares and input levels were also derived from data reported in CM and ASM. The reported data were adjusted for inventory changes, deflated by price deflators calculated from appropriately aggregated Producer Price Index series, and re-aggregated and normalized.

Calculation of the input shares and quantity indexes for capital equipment and structures was much more complicated and was based on estimates of capital service values for equipment and structures derived using Griliches and Jorgenson's durable goods model. This approach assumes that the value of the flow of capital services (V_i) is proportional to capital stock

$$V_{i,t} = P_{i,t} K_{i,t-1} \tag{2}$$

where the price of capital ($P_{i,t}$) can be calculated, following Brown, as:

$$P_{i,t} = n_{i,t-1} r_t - (n_{i,t} - n_{i,t-1}) + n_{i,t-1} w_i + n_{i,t-1} z_{i,t} \tag{3}$$

where: $n_{i,t}$ is the price of new capital investment; r_t is the rate of return on capital; w_i denotes depreciation for equipment and structures; and $z_{i,t}$ is the effective tax rate for food manufacturing. Capital stocks ($K_{i,t}$) can be estimated using the perpetual inventory method:

$$K_{i,t} = K_{i,t-1} - w_i K_{i,t-1} + I_{i,t} \tag{4}$$

where I_t is new capital investment. The data used in the calculations of these variables are available in Bureau of Economic Analysis (1982), Hulten and Wykoff, the National Income and Product Accounts, CM and ASM, and other standard sources. The estimation procedures generally follow those in Brown, Denny et. al., and Capalbo et. al.; further details are available in Lee, Maier and Lynch.

After the calculation of the output, input and multifactor productivity indexes for total U.S. food processing and the nine individual industries, an attempt was made to statistically determine, for each multifactor productivity series, the year (if any) when a significant shift in productivity growth occurred and the magnitude of that shift. The approach used is based on the switching regression procedure initially suggested by Goldfeld and Quandt and subsequently used in empirical work by Sapsford, and Blakemore and Schlagenhauf, among others. This involved four steps. First, for each industry, the 1958-1982 productivity series was divided into two subsamples using, alternatively, each year in the period 1962-1978 as a breakpoint. Second, the constant trend growth model:

$$\ln \mathrm{TFP}_t = a + rt + e_t \tag{5}$$

was estimated for each subsample (n_0 and $n - n_0$) and the value of the log likelihood function (L),

$$L = -n \log(2\pi)^{1/2} - n_0 \log \hat{S}_1 - (n - n_0) \log \hat{S}_2 - \frac{n}{2} \tag{6}$$

where $\hat{S}_1 = (SSE_1/n_0)^{1/2}$ and $\hat{S}_2 = (SSE_2/(n - n_0))^{1/2}$, was derived in each case. The maximum likelihood value at which L was maximized was used as the criterion for selecting the year where the major structural change in productivity growth occurred. Third, the Chow test for structural stability was used to formally test whether this productivity change was statistically significant. Finally, equation (5) was re-estimated for the entire series and for the designated subperiods for each industry to generate average productivity growth rates. This final step was complicated in several cases by the need for making autocorrelation corrections in each period or subperiod if the relevant Durbin-Watson statistic indicated the presence of first-order autocorrelation.

Empirical Results

Table 1 reports the Tornqvist multifactor indexes calculated for the total U.S. food manufacturing industry and its nine subsectors. The suggestion of highly variable rates of growth across the food processing sector evident in table 1 is confirmed in table 2 which summarizes annual productivity changes across several periods. As measured by simple endpoint method calculations, the industry as a whole experienced a relatively low 0.28 percent annual growth in multifactor productivity in the 1958-82 period, significantly lower than productivity growth in agricultural production (1.75 percent annually (Ball)) and in the total U.S. business economy (2.3 percent to 2.4 percent (Kendrick)). The low growth rate estimated here nonetheless significantly exceeds the negligible 0.007 annual growth rate estimated for the combined U.S. food manufacturing and distribution industries over the 1950-77 period estimated by Heien.

Considerable variation in productivity growth is evident in table 2 across both industry sectors and time. Although low in absolute magnitude, productivity growth over the 1958-82 period was relatively strong in meat, dairy and fruit and vegetable processing, largely unchanged in grain milling, sugar and confectionery, and beverage industries, and declining for miscellaneous food products.[4] Relatively moderate productivity growth occurred in bakery and fats and oils manufacturing.

While these long term trends appear clear, using 1972 and 1974 as (largely arbitrary) breakpoints in the measurement of average productivity growth yields inconclusive results as regards intertemporal trends in productivity change. For the overall industry, for example, whether productivity growth was largely unchanged or sharply increasing following the early 1970's is shown in table 2 to depend on whether 1972 or 1974 is used as a breakpoint and which of the years 1972 to 1975 is used as a starting point for the productivity growth calculations in the latter period. Similarly, across the different sub-sectors, using 1972-73 as a breakpoint, only the dairy processing and grain milling industries displayed consistently higher productivity growth after 1972. However, using 1974-75 as the breakpoint, three industries - grain milling, fats and oils and miscellaneous food products - achieved unequivocably higher productivity growth in the more recent period, while dairy processing experiences slightly lower productivity growth.

Although arbitrarily designated subperiods are commonly used in intemporal productivity comparisons, these results suggest that such comparisons can be extremely sensitive to breakpoint and end point specification. To address this problem further, the procedure outlined earlier was followed to statistically determine the breakpoints in each of these multifactor productivity series. These results are reported in table 3. The year with the highest likelihood of being a switching point as determined by the maximized value of the log likelihood function estimated from equation (6) is given in column 1, and the accompanying value of the Chow test in column 2. It is evident that the statistically determined breakpoints are highly variable across food processing industries, and although most do occur in the early 1970's as often thought, this is not uniformly the case. In all cases but one (dairy processing), the change in productivity growth rates is statistically significant based on Chow's F-test for structural change.[5] It is clear that the arbitrary selection of a uniform breakpoint in intertemporal productivity comparisons has a serious potential for biasing both quantitative calculations and qualitative comparisons.

Given these results, annual average productivity growth rates were recalculated using the new breakpoints and two alternative methods of calculation (table 3). The "endpoint" method simply determines the arithmetic average of year-to-year productivity changes in the sample period as measured by log differences. Endpoint calculations were made both including and excluding the first year following the estimated breakpoints. The "regression method" was outlined above. The results show that productivity growth estimates vary considerably depending on the method of calculation used. Perhaps this is most notable for the total food processing industry. Including 1974 in the second sample period shows a decline in productivity growth beginning in 1974, while productivity estimates beginning in 1975 show an increase. For other industry groups as well (dairy processing, sugar and confectionery products, fats and oils), whether productivity fell or grew following the estimated breakpoint is found to depend on use of the endpoint versus the regression method and/or the exclusion of the breakpoint year in productivity estimation for the second period. The differences in these estimates are due in part to the fact that only the regression technique can accommodate a one-time shift in productivity levels by accounting for <u>both</u> slope and intercept changes in the estimation process. Since one-time shifts in productivity did in fact characterize the food manufacturing industry, particularly in the 1970's, the regression method results are preferable.

Conclusions

The empirical results permit several important conclusions regarding productivity growth in U.S. food manufacturing in the 1958-82 period and its measurement:

(1) Average productivity growth in the industry between 1958 and 1982 was quite low in magnitude and significantly below that of U.S. manufacturing industries in general.

(2) Within the food processing industry, considerable variation existed in the average productivity growth of industry subsectors.

(3) Over time, specific sectors displayed widely divergent trends toward productivity rate growth or decline. Unlike U.S. manufacturing in general, the food manufacturing industry appears to have experienced an increase in productivity

growth in the mid-1970's, following a one-time downward shift in productivity in 1974-75.

(4) Formalized empirical procedures for the determination of time series breakpoints and for the estimation of average productivity growth yield significant advantages in productivity estimation and in the interpretation of productivity change.

While these results provide considerable insight into the nature of productivity growth trends in U.S. food manufacturing across the industry and over time, they do not say much about the actual determinants of productivity change. The importance of the interindustry and intertemporal differences revealed here, however, suggests that research on the determinants of productivity change may be most fruitfully conducted at the industry level rather than at a highly aggregated level.

Footnotes

[1] These industries are: meat products (SIC 201); dairy products (202); preserved fruits and vegetables (203); grain mill products (204); bakery products (205); sugar and confectionery products (206); fats and oils (207); beverage products (208); and miscellaneous food products (209).

[2] The "double deflation" of sales and materials costs in measuring real value-added requires strong partial separability of capital and labor from other inputs. Norsworthy and Malmquist test and reject this hypothesis for U.S. manufacturing industries.

[3] For most three-digit SIC industries, this required reclassification and recalculation of reported PPI's to put these data into the appropriately aggregated industry groups.

[4] The decline in miscellaneous food products productivity growth may be, in large part, a statistical artifact due to the residual nature of this "industry."

[5] Chow F-tests were also statistically significant for years other than those for which the log likelihood function was maximized. For details, see Maier.

References

Ball, V. E. "Output, Input, and Productivity Measurement in U.S. Agriculture, 1948-79." American Journal of Agricultural Economics 67(1985): 475-486.

Blakemore, A. E., and D. E. Schlagenhauf. "Estimation of the Trend Rate of Growth of Productivity," Applied Economics 15(1983): 807-814.

Brown, R. S. "Productivity, Returns, and the Structure of Production in U.S. Agriculture, 1947-74." Unpublished Ph.D. dissertation, University of Wisconsin-Madison, 1978.

Capalbo, S. M., T. V. Vo, and J. C. Wade. "An Econometric Data Base for the U.S. Agricultural Sector." Washington D.C.: RFF National Center for Food and Agricultural Policy Discussion Paper No. RR85-01, April 1985.

Chow, G. C. "Tests of Equality between Sets of Coefficients in Two Linear Regressions." Econometrica 28(1960): 591-605.

Christensen, L. R., D. W. Jorgensen, and L. J. Lau. "Transcendental Logarithmic Production Frontiers." Review of Economic Statistics 55(1973): 28-45.

Denison, E. F. "Accounting for Slower Economic Growth: An Update." International Comparisons of Productivity and Causes of the Slowdown, ed. J. W. Kendrick, pp. 1-45. Cambridge, Mass.: Ballinger Publishing Co., 1984.

Denny, M., M. Fuss, and J. D. May. "Intertemporal Changes in Regional Productivity in Canadian Manufacturing." Canadian Journal of Econometrics 14(1981): 390-408.

Diewert, W. E. "Exact and Superlative Index Numbers." Journal of Econometrics 4(1976): 115-45.

Experiment Station Committee on Organization and Policy. "Research and Agricultural Marketing." H. W. Chalsma, ed., 1985.

Gisser, M. "Welfare Implications of Oligopoly in U.S. Food Manufacturing." American Journal of Agricultural Economics 64(1982): 616-624.

Goldfeld, S. M., and R. E. Quandt. "The Estimation of Structural Shifts by Switching Regression," Annals of Social and Economic Measurement 2(1973): 475-485.

Grieg, W. S. "Productivity in the U.S. Food Industries, with Policy Options to Increase Productivity," Economics and Management of Food Processing, ed. W. S. Grieg, pp. 297-354. Westport, Conn.: Avi Publishing Co., 1984.

Heien, D. M. "Productivity in U.S. Food Processing and Distribution." American Journal of Agricultural Economics 65(1983): 297-302.

Hulten, C. R., and R. M. Schwab. "Regional Productivity Growth in U.S. Manufacturing: 1951-78." American Economic Review 74(1984): 152-162.

Hulten, C. R., and F. C. Wykoff. "The Measurement of Economic Depreciation." Depreciation, Inflation, and the Taxation of Income From Capital, ed. C. R. Hulten. Washington, D.C.: Urban Institute Press, 1981.

Jorgenson, D. W., and Z. Griliches. "The Explanation of Productivity Change." Review of Economic Studies 99(1967): 249-82.

Kelton, C. M. L. "Operational Efficiency in Food and Tobacco Manufacturing." Madison, Wisconsin: NC-117 Working Paper No. 72, September 1983.

Kendrick, J. W. "Productivity Trends in the United States." Lagging Productivity Growth, ed. S. Maital and N. M. Meltz, pp. 9-37. Cambridge, Mass.: Ballinger Publishing Co., 1980.

Lee, David R., Leopold Maier and Sarah G. Lynch. "Interindustry Productivity Changes in U.S. Food Manufacturing, 1958-1982." Unpublished manuscript, Cornell University, June, 1987.

Maier, L. "An Analysis of Multifactor Productivity Change in U.S. Food Manufacturing." Unpublished M.S. Thesis, Cornell University, 1987.

Macdonald, James M. "Review" of Economics and Management of Food Processing. American Journal of Agricultural Economics 67(1985): 166-67.

Norsworthy, J. R., and D. H. Malmquist. "Input Measurement and Productivity Growth in Japanese and U.S. Manufacturing." American Economic Review 73(1983): 947-67.

Polopolus, L. "Agricultural Economics Beyond the Farm Gate." American Journal of Agricultural Economics 64(1982): 803-10.

________________. "Labor Productivity and Agribusiness." Agribusiness: An International Journal 2(1986): 269-77.

Sapsford, D. "Productivity Growth in the U.K.: A Reconsideration." Applied Economics 13(1981): 499-511.

Tornqvist, L. "The Bank of Finland's Consumption Price Index." Bank of Finland Monthly Bulletin 10(1936): 1-8.

U.S. Department of Commerce, Bureau of the Census. Annual Survey of Manufactures, 1957-1981.

________________. Bureau of the Census. Census of Manufactures, 1958-82.

________________. Bureau of Economic Analysis. Fixed Reproducible Tangible Wealth in the United States, 1925-79. Washington, D.C., March 1982.

________________. Bureau of Economic Analysis. The National Income and Product Accounts of the United States, 1929-76.

________________. Bureau of Economic Analysis. Survey of Current Business, 1977-83.

U.S. Department of Labor. Bureau of Labor Statistics. Producer Price Index (previously Wholesale Price Index), 1958-1982.

Table 1: Multifactor Productivity Indexes in Food Manufacturing Industries, 1958-82

Year	Productivity Indexes for SIC Industries*									
	201	202	203	204	205	206	207	208	209	20
1958	92.2	98.7	90.3	103.8	90.6	96.1	96.1	96.1	108.6	96.2
1959	95.7	101.5	93.6	103.5	89.4	95.9	100.7	96.6	103.5	97.3
1960	99.4	101.7	103.0	104.7	88.0	98.3	96.2	97.7	106.0	99.4
1961	98.9	97.0	96.8	101.1	89.0	99.2	101.8	95.1	105.1	97.7
1962	98.8	96.4	101.1	101.1	91.1	103.3	101.0	96.1	110.4	98.9
1963	100.4	95.7	98.9	98.5	92.3	98.9	105.3	97.2	116.6	98.9
1964	101.0	98.4	99.5	93.7	93.8	96.8	102.5	99.1	105.2	98.3
1965	99.8	96.5	100.3	93.3	94.8	99.2	96.2	97.8	109.4	97.9
1966	96.4	95.4	102.9	94.0	93.3	103.3	105.7	100.0	103.0	97.8
1967	96.7	96.8	101.1	93.1	93.4	100.7	106.2	98.9	104.0	97.8
1968	98.3	96.2	102.1	95.3	94.2	100.6	112.5	99.3	103.8	99.0
1969	97.4	97.1	98.7	97.9	95.3	97.5	105.4	99.0	103.7	98.4
1970	97.1	99.2	99.1	98.1	95.7	99.3	100.1	99.1	103.0	98.6
1971	99.9	99.0	102.6	96.5	96.3	97.3	105.4	99.6	100.0	99.6
1972	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1973	98.6	103.9	102.2	95.4	98.4	104.2	96.0	104.6	95.9	100.1
1974	100.7	107.8	102.9	98.2	95.8	100.1	99.0	109.0	94.9	101.9
1975	93.6	109.3	100.5	101.2	94.6	78.8	96.2	97.4	96.0	97.4
1976	101.9	110.1	101.8	92.7	95.3	83.3	100.4	99.1	94.7	99.8
1977	99.3	110.9	100.0	94.7	93.9	93.5	100.3	101.4	87.1	99.5
1978	96.9	110.5	102.7	97.6	93.5	97.7	99.9	104.7	91.3	100.5
1979	98.5	111.7	100.6	98.4	93.6	97.6	101.6	104.5	91.8	101.1
1980	101.4	112.1	104.5	104.3	92.3	93.5	103.8	102.9	93.8	102.8
1981	101.5	112.6	97.9	99.6	91.6	91.7	110.6	98.3	100.2	102.0
1982	102.2	112.4	102.0	103.9	94.9	98.2	101.5	98.7	96.2	102.9

*SIC Industry Classifications:

201: Meat products
202: Dairy products
203: Preserved fruits and vegetables
204: Grain mill products
205: Bakery products
206: Sugar and confectionery products
207: Fats and oils
208: Beverage products
209: Miscellaneous food products
20 : Food and kindred products

Table 2: Average Productivity Growth in U.S. Food Manufacturing

	Industry*									
Year	201	202	203	204	205	206	207	208	209	20
				- average annual percentage growth -						
1958-82	0.43	0.54	0.51	0.004	0.19	0.09	0.23	0.11	-0.51	0.28
1958-72	0.58	0.09	0.73	-0.27	0.71	0.28	0.28	0.28	-0.59	0.28
1972-82	0.22	1.18	0.20	0.38	-0.52	-0.18	0.15	-0.13	-0.39	0.29
1973-82	0.40	0.88	-0.02	0.95	-0.40	-0.66	0.62	-0.65	0.03	0.31
1958-74	0.55	0.55	0.82	-0.35	0.35	0.26	0.19	0.79	-0.85	0.36
1974-82	0.18	0.52	-0.11	0.71	-0.12	-0.24	0.31	-1.25	0.17	0.12
1975-82	1.26	0.40	0.21	0.38	0.05	3.19	0.77	0.19	0.03	0.79

*SIC Industry Classifications:

201: Meat products
202: Dairy products
203: Preserved fruits and vegetables
204: Grain mill products
205: Bakery products
206: Sugar and confectionery products
207: Fats and oils
208: Beverage products
209: Miscellaneous food products
20 : Food and kindred products

Table 3. Intemporal Productivity Calculations

			Annual Productivity Growth Rate (%)		
SIC Industry[1]	LLF Max. Value[2](year)	F-value[3]	Period	Endpoint Method[4]	Regression Method[4]
20	86.2 (1974)	8.0	1958-82	0.28	0.19
			1958-74	0.36	0.21
			1974-82	0.13	-
			1975-82	0.79	0.71
201	64.5 (1964)	5.1	1958-82	0.43	0.14
			1958-64	1.51	1.33
			1964-82	0.07	-
			1965-82	0.14	0.19
202	74.8 (1974)	0.4	1958-82	0.54	0.61
			1958-74	0.55	0.35
			1974-82	0.53	-
			1975-82	0.40	0.42
203	64.2 (1962)	8.2	1958-82	0.51	0.22
			1958-62	2.83	2.60
			1962-82	0.04	-
			1963-82	0.16	0.06
204	58.1 (1967)	4.4	1958-82	0.003	-0.03
			1958-67	-1.20	-1.51
			1967-82	0.72	-
			1968-82	0.61	0.34
205	73.7 (1972)	4.7	1958-82	0.19	0.19
			1958-72	0.71	0.70
			1972-82	-0.52	-
			1973-82	-0.40	-0.50
206	51.7 (1974)	8.2	1958-82	0.09	-0.24
			1958-74	0.26	0.20
			1974-82	-0.24	-
			1975-82	2.76	2.72
207	51.4 (1971)	3.8	1958-82	0.23	0.10
			1958-71	0.71	0.63
			1971-82	-0.34	-
			1972-82	0.15	0.81
208	70.2 (1972)	4.5	1958-82	0.11	0.26
			1958-72	0.29	0.30
			1972-82	-0.14	-
			1973-82	-0.65	-0.47
209	52.2 (1976)	3.5	1958-82	-0.51	-0.71
			1958-76	-0.76	-0.78
			1976-82	0.27	-
			1977-82	1.98	2.42

---

[1] For SIC industry designations, see Table 2.

[2] Maximized value of equation (7) and appropriate year.

[3] Value of Chow test.

[4] For explanation, see text.