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The "Decline" of U.S. Manufacturing: Empirical Evidence and Policy Implications

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Introduction

Are America's basic industries, pressured by overwhelming import competition, becoming an anachronistic "rust belt"? Must government step in to assure the survival of older, heavy industries, especially in the Midwest? Are we becoming a service economy focusing on information, hamburgers, and dress shops?

As is so frequently the case, the facts available to answer these questions are undramatic, not supportive of any extreme position, and thus uncompetitive in the marketplace for public policy viewpoints. The truth of the matter is that some of this nation's heavy industries are no longer competitive and are in the process of shrinking in size and importance; steel and automobile companies have reported the most dramatic cutbacks. Yet, on balance, the answer to each of the questions is a clear "no." If the U.S. manufacturing sector is declining, it is far more a matter of perception than reality.

The authors are Director of the Center for the Study of American Business and John M. Olin Fellow at the Center. They are indebted to Kenneth Chilton and Fredric Raines for comments on earlier drafts and for helpful suggestions. A summary of this working paper has been published in Industrial Policy Debate, Chalmers Johnson, editor (San Francisco: ICS Press, 1984).

Highlights of the Analysis

By and large, American manufacturing companies -- producers of hard goods and soft goods alike -- are holding their own while adjusting to the business cycle. As can be readily seen in Figure 1, both durable and nondurable manufacturing sectors in the United States have recovered from the 1981-82 recession. In fact, by December 1983, total industrial production had attained an all time peak, and it continued to rise in the early months of 1984.

In view of these facts, how do we account for all of the gloom-and-doom talk about the sad prospects for U.S. manufacturing industries? First of all, the casual observer tends to generalize from a few highly-publicized instances of true distress. Moreover, the positive side of economic events is rarely considered newsworthy and thus escapes widespread public attention.

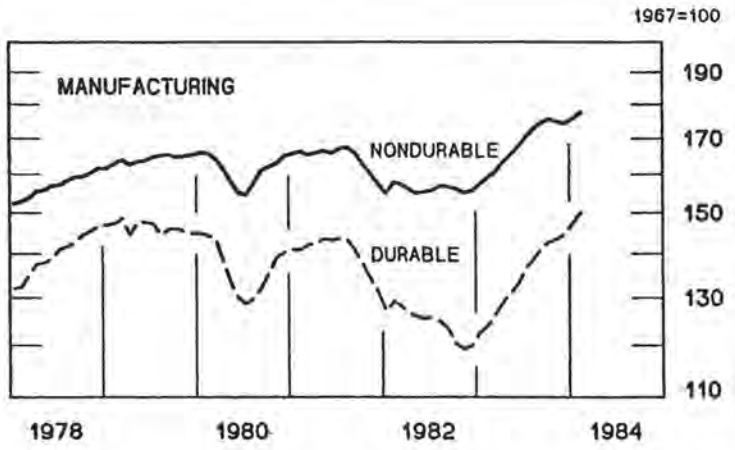
But, perhaps most important, the authors of the new gospel of industrial policy -- as well as other "megatrend" thinkers -- have fallen into one of the oldest analytical traps. They have drawn heroic and long-term conclusions from the most recent data that they have seen. Many of the doom-and-gloom soothsayers were doing their writing in 1981 or 1982 when the economy was declining and, in a simpleminded fashion, they merely extrapolated that decline into the future. Such action is on par with reacting to the spring rains by rebuilding Noah's ark.

To treat the downside of a business cycle as a fundamental and lasting new development is, of course, as silly as reacting with euphoria to news of the upturn. It is intriguing to note that some observers at the conservative end of the political spectrum are beginning to do just that. Predicting a runaway boom in the 1980s, however, is as misleading as the counsel of despair, because it sets up unattainable expectations.

Figure 1

TREND OF U.S. MANUFACTURING OUTPUT

(1967=100)



Source: Federal Reserve System, Statistical Release G.12.3, "Industrial Production," March 15, 1984.

To begin the analysis, it is useful to examine the trend of output in key sectors of the American economy. As shown in Table 1, total durable goods production dropped 11 percent from 1981 to 1982. Smaller declines occurred in the broader aggregates, such as all manufacturing and total industrial production. All three aggregate measures, however, remained substantially above the levels of the 1970s. The point being made here is not to underestimate the severity of the recent recession. Rather, it is to perceive the underlying strength of the American economy.

When we disaggregate further and examine individual industry groups, we find -- as would be expected -- a more diverse pattern of movement. For example, primary metals (including steel) took a bad tumble, declining by 31 percent between 1981 and 1982. In contrast, transportation equipment (a category covering both automotive and aerospace production) was down by 9 percent and instrument producers (a heavily defense-oriented sector) reported a 5 percent drop in production.

Of greater interest is the nature of the snapback in 1983. Two industry groups exceeded their 1981 highs -- electrical machinery and transportation equipment. At the other end of the spectrum of performance, the 1983 recovery in primary metals (up 13 percent) did not bring that industry back to its 1975 level of output. Nevertheless, taking full account of the variations among industries, it seems clear that the decline in heavy manufacturing industries that was so noticeable in 1982 did not represent a new and durable long-term trend. Rather, the decline was primarily the result of a severe but short-term cyclical contraction.

There are serious problems facing American industry. Many individual companies -- in high-tech as well as low-tech industries -- have not learned how to control their costs satisfactorily. Yet simultaneously, there are

Table 1

PRODUCTION INDEX FOR SELECTED DURABLE GOODS
MANUFACTURING INDUSTRIES
(1967 = 100)

Industry Group	1970	1975	1980	1981	1982	1983	Dec. 1983	Feb. 1984
Primary metals	107	96	102	108	75	85	90	98
Fabricated metal products	102	110	134	136	115	120	129	133
Electrical machinery	108	117	173	178	169	186	201	211
Nonelectrical machinery	104	125	163	171	149	151	164	169
Transportation equipment	90	97	117	116	105	118	131	136
Instruments	112	132	171	170	162	159	165	169
Total Durable Goods	102	109	137	141	125	135	145	150
All Manufacturing	106	116	147	150	138	148	157	162
Total Industrial Production	108	118	147	151	139	148	156	160

Source: Federal Reserve Bulletin, various issues.

numerous firms -- in both new and traditional fields -- that are succeeding in raising productivity and keeping expenses in check. Those businesses that so improve their competitiveness are maintaining or even enhancing their market positions, domestically and internationally.

This report focuses on output as the prime indicator of the economic performance of business firms. Yet we must acknowledge the great amount of interest in employment trends. After all, it is the high levels of unemployment that often exacerbate pressures for restricting imports and for providing federal bailouts of domestic corporations. However, public discussions rarely acknowledge the relationship between production, job creation, and productivity. That is, in an economy with rising productivity (technically, output per worker hour), we would expect that employment rises more slowly than does output. In fact, instances of slowly growing or stable output might be accompanied by declining employment. That is, declining employment does not automatically and inevitably imply declining production. And the health of an industry is determined not by its demand for inputs (labor, capital, etc.), but by its supply of output -- by its contribution of goods and services to the society's standard of living.

Thus, if there is a social responsibility of companies, it is to supply consumer's wants, the generation of employment being an important by-product. Because of the interest in the subject of employment (and the related question of unemployment), it is useful to examine Table 2, which contains data on employment for selected years since 1970. It can be seen that total manufacturing employment in the United States has fluctuated in the range of 18 to 20 million during this period, and that the performance in 1982, although low, was merely at the bottom end of the range. It is interesting to

Table 2

EMPLOYMENT IN SELECTED DURABLE GOODS
MANUFACTURING INDUSTRIES
(thousands of employees)

Industry Group	1970	1975	1980	1981	Dec. 1982	Dec. 1983	Feb. 1984[a]
Primary metals	1,260	1,139	1,142	1,121	816	881	879
Fabricated metal products	1,560	1,458	1,613	1,592	1,359	1,449	1,466
Electrical machinery	1,871	1,702	2,091	2,092	1,957	2,146	2,195
Nonelectrical machinery	1,984	2,057	1,494	2,507	2,066	2,172	2,202
Transportation equipment	1,853	1,715	1,900	1,893	1,696	1,887	1,929
Instruments	527	550	711	727	695	701	709
Total Durable Goods	11,208	10,688	12,187	12,117	10,559	11,406	11,575
All Manufacturing	19,367	18,323	20,285	20,173	18,193	19,280	19,495

[a]Preliminary

Source: U.S. Bureau of Labor Statistics, various statistical releases.

note that the decline in employment in 1982 was followed, in every major hard-goods sector, by an expansion in 1983. In most cases, that rise continued into the early months of 1984. As in the case of the production data, variations among and within industry groups are substantial.

The above statistics clearly do not support a counsel of despair for U.S. manufacturing industries. Of course, neither should the data engender elation. The following section of this report examines these matters in more detail.

Statistical Analysis of U.S. Manufacturing, 1948-1982

The burst of concern about the decline of U.S. manufacturing has focused on the older, low-tech industries often referred to collectively as the "rust belt." Let us see what the facts are.

The analysis presented in this section is based upon the twenty-one subsectors of manufacturing for which data are published in the National Income and Product Accounts. These industries are presented in Table A-1 of the Appendix along with their respective standard industrial classification (SIC) code.[1] As can be seen, the categories correspond to the two-digit level of aggregation except for transportation equipment (SIC37), which is further divided into motor vehicles and equipment (SIC371) and other transportation equipment (SIC372-9).

In order to aid in the analysis of the manufacturing sector, these industries are divided into two groups: high-tech and low-tech. The method used to make this division is to rank the industries by the percentage of the net sales devoted to research and development (R & D). The high-tech industries are those in which percentages exceed the average for all manufacturing in 1980. The low-tech sectors are those with below average percentages.[2]

Table 3 shows the results of this classification. Six of the 21 major sectors of U.S. manufacturing are classified as high-tech and the remaining 15 as low-tech. There are a few surprises in this dichotomy. Motor vehicles and equipment show up as high-tech. Presumably, this reflects their substantial commitment of scientists and engineers to redesigning the contemporary automobile to meet the array of fuel economy, safety, and environmental requirements set by federal regulatory agencies. Also, petroleum (which is lumped with coal products) is assigned to the low-tech category.

We now turn to the question, "Is the U.S. manufacturing sector in decline?" To answer this, we examine the most comprehensive body of data available, the statistics on income produced by each of the twenty-one manufacturing industries presented in Table A-1.[3] In order to determine whether a given industry has been growing or declining in terms of income produced, we fit the data to the following equation:

$$Y_{it} = \beta_{i0} + \beta_{i1}\, t + \beta_{i2}\, CUR_t + \varepsilon_{it} \qquad (1)$$

where: Y_{it} = real income produced by industry i at time t

t = year less 1948; 0 in 1948

CUR_t = capacity utilization rate at time t

ε_{it} = random error term for industry i at time t

$\hat{\beta}_{i1}$ = the estimated trend for industry i.

With this model the trend of an industry can be readily determined by estimating $\hat{\beta}_{i1}$. If industry i is declining, $\hat{\beta}_{i1}$ will be significantly less than zero ($\hat{\beta}_{i1} < 0$), while if the industry is growing, $\hat{\beta}_{i1}$ will be

Table 3

CLASSIFICATION OF HIGH-TECH AND LOW-TECH INDUSTRIES IN 1980

Industry	R & D Funds as Percent of Net Sales
High-Tech	
Other transportation equipment	11.6*
Electric and electronic equipment	6.5
Instruments and related products	6.0
Machinery, except electrical	5.6
Motor vehicles and equipment	5.0
Chemicals and allied products	3.5
All Manufacturing Average	3.1
Low-Tech	
Rubber and miscellaneous plastic products	2.2
Stone, glass, and clay products	1.3
Fabricated metal products	1.3
Paper and allied products	1.1
Printing and publishing Leather and leather products Miscellaneous manufacturing Tobacco manufacturing	0.9
Lumber and wood products Furniture and fixtures	0.8
Primary metals industries	0.6
Petroleum and coal products	0.6
Textile mill products Apparel and other textile products	0.4
Food and kindred products	0.4

*Based on data for aircraft and missiles, which is the dominant industry in this category.

Source: National Science Foundation, National Patterns of Science and Technology Resources 1982, U.S. Government Printing Office, Washington, D.C., March 1982.

significantly greater than zero ($\hat{\beta}_{i1} > 0$). A stable industry, one with no growth trend over time, yields a coefficient which is not significantly different from zero ($\hat{\beta}_{i1} \approx 0$).

Using this method,[4] results were obtained for each industry for the period 1948-82 and are presented in Table 4. As can be seen, there is no statistical support for the claim that the low-tech industries are declining or even reaching a period of stagnation or stability. This type of analysis can be criticized, however, because an industry showing a growth trend at the beginning of the period could be declining toward the end and still show a positive trend overall. To deal with this possibility, we used the same methodology for a shorter, more recent period, 1970-82.

The results for the 1970-82 period can be seen in Table 5. As in the case of Table 4, which covers the period 1948-82, there is no apparent support for the claim that the low-tech industries are declining. All of the high-tech industries show a positive trend except for motor vehicles and equipment which registers stability in this more recent period. None of the low-tech industries is measured as declining, and only leather and leather products along with primary metal industries have moved from the growth category to the stability category. Hence, neither the high-tech nor the low-tech industries show signs of decline in the later years of their respective time series. The potential statistical problem suggested above is thus not supported by the data.

Why then do so many commentators contend that low-tech industries are declining? We suggest three possibilities: (1) they draw long-term conclusions from the data for the last few years, (2) they equate trends in employment in an industry with its overall health, or (3) they implicitly

Table 4

TREND IN REAL NATIONAL INCOME BY INDUSTRY, 1948-1982

Trend in Real Income	High-tech industries	Low-tech industries
Growth	Machinery, except electrical Electric and electronic equipment Other transportation equipment Motor vehicles and equipment Instruments and related products Chemicals and allied products	Lumber and wood products Furniture and fixtures Stone, clay, and glass products Primary metal industries Fabricated metal products Miscellaneous manufacturing Food and kindred products Tobacco manufacturing Textile mill products Apparel and other textile products Paper and allied products Printing and publishing Petroleum and coal products* Rubber and miscellaneous plastic products Leather and leather products
Stability	None	None
Decline	None	None

*In this and subsequent tables based on real income data, the results for petroleum and coal products are probably biased upward because the nondurable goods price deflator does not fully reflect the dramatic increase in the price of oil which took place in the 1970s.

Note: The division between high-tech and low-tech industries in this table and the ones that follow are based upon the classification presented in Table 3.

Sources: Tables A-12 and A-13.

Table 5

TREND IN REAL NATIONAL INCOME BY INDUSTRY, 1970-1982

Trend in Real Income	High-tech industries	Low-tech industries
Growth	Machinery, except electrical Electric and electronic equipment Other transportation equipment Instruments and related products Chemicals and allied products	Lumber and wood products Furniture and fixtures Stone, clay, and glass products Fabricated metal products Miscellaneous manufacturing Food and kindred products Tobacco manufacturing Textile mill products Apparel and other textile products Paper and allied products Printing and publishing Petroleum and coal products Rubber and miscellaneous plastic products
Stability	Motor vehicles and equipment	Leather and leather products Primary metal industries
Decline	None	None

Sources: Tables A-14 and A-15.

define "declining" as growing more slowly than the rest of the economy. Each of these possibilities will be addressed in the following sections.

The Business Cycle Rediscovered

The period from 1970 to 1982 was a time of major economic disruptions. With supply shocks from the rapid rise in food exports and an oil embargo followed by a dramatic rise in oil prices, the U.S. economy was subjected to wide swings and deep recessions in 1973-75, 1980, and again in 1981-82.

As can be seen in Table 6, the majority of two-digit manufacturing industries followed this same pattern. Focusing on both the low-tech and high-tech industries, one sees that during this time 14 out of the 21 industries (67 percent) experienced their worst declines of the post-World War II period. This pattern is even more pronounced when only the low-tech industries are considered. In this case, 12 out of the 15 industries (80 percent) suffered their most severe setback. Thus the recent period during which the proponents of an industrial policy for the U.S. have developed their arguments has contained several of the worst recessions experienced since World War II. It is not surprising that analysts focusing on one of these downturns have concluded that there has been a structural shift in the U.S. economy away from low-tech manufacturing industries.

One must ask, however, whether or not it is proper to draw long-run conclusions from this unrepresentative sample period. We suggest that it is not. Focusing our attention on the period 1981-82, one sees that this recession was, at least for low-tech industries, worse than those which took place in the 1950s and 1960s, on a par with the recession of 1948-49, and less severe than that of 1973-75. This suggests that what we have been experiencing is not new. Rather, it is only another stage in the continuous process of change known as the business cycle. It is interesting that this

Table 6

PERCENT CHANGES IN REAL NATIONAL INCOME BY INDUSTRY
DURING EACH POST-WORLD WAR II BUSINESS CYCLE
(From Peak to Trough)

	1948-49	1953-54	1957-58	1960-61	1969-70	1973-75	1981-82
Low-Tech Industries							
Lumber and wood products	-20.0	-7.8	-4.0	-4.6	-9.3	-29.4	-15.0
Furniture and fixtures	-7.9	-7.0	-10.8	-2.0	-9.3	-19.1	-5.6
Stone, clay, and glass products	-7.6	-1.8	-6.1	-2.0	-5.3	-16.3	-15.5
Primary metal industries	-14.2	-19.6	-22.5	-7.9	-6.8	-6.3	-37.9
Fabricated metal products	-12.7	-9.9	-12.6	0.4	-9.7	-10.4	-10.6
Miscellaneous manufacturing	-13.8	-6.5	-5.7	4.5	-4.1	-8.0	-7.7
Food and kindred products	0.7	1.6	2.9	2.7	2.6	15.2	-6.6
Tobacco manufacturing	22.1	-1.2	6.7	-0.7	13.0	3.6	-3.6
Textile mill products	-17.8	-13.4	-5.5	-3.2	-3.7	-21.9	-12.1
Apparel and other textile industries	-1.8	-4.5	-1.5	1.5	-3.7	-15.8	-7.4
Paper and allied products	-4.3	2.6	-2.3	4.3	-4.7	-13.7	-10.4
Printing and publishing	7.6	4.4	-2.6	1.9	-2.8	-10.6	-0.8
Petroleum and coal products	-19.1	0.1	-11.4	-5.8	4.8	33.8	-13.3
Rubber and miscellaneous plastic products	-5.0	-13.0	-5.5	3.5	-9.4	-21.3	-9.0
Leather and leather products	-8.1	-0.4	-7.2	-2.1	-6.2	-20.3	-5.3
High-Tech Industries							
Machinery, except electrical	-14.1	-11.9	-17.5	-0.4	-3.6	-5.5	-12.3
Electric and electronic equipment	-11.1	-11.4	-7.5	3.2	-6.7	-16.5	-3.3
Other transportation equipment	-4.3	-5.8	-6.2	6.1	-13.5	-8.3	1.4
Motor vehicles and equipment	12.6	-17.8	-33.4	-12.0	-27.8	-31.2	-12.2
Instruments and related products	-7.6	-3.3	-3.6	0.0	-10.2	-6.6	1.4
Chemicals and allied products	3.9	2.7	-3.5	4.5	-4.0	-2.5	-7.1

Note: Figures may not correspond to those derived from the tables due to rounding.

Sources: Computed from data in Tables A-5 and A-6.

volatility of manufacturing, especially in durable goods products, has been noted by students of the business cycle for more than half a century.[5] Yet it appears that the existence of a business cycle has been overlooked by the proponents of an industrial policy.

The point to be emphasized here is that our experience during the past decade has been typical of the economic swings associated with the business cycle. Of course, for most industries these swings have been severe. But, on reflection, when the economy goes through a recession it is not surprising to see a disproportionate decline in the manufacturing industries. The other side of the coin, however, is that in 1983 and early 1984 these same industries recovered from the recession more rapidly than the rest of the economy. Thus, current data do not support the gloom-and-doom prediction that the low-tech industries are on an irreversible decline.

Is Employment the Problem?

To many people, an upward trend in employment is a sign of a healthy and growing industry. In this study, it can be seen that five of the high-tech industries experienced growth in employment over the period 1948-82, with motor vehicles and equipment registering stability (see Table 7).[6] Thus, there is some logic in taking the trend in job creation in those industries as a rough approximation for general growth.

When the same analysis is made for the low-tech industries, we obtain results that indicate at first blush a group of declining industries. As can be seen in Table 7, five of the fifteen low-tech industries show declining trends in employment, while four others experience stability. Six low-tech industries, however, reflect a growth trend in employment over the period 1948-82.

Table 7

TREND IN EMPLOYMENT BY INDUSTRY, 1948-1982

Trend in Employment	High-tech industries	Low-tech industries
Growth	Machinery, except electrical Electric and electronic equipment Other transportation equipment Instruments and related products Chemicals and allied products	Furniture and fixtures Stone, clay, and glass products Fabricated metal products Paper and allied products Printing and publishing Rubber and miscellaneous plastic products
Stability	Motor vehicles and equipment	Miscellaneous manufacturing Primary metal industries Apparel and other textile products Petroleum and coal products
Decline	None	Lumber and wood products Food and kindred products Tobacco manufacturing Textile mill products Leather and leather products

Sources: Tables A-16 and A-17.

The question that must be addressed, however, is whether or not it is necessarily true that an industry which is reducing its labor force is truly a declining industry. This proposition -- which underlies so much of the popular writing on industrial policy -- does not necessarily hold. Surely an industry in which output is declining is also likely to be reducing employment. Yet, there are other reasons why employment may be decreasing. Referring back to Table 4, we recall that all the industries have been growing in terms of output. This means that those industries in Table 7 which are declining in terms of employment are at the same time raising their productivity (technically, they are increasing their capital to labor ratios).

More aggregate analyses show that, in each of the past six recoveries, a higher level of manufacturing output has been attained with fewer workers working fewer hours. This is primarily a result of the long-run trend in productivity growth, combined with the cyclical effects of overhead reduction and the closing of the least efficient production facilties.[7]

From a social viewpoint, declines in the employment of some manufacturing industries may result in severe hardships to the laid-off workers whose skills are not demanded in other industries or not in the region in which they seek employment. For these and other reasons, government has been assigned the important role in our society of providing income support via unemployment compensation, trade adjustment, and various welfare programs. Retraining is also offered through a variety of government programs.

In any event, the point relevant to this study is that such employment problems may arise when a healthy industry is merely adjusting to changes in its environment. That is, low-tech industries are becoming more automated in

order to compete and survive in the marketplace. In many specific instances, company investments in new productive equipment have increased the productivity of individual workers and thus reduced the demand for total employment. For example, in the textile industry, lasers inspect 10,000 yards of cloth an hour -- 15 times faster than a human once could. In the steel industry, lasers and innovative sensing devices perform inspections and even check refractory lining wear in steelmaking furnaces.[8] Economizing on labor costs, of course, can be a key to maintaining an industry's competitiveness.

When the analysis of employment trends is limited to the 1970-82 period, the results for the most part are similar (see Table 8).

The Manufacturing Sector Relative to the Economy

Some of those who worry that low-tech industries are declining do not focus on decreases in output in an absolute sense. They consider an industry's performance to be unsatisfactory if it is not growing as fast as the economy as a whole. Hence, if the low-tech industries are declining according to this definition, we should observe over the period from 1948 to 1982 a significant negative trend in the ratio of industry income to national income.

To test this hypothesis, the following equation is used:

$$Y_{it} = \beta_{i0} + \beta_{i1}\, t + \varepsilon_{it} \qquad (2)$$

where: Y_{it} = ratio of real income produced by industry i to real national income, at time t

t = year less 1948; 0 in 1948

ε_{it} = random error term for industry i at time t

$\hat{\beta}_{i1}$ = the estimated trend for industry i.

Table 8

TREND IN EMPLOYMENT BY INDUSTRY, 1970-1982

Trend in Employment	High-tech industries	Low-tech industries
Growth	Machinery, except electrical Electric and electronic equipment Instruments and related products Chemicals and allied products	Furniture and fixtures Printing and publishing Petroleum and coal products Rubber and miscellaneous plastic products
Stability	Other transportation equipment Motor vehicles and equipment	Lumber and wood products Stone, clay, and glass products Fabricated metal products Food and kindred products Paper and allied products
Decline	None	Primary metal industries Miscellaneous manufacturing Tobacco manufacturing Textile mill products Apparel and other textile products Leather and leather products

Sources: Tables A-18 and A-19.

The methodology used to determine the sign of the trend coefficient, β_{i1}, can be found in the Appendix.

Considering the results presented in Table 9, we see that all the high-tech industries have been growing at least as fast as the economy, four have been expanding at a faster rate. This should come as no surprise, because it is exactly what the proponents of an industrial policy have been claiming. But what about the low-tech industries? According to the proposition being examined, we should expect that these industries would demonstrate slower growth than the national average, or even a decline. Once again, this is true of some, but certainly not all, of the low-tech industries. As can be seen in Table 9, nine of the fifteen industries are growing less rapidly than the economy as a whole. However, such industries as tobacco manufacturing, paper and allied products, and printing and publishing have been growing faster than the economy. Hence, any tendency for low-tech industries to grow more slowly than the economy is by no means universal. Redoing the analysis for the period 1970-82 does not significantly alter this conclusion (see Table 10).

Summary

The data on national income by industry, when viewed in real terms during the periods 1948-82 and 1970-82, do not support the claim that the old-line industries located in America's "rust belt" are going the way of the dinosaur.[9] All the industries, both high-tech and low-tech, show at least stability over these periods, with no examples of industries with absolute long-term declines in the level of their output.

Table 9

INDUSTRIAL GROWTH RELATIVE TO
GROWTH IN NATIONAL INCOME, 1948-1982

Trend	High-tech industries	Low-tech industries
Growing Faster Than National Income	Machinery, except electrical Electric and electronic equipment Instruments and related products Chemicals and allied products	Tobacco manufacturing Paper and allied products Printing and publishing Rubber and miscellaneous plastic products
Growing at About the Same Rate	Other transportation equipment Motor vehicles and equipment	Petroleum and coal products Fabricated metal products
Growing More Slowly or Declining	None	Lumber and wood products Furniture and fixtures Stone, clay, and glass products Primary metal industries Miscellaneous manufacturing Food and kindred products Textile mill products Apparel and other textile products Leather and leather products

Sources: Tables A-20 and A-21.

Table 10

INDUSTRIAL GROWTH RELATIVE TO
GROWTH IN NATIONAL INCOME, 1970-1982

Trend	High-tech industries	Low-tech industries
Growing Faster Than National Income	Machinery, except electrical Instruments and related products	Tobacco manufacturing Petroleum and coal products
Growing at About the Same Rate	Electric and electronic equipment Other transportation equipment Motor vehicles and equipment Chemicals and allied products	Lumber and wood products Stone, clay, and glass products Primary metal industries Fabricated metal products Food and kindred products Paper and allied products Printing and publishing Rubber and miscellaneous plastic products
Growing More Slowly or Declining	None	Furniture and fixtures Miscellaneous manufacturing Textile mill products Apparel and other textile products Leather and leather products

Sources: Tables A-22 and A-23.

Shortcomings of Existing Industrial Policy

In the debate on industrial policy proposals, it is important to note that many existing government policies affect industry in important ways and often have contributed to the difficulties faced by the manufacturing sector. These negative impacts of government action are, in the main, side effects of laws designed for other purposes -- providing a more equitable tax structure, redistributing income and wealth, enhancing the quality of life, improving the physical environment, and so forth.

Intentionally or not, many of these policies have weakened the manufacturing sector of the economy, either by increasing its costs or by reducing the amount of capital available for expansion and for new product development. This influence on the fundamental structure of American industry can be seen as manufacturing companies shift portions of their work force away from the creative and productive areas of business such as research and development, manufacturing, and marketing. The result has been an increase in such overhead functions as legal activities, accounting and finance, public affairs, and government relations.[10] For the individual firm, changes in the corporate work force may be essential to respond to pressures from government agencies and self-styled public interest groups. But the effect of these shifts on national productivity and competitiveness is negative. Poorer industrial peformance, in turn, leads to calls for an industrial policy.

If we overlook these structural responses to existing governmental policy, all that is visible are pleas for bailouts, subsidies, and other special assistance. But, on reflection, the willingness of government to bail out a Lockheed or a Chrysler is not surprising. It is the price that Congress pays to avoid dealing with the underlying industrial problems that arise from the present pattern of governmental intervention in the economy.

Variations on the negative theme of propping up the economy's "losers" cover a great variety of proposals. Some would establish a national industrial development bank along the lines of the discredited Reconstruction Finance Corporation.[11] Others would attempt to stop economic change by dealing with the so-called "runaway plant problem"; their response is to make it extremely difficult and costly to move or close down an industrial facility. This "King Canute" approach ignores the reasons why companies are forced to take such actions in the first place. Frequently, in fact, those plants have lost their competitiveness due in large part to the government policies advocated by the same groups that now support legislation against runaway plants. Such proposals also overlook the negative signals that would be sent to any company considering building a new plant in a region that has adopted restrictive legislation (and a few states already have done so).

Close cousins of this negative approach are proposals to "protect" various industries and markets from foreign competition and to inhibit American investments overseas. None of these approaches would lead to a more productive or more competitive economy. Instead they would shelter companies and localities from their own mistakes.

Concluding Thoughts

The simple-minded dichotomy that sees only expanding high-tech and declining low-tech industries needs to be examined more carefully than has been done by the widely publicized prognosticators of the demise of traditional industry. If industrial giants of the past such as Andrew Carnegie and Harvey Firestone were to visit their old companies, they would be pleasantly surprised by the array of high technology now in use -- industrial robots, sophisticated process control, laser inspection, flexible

manufacturing systems (FMS), automated material handling, and CAD/CAM (computer-aided design and computer-aided manufacturing).[12]

Deere & Company's sprawling tractor works provides a good example. The facility includes four FMS installations, and 16 machining centers -- groups of totally automated machines and conveyors linked to a computer. In addition, visitors can see robotic welding and robotic spray painting with computers providing total integration of conveyors, towlines, monorails, cranes, and automated storage and retrieval systems. There is hardly a conventional forklift truck in sight.

Many companies have adopted "flexible manufacturing," a high-tech marriage of robots and computers. Deere's plant can turn out tractors in more than 5,000 configurations. General Electric now makes 2,000 versions of its basic electric meter at a single small plant.[13] In a new facility, General Motors has installed a robot system that paints its cars. The man-machine interface is being redefined. Manual operations using gears, pulleys, and belts have often been replaced by microprocessors, keyboards, electronic switches, and cathode ray tubes.

It is ironic that, just when the promoters of industrial policy in the United States are bemoaning the effects of reliance on free markets, writers in the Soviet Union are blaming that nation's poor economic performance on the centralized nature of the Soviet state. Here are some of the "outdated . . . peculiarities of the system of state economic management" that Soviet economists bemoan:

- "a very high degree of centralization in economic decision-making"
- "the inhibition of market forces"
- "a centralized system of allocation of materials and supplies to all enterprises"

- "the centralized regulation of all forms of material incentives for workers"
- "overlapping authority and resulting confusion among ministries and agencies"
- "the limited economic authority and, as a result, the limited economic liability of enterprises for the results of their economic performance"
- "restrictions on all forms of unregulated economic activity in the sphere of production, service and distribution."[14]

It is intriguing to read the Soviet's own description of how individuals attempt to adjust to this "most rigid regimentation of economic behavior":

> " . . . the population always enjoys a certain amount of freedom to respond to the limitations imposed by the state . . . When established rules and regulation, for instance, limitations on the size of private plots, fishing limits, etc., affect the vital interests of certain categories of people, they look for ways to circumvent the constraints and satisfy their requirements. Then the state introduces still harsher measures to block undesirable forms of activity, in response to which the population comes up with more refined methods that make it possible to meet their interests under the new conditions."[15]

All this, however, need not lead to a do-nothing approach to the serious economic questions that face the United States. There is a growth strategy that involves no expansion in government power or federal spending. Its elements are basic -- tax simplification, regulatory relief, lower deficit financing, and curtailed government lending. In each of these areas, much can be done.

For example, the 1981 tax reductions were surely helpful. But the sad fact of the matter is that the tax code is far more complicated today than it was just a few years ago. To anyone who has ever tried to fill out the tax forms for a small company, it is clear that simplification is not just a pleasant thought, but rather a vitally important need.

Similarly, the regulatory relief effort has accomplished much in reducing the burden of new rules. But fundamental improvement can come only from revising existing statutes that mandate unreasonable burdens of compliance, such as the "zero discharge" goal of the Clean Water Act and the "zero risk" provision of the Delaney Amendment to the Food, Drug, and Cosmetic Act.

Furthermore, it is ironic to contemplate the numerous industrial policy proposals for funneling federal funds to "worthy" private investment areas at a time when the federal government is running budget deficits in the neighborhood of $200 billion a year. The most effective way to increase private capital formation is just the reverse of the federal investment bank approach; it is to reduce the federal drain on private saving represented by massive deficit financing. Federal lending programs are a classic example of robbing Peter to pay -- or lend to -- Paul. They do nothing to increase the pool of private saving. But they do reduce the amount available in the private market.

The most effective strategy for encouraging economic growth is no secret: it is to reduce government barriers and achieve a better functioning market economy. However, this approach is not accompanied by any guarantee. In a truly dynamic, competitive economy, we do not know in advance where the new product breakthroughs will occur. And the benefits will not be evenly distributed. But we do know that society as a whole will be better off, since it is likely that most -- though not all -- industrial workers and employers will enjoy higher real incomes and improved living standards. Surely positive public policy should enhance productivity, capital formation, and international competitiveness. The negative approaches embodied in most

industrial policy suggestions, which extend further the role of government in the economy, are adverse to these key economic goals. Hence, given the gap between the ideal embodied in most policy proposals and the shortcomings of actual practice, a cynic would perhaps conclude that the optimum amount of new government initiatives directed toward the industrial economy is zero.

APPENDIX

APPENDIX

Part A: Methodology

Part B: Informational Tables

Part C: Statistical Regressions

Methodology

This section explains the procedure used to derive the empirical results presented in the section, "Statistical Analysis of U.S. Manufacturing, 1948-1982."

The Data

This study uses data on the national income produced in an industry excluding capital consumption allowances (NI) and full-time equivalent employees (N) as the prime indicators of the health of an industry. These data were obtained from the National Income and Products Accounts of the United States for the periods 1948-82 and 1970-82, via Citibase, as of September 1983.

The national income data were deflated by either the implicit price deflator for Gross National Product produced by nondurable goods manufacturing industries or the deflator for durable goods manufacturing industries, depending upon whether the industry produces nondurable or durable goods (see Table A-4). This procedure results in the dependent variable, real national income without capital consumption allowances (RNI), which is used as an estimate of the output produced by each industry. The deflated figures are presented in Tables A-5 and A-6.

Full-time equivalent employees, the second dependent variable used in this study, is defined as the number of workers employed on a full-time basis plus the number of workers employed on a part-time basis converted to full-time equivalents. The number of full-time equivalent employees in industry i is used as a proxy for total employment in that industry (see Tables A-7 and A-8).

The third dependent variable is the ratio of RNI produced by each industry to total RNI (see Tables A-9 and A-10). Real values for RNI were used rather than nominal, because of the different deflators employed.

The last variable, which is used as an independent variable, is the capacity utilization rate for manufacturing industries. For the period 1948 to 1966, the capacity utilization rate for total manufacturing is used for both nondurable and durable goods manufacturing industries because disaggregated figures were not available (see Table A-11).

The Equations

As presented in the body of the paper, the basic equation used to determine the statistical significance of the trend coefficient (β_{i1}) for each industry is:

$$Y_{it} = \beta_{i0} + \beta_{i1}\, t + \varepsilon_{it} \qquad \text{(A-1)}$$

where: Y_{it} = the dependent variable for industry i at time t

t = year less 1948; 0 in 1948

ε_{it} = random error term for industry i at time t.

The estimated β_{i1} ($\hat{\beta}_{i1}$) from this equation is an arithmetic trend based on the assumption that industry i grows or declines by a constant amount each year.

The second equation used in this analysis is an extension of equation A-1. In this case, equation A-1 remains the same, except that now the capacity utilization rate (CUR) is included as an independent variable. The equation is:

$$Y_{it} = \beta_{i0} + \beta_{i1}\, t + \beta_{i2}\, CUR_t + \varepsilon_{it} \qquad \text{(A-2)}$$

where: Y_{it}, t, and ε_{it} are defined as in equation A-1

CUR_t = capacity utilization rate at time t.

The capacity utilization rate is used as an explanatory variable to account for cyclical fluctuations in the time-series data, so that a better measurement of the trend can be derived. CUR can be considered an approximation for these cyclical movements. That is, it is used to account for changes in the dependent variable due to cyclical behavior in contrast to long-run secular changes over time.

When the coefficients for industry i are estimated, the capacity utilization rates for nondurable goods manufacturing industries (NCUR) or durable goods manufacturing industries (DCUR) are used, depending upon whether industry i produces nondurable or durable goods, when available.

Autocorrelated Error Terms

The implications of autocorrelated error terms for the analysis of time-series data have been documented in many sources.[16] In order to test and correct (if needed) for this problem, the following procedure was used.

1) Use ordinary-least-squares (OLS) to estimate the coefficients of the equations, and to calculate the Durbin-Watson d statistic.
2) Test for positive first-order autocorrelation using the following method:

H_0: there is no positive first-order autocorrelation

If $d < d_u$, reject H_0

If $d > d_u$, do not reject H_0

where: d = the Durbin-Watson d statistic calculated in step 1

d_u = the upper critical value for the Durbin-Watson d statistic obtained at a 5% level of significance.[17]

If d is less than or equal to d_u, there is positive first-order autocorrelation present in the time-series data. However, if d is greater than d_u, the null hypothesis of no positive first-order autocorrelation cannot be rejected.

The justification for using only the upper critical value, d_u, and thus disregarding the indeterminate region is that we are dealing with time-series data which characteristically contains positively correlated error terms. Hence, we will suspect positive first-order autocorrelation unless the test does not reject the null hypothesis.

3) If the null hypothesis is not rejected, there is no need to correct for positive first-order autocorrelation. The results from the OLS estimation are presented along with the d statistics in Tables A-12 to A-23. However, if the null hypothesis were rejected, the equation is reestimated using the two-step full transform method (TSFTM)[18] and the results are presented along with their estimated autocorrelation coefficient ($\hat{\rho}$). For example, in Table A-14, food and kindred products (SIC20) was estimated using OLS, while tobacco manufacturing (SIC21) used TSFTM.

Significance of the Trend Coefficient, $\hat{\beta}_{i1}$

After the equations have been estimated, whether by OLS or TSFTM, the last step is to determine the significance of the trend coefficient ($\hat{\beta}_{i1}$). The procedure is as follows:

H_0: $\beta_{i1} = 0$

H_a: $\beta_{i1} \neq 0$

If $|t^*| < t$, do not reject H_0

If $|t^*| > t$, reject H_0 in favor of H_a

where: t^* = the calculated t statistic for $\hat{\beta}_{i1}$

t = the critical value of the student t distribution at a 2.5% level of significance.

Once it has been determined that the coefficient is not equal to zero, the sign of the estimated coefficient is used to determine whether the trend is significantly positive or negative. That is, if the estimated coefficient is positive then the trend is positive, and if the estimated coefficient is negative the trend is considered negative.

The Results

The estimated equations used to construct Tables 4, 5, and 7 through 10 are presented in Tables A-12 to A-23. The results presented in Table A-12, as well as the other tables containing regression results, are as follows:

Regressions: the estimated coefficients along with their t statistics

R^2: the coefficient of determination

SSE: the sum of squared errors

DFE: the degrees of freedom

d: the Durbin-Watson d statistic

$\hat{\rho}$: the estimated correlation coefficent, and

Class: the classification of each industry based on Table 3.

These estimates, along with the method described above, are used to construct the tables.

Table A-1

INDUSTRIAL CLASSIFICATION

NIPA Industry	SIC Codes
Nondurable Goods Industries	
Food and kindred products	20
Tobacco manufacturing	21
Textile mill products	22
Apparel and other textile products	23
Paper and allied products	26
Printing and publishing	27
Chemicals and allied products	28
Petroleum and coal products	29
Rubber and miscellaneous plastic products	30
Leather and leather products	31
Durable Goods Industries	
Lumber and wood products	24
Furniture and fixtures	25
Stone, clay, and glass products	32
Primary metal industries	33
Fabricated metal products	34
Machinery, except electrical	35
Electric and electronic equipment	36
Other transportation equipment	372-9
Motor vehicles and equipment	371
Instruments and related products	38
Miscellaneous manufacturing	39

Sources: U.S. Department of Commerce, Bureau of Economic Analysis, The National Income and Product Accounts of the United States and U.S. Office of Management and Budget, Standard Industrial Classification Manual, 1972.

Table A-2

NATIONAL INCOME PRODUCED BY NONDURABLE GOODS MANUFACTURING INDUSTRIES
(billions of dollars)

Year	National Income	SIC20	SIC21	SIC22	SIC23	SIC26	SIC27	SIC28	SIC29	SIC30	SIC31
1948	226.7	7.6	0.4	5.0	3.6	2.4	3.4	4.0	3.9	1.3	1.3
1949	220.1	7.5	0.5	4.0	3.4	2.2	3.5	4.1	3.0	1.2	1.1
1950	244.0	7.7	0.5	4.4	3.5	2.7	3.7	4.9	3.4	1.4	1.1
1951	281.7	8.2	0.5	5.1	3.9	3.4	3.9	5.9	4.1	2.0	1.3
1952	295.5	8.9	0.6	4.5	4.0	3.2	4.2	5.7	3.8	2.1	1.4
1953	309.0	9.3	0.7	4.3	4.2	3.3	4.5	6.0	4.4	2.2	1.4
1954	307.2	9.4	0.7	3.7	4.0	3.4	4.7	6.1	4.4	1.9	1.4
1955	335.5	10.3	0.7	4.2	4.2	3.8	5.1	7.2	4.8	2.3	1.4
1956	355.7	10.4	0.8	4.3	4.5	4.3	5.5	7.5	5.1	2.6	1.5
1957	371.7	10.7	0.8	4.0	4.4	4.1	5.8	7.9	4.5	2.6	1.5
1958	373.4	11.2	0.9	3.9	4.4	4.1	5.7	7.7	4.0	2.5	1.4
1959	406.8	12.0	1.0	4.5	4.8	4.6	6.3	9.0	4.5	2.9	1.6
1960	420.8	12.2	1.1	4.5	4.9	4.7	6.7	8.9	4.4	2.9	1.6
1961	433.3	12.5	1.1	4.3	5.0	4.9	6.8	9.3	4.2	3.0	1.6
1962	463.4	12.9	1.1	4.7	5.4	5.1	7.1	9.6	4.1	3.4	1.7
1963	488.6	13.5	1.2	4.8	5.6	5.3	7.4	10.4	4.1	3.5	1.7
1964	524.2	14.0	1.2	5.2	6.0	5.6	8.3	11.1	4.3	3.8	1.8
1965	571.1	14.5	1.1	5.9	6.6	6.0	8.7	12.2	4.9	4.2	1.9
1966	627.0	15.7	1.1	6.4	7.2	6.7	9.6	13.4	5.3	4.8	2.1
1967	661.5	16.2	1.3	6.3	7.5	6.8	9.9	13.4	6.1	5.0	2.1
1968	722.7	17.1	1.3	7.1	8.2	7.5	10.8	15.3	6.2	5.9	2.3
1969	780.8	18.0	1.4	7.5	8.7	8.2	11.7	15.6	6.0	6.3	2.2
1970	814.8	19.3	1.7	7.5	8.7	8.2	11.9	15.7	6.5	6.0	2.2
1971	878.1	20.2	1.8	7.7	8.9	8.4	12.5	16.7	6.9	6.8	2.2
1972	969.9	20.5	1.7	8.5	9.8	9.5	13.5	18.2	6.7	7.7	2.2
1973	1,094.1	21.2	1.8	9.1	10.3	10.9	15.0	20.3	8.8	8.8	2.4
1974	1,176.8	23.5	1.9	9.7	10.5	12.0	15.2	22.0	14.6	8.7	2.4
1975	1,267.4	30.7	2.3	8.9	10.9	11.8	16.8	24.8	14.8	8.7	2.4
1976	1,413.0	31.2	2.6	10.8	12.4	14.2	18.6	28.6	18.7	9.9	2.8
1977	1,586.0	33.5	2.9	12.3	13.7	15.5	21.2	30.8	18.5	12.3	2.9
1978	1,802.0	35.4	3.4	12.8	14.8	17.2	23.7	33.4	21.3	13.9	3.2
1979	2,015.8	38.1	3.8	13.7	15.3	19.3	26.0	35.5	28.3	15.1	3.3
1980	2,174.0	41.3	4.1	13.4	16.1	19.6	28.1	37.0	36.3	14.9	3.8
1981	2,426.5	47.1	4.8	14.3	17.2	21.3	30.6	41.6	36.2	17.6	4.1
1982	2,492.4	47.2	4.9	13.5	17.1	20.4	32.5	41.4	33.7	17.2	4.2

Note: Figures are rounded.

Source: U.S. Department of Commerce, Bureau of Economic Analysis, The National Income and Product Accounts of the United States, obtained via Citibase (September 1983).

Table A-3

NATIONAL INCOME PRODUCED BY DURABLE GOODS MANUFACTURING INDUSTRIES
(billions of dollars)

Year	SIC24	SIC25	SIC32	SIC33	SIC34	SIC35	SIC36	SIC372-9	SIC371	SIC38	SIC39
1948	2.8	1.2	2.3	6.0	4.6	6.3	4.0	1.9	4.0	1.1	1.6
1949	2.4	1.1	2.2	5.4	4.3	5.8	3.7	2.0	4.8	1.1	1.5
1950	3.0	1.4	2.8	7.2	5.4	6.6	4.8	2.1	6.6	1.4	1.7
1951	3.4	1.5	3.2	9.0	6.6	9.1	5.7	3.5	6.3	1.8	1.8
1952	3.2	1.6	3.0	7.8	6.7	10.0	6.6	5.3	6.4	2.0	1.8
1953	3.1	1.6	3.3	9.3	7.4	10.0	7.3	6.3	7.6	2.3	2.0
1954	3.0	1.5	3.4	7.7	6.9	9.1	6.7	6.1	6.4	2.2	1.9
1955	3.5	1.8	4.1	10.2	7.7	9.6	7.1	6.1	9.5	2.4	2.1
1956	3.6	1.9	4.2	10.9	8.2	11.4	7.9	6.6	7.4	2.7	2.2
1957	3.1	1.9	4.2	11.4	8.7	11.5	8.7	7.7	7.8	2.8	2.2
1958	3.1	1.7	4.1	9.2	7.9	9.9	8.3	7.5	5.4	2.9	2.1
1959	3.7	2.0	4.8	10.4	8.8	11.8	10.2	7.7	8.0	3.3	2.3
1960	3.5	2.0	4.6	10.5	8.8	11.9	10.5	7.4	8.4	3.4	2.3
1961	3.4	2.0	4.5	9.8	8.9	11.9	10.8	7.8	7.4	3.4	2.4
1962	3.6	2.2	4.7	10.3	9.8	13.5	12.0	8.8	9.8	3.7	2.5
1963	4.0	2.3	5.1	11.0	10.3	14.2	12.2	9.6	11.3	3.8	2.6
1964	4.4	2.5	5.4	12.5	11.2	16.2	12.6	9.9	11.8	4.0	2.7
1965	4.9	2.8	5.7	13.9	12.6	18.4	14.7	10.4	14.5	4.6	2.9
1966	4.9	3.1	5.9	15.4	14.4	21.3	17.0	12.7	14.2	5.5	3.2
1967	5.0	3.1	5.8	14.4	15.2	21.9	18.1	13.8	12.6	5.8	3.3
1968	5.8	3.4	6.3	14.7	16.4	22.9	19.3	14.6	15.9	6.3	3.6
1969	6.5	3.7	7.0	15.7	17.5	24.7	20.4	14.0	16.0	6.8	3.8
1970	6.1	3.5	6.9	15.2	16.4	24.7	19.8	12.6	12.0	6.3	3.8
1971	6.8	3.7	7.6	15.1	17.0	23.8	20.2	12.1	17.6	6.5	4.1
1972	8.3	4.4	8.7	17.9	19.4	27.7	22.6	13.1	20.1	7.2	4.6
1973	9.8	4.7	9.8	21.3	22.4	32.3	26.2	14.3	22.9	8.1	4.9
1974	9.7	4.7	9.9	27.1	23.3	34.9	25.7	14.6	17.5	8.5	4.8
1975	8.4	4.6	10.0	24.3	24.5	37.2	26.7	16.0	19.2	9.2	5.5
1976	11.2	5.4	11.9	26.3	27.9	41.7	30.7	17.7	27.4	10.6	6.1
1977	13.3	6.2	13.4	28.5	31.5	49.0	35.9	19.6	33.3	12.2	6.9
1978	15.8	7.3	15.7	34.4	35.8	56.1	41.5	22.8	35.1	14.0	7.3
1979	17.0	7.7	17.1	38.4	39.9	63.8	45.0	26.3	32.4	15.3	7.6
1980	15.1	7.9	16.4	37.6	40.6	68.4	49.9	29.0	21.9	17.4	7.8
1981	14.3	8.6	17.0	41.7	43.9	76.8	55.2	31.9	26.3	20.1	9.6
1982	12.6	8.4	14.9	26.9	40.8	69.9	55.4	33.6	23.9	21.2	9.1

Note: Figures are rounded.

Source: U.S. Department of Commerce, Bureau of Economic Analysis, The National Income and Product Accounts of the United States, obtained via Citibase (September 1983).

Table A-4

IMPLICIT PRICE DEFLATORS FOR GROSS NATIONAL PRODUCT, NONDURABLE GOODS MANUFACTURING INDUSTRIES, AND DURABLE GOODS MANUFACTURING INDUSTRIES (1972=100)

Year	GNP*	Nondurable Goods	Durable Goods
1948	53.0	73.9	53.0
1949	52.5	71.7	56.1
1950	53.6	71.6	58.6
1951	57.1	77.2	61.6
1952	57.9	78.1	62.5
1953	58.8	79.0	64.2
1954	59.6	78.7	66.3
1955	60.8	80.7	68.3
1956	62.8	82.6	71.8
1957	64.9	82.8	75.5
1958	66.0	83.9	78.5
1959	67.6	85.4	80.5
1960	68.7	87.1	81.3
1961	69.3	87.1	81.7
1962	70.6	86.6	83.1
1963	71.7	84.3	81.7
1964	72.8	85.4	81.1
1965	74.4	86.5	81.6
1966	76.8	88.4	82.9
1967	79.1	91.5	84.9
1968	82.5	94.3	88.2
1969	86.8	95.7	90.7
1970	91.5	100.0	94.2
1971	96.0	101.2	98.4
1972	100.0	100.0	100.0
1973	105.7	99.4	100.9
1974	114.9	111.2	108.0
1975	125.6	124.6	123.0
1976	132.3	131.0	128.2
1977	140.1	137.3	136.9
1978	150.4	144.4	145.7
1979	163.4	152.5	154.1
1980	178.4	164.1	166.7
1981	195.1	176.9	179.5
1982	206.9	189.7	186.3

*Figures are rounded.

Sources: U.S. Department of Commerce Bureau of Economic Analysis, The National Income and Product Accounts of the United States, 1929-76 and Survey of Current Business, various issues.

Table A-5

REAL NATIONAL INCOME PRODUCED BY NONDURABLE GOODS MANUFACTURING INDUSTRIES
(billions of 1972 dollars)

Year	National Income	SIC20	SIC21	SIC22	SIC23	SIC26	SIC27	SIC28	SIC29	SIC30	SIC31
1948	428.0	10.3	0.6	6.8	4.9	3.2	4.5	5.5	5.3	1.8	1.7
1949	419.3	10.4	0.7	5.6	4.8	3.0	4.9	5.7	4.2	1.7	1.6
1950	455.7	10.8	0.7	6.2	4.9	3.8	5.2	6.8	4.8	2.0	1.6
1951	493.5	10.6	0.7	6.5	5.1	4.4	5.1	7.6	5.3	2.6	1.7
1952	510.2	11.4	0.8	5.7	5.2	4.0	5.4	7.3	4.9	2.7	1.7
1953	525.3	11.8	0.9	5.4	5.3	4.2	5.7	7.6	5.6	2.8	1.7
1954	515.9	12.0	0.9	4.7	5.0	4.3	6.0	7.8	5.6	2.4	1.7
1955	551.5	12.8	0.9	5.2	5.2	4.7	6.4	9.0	5.9	2.8	1.7
1956	566.5	12.6	0.9	5.2	5.4	5.2	6.6	9.1	6.1	3.1	1.8
1957	572.4	12.9	1.0	4.9	5.4	5.0	7.0	9.5	5.4	3.2	1.8
1958	565.4	13.3	1.0	4.6	5.3	4.9	6.8	9.1	4.8	3.0	1.7
1959	601.7	14.1	1.1	5.3	5.6	5.4	7.4	10.6	5.3	3.4	1.9
1960	612.4	14.0	1.2	5.1	5.7	5.4	7.6	10.2	5.1	3.4	1.8
1961	624.9	14.4	1.2	5.0	5.8	5.6	7.8	10.7	4.8	3.5	1.8
1962	656.2	14.9	1.3	5.4	6.3	5.9	8.2	11.1	4.7	3.9	1.9
1963	681.7	16.0	1.5	5.7	6.7	6.3	8.8	12.3	4.9	4.2	2.1
1964	720.4	16.4	1.4	6.1	7.0	6.6	9.7	13.0	5.1	4.5	2.1
1965	768.0	16.7	1.3	6.8	7.6	7.0	10.1	14.1	5.6	4.9	2.2
1966	816.8	17.7	1.3	7.2	8.1	7.6	10.9	15.1	6.0	5.4	2.3
1967	836.7	17.7	1.4	6.9	8.2	7.5	10.9	14.7	6.7	5.5	2.3
1968	875.5	18.2	1.4	7.5	8.7	7.9	11.4	16.2	6.5	6.2	2.4
1969	899.6	18.8	1.5	7.8	9.0	8.6	12.2	16.3	6.2	6.6	2.3
1970	891.0	19.3	1.7	7.5	8.7	8.2	11.9	15.7	6.5	6.0	2.2
1971	914.6	20.0	1.8	7.6	8.8	8.3	12.4	16.5	6.8	6.7	2.2
1972	969.9	20.5	1.7	8.5	9.8	9.5	13.5	18.2	6.7	7.7	2.2
1973	1,035.2	21.4	1.8	9.1	10.4	11.0	15.1	20.4	8.9	8.9	2.4
1974	1,024.0	21.2	1.7	8.7	9.5	10.8	13.7	19.8	13.1	7.8	2.2
1975	1,009.4	24.6	1.9	7.1	8.7	9.5	13.5	19.9	11.9	7.0	1.9
1976	1,067.7	23.8	2.0	8.2	9.5	10.8	14.2	21.9	14.3	7.6	2.2
1977	1,132.4	24.4	2.1	9.0	10.0	11.3	15.4	22.4	13.5	9.0	2.1
1978	1,198.0	24.5	2.4	8.9	10.2	11.9	16.4	23.1	14.7	9.6	2.2
1979	1,233.5	25.0	2.5	9.0	10.0	12.6	17.1	23.2	18.6	9.9	2.1
1980	1,218.5	25.2	2.5	8.2	9.8	11.9	17.1	22.5	22.1	9.1	2.3
1981	1,243.4	26.6	2.7	8.1	9.7	12.0	17.3	23.5	20.5	10.0	2.3
1982	1,204.8	24.9	2.6	7.1	9.0	10.8	17.2	21.8	17.7	9.1	2.2

Note: Figures are rounded.

Source: Computed from data in Tables A-2 and A-4.

Table A-6

REAL NATIONAL INCOME PRODUCED BY DURABLE GOODS MANUFACTURING INDUSTRIES
(billions of 1972 dollars)

Year	SIC24	SIC25	SIC32	SIC33	SIC34	SIC35	SIC36	SIC372-9	SIC371	SIC38	SIC39
1948	5.4	2.2	4.3	11.3	8.7	11.9	7.5	3.6	7.6	2.1	3.0
1949	4.3	2.0	4.0	9.7	7.6	10.3	6.7	3.5	8.6	1.9	2.6
1950	5.2	2.3	4.8	12.2	9.2	11.3	8.1	3.6	11.2	2.3	2.9
1951	5.5	2.4	5.2	14.6	10.6	14.8	9.3	5.7	10.2	2.9	3.0
1952	5.1	2.5	4.8	12.5	10.7	15.9	10.5	8.4	10.2	3.2	2.9
1953	4.9	2.5	5.2	14.4	11.6	15.7	11.3	9.8	11.8	3.5	3.0
1954	4.5	2.3	5.1	11.6	10.4	13.8	10.0	9.3	9.7	3.4	2.8
1955	5.1	2.6	5.9	14.9	11.2	14.1	10.3	8.9	14.0	3.5	3.1
1956	5.0	2.6	5.9	15.2	11.4	15.8	11.0	9.2	10.3	3.8	3.0
1957	4.1	2.5	5.5	15.1	11.5	15.3	11.5	10.2	10.3	3.8	2.9
1958	4.0	2.2	5.2	11.7	10.0	12.6	10.6	9.6	6.9	3.6	2.7
1959	4.7	2.5	5.9	13.0	10.9	14.7	12.7	9.6	9.9	4.0	2.9
1960	4.3	2.5	5.6	13.0	10.9	14.6	12.9	9.1	10.3	4.1	2.9
1961	4.1	2.4	5.5	11.9	10.9	14.6	13.3	9.6	9.1	4.1	3.0
1962	4.4	2.6	5.7	12.4	11.7	16.3	14.4	10.6	11.8	4.5	3.1
1963	4.9	2.8	6.2	13.5	12.6	17.4	14.9	11.7	13.9	4.7	3.1
1964	5.5	3.1	6.7	15.4	13.8	20.0	15.5	12.2	14.5	5.0	3.3
1965	6.0	3.5	6.9	17.1	15.5	22.5	18.0	12.8	17.8	5.6	3.5
1966	6.0	3.8	7.1	18.6	17.4	25.7	20.5	15.3	17.1	6.6	3.9
1967	5.9	3.7	6.8	17.0	18.0	25.8	21.3	16.2	14.8	6.8	3.9
1968	6.6	3.9	7.2	16.7	18.6	26.0	21.9	16.6	18.1	7.1	4.1
1969	7.2	4.1	7.7	17.3	19.3	27.2	22.5	15.5	17.6	7.5	4.2
1970	6.5	3.7	7.3	16.1	17.5	26.3	21.0	13.4	12.7	6.7	4.0
1971	6.9	3.8	7.8	15.4	17.2	24.2	20.5	12.3	17.9	6.6	4.2
1972	8.3	4.4	8.7	17.9	19.4	27.7	22.6	13.1	20.1	7.2	4.6
1973	9.7	4.6	9.7	21.1	22.2	32.0	25.9	14.2	22.7	8.0	4.8
1974	9.0	4.4	9.1	25.1	21.6	32.4	23.8	13.5	16.2	7.9	4.5
1975	6.9	3.7	8.1	19.8	19.9	30.3	21.7	13.0	15.6	7.5	4.5
1976	8.7	4.2	9.3	20.5	21.7	32.6	24.0	13.8	21.3	8.2	4.8
1977	9.7	4.5	9.8	20.8	23.0	35.8	26.2	14.3	24.3	8.9	5.0
1978	10.8	5.0	10.8	23.6	24.6	38.5	28.4	15.6	24.1	9.6	5.0
1979	11.1	5.0	11.1	24.9	25.9	41.4	29.2	17.0	21.0	9.9	4.9
1980	9.1	4.7	9.9	22.5	24.4	41.0	29.9	17.4	13.1	10.4	4.7
1981	8.0	4.8	9.5	23.2	24.5	42.8	30.7	17.8	14.6	11.2	5.3
1982	6.8	4.5	8.0	14.4	21.9	37.5	29.7	18.0	12.9	11.4	4.9

Note: Figures are rounded.

Source: Computed from data in Tables A-3 and A-4.

Table A-7

FULL-TIME EQUIVALENT EMPLOYEES IN NONDURABLE GOODS MANUFACTURING INDUSTRIES
(thousands of employees)

Year	SIC20	SIC21	SIC22	SIC23	SIC26	SIC27	SIC28	SIC29	SIC30	SIC31
1948	1,783	99	1,329	1,196	470	720	633	220	322	406
1949	1,753	101	1,186	1,167	451	717	599	214	297	389
1950	1,750	96	1,243	1,181	482	722	617	216	320	391
1951	1,780	104	1,220	1,180	504	736	687	227	345	374
1952	1,764	103	1,139	1,185	497	738	708	231	346	375
1953	1,754	103	1,129	1,202	523	752	746	235	366	375
1954	1,719	101	1,016	1,135	522	756	729	232	337	356
1955	1,706	99	1,021	1,160	537	766	745	231	365	366
1956	1,709	95	996	1,154	554	780	773	229	373	360
1957	1,702	92	953	1,142	555	800	793	232	377	358
1958	1,637	90	885	1,083	542	788	758	219	351	339
1959	1,651	90	913	1,141	567	804	778	209	382	354
1960	1,671	90	890	1,152	576	830	793	202	384	343
1961	1,654	87	860	1,130	582	837	792	194	377	339
1962	1,647	87	873	1,179	598	849	803	189	422	340
1963	1,634	86	860	1,192	605	852	818	185	431	331
1964	1,637	88	861	1,209	607	870	830	180	444	330
1965	1,663	86	901	1,269	628	903	869	178	483	339
1966	1,685	83	941	1,324	656	941	925	179	527	349
1967	1,704	84	943	1,322	672	974	965	179	534	341
1968	1,702	82	974	1,334	681	991	993	183	573	345
1969	1,715	79	984	1,342	705	1,012	1,022	186	613	328
1970	1,711	79	945	1,287	694	1,017	1,009	187	593	304
1971	1,673	74	934	1,264	669	978	974	186	592	284
1972	1,650	74	969	1,307	674	983	963	183	642	286
1973	1,645	76	1,003	1,344	689	1,009	991	184	693	282
1974	1,635	77	951	1,267	688	1,012	1,014	189	689	263
1975	1,588	71	824	1,161	628	981	1,008	187	585	234
1976	1,611	70	887	1,252	662	997	1,039	193	637	255
1977	1,632	68	887	1,250	679	1,035	1,067	198	702	246
1978	1,655	67	881	1,268	690	1,080	1,089	203	739	247
1979	1,660	68	864	1,237	697	1,129	1,104	205	766	234
1980	1,625	66	820	1,200	681	1,138	1,099	202	708	227
1981	1,606	68	794	1,184	678	1,153	1,098	210	723	230
1982	1,563	66	715	1,087	650	1,149	1,068	193	676	209

Source: U.S. Department of Commerce, Bureau of Economic Analysis, The National Income and Product Accounts of the United States, obtained via Citibase (September 1983).

Table A-8

FULL-TIME EQUIVALENT EMPLOYEES IN DURABLE GOODS MANUFACTURING INDUSTRIES
(thousands of employees)

Year	SIC24	SIC25	SIC32	SIC33	SIC34	SIC35	SIC36	SIC372-9	SIC371	SIC38	SIC39
1948	862	334	556	1,231	1,085	1,384	975	472	757	271	416
1949	752	310	517	1,084	983	1,189	839	458	733	248	381
1950	815	357	549	1,185	1,083	1,214	961	452	797	271	399
1951	864	348	586	1,295	1,190	1,468	1,085	696	835	320	399
1952	805	349	565	1,225	1,215	1,544	1,169	998	778	349	390
1953	774	356	575	1,306	1,320	1,566	1,300	1,143	899	381	418
1954	706	329	548	1,164	1,198	1,412	1,169	1,034	765	360	395
1955	746	354	578	1,266	1,260	1,438	1,214	987	874	365	397
1956	737	361	592	1,300	1,282	1,549	1,286	1,051	784	388	401
1957	664	361	582	1,294	1,297	1,554	1,309	1,122	755	401	383
1958	618	337	547	1,082	1,145	1,327	1,185	1,009	596	375	358
1959	661	358	586	1,113	1,205	1,432	1,346	1,014	666	395	372
1960	641	357	591	1,150	1,217	1,447	1,419	936	699	402	375
1961	595	341	569	1,077	1,179	1,398	1,429	920	628	394	366
1962	605	360	579	1,101	1,241	1,475	1,531	980	686	405	379
1963	612	363	589	1,110	1,259	1,513	1,505	990	729	409	378
1964	634	378	602	1,159	1,290	1,586	1,480	965	748	407	385
1965	651	403	621	1,234	1,375	1,730	1,590	998	828	436	407
1966	662	436	639	1,278	1,496	1,910	1,836	1,170	863	491	424
1967	645	428	624	1,250	1,540	1,955	1,886	1,238	816	511	419
1968	661	443	630	1,248	1,590	1,947	1,902	1,247	870	529	423
1969	679	452	652	1,283	1,649	2,007	1,954	1,211	906	545	429
1970	665	421	632	1,243	1,532	1,954	1,843	1,027	797	524	410
1971	689	419	621	1,154	1,442	1,783	1,705	894	838	489	405
1972	712	459	645	1,165	1,492	1,864	1,757	915	877	515	416
1973	734	489	681	1,250	1,606	2,053	1,939	948	961	556	433
1974	692	469	671	1,271	1,596	2,193	1,949	950	901	579	433
1975	588	397	618	1,118	1,428	2,023	1,676	905	778	539	393
1976	655	432	633	1,137	1,488	2,048	1,753	902	871	565	410
1977	695	452	653	1,175	1,547	2,148	1,853	924	941	607	421
1978	732	479	690	1,210	1,631	2,304	1,991	992	996	642	432
1979	744	480	700	1,241	1,675	2,462	2,100	1,071	988	678	427
1980	658	449	651	1,134	1,579	2,446	2,075	1,096	787	695	400
1981	631	448	631	1,109	1,560	2,461	2,075	1,096	787	714	392
1982	563	413	559	902	1,398	2,220	1,989	1,025	698	704	365

Source: U.S. Department of Commerce, Bureau of Economic Analysis, The National Income and Product Accounts of the United States, obtained via Citibase (September 1983).

Table A-9

RATIO OF REAL NATIONAL INCOME PRODUCED BY NONDURABLE GOODS MANUFACTURING INDUSTRIES TO REAL NATIONAL INCOME

Year	SIC20	SIC21	SIC22	SIC23	SIC26	SIC27	SIC28	SIC29	SIC30	SIC31
1948	0.0241	0.0013	0.0159	0.0114	0.0074	0.0106	0.0128	0.0123	0.0042	0.0040
1949	0.0248	0.0016	0.0134	0.0114	0.0073	0.0117	0.0135	0.0101	0.0041	0.0037
1950	0.0237	0.0014	0.0135	0.0108	0.0083	0.0113	0.0149	0.0106	0.0043	0.0035
1951	0.0215	0.0014	0.0133	0.0103	0.0089	0.0103	0.0155	0.0108	0.0053	0.0035
1952	0.0223	0.0015	0.0112	0.0101	0.0079	0.0105	0.0142	0.0096	0.0053	0.0034
1953	0.0225	0.0017	0.0103	0.0100	0.0080	0.0109	0.0144	0.0107	0.0053	0.0033
1954	0.0232	0.0017	0.0091	0.0098	0.0084	0.0116	0.0151	0.0109	0.0047	0.0033
1955	0.0232	0.0016	0.0094	0.0094	0.0086	0.0116	0.0163	0.0107	0.0052	0.0031
1956	0.0222	0.0016	0.0091	0.0096	0.0092	0.0117	0.0160	0.0108	0.0055	0.0032
1957	0.0226	0.0017	0.0085	0.0093	0.0087	0.0122	0.0166	0.0095	0.0055	0.0032
1958	0.0235	0.0019	0.0082	0.0093	0.0086	0.0121	0.0162	0.0085	0.0053	0.0030
1959	0.0234	0.0019	0.0088	0.0093	0.0090	0.0122	0.0176	0.0087	0.0057	0.0031
1960	0.0229	0.0020	0.0084	0.0093	0.0088	0.0125	0.0167	0.0083	0.0055	0.0030
1961	0.0230	0.0019	0.0080	0.0092	0.0090	0.0125	0.0171	0.0077	0.0056	0.0029
1962	0.0227	0.0020	0.0082	0.0095	0.0090	0.0125	0.0170	0.0072	0.0060	0.0030
1963	0.0235	0.0021	0.0083	0.0098	0.0092	0.0129	0.0180	0.0071	0.0061	0.0030
1964	0.0228	0.0019	0.0085	0.0097	0.0091	0.0134	0.0181	0.0071	0.0062	0.0029
1965	0.0218	0.0017	0.0089	0.0099	0.0091	0.0131	0.0184	0.0073	0.0063	0.0028
1966	0.0217	0.0016	0.0088	0.0099	0.0093	0.0133	0.0185	0.0074	0.0066	0.0029
1967	0.0212	0.0017	0.0082	0.0098	0.0089	0.0130	0.0175	0.0080	0.0066	0.0028
1968	0.0208	0.0016	0.0086	0.0099	0.0091	0.0130	0.0185	0.0075	0.0071	0.0028
1969	0.0209	0.0017	0.0087	0.0101	0.0095	0.0136	0.0182	0.0069	0.0074	0.0026
1970	0.0216	0.0019	0.0085	0.0098	0.0092	0.0133	0.0176	0.0073	0.0067	0.0025
1971	0.0219	0.0019	0.0083	0.0096	0.0090	0.0135	0.0180	0.0075	0.0073	0.0024
1972	0.0211	0.0018	0.0087	0.0101	0.0097	0.0140	0.0188	0.0069	0.0080	0.0022
1973	0.0206	0.0018	0.0088	0.0100	0.0106	0.0146	0.0197	0.0086	0.0086	0.0023
1974	0.0207	0.0017	0.0085	0.0092	0.0105	0.0134	0.0193	0.0128	0.0076	0.0021
1975	0.0244	0.0019	0.0071	0.0087	0.0094	0.0134	0.0197	0.0118	0.0069	0.0019
1976	0.0223	0.0019	0.0077	0.0089	0.0101	0.0133	0.0205	0.0134	0.0071	0.0020
1977	0.0216	0.0018	0.0079	0.0088	0.0100	0.0136	0.0198	0.0119	0.0079	0.0018
1978	0.0204	0.0020	0.0074	0.0085	0.0099	0.0137	0.0193	0.0123	0.0080	0.0019
1979	0.0202	0.0020	0.0073	0.0081	0.0103	0.0138	0.0188	0.0150	0.0080	0.0017
1980	0.0207	0.0021	0.0067	0.0081	0.0098	0.0141	0.0185	0.0181	0.0074	0.0019
1981	0.0214	0.0022	0.0065	0.0078	0.0097	0.0139	0.0189	0.0165	0.0080	0.0019
1982	0.0207	0.0022	0.0059	0.0075	0.0089	0.0142	0.0181	0.0147	0.0075	0.0018

Note: Figures may not correspond to the results derived from the preceding table due to rounding.

Source: Computed from data in Table A-5.

Table A-10

RATIO OF REAL NATIONAL INCOME PRODUCED BY DURABLE GOODS MANUFACTURING INDUSTRIES TO REAL NATIONAL INCOME

Year	SIC24	SIC25	SIC32	SIC33	SIC34	SIC35	SIC36	SIC372-9	SIC371	SIC38	SIC39
1948	0.0125	0.0051	0.0101	0.0264	0.0204	0.0279	0.0175	0.0085	0.0178	0.0049	0.0071
1949	0.0102	0.0048	0.0095	0.0231	0.0182	0.0245	0.0159	0.0083	0.0204	0.0046	0.0062
1950	0.0114	0.0051	0.0105	0.0268	0.0202	0.0248	0.0178	0.0080	0.0247	0.0051	0.0065
1951	0.0112	0.0049	0.0105	0.0296	0.0216	0.0301	0.0188	0.0115	0.0207	0.0058	0.0060
1952	0.0100	0.0049	0.0095	0.0246	0.0209	0.0312	0.0206	0.0166	0.0200	0.0063	0.0058
1953	0.0093	0.0047	0.0099	0.0275	0.0220	0.0298	0.0216	0.0187	0.0225	0.0067	0.0058
1954	0.0087	0.0044	0.0099	0.0225	0.0202	0.0267	0.0195	0.0180	0.0188	0.0066	0.0055
1955	0.0093	0.0047	0.0108	0.0270	0.0204	0.0256	0.0187	0.0161	0.0253	0.0064	0.0055
1956	0.0088	0.0046	0.0103	0.0268	0.0202	0.0279	0.0194	0.0163	0.0181	0.0067	0.0053
1957	0.0072	0.0044	0.0096	0.0264	0.0201	0.0267	0.0201	0.0178	0.0180	0.0066	0.0050
1958	0.0070	0.0039	0.0092	0.0207	0.0178	0.0223	0.0188	0.0169	0.0121	0.0064	0.0048
1959	0.0077	0.0041	0.0098	0.0216	0.0182	0.0244	0.0211	0.0160	0.0165	0.0067	0.0048
1960	0.0070	0.0041	0.0092	0.0212	0.0177	0.0239	0.0210	0.0148	0.0168	0.0067	0.0047
1961	0.0066	0.0039	0.0089	0.0191	0.0175	0.0233	0.0212	0.0154	0.0145	0.0066	0.0048
1962	0.0067	0.0040	0.0086	0.0189	0.0179	0.0248	0.0220	0.0162	0.0180	0.0068	0.0047
1963	0.0072	0.0041	0.0091	0.0198	0.0184	0.0255	0.0219	0.0172	0.0204	0.0069	0.0046
1964	0.0076	0.0043	0.0093	0.0214	0.0191	0.0278	0.0215	0.0169	0.0201	0.0069	0.0046
1965	0.0078	0.0045	0.0090	0.0222	0.0201	0.0293	0.0234	0.0166	0.0232	0.0074	0.0046
1966	0.0073	0.0046	0.0086	0.0227	0.0213	0.0315	0.0251	0.0188	0.0209	0.0081	0.0047
1967	0.0070	0.0044	0.0081	0.0203	0.0215	0.0308	0.0255	0.0194	0.0177	0.0081	0.0046
1968	0.0075	0.0044	0.0082	0.0191	0.0213	0.0297	0.0250	0.0189	0.0206	0.0081	0.0046
1969	0.0080	0.0046	0.0086	0.0192	0.0215	0.0303	0.0250	0.0172	0.0196	0.0083	0.0047
1970	0.0073	0.0042	0.0082	0.0181	0.0196	0.0295	0.0236	0.0150	0.0143	0.0076	0.0045
1971	0.0075	0.0041	0.0085	0.0168	0.0189	0.0264	0.0225	0.0134	0.0196	0.0072	0.0046
1972	0.0085	0.0045	0.0089	0.0185	0.0200	0.0286	0.0233	0.0135	0.0208	0.0075	0.0047
1973	0.0094	0.0045	0.0094	0.0204	0.0215	0.0310	0.0251	0.0137	0.0219	0.0077	0.0047
1974	0.0088	0.0043	0.0089	0.0245	0.0211	0.0316	0.0233	0.0132	0.0158	0.0077	0.0044
1975	0.0068	0.0037	0.0080	0.0196	0.0197	0.0300	0.0215	0.0129	0.0155	0.0074	0.0044
1976	0.0082	0.0039	0.0087	0.0192	0.0204	0.0305	0.0225	0.0129	0.0200	0.0077	0.0045
1977	0.0086	0.0040	0.0086	0.0184	0.0203	0.0316	0.0232	0.0126	0.0215	0.0079	0.0044
1978	0.0091	0.0042	0.0090	0.0197	0.0205	0.0321	0.0237	0.0131	0.0201	0.0080	0.0042
1979	0.0090	0.0041	0.0090	0.0202	0.0210	0.0336	0.0237	0.0138	0.0171	0.0081	0.0040
1980	0.0074	0.0039	0.0081	0.0185	0.0200	0.0337	0.0246	0.0143	0.0108	0.0086	0.0038
1981	0.0064	0.0038	0.0076	0.0187	0.0197	0.0344	0.0247	0.0143	0.0118	0.0090	0.0043
1982	0.0056	0.0037	0.0066	0.0120	0.0182	0.0312	0.0247	0.0150	0.0107	0.0094	0.0041

Note: Figures may not correspond to the results derived from the preceding tables due to rounding.

Source: Computed from data in Tables A-5 and A-6.

Table A-11

CAPACITY UTILIZATION RATES FOR MANUFACTURING INDUSTRIES
(Federal Reserve Board Series, in percent)

Year	Nondurable Goods	Durable Goods
1948	82.5	82.5
1949	74.2	74.2
1950	82.8	82.8
1951	85.8	85.8
1952	85.4	85.4
1953	89.2	89.2
1954	80.3	80.3
1955	87.1	87.1
1956	86.4	86.4
1957	83.7	83.7
1958	75.2	75.2
1959	81.9	81.9
1960	80.2	80.2
1961	77.4	77.4
1962	81.6	81.6
1963	83.5	83.5
1964	85.6	85.6
1965	89.6	89.6
1966	91.1	91.1
1967	86.8	87.1
1968	87.1	87.2
1969	87.0	85.9
1970	83.9	76.5
1971	84.0	74.6
1972	87.4	80.7
1973	88.1	87.2
1974	84.7	83.1
1975	76.6	70.3
1976	83.0	77.1
1977	85.0	81.1
1978	85.6	86.0
1979	86.3	86.7
1980	81.8	77.8
1981	81.1	78.2
1982	74.8	68.2

Note: For the period 1948 to 1966, the capacity utilization rate for total manufacturing is used for durable goods manufacturing industries and nondurable goods manufacturing industries.

Source: Economic Report of the President, February 1984.

Table A-12

REGRESSIONS ON REAL NATIONAL INCOME PRODUCED BY NONDURABLE GOODS MANUFACTURING INDUSTRIES, 1948-1982

Regressions	R^2	SSE	DFE	d	$\hat{\rho}$	Class*
$\hat{SIC20}_t = 9.60 + 0.49\ t - 0.01\ NCUR_t$ (24.2) (-0.2)	0.95	16.25	31	-	0.44 (2.9)	L
$\hat{SIC21}_t = 0.75 + 0.06\ t - 0.003\ NCUR_t$ (14.7) (-0.8)	0.88	0.26	31	-	0.67 (5.4)	L
$\hat{SIC22}_t = -3.87 + 0.08\ t + 0.11\ NCUR_t$ (3.3) (6.8)	0.64	4.92	31	-	0.78 (7.4)	L
$\hat{SIC23}_t = -1.10 + 0.17\ t + 0.07\ NCUR_t$ (11.8) (4.7)	0.83	3.43	31	-	0.67 (5.4)	L
$\hat{SIC26}_t = -4.53 + 0.27\ t + 0.09\ NCUR_t$ (15.5) (4.6)	0.89	6.05	31	-	0.63 (4.8)	L
$\hat{SIC27}_t = -0.32 + 0.40\ t + 0.05\ NCUR_t$ (20.3) (2.4)	0.93	6.53	31	-	0.66 (5.3)	L
$\hat{SIC28}_t = -5.08 + 0.55\ t + 0.12\ NCUR_t$ (20.2) (4.5)	0.93	11.96	31	-	0.67 (5.4)	H
$\hat{SIC29}_t = -1.84 + 0.39\ t + 0.05\ NCUR_t$ (4.5) (0.8)	0.40	70.53	31	-	0.78 (7.3)	L
$\hat{SIC30}_t = -5.06 + 0.25\ t + 0.08\ NCUR_t$ (14.0) (3.9)	0.87	6.05	31	-	0.64 (4.9)	L
$\hat{SIC31}_t = 0.20 + 0.02\ t + 0.02\ NCUR_t$ (6.4) (4.0)	0.64	0.31	31	-	0.52 (3.6)	L

Note: In this and the following tables presenting regression results, the t-statistics for the estimated coefficients are in parenthesis.

*Represents the classification of each industry based upon the results presented in Table 3. "L" corresponds to a low-tech industry while "H" represents a high-tech industry.

Sources: Computed from data in Tables A-5 and A-11.

Table A-13

REGRESSIONS ON REAL NATIONAL INCOME PRODUCED BY DURABLE GOODS MANUFACTURING INDUSTRIES, 1948-1982

Regressions	R^2	SSE	DFE	d	$\hat{\rho}$	Class
$\hat{SIC24}_t = -6.59 + 0.14\ t + 0.13\ DCUR_t$ (4.0) (7.3)	0.67	9.23	31	-	0.81 (8.1)	L
$\hat{SIC25}_t = -1.59 + 0.09\ t + 0.04\ DCUR_t$ (10.4) (10.6)	0.86	0.48	31	-	0.83 (8.9)	L
$\hat{SIC32}_t = -3.83 + 0.17\ t + 0.10\ DCUR_t$ (9.7) (8.5)	0.82	3.53	31	-	0.75 (6.7)	L
$\hat{SIC33}_t = -18.56 + 0.36\ t + 0.35\ DCUR_t$ (6.9) (6.5)	0.71	74.97	31	-	0.54 (3.8)	L
$\hat{SIC34}_t = -9.02 + 0.50\ t + 0.20\ DCUR_t$ (11.1) (11.6)	0.88	9.38	31	-	0.87 (10.6)	L
$\hat{SIC35}_t = -14.44 + 0.91\ t + 0.28\ DCUR_t$ (9.4) (6.3)	0.79	59.46	31	-	0.83 (9.0)	H
$\hat{SIC36}_t = -9.22 + 0.73\ t + 0.18\ DCUR_t$ (18.3) (6.7)	0.92	20.27	31	-	0.72 (6.2)	H
$\hat{SIC372\text{-}9}_t = -2.34 + 0.39\ t + 0.09\ DCUR_t$ (9.9) (2.8)	0.76	28.96	31	-	0.64 (4.9)	H
$\hat{SIC371}_t = -23.11 + 0.38\ t + 0.38\ DCUR_t$ (4.9) (4.9)	0.57	150.77	31	-	0.56 (4.0)	H
$\hat{SIC38}_t = -1.90 + 0.27\ t + 0.04\ DCUR_t$ (16.5) (4.1)	0.90	2.80	31	-	0.76 (6.9)	H
$\hat{SIC39}_t = 0.24 + 0.08\ t + 0.03\ DCUR_t$ (8.9) (4.6)	0.74	0.97	31	-	0.72 (6.1)	L

Sources: Computed from data in Tables A-6 and A-11.

Table A-14

REGRESSIONS ON REAL NATIONAL INCOME PRODUCED BY NONDURABLE GOODS MANUFACTURING INDUSTRIES, 1970-1982

Regressions	R^2	SSE	DFE	d	$\hat{\rho}$	Class
$\hat{SIC20}_t = 9.02 + 0.56\ t - 0.02\ NCUR_t$ (6.8) (-0.2)	0.86	9.51	10	1.78	-	L
$\hat{SIC21}_t = -1.02 + 0.09\ t + 0.01\ NCUR_t$ (6.3) (0.7)	0.83	0.12	9	-	0.47 (1.9)	L
$\hat{SIC22}_t = -10.58 + 0.10\ t + 0.19\ NCUR_t$ (3.3) (10.6)	0.93	0.42	9	-	0.59 (2.6)	L
$\hat{SIC23}_t = -5.74 + 0.11\ t + 0.15\ NCUR_t$ (5.5) (7.0)	0.85	0.61	10	1.94	-	L
$\hat{SIC26}_t = -18.41 + 0.39\ t + 0.22\ NCUR_t$ (7.5) (6.6)	0.89	1.35	9	-	0.54 (2.3)	L
$\hat{SIC27}_t = -13.36 + 0.54\ t + 0.16\ NCUR_t$ (14.6) (4.4)	0.96	1.90	10	2.18	-	L
$\hat{SIC28}_t = -18.44 + 0.70\ t + 0.23\ NCUR_t$ (6.7) (3.5)	0.84	5.47	9	-	0.53 (2.3)	H
$\hat{SIC29}_t = -33.04 + 1.31\ t + 0.12\ NCUR_t$ (7.1) (0.7)	0.87	36.45	9	-	0.12 (0.4)	L
$\hat{SIC30}_t = -17.48 + 0.36\ t + 0.19\ NCUR_t$ (11.1) (5.9)	0.93	1.47	10	2.21	-	L
$\hat{SIC31}_t = 0.58 + 0.01\ t + 0.02\ NCUR_t$ (1.3 (1.5)	0.22	0.14	10	1.72	-	L

Sources: Computed from data in Tables A-5 and A-11.

Table A-15

REGRESSIONS ON REAL NATIONAL INCOME PRODUCED BY DURABLE GOODS MANUFACTURING INDUSTRIES, 1970-1982

Regressions	R^2	SSE	DFE	d	$\hat{\rho}$	Class
$\hat{SIC24}_t = -13.02 + 0.15\ t + 0.22\ DCUR_t$ (3.0) (8.0)	0.88	2.57	9	-	0.28 (1.0)	L
$\hat{SIC25}_t = -2.11 + 0.09\ t + 0.05\ DCUR_t$ (8.6) (9.0)	0.94	0.11	9	-	0.25 (0.9)	L
$\hat{SIC32}_t = -7.54 + 0.17\ t + 0.15\ DCUR_t$ (5.0) (8.1)	0.90	1.21	9	-	0.25 (0.9)	L
$\hat{SIC33}_t = -25.34 + 0.35\ t + 0.45\ DCUR_t$ (1.7) (3.9)	0.65	47.31	9	-	0.25 (0.9)	L
$\hat{SIC34}_t = -15.26 + 0.60\ t + 0.26\ DCUR_t$ (13.0) (10.3)	0.96	2.20	9	-	0.26 (1.0)	L
$\hat{SIC35}_t = -34.40 + 1.48\ t + 0.34\ DCUR_t$ (15.8) (5.5)	0.96	15.90	10	1.65	-	H
$\hat{SIC36}_t = -15.09 + 0.88\ t + 0.20\ DCUR_t$ (8.2) (4.1)	0.89	8.56	9	-	0.42 (1.7)	H
$\hat{SIC372\text{-}9}_t = -1.90 + 0.46\ t + 0.05\ DCUR_t$ (5.1) (1.3)	0.75	5.11	9	-	0.49 (2.0)	H
$\hat{SIC371}_t = -16.80 + 0.01\ t + 0.44\ DCUR_t$ (0.04) (2.5)	0.42	103.31	9	-	0.34 (1.3)	H
$\hat{SIC38}_t = -5.45 + 0.41\ t + 0.03\ DCUR_t$ (10.4) (2.1)	0.92	0.96	9	-	0.50 (2.1)	H
$\hat{SIC39}_t = 0.74 + 0.08\ t + 0.02\ DCUR_t$ (5.4) (2.5)	0.77	0.36	10	1.91	-	L

Sources: Computed from data in Tables A-6 and A-11.

Table A-16

REGRESSIONS ON FULL-TIME EQUIVALENT EMPLOYEES IN NONDURABLE GOODS MANUFACTURING INDUSTRIES, 1948-1982

Regressions	R^2	SSE	DFE	d	$\hat{\rho}$	Class
$\hat{SIC20}_t = 1{,}495.08 - 4.80\ t + 3.16\ NCUR_t$ (-4.9) (4.0)	0.58	11,041	31	-	0.74 (6.6)	L
$\hat{SIC21}_t = 93.38 - 1.15\ t + 0.12\ NCUR_t$ (-21.3) (1.2)	0.94	171	31	-	0.30 (1.9)	L
$\hat{SIC22}_t = 455.67 - 13.33\ t + 9.04\ NCUR_t$ (-5.9) (7.1)	0.75	30,174	31	-	0.84 (9.3)	L
$\hat{SIC23}_t = 455.96 + 1.47\ t + 8.73\ NCUR_t$ (1.1) (7.2)	0.63	25,307	31	-	0.69 (5.6)	L
$\hat{SIC26}_t = 209.41 + 6.54\ t + 3.39\ NCUR_t$ (9.0) (5.8)	0.78	6,033	31	-	0.74 (6.6)	L
$\hat{SIC27}_t = 578.33 + 13.09\ t + 1.35\ NCUR_t$ (13.9) (1.9)	0.86	9,348	31	-	0.76 (6.9)	L
$\hat{SIC28}_t = 350.19 + 14.40\ t + 3.42\ NCUR_t$ (17.3) (3.9)	0.91	12,684	31	-	0.65 (5.0)	H
$\hat{SIC29}_t = 183.66 - 0.85\ t + 0.42\ NCUR_t$ (-1.8) (1.8)	0.18	1,034	31	-	0.88 (10.9)	L
$\hat{SIC30}_t = -213.75 + 13.33\ t + 5.93\ NCUR_t$ (12.2) (6.1)	0.85	16,312	31	-	0.71 (6.0)	L
$\hat{SIC31}_t = 246.49 - 5.27\ t + 1.92\ NCUR_t$ (-10.3) (5.9)	0.83	1,985	31	-	0.81 (8.2)	L

Sources: Computed from data in Tables A-7 and A-11.

Table A-17

REGRESSIONS ON FULL-TIME EQUIVALENT EMPLOYEES IN DURABLE GOODS MANUFACTURING INDUSTRIES, 1948-1982

Regressions	R^2	SSE	DFE	d	$\hat{\rho}$	Class
$\hat{SIC24}_t = 220.35 - 4.30\ t + 6.78\ DCUR_t$ (-2.4) (7.5)	0.69	24,021	31	-	0.81 (8.2)	L
$\hat{SIC25}_t = -15.89 + 4.53\ t + 4.11\ DCUR_t$ (7.4) (13.1)	0.87	2,853	31	-	0.81 (8.0)	L
$\hat{SIC32}_t = 169.89 + 3.64\ t + 4.56\ DCUR_t$ (7.7) (9.8)	0.81	5,568	31	-	0.56 (4.0)	L
$\hat{SIC33}_t = 148.30 - 1.13\ t + 12.87\ DCUR_t$ (-0.7) (8.3)	0.70	62,381	31	-	0.55 (3.9)	L
$\hat{SIC34}_t = -8.35 + 16.42\ t + 13.35\ DCUR_t$ (7.2) (10.4)	0.82	47,037	31	-	0.78 (7.4)	L
$\hat{SIC35}_t = 9.80 + 34.16\ t + 14.57\ DCUR_t$ (8.7) (5.0)	0.74	233,167	31	-	0.69 (5.6)	H
$\hat{SIC36}_t = -285.07 + 35.86\ t + 15.24\ DCUR_t$ (12.6) (7.1)	0.86	125,517	31	-	0.68 (5.5)	H
$\hat{SIC372\text{-}9}_t = 117.10 + 12.44\ t + 7.53\ DCUR_t$ (2.7) (2.3)	0.26	285,412	31	-	0.71 (5.9)	H
$\hat{SIC371}_t = -286.46 + 4.60\ t + 12.38\ DCUR_t$ (1.9) (9.4)	0.74	50,450	31	-	0.80 (7.8)	H
$\hat{SIC38}_t = 36.71 + 12.99\ t + 2.66\ DCUR_t$ (13.1) (4.5)	0.85	10,000	31	-	0.76 (7.0)	H
$\hat{SIC39}_t = 176.56 + 0.45\ t + 2.66\ DCUR_t$ (0.9) (9.9)	0.76	2,063	31	-	0.78 (7.3)	L

Sources: Computed from data in Tables A-8 and A-11.

Table A-18

REGRESSIONS ON FULL-TIME EQUIVALENT EMPLOYEES IN NONDURABLE GOODS MANUFACTURING INDUSTRIES, 1970-1982

Regressions	R^2	SSE	DFE	d	$\hat{\rho}$	Class
$\hat{SIC20}_t = 1{,}410.85 - 5.77\ t + 4.66\ NCUR_t$ (-2.2) (2.7)	0.69	3,761	9	-	0.47 (1.9)	L
$\hat{SIC21}_t = 102.44 - 1.04\ t - 0.03\ NCUR_t$ (-5.8) (-0.2)	0.81	45	10	1.65	-	L
$\hat{SIC22}_t = 207.11 - 11.28\ t + 11.90\ NCUR_t$ (-6.1) (9.1)	0.96	2,080	9	-	0.45 (1.8)	L
$\hat{SIC23}_t^* = 338.10 - 6.18\ t + 12.90\ NCUR_t$ (-6.7) (12.5)	0.98	1,694	9	-	-0.35 (-1.3)	L
$\hat{SIC26}_t = 245.24 + 1.50\ t + 4.67\ NCUR_t$ (1.3) (4.4)	0.69	1,396	9	-	0.13 (0.5)	L
$\hat{SIC27}_t = 420.93 + 15.29\ t + 2.50\ NCUR_t$ (4.1) (1.1)	0.65	7,010	9	-	0.54 (2.3)	L
$\hat{SIC28}_t = 468.29 + 11.73\ t + 2.93\ NCUR_t$ (4.9) (1.5)	0.73	4,505	9	-	0.31 (1.2)	H
$\hat{SIC29}_t = 62.15 + 2.21\ t + 0.84\ NCUR_t$ (5.0) (1.9)	0.73	236	9	-	0.04 (0.2)	L
$\hat{SIC30}_t = -736.10 + 15.72\ t + 11.63\ NCUR_t$ (10.8) (8.0)	0.93	3,000	10	1.70	-	L
$\hat{SIC31}_t = 262.37 - 5.94\ t + 1.90\ NCUR_t$ (-7.9) (2.7)	0.93	604	9	-	0.12 (0.4)	L

*For this industry the null hypothesis of no negative first-order autocorrelation was rejected at a 5% level of significance. Hence, the equation was corrected for negative autocorrelation instead of positive autocorrelation.

Sources: Computed from data in Tables A-7 and A-11.

Table A-19

REGRESSIONS ON FULL-TIME EQUIVALENT EMPLOYEES IN DURABLE GOODS MANUFACTURING INDUSTRIES, 1970-1982

Regressions	R^2	SSE	DFE	d	$\hat{\rho}$	Class
$\hat{SIC24}_t = 140.68 - 3.60\ t + 8.01\ DCUR_t$ (-2.1) (8.5)	0.90	3,057	9	-	0.25 (0.9)	L
$\hat{SIC25}_t = 31.19 + 1.54\ t + 4.71\ DCUR_t$ (2.3) (13.4)	0.95	429	9	-	0.31 (1.2)	L
$\hat{SIC32}_t = 214.90 - 0.63\ t + 5.66\ DCUR_t$ (-0.5) (8.4)	0.89	1,575	9	-	0.23 (0.9)	L
$\hat{SIC33}_t = 584.15 - 12.67\ t + 11.80\ DCUR_t$ (-3.4) (5.5)	0.84	16,379	9	-	0.19 (0.7)	L
$\hat{SIC34}_t = 383.56 + 4.24\ t + 13.09\ DCUR_t$ (1.5) (7.8)	0.87	9,890	9	-	0.19 (0.7)	L
$\hat{SIC35}_t = -357.83 + 49.46\ t + 14.23\ DCUR_t$ (6.0) (2.9)	0.82	85,265	9	-	0.16 (0.6)	H
$\hat{SIC36}_t = 119.02 + 26.39\ t + 13.32\ DCUR_t$ (3.1) (3.3)	0.67	56,312	9	-	0.41 (1.6)	H
$\hat{SIC372\text{-}9}_t = 478.82 + 9.99\ t + 2.88\ DCUR_t$ (1.6) (1.0)	0.26	30,669	9	-	0.38 (1.5)	H
$\hat{SIC371}_t = -131.00 - 1.54\ t + 13.10\ DCUR_t$ (-0.4) (6.6)	0.83	13,747	9	-	0.37 (1.4)	H
$\hat{SIC38}_t = -105.14 + 18.95\ t + 2.24\ DCUR_t$ (8.8) (2.0)	0.90	4,284	9	-	0.32 (1.2)	H
$\hat{SIC39}_t = 240.67 - 1.76\ t + 2.76\ DCUR_t$ (-2.8) (10.5)	0.93	243	9	-	0.49 (2.0)	L

Sources: Computed from data in Tables A-8 and A-11.

Table A-20

REGRESSIONS ON THE RATIO OF REAL NATIONAL INCOME PRODUCED BY NONDURABLE GOODS MANUFACTURING INDUSTRIES TO REAL NATIONAL INCOME, 1948-1982

Regressions	R^2	SSE	DFE	d	$\hat{\rho}$	Class
$\hat{SIC20}_t = 0.02359 - 0.00008\ t$ (-3.9)	0.32	2.4E-5	32	-	0.35 (2.2)	L
$\hat{SIC21}_t = 0.00148 + 0.00002\ t$ (3.7)	0.30	4.8E-7	32	-	0.63 (4.8)	L
$\hat{SIC22}_t = 0.01268 - 0.00020\ t$ (-5.6)	0.50	1.9E-5	32	-	0.70 (5.8)	L
$\hat{SIC23}_t = 0.01100 - 0.00009\ t$ (-4.8)	0.42	2.7E-6	32	-	0.81 (8.1)	L
$\hat{SIC26}_t = 0.00804 + 0.00006\ t$ (6.4)	0.56	6.2E-6	32	-	0.26 (1.6)	L
$\hat{SIC27}_t = 0.01096 + 0.00010\ t$ (8.3)	0.68	5.1E-6	32	-	0.51 (3.5)	L
$\hat{SIC28}_t = 0.01448 + 0.00016\ t$ (7.1)	0.61	1.7E-5	32	-	0.52 (3.6)	H
$\hat{SIC29}_t = 0.00933 + 0.00009\ t$ (1.0)	0.03	6.1E-5	32	-	0.83 (8.7)	L
$\hat{SIC30}_t = 0.00446 + 0.00011\ t$ (10.7)	0.78	5.3E-6	32	-	0.38 (2.4)	L
$\hat{SIC31}_t = 0.00376 - 0.00006\ t$ (-16.3)	0.89	4.3E-7	32	-	0.52 (3.6)	L

Source: Computed from data in Table A-9.

Table A-21

REGRESSIONS ON THE RATIO OF REAL NATIONAL INCOME PRODUCED BY DURABLE GOODS MANUFACTURING INDUSTRIES TO REAL NATIONAL INCOME, 1948-1982

Regressions	R^2	SSE	DFE	d	$\hat{\rho}$	Class
$\hat{SIC24}_t = 0.01026 - 0.00011\ t$ (-3.0)	0.21	2.6E-5	32	-	0.67 (5.3)	L
$\hat{SIC25}_t = 0.00484 - 0.00003\ t$ (-3.6)	0.29	1.5E-6	32	-	0.60 (4.5)	L
$\hat{SIC32}_t = 0.01025 - 0.00007\ t$ (-5.5)	0.48	8.0E-6	32	-	0.40 (2.6)	L
$\hat{SIC33}_t = 0.02625 - 0.00028\ t$ (-5.4)	0.47	1.8E-4	32	-	0.28 (1.7)	L
$\hat{SIC34}_t = 0.02003 - 0.00001\ t$ (-0.2)	0.002	3.3E-5	32	-	0.62 (4.6)	L
$\hat{SIC35}_t = 0.02572 + 0.00018\ t$ (2.4)	0.15	1.2E-4	32	-	0.63 (4.8)	H
$\hat{SIC36}_t = 0.01839 + 0.00020\ t$ (4.4)	0.38	3.9E-5	32	-	0.66 (5.2)	H
$\hat{SIC372\text{-}9}_t = 0.01265 + 0.00010\ t$ (1.0)	0.03	7.2E-5	32	-	0.81 (8.1)	H
$\hat{SIC371}_t = 0.02088 - 0.00015\ t$ (-1.9)	0.10	3.2E-4	32	-	0.37 (2.3)	H
$\hat{SIC38}_t = 0.00533 + 0.00011\ t$ (7.0)	0.60	3.1E-6	32	-	0.72 (6.2)	H
$\hat{SIC39}_t = 0.00612 - 0.00007\ t$ (-7.1)	0.61	2.0E-6	32	-	0.62 (4.6)	L

Source: Computed from data in Table A-10.

Table A-22

REGRESSIONS ON THE RATIO OF REAL NATIONAL INCOME PRODUCED BY NONDURABLE GOODS MANUFACTURING INDUSTRIES TO REAL NATIONAL INCOME, 1970-1982

Regressions	R^2	SSE	DFE	d	$\hat{\rho}$	Class
$\hat{SIC20}_t = 0.02352 - 0.00008\ t$ (-0.9)	0.07	1.4E-5	11	1.63	-	L
$\hat{SIC21}_t = 0.00112 + 0.00003\ t$ (2.9)	0.45	9.8E-8	10	-	0.37 (1.4)	L
$\hat{SIC22}_t = 0.01356 - 0.00021\ t$ (-6.7)	0.80	2.0E-6	11	1.57	-	L
$\hat{SIC23}_t = 0.01467 - 0.00021\ t$ (-10.3)	0.91	8.2E-7	11	1.50	-	L
$\hat{SIC26}_t = 0.00976 - 0.0000006\ t$ (-0.01)	0.00	3.2E-6	10	-	0.25 (0.9)	L
$\hat{SIC27}_t = 0.01280 + 0.00003\ t$ (1.2)	0.11	1.7E-6	11	1.43	-	L
$\hat{SIC28}_t = 0.01800 + 0.00003\ t$ (0.3)	0.01	4.6E-6	10	-	0.56 (2.4)	H
$\hat{SIC29}_t = -0.01140 + 0.00084\ t$ (7.0)	0.82	2.9E-5	11	1.60	-	L
$\hat{SIC30}_t = 0.00656 + 0.00004\ t$ (0.7)	0.05	3.0E-6	10	-	0.23 (0.9)	L
$\hat{SIC31}_t = 0.00360 - 0.00006\ t$ (-6.0)	0.76	1.8E-7	11	1.42	-	L

Source: Computed from data in Table A-9.

Table A-23

REGRESSIONS ON THE RATIO OF REAL NATIONAL INCOME PRODUCED BY DURABLE GOODS MANUFACTURING INDUSTRIES TO REAL NATIONAL INCOME, 1970-1982

Regressions	R^2	SSE	DFE	d	$\hat{\rho}$	Class
$\hat{SIC24}_t = 0.01094 - 0.00011\ t$ (-1.0)	0.09	1.1E-5	10	-	0.41 (1.6)	L
$\hat{SIC25}_t = 0.00530 - 0.00004\ t$ (-2.7)	0.41	5.2E-7	11	1.37	-	L
$\hat{SIC32}_t = 0.01128 - 0.00010\ t$ (-1.7)	0.22	3.9E-6	10	-	0.35 (1.3)	L
$\hat{SIC33}_t = 0.02544 - 0.00024\ t$ (-1.0)	0.09	7.7E-5	10	-	0.19 (0.7)	L
$\hat{SIC34}_t = 0.02138 - 0.00005\ t$ (-0.6)	0.03	8.3E-6	10	-	0.30 (1.1)	L
$\hat{SIC35}_t = 0.01863 + 0.00046\ t$ (4.3)	0.62	2.2E-5	11	1.77	-	H
$\hat{SIC36}_t = 0.02032 + 0.00012\ t$ (1.6)	0.19	1.0E-5	11	1.35	-	H
$\hat{SIC372\text{-}9}_t = 0.01295 + 0.00003\ t$ (0.4)	0.02	5.1E-6	10	-	0.42 (1.6)	H
$\hat{SIC371}_t = 0.03050 - 0.00050\ t$ (-1.4)	0.17	1.2E-4	10	-	0.36 (1.4)	H
$\hat{SIC38}_t = 0.00393 + 0.00015\ t$ (4.6)	0.68	8.6E-7	10	-	0.41 (1.6)	H
$\hat{SIC39}_t = 0.00589 - 0.00005\ t$ (-4.3)	0.63	3.2E-7	11	1.65	-	L

Source: Computed from data in Table A-10.

NOTES

1. The standard industrial classification codes are taken from Executive Office of the President, Office of Management and Budget, Standard Industrial Classification Manual (Washington, D.C.: U.S. Government Printing Office, 1972).

2. For a discussion of the classification of high-tech industries, see Lynn E. Browne, "Can High Tech Save the Great Lakes States?" New England Economic Review, November/December 1983, pp. 20-21.

3. Technically, we are measuring the amount of national income attributed to each industry, without capital consumption allowances, in real terms. The deflators used are taken from the implicit price deflators for major categories of Gross National Product, 1972 = 100. Specifically, the index for durable goods is used for industries in that category and the nondurable goods index is used if the industry is classified as nondurable.

4. For a detailed discussion of the econometric methods used throughout this paper, see the section on methodology in the Appendix.

5. Wesley C. Mitchell, Business Cycles and Unemployment (New York: National Bureau of Economic Research, 1923).

6. The results presented in this section were derived from equation (1) with full-time equivalent employees replacing real income as the dependent variable.

7. Robert F. Dieli, "Employment: One Year Later," Continental Comment, December 30, 1983, p. 1.

8. William H. Miller, "The Phony War Between High Tech and Low Tech," Industry Week, October 3, 1983, p. 39.

9. A similar position has been reached by Robert Z. Lawrence, "Changes in U.S. Industrial Structure: The Role of Global Forces, Secular Trends and Transitory Cycles," in Federal Reserve Bank of Kansas City, Industrial Change and Public Policy, Kansas City, MO, 1984, pp. 29-77.

10. See Murray L. Weidenbaum, The Future of Business Regulation (New York: Amacom, 1980).

11. Murray L. Weidenbaum and Reno Harnish, Government Credit Subsidies for Energy Development (Washington, D.C.: American Enterprise Institute, 1976), pp. 15-17; Arthur Denzau and Clifford Hardin, A National Development Bank: Ghost of the RFC Past (St. Louis: Center for the Study of American Business, Washington University, Formal Publication No. 62, 1984).

12. Miller, op. cit., p. 39.

13. John Holusha, "Deere & Co. Leads the Way in 'Flexible' Manufacturing," Des Moines Register, January 29, 1984, p. 10F.

14. "Excerpts from Soviet Study on the Need for an Overhaul of the Economy," The New York Times, August 5, 1983, p. 4.

15. Ibid.

16. See, for example, Dale G. Bails and Larry C. Peppers, Business Fluctuations: Forecasting Techniques and Applications (Englewood Cliffs, NJ: Prentice-Hall, 1982), Damodar Gujarati, Basic Econometrics (New York: McGraw-Hill, 1978), and G. G. Judge, W. E. Griffiths, R. C. Hill, and T. C. Lee, The Theory and Practice of Econometrics (New York: John Wiley & Sons, 1980).

17. Critical values for the Durbin-Watson d statistic were obtained from N. E. Savin and Kenneth J. White, "The Durbin-Watson Test for Serial Correlation with Extreme Sample Sizes or Many Regressors," Econometrica, November 1977, pp. 1989-1996.

18. For a detailed explanation of this procedure see, SAS Institute, Inc., SAS/ETS User's Guide, 1982 Edition (Cary, N.C.: SAS Institute Inc., 1982), pp. 187-202.