UNITED STATES INTERNATIONAL TRADE COMMISSION

TRANSISTORS AND DIODES: WORKERS AND FORMER WORKERS OF THE SYRACUSE, N.Y., AND AUBURN, N.Y., PLANTS OF GENERAL ELECTRIC CO.

Report to the President
on Investigation No. TEA-W-255
Under Section 301(c)(2) of the Trade Expansion Act of 1962

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UNITED STATES INTERNATIONAL TRADE COMMISSION

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Daniel Minchew

Kenneth R. Mason, Secretary to the Commission

Address all communications to
United States International Trade Commission
Washington, D. C. 20436

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Note.--The whole of the Commission's report to the President may not be made public since it contains certain information that could result in the disclosure of the operations of an individual concern. This published report is the same as the report to the President, except that the above-mentioned information has been omitted. Such omissions are indicated by asterisks.

REPORT TO THE PRESIDENT

U.S. International Trade Commission,
February 7, 1975.

To the President:

In accordance with section 301 of the Trade Expansion Act of 1962 (TEA) (19 U.S.C. 1901), the U.S. International Trade Commission herein reports the results of investigation No. TEA-W-255 made under section 301(c)(2) of the act to determine whether, as a result in major part of concessions granted under trade agreements, articles like or directly competitive with transistors and diodes (of the types provided for in item 687.60 of the Tariff Schedules of the United States (TSUS)) produced by General Electric Co., New York, N.Y., are being imported into the United States in such increased quantities as to cause, or threaten to cause, the unemployment or underemployment of a significant number or proportion of the workers of such firm or an appropriate subdivision thereof.

The investigation was instituted on December 17, 1974, on the basis of a petition for adjustment assistance filed under section 301 (a)(2) of the act on behalf of the workers and former workers of the Syracuse, N.Y., plant of General Electric Co. The petition was received on December 9, 1974.

On January 16, 1975, the U.S. International Trade Commission received a petition for adjustment assistance filed by a union on behalf of the workers and former workers engaged in the manufacture of transistors and diodes at the Auburn, N.Y., plant of General Electric Co.

By letter of January 29, 1975, the Commission notified the representatives of the union petitioning that, in accordance with section 301(c)(2) of the TEA, the Commission's finding in connection with investigation No. TEA-W-255 will apply to all appropriate workers or former workers of General Electric Co. producing transistors and diodes.

Notice of the investigation was published in the Federal Register (39 F. R. 44102) on December 20, 1974. No public hearing was requested, and none was held.

The information in this report was obtained from General Electric Co., other domestic producers, importers, users of the aforementioned articles, trade associations, the petitioners, and the Commission's files.

In 1973 the Commission conducted an investigation (TEA-W-196) under section 301 of the TEA on petition of the workers of the Buffalo, N. Y., plant of General Electric Co., who also produced transistors and diodes. The Commission, being equally divided, made no determination in that investigation. Vice Chairman Parker and Commissioners Moore and Ablondi found in the affirmative; Chairman Bedell and Commissioners Leonard and Young found in the negative. On August 7, 1973, the President announced that he was accepting the finding of the Commissioners voting in the affirmative as the finding of the Commission; the Department of Labor subsequently certified the workers of the Buffalo plant to be eligible for adjustment assistance.

Finding of the Commission

On the basis of its investigation, the Commission finds (Chairman Bedell and Commissioner Leonard dissenting) that articles like or directly competitive with transistors and diodes (of the types provided for in item 687.60 of the Tariff Schedules of the United States) produced by General Electric Co., New York, N. Y., are, as a result in major part of concessions granted under trade agreements, being imported into the United States in such increased quantities as to cause the unemployment or underemployment of a significant number or proportion of the workers of such firm or an appropriate subdivision thereof.

Views of Vice Chairman Parker and
Commissioner Moore 1/

This investigation is in response to a petition filed by the workers and former workers of the Syracuse, N.Y., and Auburn, N.Y., plants of the General Electric Co., in which semiconductors, principally transistors and diodes, are produced, for adjustment assistant under the provisions of the Trade Expansion Act of 1962.

The facts in this case are virtually the same as those in an earlier investigation involving workers of the General Electric Co. plant at Buffalo, N.Y., wherein we made an affirmative determination. 2/

The facts in the instant case reveal that imports of semiconductors have increased. Substantially all of such articles produced by the General Electric Co. at its Dundalk, Ireland, plant are exported to the United States and such imports have further increased since 1972. In addition, imports have been entered from General Electric's new plant in Singapore since * * *. As a result, a significant proportion of the workers of the firm's remaining two plants producing transistors and diodes in Syracuse, N.Y., and Auburn, N.Y., have become unemployed or are threatened with unemployment.

1/ Commissioners Ablondi and Minchew concur in the result.

2/ In June 1973 the Commission reported on the results of its investigation concerning the petition for adjustment assistance filed on behalf of the former workers of the the Buffalo, N.Y., plant of the General Electric Co. (Transistors and Diodes: Workers of the Buffalo, N.Y., Plant of General Electric Co., . . . Investigation No. TEA-W-196 . . ., TC Publication 588, June 1973.)

The Trade Expansion Act of 1962 establishes four criteria to be met in order for an affirmative determination to be made in a worker case. These criteria are as follows:

(1) An article like or directly competitive with an article produced by the workers concerned must be imported in increased quantities;

(2) The increased imports must be a result in major part of concessions granted under trade agreements;

(3) A significant number or proportion of the workers concerned must be unemployed or underemployed or threatened with unemployment or underemployment; and

(4) The increased imports resulting in major part from trade-agreement concessions must be the major factor causing or threatening to cause the unemployment or underemployment.

Increased imports

It is evident from the facts before us that the first criterion of the statute has been satisfied. Semiconductors like or directly competitive with those produced by the General Electric Co. at its Syracuse and Auburn plants are being imported in increased quantities. Total U.S. imports of semiconductors rose from 1.5 billion units in 1969 to 4.7 billion units in 1973. In January-September 1974, 4.6 billion units units were imported, compared with 3.3 billion units in the corresponding period of 1973. In 1969 such imports supplied 35 percent of U.S. apparent consumption; in January-September 1974 they supplied an estimated 63 percent.

Imports by the General Electric Co. rose from * * * units in 1969 to * * * units in 1973, a * * * increase over 1969. In January-September 1974, imports of semiconductors by the General Electric Co. were * * * than during the corresponding period of 1973. As imports of semiconductors by the General Electric Co. from its plants in Ireland and Singapore increased, its shipments of domestically produced semiconductors decreased. In 1969, the latter accounted for * * * of the quantity of total shipments by General Electric of both domestically produced and imported semiconductors; in 1973, domestically produced semiconductors accounted for * * * percent of such total shipments.

In major part

The criterion that increased imports must be a result in major part of concessions granted under trade agreements has also been met. Between 1930 and 1972 the rate of duty on semiconductors has been reduced progressively from 35 percent ad valorem to 6 percent ad valorem. Immediately prior to the Kennedy Round of trade concessions, the rate of duty on semiconductors was 12.5 percent ad valorem. As a result of the Kennedy Round, the applicable rate was reduced to 6 percent ad valorem by 1972.

A large proportion of the semiconductors imported are entered under TSUS items 806.30 and 807.00, which afford a duty exemption on the value of the U.S. components returned to the United States in the imported articles. The General Electric Co. has availed itself of this benefit in its importation of semiconductors. However, during

1969-73, the value of U.S. goods returned as parts of semiconductors imported by the General Electric Co., as a proportion of the total value of its imports, * * *. * * * of the total value of General Electric's imports benefited from the duty reductions resulting from trade-agreement concessions.

As in the earlier investigation, the Commission obtained cost data on identical transistors and diodes produced in the United States and in foreign plants. Comparing the amount of duty saved as a result of the reductions in the rate of duty on semiconductors from 35 percent ad valorem to 6 percent ad valorem, the amount of such savings was larger than most of the individual cost advantages derived from producing such semiconductors in foreign plants.

The reductions in the rate of duty pursuant to the Kennedy Round were an obvious recent inducement to the importation of semiconductors. The continued reductions in the duty plus the assurance that it would not be raised have, we believe, been significant factors in encouraging investment abroad and the shifting of production of transistors and diodes to foreign plants. Consequently, it is our view that imports would not have increased to their present level except for trade-agreement concessions.

Unemployment

The third criterion has also been satisfied. During the period 1969-74, the aggregate number of workers employed in the production of transistors and diodes in the Syracuse and Auburn plants fluctuated.

However, by 1974 there were on the average * * * fewer production workers employed in the two plants combined than there were in 1969. Officials of the General Electric Co. indicated that * * * further layoffs had occurred.

Major factor

The final criterion under the statute for an affirmative determination is that the imports resulting in major part from tariff concessions must be the major factor causing, or threatening to cause, the unemployment or underemployment of the workers concerned. This requirement is satisfied if, in the absence of increased imports of the articles concerned, the unemployment, or threat thereof, would not have occurred. The increased imports of transistors and diodes from General Electric's plants in Ireland and Singapore, accompanied by the increase in imports from other sources, are the major factor causing, or threatening to cause, the unemployment of the workers at the Syracuse, N.Y., and the Auburn, N.Y., plants of General Electric. The substantial reduction in the duty on semiconductors with the assurances not to increase such duty and the advantages afforded thereby to produce and import from plants located abroad encouraged General Electric to shift * * * portion of its output of semiconductors overseas, resulting in the reduction of employment of the workers at the Syracuse and Auburn plants.

It is clear, therefore, that increased imports, in major part the result of trade-agreement concessions, were the major factor causing the unemployment of the workers in question.

Conclusion

As all four requirements of the statute have been met, we have made an affirmative determination.

View of Chairman Bedell

In the case of the workers of the Buffalo, N. Y., plant of the General Electric Co., 1/ I concurred in the determination of the Commissioners voting in the negative. On the basis of the information obtained in the instant investigation, I have again concluded that articles like or directly competitive with transistors and diodes (of the types provided for in item 687.60 of the Tariff Schedules of the United States) produced by the General Electric Co. are not, as a result in major part of concessions granted under trade agreements, being imported into the United States in such increased quantities as to cause, or threaten to cause, unemployment or underemployment of a significant number or proportion of the workers of the firm or an appropriate subdivision thereof.

1/ Transistors and Diodes: Workers of the Buffalo, N.Y., Plant of General Electric Co., . . . Investigation No. TEA-W-196 . . ., TC Publication 588, June 1973.

View of Commissioner Leonard

My determination in the instant case is negative because one of the statutory criteria has not been met, i.e., that the increase in imports of articles like of directly competitive with transistors and diodes produced by General Electric Co., New York, N.Y., is the result in major part of concessions granted under trade agreements. My reasoning in support of this determination is set forth in a statement of my views in an earlier Commission investigation under the Trade Expansion Act. 1/

1/ Transistors and Diodes: Workers of the Buffalo, N.Y., Plant of General Electric Co., . . . Investigation No. TEA-W-196 . . ., TC Publication 588, June 1973, pp. 10-12.

INFORMATION OBTAINED IN THE INVESTIGATION

Description and Uses

The Syracuse and Auburn plants of General Electric Co. produce various types of transistors and diodes (including rectifiers and thyristors), which are articles classified as active semiconductors, and also produce wafers and pellets, which are parts of semiconductors, for domestic consumption and export to foreign General Electric semiconductor plants. Semiconductors are devices which allow current flow through a solid rather than than a vacuum or gas. Silicon and germanium are the most commonly used materials in the production of semiconductors. To produce an active semiconductor device, an impurity or dopant is introduced into the semiconductor material to provide the desired characteristic of the semiconductor such as the capability to amplify, rectify, or detect an electrical or electronic signal.

The three major types of active semiconductors are transistors, integrated circuits, and diodes (including rectifiers and thyristors). Diodes are two-electrode, single-function devices, which are utilized in signal sensing and in the highly efficient conversion of alternating current to direct current. Thyristors are three-electrode, solid-state devices commonly called silicon-controlled rectifiers or triacs.

A transistor is most often a three-electrode device which can perform most functions of a diode but is frequently used for signal amplification. The base electrode controls the electron flow in the device in much the same manner as the control grid does in a vacuum tube. Integrated circuits, which include small-, medium-, and large-scale

integration arrays, may consist of both active and passive components integrated on a single substrate. Integrated circuits may function as, or include the functions of, hundreds of transistors, diodes, resistors, capacitors, and inductors.

Semiconductor diodes and transistors have displaced vacuum tubes in many applications. However, vacuum-tube diodes and receiving tubes continue to be used, largely in high-current or high voltage circuits and as replacements in previously produced equipment utilizing vacuum tubes.

Semiconductors are widely used in consumer electronic products, data-processing equipment, communications equipment, and industrial equipment and controls.

U.S. Tariff Treatment

Transistors and diodes, as well as other semiconductors and receiving tubes, were not specifically provided for in the Tariff Act of 1930. They were dutiable, however, under paragraph 353 at 35 percent ad valorem as ". . . articles suitable for producing, rectifying, modifying, controlling, or distributing electrical energy. . . ." 1/ Under the TSUS, effective August 31, 1963, they were made dutiable under item 687.60 at the then existing rate of 12.5 percent ad valorem. Since January 1, 1972, the applicable rate has been 6 percent ad valorem. The rate history is shown in the following table.

1/ Language excerpted from the Tariff Act of 1930. Transistors and diodes had not been invented when this language was adopted.

Transistors and diodes and other semiconductor devices and receiving tubes: U.S. rates of duty, June 18, 1930-Jan. 1, 1972

Effective date	Rate of duty	Authority
	Percent ad valorem	
June 18, 1930	35	Tariff Act of 1930.
Jan. 1, 1939	25	Bilateral agreement with the United Kingdom.
Jan. 1, 1948	15	GATT 1/ concession.
June 6, 1951	12.5	Do.
Aug. 31, 1963	12.5	Tariff Classification Act of 1962.
Jan. 1, 1968	11	GATT 1/ concession.
Jan. 1, 1969	10	Do.
Jan. 1, 1970	8.5	Do.
Jan. 1, 1971	7	Do.
Jan. 1, 1972	6	Do.

1/ General Agreement on Tariffs and Trade.

Semiconductors are also entered under items 806.30 and 807.00. Item 806.30 provides for imports of certain metal articles which were previously processed in the United States and then exported for further processing. Article 807.00 provides for imported articles assembled in whole or in part of U.S.-fabricated components. Imports qualifying under those provisions, which have never been the subject of trade-agreement concessions, are dutiable, in effect, only to the extent of the value added abroad.

The tariff reductions on certain consumer electronic products in which semiconductors are used are shown in table 1 of appendix A.

U.S. Producers

The number of U.S. producers of transistors and diodes has generally declined since 1966. The number of U.S. manufacturers

(with annual shipments valued at $100,000 or more) producing silicon transistors declined from 30 in 1967 to 24 in 1972; 1/ producers of germanium transistors declined from 17 to 11; producers of silicon diodes, from 34 to 22; and producers of germanium diodes, from 12 to 5. All the firms produced more than one of the products, so that the total number of firms involved declined from about 35 to about 24. The number of producers of integrated circuits (with annual shipments valued at $100,000 or more) has remained at approximately 30 since 1967. Many manufacturers of integrated circuits also produce transistors and diodes. Six firms produced receiving tubes from 1967 to 1971, but this total was reduced to five in 1972. In 1974 there were only three significant domestic manufacturers of receiving tubes.

U.S. producers of semiconductors have effected rapid technological changes in the years since the transistor was first demonstrated in 1947. Many firms entered and many firms left the semiconductor industry as new products and new techniques were discovered.

Most large U.S. producers are multinational firms with plants and offices in developed and less developed areas. A large share of the necessary manual assembly work is accomplished by subsidiaries of the U.S. producers situated in the Republic of China, Republic of Korea, Hong Kong, Singapore, Mexico, and Ireland.

1/ Available data on U.S. producers of semiconductors are contained in U.S. Department of Commerce, Current Industrial Reports, through 1972, the last year these data are available.

U. S. Consumption and Trade

Semiconductors

Apparent U. S. consumption of semiconductors has increased markedly in recent years, but the growth has not been steady. Consumption of such articles, which amounted to 4. 4 billion units in 1969, declined to about 4. 0 billion units in 1970 and 1971 but then increased sharply to 8. 2 billion units in 1973 (table 2). The value of apparent U. S. consumption of semiconductors followed about the same pattern; it rose from $1. 1 billion in 1969 to $1. 8 billion in 1973. During January-September 1974, apparent U. S. consumption reached 7. 3 billion units, valued at $1. 8 billion, compared with 6. 0 billion units, valued at $1. 4 billion, during the corresponding 1973 period. The average unit value rose from 25 cents in 1969 to 30 cents in 1970, but fell to 22 cents in 1973. The consumption of end products utilizing semiconductors increased from $28. 2 billion in 1969 to $31. 6 billion in 1973. 1/ In the first three quarters of 1974, U. S. demand for semiconductors was still strong. However, beginning in the third quarter and continuing through the fourth quarter, the semiconductor market saw a significant downward shift in demand resulting in mass worldwide layoffs and rising idle plant capacities. The decline in demand for semiconductors resulted from a marked decline in the demand for consumer products using semiconductors. The demand for semiconductors continued to be soft at the beginning of 1975, and most industry analysts do not see an upswing until the

1/ Electronic Industries Association, 1974 Electronic Market Data Book, p. 2.

fourth quarter. Appendix B, which is a reprint from the Wall Street Journal dated January 9, 1975, reports further on the current and future prospects for the U.S. semiconductor industry.

Annual shipments of semiconductors by U.S. producers have followed generally the same trend as U.S. consumption of these articles. The volume of shipments declined from 3.4 billion units in 1969 to 2.8 billion units in 1971, but then rose to an estimated 4.3 billion units in 1973. The value of shipments was stable in 1969-71, amounting to $1.2 billion annually, but rose to an estimated $1.7 billion in 1973. U.S. imports of semiconductors were stable in 1969-71 (when U.S. consumption and shipments by producers declined), and then rose at a faster rate than shipments by producers in 1972 and 1973. Imports amounted to 1.5 billion units in each of the years 1969-71, then rose to 4.7 billion units in 1973. Imports in January-September 1974 nearly equaled the volume for all of 1973. Imports increased steadily in value--from $104 million in 1969 to $586 million in 1973 and $722 million in January-September 1974, compared with $417 million during the corresponding 1973 period. The ratio of imports to consumption rose steadily every year from 1969 through 1973; it increased from 35 percent in 1969 to 57 percent in 1973 in terms of volume, and from 9 percent in 1969, to 32 percent in 1973 in terms of value. This trend continued for the first three quarters of 1974. Changes in the rates of duty and the total value of imports of semiconductors in 1964-73 and January-September 1974 are shown in table 3.

U.S. exports of semiconductors increased from 497 million units, valued at $211 million, in 1969 to 545 million units, valued at $246 million, in 1970, decreased to 331 million units, valued at $191 million, in 1971, and then steadily increased to 780 million units, valued at $417 million, in 1973. U.S. exports were 704 million units, valued at $439 million, in January-September 1974 compared with 554 million units, valued at $294 million, during the corresponding period of 1973.

As noted above, semiconductors consist of three major product areas--transistors, integrated circuits, and diodes (including rectifiers and thyristors). Changes occur in the three product areas as new products and technological improvements of existing products result in the substitution of one type of semiconductor for another. Recently, integrated circuits have been used more and more widely in place of transistors and diodes. The effect of this substitution is compounded because a single integrated circuit may substitute for hundreds of transistors and diodes, as well as large quantities of passive components such as resistors, capacitors, and inductors. The substitution factor has become greater since 1968 with the introduction of more sophisticated integrated circuits such as meduim-scale integration arrays and large-scale integration arrays having progressively larger substitution factors.

Although the average unit value of U.S. producers' shipments of semiconductors increased from 36 cents in 1969 to 39 cents in 1973, the average unit value of each of the individual areas declined or remained constant. The apparent anomaly is explained by the increased share of consumption accounted for by integrated circuits. Although the average

unit value of integrated circuits has declined, this average unit value is higher than those of transistors and diodes. Integrated circuits accounted for 38 percent of the value of producers' shipments in 1969 but had increased to 50 percent in 1973; the unit value fell from $1.65 in 1969 to $1.16 in 1973, even though (as indicated above) the complexity of integrated circuits has increased over the same period.

The great bulk of U.S. imports of semiconductors in recent years were classified under TSUS items 806.30 and 807.00 and were entered by a few U.S. firms, principally Texas Instruments, Fairchild, and Motorola. Except for a small decrease in quantity in 1970 and 1971, such imports increased both in quantity and in value in 1969-72, rising from 1.4 billion units, valued at $87 million, to 3.5 billion units, valued at $408 million (table 4). However, the ratio of these imports to total U.S. imports has decreased in both quantity and value each year during 1969-73 except in 1970, when there was a slight increase. Duty-exempt components in these imports increased, in terms of value, from $51 million in 1969 to $184 million in 1973 (table 5). However, the ratio of the the value of duty-exempt U.S. components to the total value of imports under TSUS item 806.30 and 807.00 decreased from 58 percent in 1969 to 45 percent in 1973.

It is believed that imports of wafers and pellets are negligible or nil. It is normal practice for multinational U.S. semiconductor manufacturers to export these articles to be incorporated in finished semiconductors abroad.

Transistors.--Apparent U.S. consumption of transistors declined from 1.6 billion units valued at $436 million, in 1969 to 1.4 billion units, valued at $373 million, in 1971 and then rose to 3.2 billion units, valued at $551 million, in 1973 (table 6). Apparent U.S. consumption of transistors was 2.9 billion units, valued $529 million, in January-September 1974, compared with 2.4 billion units, valued at $410 million, in the corresponding period of 1973. The value of U.S. imports was stable at about $60 million in 1969-71 but then increased to $160 million in 1973.

The ratio of imports to consumption, in terms of quantity, declined from 44 percent in 1969 to 40 percent in 1971, and then rose to 64 percent in 1973; it was 65 percent in January-September 1974, compared with 63 percent in the corresponding period of 1973. In terms of value, the ratio increased steadily from 14 percent in 1969 to 29 percent in 1973; in January-September 1974, it was 35 percent, compared with 28 percent in the corresponding period of 1973.

U.S. exports of transistors, in terms of quantity, decreased from 280 million units in 1969 to 140 million units in 1971 and then increased to 351 million units in 1973. Exports were 254 million units in January-September 1974, compared with 252 million units in the corresponding period of 1973. In terms of value, these exports increased from $83 million in 1969 to $89 million in 1970, decreased to $50 million in 1971, and then increased to $95 million in 1973. Exports were $84 million in January-September 1974, compared with $68 million in the corresponding period of 1973.

Silicon transistors constitute the bulk of apparent U.S. consumption of transistors. According to statistics supplied by the Electronic Industries Association, sales of silicon transistors in 1972 accounted for 95 percent of the quantity and 90 percent of the value of total factory sales of transistors. Sales of silicon transistors surpassed those of germanium transistors in 1964 and 1965, and the share of sales represented by the germanium units has declined progressively since then.

Diodes.--Apparent U.S. consumption of diodes (including rectifiers and thyristors) decreased from 2.2 billion units, valued at $272 million, in 1970 to 1.9 billion units, valued at $217 million, in 1971 then rose to 2.4 billion units, valued at $260 million, in 1972 and reached 3.4 billion units, valued at $317 million, in 1973 (table 7). Apparent U.S. consumption of diodes was 2.9 billion units, valued at $272 million, in January-September 1974, compared with 2.5 billion units, valued at $239 million, in the corresponding period of 1973. U.S. producers' shipments followed about the same trend as consumption; imports, however, increased steadily from 614 million units, valued at $28 million, in 1970 to 1.6 billion units, valued at $69 million, in 1973. Imports were 1.5 billion units, valued at $68 million, in January-September 1974, compared with 1.1 billion units, valued at $49 million, in the corresponding period of 1973. The ratio of imports to apparent consumption increased steadily, in terms of quantity, from 28 percent in 1969 to 46 percent in 1973. This ratio was 51 percent in January-September 1974, compared with 44 percent in the corresponding period of 1973. U.S. exports of diodes

increased from 162 million units, valued at $56 million, in 1969 to 229 million units, valued at $57 million, in 1970, decreased to 138 million units, valued at $50 million, in 1971, and increased to $254 million units, valued at $105 million, in 1973. Exports were 255 million units, valued at $102 million, in January-September 1974, compared with 178 million units, valued at $74 million in the corresponding period of 1973. Silicon diodes have constituted the bulk of apparent U.S. consumption of diodes since 1967. According to the Electronic Industries Association, in 1972 (the last year for which statistics are available) silicon diodes accounted for approximately 90 percent of both the quantity and the value of the entire diode market.

Integrated circuits.--Apparent U.S. consumption of integrated circuits rose steadily from 474 million units, valued at $434 million, in 1970 to 1.7 billion units, valued at $990 million, in 1973 (table 8). The increase, in terms of value, amounted to $556 million, compared with an increase of only $188 million in the total apparent consumption of diodes and transistors in 1970-73. U.S. producers' shipments of integrated circuits increased steadily each year from 278 million units, valued at $459 million, in 1969 to 734 million units, valued at $851 million in 1973. Shipments were 651 million units, valued at $768 million, in January-September 1974, compared with 550 million units, valued at $638 million, in the corresponding period of 1973. Imports followed the same trend, having reached a level of 1.1 billion units, valued at $357 million, in 1973, compared with 249 million units, valued at $69 million in 1970. Imports were 1.2 billion units, valued at $471 million,

in January-September 1974, compared with 773 million units, valued at $254 million, in the corresponding period of 1973. U.S. exports of integrated circuits increased from 55 million units, valued at $72 million, in 1969 to 174 million units, valued at $218 million, in 1973. Exports were 195 million units, valued at $252 million, in January-September 1974, compared with 120 million units, valued at $147 million, in the corresponding period of 1973. Monolithic analog and digital integrated circuits account for the largest share of the integrated circuit market. Thin-film and thick-film circuits account for only a small percentage of the market.

Receiving tubes

Caught in a technological squeeze with semiconductors, receiving tubes declined in use; apparent U.S. consumption of receiving tubes declined steadily from 269 million units, valued at $230 million, in 1969 to 159 million units, valued at $158 million, in 1973 (table 9). The volume of U.S. imports of receiving tubes declined over the same period from 49 million units to 35 million units, but the value increased from $18 million to $19 million. In addition, imports accounted for an increasing share of U.S. consumption, rising from 18 percent of volume and 8 percent of value in 1969 to 22 percent of volume and 12 percent of value in 1973.

Consumption of receiving tubes has declined since 1966 as solid-state television receivers have become increasingly popular. As semiconductors have been improved for use in higher voltage and power applications, there have been fewer uses for receiving tubes.

Electronic end products

Most electronic end products utilize semiconductors. Many consumer electronic products, such as television sets, radio receivers, and tape recorders, are imported in large quantities, as shown in tables 10 through 12.

General Electric Co.

General Electric Co. (GE), with headquarters in New York City, is a large multinational, multiproduct firm with numerous establishments in the United States and foreign countries. International sales account for approximately 18 percent of its total sales of products and services, which in 1973 amounted to nearly $12 billion, more than double the 1963 figure. In 1973 GE was number 5 on Fortune magazine's directory of the 500 largest industrial firms. Its worldwide employment had reached 388,000 in 1973.

GE is organized into 10 operational groups. The group concerned with the articles in this investigation is the Components and Materials Group, which in turn is subdivided into six operating units; the Electronic Components Division, the Medical Systems Division, the Appliance Components Division, the Chemical and Metallurgical Division, the Plastics Division, and International Projects. A simplified organizational chart of GE is shown on page A-14.

A-14 through A-45

* * * * * * *

APPENDIX A

STATISTICAL APPENDIX

Table 1.--Certain consumer electronic products: Effective dates of U.S. rates of duty, June 18, 1930-Jan. 1, 1972

(In percent ad valorem)

Effective date	Television receivers (TSUS item 685.20)	Radio receivers		Tape recorders and parts 1/ (TSUS item 685.40)	Tape players and parts 1/ (TSUS item 678.50)
		Solid-state (TSUS item 685.23)	Tube-type (TSUS item 685.25)		
June 18, 1930---	35	35		35	35
Jan. 1, 1939---	25	25		27.5	25
Jan. 1, 1948---	15	15		15	15
June 6, 1951---	12.5	12.5		13.75	13.75
June 30, 1956---	11.5	12.5		13.75	13.75
June 30, 1957---	11	12.5		13.75	13.75
June 30, 1958---	10.5	12.5		13.75	13.75
July 1, 1962---	10	12.5		12.5	12.5
July 1, 1963---	10	12.5		11.5	11.5
Aug. 31, 1963---	10	12.5		11.5	2/ 10
Jan. 1, 1968---	9	12	11	10	9
Jan. 1, 1969---	8	11.5	10	9	8
Jan. 1, 1970---	7	11	8.5	8	7
Jan. 1, 1971---	6	10.4	7	6.5	6
Jan. 1, 1972---	5	10.4	6	5.5	5

1/ Parts of tape recorders and tape players include tape decks that are parts of the respective items.

2/ This rate was a result of combining several different rates.

Table 2.--Semiconductors: U.S. producers' shipments, imports for consumption, exports of domestic merchandise, and apparent consumption, 1969-73, January-September 1973, and January-September 1974

(Quantity in millions of units; value in millions of dollars)

Period	Shipments	Imports	Exports	Apparent consumption	Ratio (percent) of imports to consumption
	Quantity				
1969	3,386.5	1,534.4	497.1	4,423.8	34.7
1970	3,126.0	1,464.8	544.7	4,046.1	36.2
1971	2,773.1	1,516.4	331.3	3,958.2	38.3
1972	1/ 3,533.2	2,979.4	468.6	1/ 6,044.0	1/ 49.3
1973	1/ 4,276.4	4,713.9	779.5	1/ 8,210.8	1/ 57.4
January-September--					
1973	1/ 3,207.3	3,343.0	554.2	1/ 5,996.1	1/ 55.8
1974	1/ 3,435.3	4,577.3	2/ 704.0	1/ 7,308.6	1/ 62.6
	Value				
1969	1,223.1	104.3	211.0	1,116.4	9.3
1970	1,202.2	157.1	246.0	1,113.3	14.1
1971	1,189.2	179.1	191.2	1,177.1	15.2
1972	1/ 1,394.6	316.4	229.5	1/ 1,481.5	1/ 21.4
1973	1/ 1,667.8	586.0	417.1	1/ 1,836.7	1/ 31.9
January-September--					
1973	1/ 1,250.9	416.9	293.5	1/ 1,374.3	1/ 30.3
1974	1/ 1,477.2	721.5	2/ 438.8	1/ 1,759.9	1/ 41.0
	Unit value				
1969	$0.36	$0.07	$0.42	$0.25	3/
1970	.38	.11	.45	.28	3/
1971	.43	.12	.58	.30	3/
1972	1/ .39	.11	.49	1/ .25	3/
1973	1/ .39	.12	.54	1/ .22	3/
January-September--					
1973	1/ .39	.12	.53	1/ .23	3/
1974	1/ .43	.16	2/ .62	1/ .24	3/

1/ Estimated by the U.S. International Trade Commission.
2/ Data are available for January-August 1974; September data estimated by the U.S. International Trade Commission.
3/ Not applicable.

Source: Compiled from official statistics of the U.S. Department of Commerce, except as noted.

Table 3.--Semiconductors: U.S. rates of duty and imports for consumption, 1964-73 and January-September 1974

Period	Rate of duty	Imports					
		Transistors	Diodes	Rectifiers and thyristors	Integrated circuits	Other	Total
	Percent ad valorem	Million dollars	Million dollars	Million dollars	Million dollars	Million dollars	Million dollars
1964	12.5	5.6	1/	1/	1/	2/ 2.8	8.4
1965	12.5	15.1	1/	1/	1/	2/ 9.3	24.4
1966	12.5	28.7	1/	1/	1/	2/ 13.6	42.3
1967	12.5	26.7	1/	1/	1/	2/ 16.7	43.4
1968	11	44.7	1/	1/	1/	2/ 26.8	71.5
1969	10	59.0	1/	1/	1/	2/ 45.3	104.3
1970	8.5	59.8	1/	1/	69.4	3/ 27.9	157.1
1971	7	60.4	1/	1/	94.2	3/ 24.5	179.1
1972	6	100.1	20.6	8.5	180.5	6.7	316.4
1973	6	159.8	40.3	14.4	356.9	14.6	586.0
1974 (Jan.-Sept.)	6	182.7	39.2	14.4	470.6	14.6	721.5

1/ Included with data on "other" semiconductors.
2/ Includes data on diodes, rectifiers and thyristors, and integrated circuits.
3/ Includes data on diodes, and rectifiers and thyristors.

Source: Compiled from official statistics of the U.S. Department of Commerce.

Table 4.--Semiconductors: U.S. imports under TSUS items 806.30 and 807.00, by types, 1969-73 and January-September 1974

Type	1969	1970	1971	1972	1973	Jan.-Sept. 1974
	Quantity (million units)					
Integrated circuits	1/	240.5	275.0	538.7	697.2	823.8
Transistors	646.3	548.1	481.7	1,223.3	1,529.1	1,205.1
Diodes	1/	1/	1/	577.1	970.8	879.2
Rectifiers	1/	1/	1/	2/ 72.2	2/ 164.6	2/ 166.8
Thyristors	1/	1/	1/	3/	3/	3/
Other	4/ 718.2	5/ 529.9	5/ 517.7	86.9	102.0	127.2
Total	1,364.5	1,318.5	1,274.5	2,498.2	3,463.7	3,202.1
	Value (million dollars)					
Integrated circuits	1/	65.8	82.6	143.0	249.3	345.2
Transistors	50.7	53.1	52.8	81.8	116.1	134.5
Diodes	1/	1/	1/	12.6	23.0	26.1
Rectifiers	1/	1/	1/	2/ 7.5	2/ 11.0	2/ 10.9
Thyristors	1/	1/	1/	3/	3/	3/
Other	4/ 36.6	5/ 20.2	5/ 16.8	4.4	8.2	8.9
Total	87.3	139.1	152.2	249.4	407.6	525.6
	Unit value					
Integrated circuits	1/	$0.27	$0.30	$0.27	$0.36	$0.42
Transistors	$0.08	.10	.11	.07	.08	.11
Diodes	1/	1/	1/	.02	.02	.03
Rectifiers	1/	1/	1/	2/ .10	2/ .07	2/ .07
Thyristors	1/	1/	1/	3/	3/	3/
Other	4/ .05	5/ .04	5/ .03	.05	.08	.07
Average	.06	.11	.12	.12	.12	.16

1/ Included with data on "other" semiconductors.
2/ Includes data on thyristors.
3/ Included with data on rectifiers.
4/ Includes data on integrated circuits, diodes, rectifiers, and thyristors. The total value of integrated circuits entered under TSUS item 806.30 was approximately $20.3 million, which is not included.
5/ Includes data on diodes, rectifiers, and thyristors.

Source: Compiled from official statistics of the U.S. Department of Commerce.

Note.--Because of rounding, figures may not add to the totals shown.

Table 5.--Semiconductors: Value of duty-exempt U.S. components contained in semiconductors imported under TSUS items 806.30 and 807.00, by types, 1969-73 and January-September 1974

(In millions of dollars)

Type	1969	1970	1971	1972	1973	Jan.-Sept. 1974
Integrated circuits	1/	38.8	44.6	77.2	115.7	160.5
Transistors	27.4	29.2	27.5	38.4	53.3	59.9
Diodes	1/	1/	1/	6.4	9.6	13.0
Rectifiers	1/	1/	1/	2/ 2.3	2/ 2.9	2/ 2.9
Thyristors	1/	1/	1/	3/	3/	3/
Other	4/ 23.4	5/ 10.5	5/ 9.1	2.6	2.9	2.6
Total	50.8	78.5	81.2	126.9	184.4	238.9

1/ Included with data on "other" semiconductors.
2/ Includes data on thyristors.
3/ Included with data on rectifiers.
4/ Includes data on integrated circuits, diodes, rectifiers, and thyristors.
5/ Includes data on diodes, rectifiers, and thyristors.

Source: Compiled from official statistics of the U.S. Department of Commerce.

Table 6.--Transistors: U.S. producers' shipments, imports for consumption, exports of domestic merchandise, and apparent consumption, 1969-73, January-September 1973, and January-September 1974

(Quantity in millions of units; value in millions of dollars)

Period	Shipments	Imports	Exports	Apparent consumption	Ratio (percent) of imports to consumption
	Quantity				
1969	1,192.3	701.4	280.2	1,613.5	43.5
1970	1,064.4	602.3	249.5	1,417.2	42.5
1971	997.1	559.8	139.6	1,417.3	39.5
1972	1,259.0	1,408.3	212.3	2,455.0	57.4
1973	1/ 1,517.5	2,038.3	351.2	1/ 3,204.6	1/ 63.6
Jan.-Sept.--					
1973	1/ 1,138.1	1,484.0	251.5	1/ 2,370.6	1/ 62.6
1974	1/ 1,265.1	1,839.3	2/ 254.1	1/ 2,850.3	1/ 64.5
	Value				
1969	460.5	59.0	83.1	436.4	13.5
1970	435.8	59.8	88.9	406.7	14.7
1971	363.1	60.4	50.3	373.2	16.2
1972	406.1	100.1	61.3	444.9	22.5
1973	1/ 485.4	159.8	94.6	1/ 550.6	1/ 29.0
Jan.-Sept.--					
1973	1/ 364.1	113.4	67.9	1/ 409.6	1/ 27.7
1974	1/ 430.1	182.7	2/ 84.1	1/ 528.7	1/ 34.6
	Unit value				
1969	$0.39	$0.08	$0.30	$0.27	3/
1970	.41	.10	.36	.29	3/
1971	.36	.11	.36	.26	3/
1972	.32	.07	.29	.18	3/
1973	1/ .32	.08	.27	1/ .17	3/
Jan.-Sept.--					
1973	1/ .32	.08	.27	1/ .17	3/
1974	1/ .34	.10	2/ .33	1/ .19	3/

1/ Estimated by the U.S. International Trade Commission.

2/ Data are available for January-August 1974; September data estimated by the U.S. International Trade Commission.

3/ Not applicable.

Source: Compiled from official statistics of the U.S. Department of Commerce, except as noted.

Table 7.--Diodes: 1/ U.S. producers' shipments, imports for consumption, exports of domestic merchandise, and apparent consumption, 1969-73, January-September 1973, and January-September 1974

(Quantity in millions of units; value in millions of dollars)

Period	Shipments	Imports	Exports	Apparent consumption	Ratio (percent) of imports to consumption
	Quantity				
1969	1,915.6	2/	162.0	2/	2/
1970	1,769.9	613.8	229.2	2,154.5	28.5
1971	1,369.9	633.1	137.5	1,865.5	33.9
1972	1,669.8	901.2	163.8	2,407.2	37.4
1973	3/ 2,071.0	1,579.2	254.0	3/ 3,396.2	3/ 46.5
January-September--					
1973	3/ 1,553.3	1,086.3	177.7	3/ 2,461.9	3/ 44.1
1974	3/ 1,701.8	1,498.9	4/ 254.5	3/ 2,946.2	3/ 50.9
	Value				
1969	303.9	2/	55.5	2/	2/
1970	301.8	27.9	57.3	272.4	10.2
1971	242.4	24.5	49.6	217.3	11.3
1972	289.2	35.8	64.7	260.3	13.7
1973	3/ 352.1	69.3	104.8	3/ 316.6	3/ 21.9
January-September--					
1973	3/ 264.1	49.1	74.1	3/ 239.1	3/ 20.5
1974	3/ 306.3	68.2	4/ 102.3	3/ 272.2	3/ 25.1
	Unit value				
1969	$0.16	2/	$0.34	2/	5/
1970	.17	$0.05	.25	$0.13	5/
1971	.18	.04	.36	.12	5/
1972	.17	.04	.39	.11	5/
1973	3/ .17	.04	.41	3/ .09	5/
January-September--					
1973	3/ .17	.05	.42	3/ .10	5/
1974	3/ .18	.05	4/ .40	3/ .09	5/

1/ Data on diodes include data on all semiconductors except transistors and integrated circuits. Separate data are not available.

2/ Not available.

3/ Estimated by the U.S. International Trade Commission.

4/ Data are available for January-August 1974; September data estimated by the U.S. International Trade Commission.

5/ Not applicable.

Source: Compiled from official statistics of the U.S. Department of

Table 8.--Integrated circuits: U.S. producers' shipments, imports for consumption, exports of domestic merchandise, and apparent consumption, 1969-73, January-September 1973, and January-September 1974

(Quantity in millions of units; value in millions of dollars)

Period	Shipments	Imports	Exports	Apparent consumption	Ratio (percent) of imports to consumption
	Quantity				
1969	277.6	1/	54.8	1/	1/
1970	291.7	248.7	66.0	474.4	52.4
1971	406.1	323.5	54.2	675.4	47.9
1972	2/ 604.4	670.0	92.5	2/ 1,181.9	2/ 56.7
1973	2/ 733.5	1,096.4	174.3	2/ 1,655.6	2/ 66.2
January-September--					
1973	2/ 550.1	772.7	120.2	2/ 1,202.6	2/ 64.3
1974	2/ 650.7	1,239.1	3/ 195.4	2/ 1,694.4	2/ 73.1
	Value				
1969	458.7	1/	72.4	1/	1/
1970	464.6	69.4	99.8	434.2	16.0
1971	583.7	94.2	91.2	586.7	16.1
1972	699.3	180.5	103.5	776.3	23.3
1973	2/ 850.9	356.9	217.7	2/ 990.1	2/ 36.0
January-September--					
1973	2/ 638.2	254.4	147.0	2/ 745.6	2/ 34.1
1974	2/ 767.8	470.6	3/ 252.4	2/ 986.0	2/ 47.7
	Unit value				
1969	$1.65	1/	$1.32	1/	4/
1970	1.59	$0.28	1.51	$0.92	4/
1971	1.44	.29	1.68	.87	4/
1972	2/ 1.16	.27	1.12	2/ .66	4/
1973	2/ 1.16	.33	1.25	2/ .60	4/
January-September--					
1973	2/ 1.16	.33	1.22	2/ .62	4/
1974	2/ 1.18	.38	3/ 1.29	2/ .58	4/

1/ Not available.
2/ Estimated by the U.S. International Trade Commission.
3/ Data are available for January-August 1974; September data estimated by the U.S. International Trade Commission.
4/ Not applicable.

Source: Compiled from official statistics of the U.S. Department of Commerce, except as noted.

Table 9.--Electronic receiving tubes: U.S. producers' shipments, imports for consumption, exports of domestic merchandise, and apparent consumption, 1969-73, January-September 1973, and January-September 1974

(Quantity in millions of units; value in millions of dollars)

Period	Shipments 1/	Imports 2/	Exports	Apparent consumption	Ratio (percent) of imports to consumption
	Quantity				
1969	232.2	48.7	11.9	269.0	18.1
1970	184.7	46.7	12.7	218.7	21.4
1971	177.4	46.0	10.7	212.7	21.6
1972	159.9	39.4	9.8	189.5	20.8
1973	133.4	35.4	9.9	158.9	22.3
Jan.-Sept.--					
1973	3/ 100.1	27.9	7.5	3/ 120.5	3/ 23.2
1974	86.8	22.3	3/ 8.5	3/ 100.6	3/ 22.2
	Value				
1969	225.0	18.4	13.2	230.2	8.0
1970	200.2	17.6	13.3	204.5	8.6
1971	197.4	18.0	12.7	202.7	8.9
1972	178.4	18.7	12.9	184.2	10.2
1973	3/ 152.1	18.8	12.4	3/ 158.5	3/ 11.9
Jan.-Sept.--					
1973	3/ 114.1	14.9	9.1	3/ 119.9	3/ 12.4
1974	3/ 104.2	11.0	3/ 10.5	3/ 104.7	3/ 10.5
	Unit value				
1969	$0.97	$0.38	$1.11	$0.86	4/
1970	1.08	.38	1.05	.94	4/
1971	1.11	.39	1.19	.95	4/
1972	1.12	.47	1.32	.97	4/
1973	3/ 1.14	.53	1.25	3/ 1.00	4/
Jan.-Sept.--					
1973	3/ 1.14	.53	1.21	3/ 1.00	4/
1974	3/ 1.20	.49	3/ 1.24	3/ 1.05	4/

1/ Compiled from sales data supplied by the Electronic Industries Association and average prices derived from U.S. Department of Commerce estimates.

2/ Total imports adjusted by the U.S. International Trade Commission to omit imports of mounts entered under TSUSA item 687.6010 (estimated). See Customs Information Exchange (C.I.E.) N-95/73 dated Mar. 6, 1973.

3/ Estimated by the U.S. International Trade Commission.

4/ Not applicable.

Source: Compiled from official statistics of the U.S. Department of

Table 10.--Television receivers: U.S. producers' shipments, imports for consumption, exports of domestic merchandise, and apparent consumption, 1969-73, January-September 1973, and January-September 1974

(Quantity in thousands of units; value in millions of dollars)

Period	Shipments	Imports	Exports	Apparent consumption	Ratio (percent) of imports to consumption
	Quantity				
1969	8,721	4,033	157	12,597	32
1970	8,308	4,510	126	12,692	36
1971	8,740	5,447	162	14,025	39
1972	10,219	6,375	224	16,370	39
1973	10,631	6,387	314	16,704	39
Jan.-Sept.--					
1973	1/ 7,973	4,763	229	1/ 12,507	1/ 38
1974	1/ 7,500	4,514	1/ 229	1/ 11,785	1/ 38
	Value				
1969	1,852	296	33	2,115	14
1970	1,714	315	26	2,003	16
1971	1,976	413	37	2,352	18
1972	2,248	497	59	2,686	19
1973	2,329	531	84	2,776	19
Jan.-Sept.--					
1973	1/ 1,747	395	61	1/ 2,081	1/ 19
1974	1/ 1,650	396	1/ 57	1/ 1,989	1/ 20
	Unit value				
1969	$212.36	$73.39	$210.19	$167.90	2/
1970	206.31	69.85	206.35	157.82	2/
1971	226.09	75.82	228.40	167.70	2/
1972	219.98	77.96	263.39	164.08	2/
1973	219.08	83.14	267.52	167.15	2/
Jan.-Sept.--					
1973	1/ 219.08	82.93	266.37	1/ 166.39	2/
1974	1/ 220.00	87.82	1/ 248.91	1/ 168.77	2/

1/ Estimated by the U.S. International Trade Commission.
2/ Not applicable.

Source: Compiled from official statistics of the U.S. Department of Commerce, except as noted.

Table 11.--Auto and home radio receivers: U.S. producers' shipments, imports for consumption, exports of domestic merchandise, and apparent consumption, 1969-73, January-September 1973, and January-September 1974

(Quantity in thousands of units; value in thousands of dollars)

Period	Shipments	Imports	Exports	Apparent consumption	Ratio (percent) of imports to consumption
	Quantity				
1969	15,683	36,468	770	51,381	71.0
1970	11,998	33,382	677	44,703	74.7
1971	12,307	34,138	719	45,726	74.7
1972	12,325	43,083	814	54,594	78.9
1973	12,062	45,366	754	56,674	80.0
Jan.-Sept.--					
1973	9,047	33,757	555	42,249	79.9
1974	1/ 8,500	29,465	565	1/ 37,400	1/ 78.8
	Value				
1969	372,927	336,136	15,258	693,805	48.4
1970	284,623	343,812	13,406	615,029	55.9
1971	365,909	358,088	16,171	707,826	50.6
1972	420,413	457,857	19,288	858,982	53.3
1973	492,892	540,007	19,950	1,012,948	53.3
Jan.-Sept.--					
1973	369,669	382,831	14,551	737,949	51.9
1974	1/ 382,500	432,064	13,702	1/ 800,862	1/ 54.0
	Unit value				
1969	$23.78	$9.22	$19.82	$13.50	2/
1970	23.72	10.30	19.80	13.76	2/
1971	29.73	10.49	22.49	15.48	2/
1972	34.11	10.63	23.70	15.73	2/
1973	40.86	11.90	26.46	17.87	2/
Jan.-Sept.--					
1973	40.86	11.34	26.22	17.46	2/
1974	1/ 45.00	14.66	24.25	1/ 21.41	2/

1/ Estimated by the U.S. International Trade Commission.
2/ Not applicable.

Source: General Electric Co.

Table 12.--Home audio magnetic-tape recorders and players: U.S. producers' shipments, imports for consumption, and apparent consumption, 1969-73 and January-September 1974 1/

(Quantity in thousands of units; value in millions of dollars)

Period	Shipments	Imports	Apparent consumption	Ratio (percent) of imports to consumption
	Quantity			
1969	676	6,253	6,929	90.2
1970	381	8,078	8,459	95.5
1971	357	8,390	8,747	96.0
1972	395	9,873	10,268	96.2
1973	2/	10,470	2/	2/
1974 (January-September)	2/	5,772	2/	2/
	Value			
1969	55.7	142.7	198.4	71.9
1970	41.6	202.3	243.9	82.9
1971	22.9	212.9	235.8	90.3
1972	22.0	266.7	288.7	92.4
1973	2/	318.7	2/	2/
1974 (January-September)	2/	192.0	2/	2/
	Unit value			
1969	$82.40	$22.82	$28.63	3/
1970	109.19	25.04	28.83	3/
1971	64.15	25.38	26.96	3/
1972	55.70	27.01	28.12	3/
1973	2/	30.44	2/	3/
1974 (January-September)	2/	33.26	2/	3/

1/ Data on exports are not shown in this table because they are not comparable with those on shipments and imports; annual exports of products like those shipped or imported are believed to have been negligible or nil during 1969-74.

2/ Not available.

3/ Not applicable.

Source: Electronic Industries Association, Electronic Market Data Book, 1973 and 1974.

A-59 through A-80

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APPENDIX B

REPRINT FROM THE WALL STREET JOURNAL
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Gloomy Prospects

After Bad 2nd Half, Semiconductor Firms See More of Same for Much of This Year

By A. RICHARD IMMEL
Staff Reporter of THE WALL STREET JOURNAL

After finishing 1974 on a gloomy note, the nation's slumping semiconductor industry now is assessing the new year's outlook. Its conclusion: more gloom, at least until summer.

This industry, which makes the tiny transistors, integrated circuits and other miniature solid-state electronic devices that go into a myriad of consumer and industrial products, was one of the first really to feel the bite of the recession in 1974. This happened in the early summer when the industry's two largest markets—computers and consumer products (especially the television industry)—began chopping inventory buying as their own markets started to soften. This led to a sharp slump in the second half after a good first half for the industry.

Major semiconductor companies are hoping that the worst is over as heavy year-end production curtailments and accompanying deep manpower cuts in many cases have helped to bring inflated inventories back into line. But nobody sees a turnaround until later in 1975, and some fear that the situation could worsen between now and then.

There is some consensus that, after declining since early summer, factory shipments of semiconductors will remain flat or fall slightly over the next two quarters, picking up again in the second half of 1975. But that assumes a reviving U.S. economy, something that no prognosticator is willing to guarantee at this point.

"Most major distributors and manufacturers still have enough inventory on hand to last up to the middle of 1975 at the present rate of consumption," says Walt Matthews, a spokesman for WEMA, an electronics trade group that represents the bulk of the semiconductor industry. But, he notes, if consumption declines, which it probably would in a worsening economy, inventories would be stretched out even further, prolonging the day when the industry could count on an influx of new orders.

Postponing the Updating

In a report prepared last October, WEMA predicted that world-wide semiconductor consumption would close out 1974 at $4.8 billion, a 15% increase from the record 1973 level. Demand in 1975 was expected to increase 1.4%, followed by another 15% gain in 1976. However, many in the industry now feel that WEMA's 1975 projections are too optimistic and that 1975 might show no growth at all or even a decline. WEMA says it has postponed updating the forecast until after the first of the year "because of uncertainty."

James Berdell, an analyst for Shuman, Agnew & Co., a San Francisco securities firm, estimates industry-wide shipments in the U.S. for all 1974 at $2.6 billion, up about 16% from the $2.2 billion of 1973, a record year. But what is particularly significant, he says, is the precipitous decline in quarter-to-quarter shipments, beginning with the third period of 1974. "My estimate suggests that fourth quarter industry shipments were $360 million, down from a peak second quarter of $720 million," he says—a 24% drop.

Mr. Berdell sees shipments bottoming out at something below $500 million during the second quarter of 1975, with no upturn likely until possibly the third quarter. For all 1975, he estimates U.S. shipments at $2.2 billion to $2.4 billion, down 8% to 16% from 1974.

The effect of the slump on the industry has been traumatic, especially after coming off the 1973 boom that carried over into the first part of 1974. Indeed, conditions could hardly have been more different a year ago; Backlogs were at record levels, profits were soaring at a dizzy rate, and companies were scrambling to build new plants and expand production as delivery lead times stretched to records.

A Sudden Change

At one point in 1974, Texas Instruments, the industry leader in integrated circuits, was predicting that its sales last year would be limited only by production, not by demand. Such remarks were common throughout the industry. Citing the broad use of semiconductors in industrial and consumer products, some of the less cautious executives even suggested that the semiconductor business had broken free of its boom-and-bust tendencies.

Suddenly, the orders stopped coming in as industry after industry began cutting back on inventories against the expected downturn in its own fortunes. Looking back, some observers believe that the boom was in part artificial, the result of panic ordering by distributors and manufacturers that, in some cases, doubled and tripled orders just to make sure they would eventually get the parts from somebody.

The industry has responded to shrinking backlogs by cutting production and reducing costs. During the recent Christmas and New Year holiday period, almost all semiconductor makers either closed or sharply curtailed their production units. In Dallas, Texas Instruments said its holiday closings affected 80% of its world-wide work force. California's "Silicon Gulch," the peninsula area south of San Francisco that accounts for 35% of the world's semiconductor production, resembled a no-man's land because of vacation closedowns.

A major cost savings has come from payroll cuts, which also accelerated as the year came to an end. Motorola Corp., one of the last companies to be affected by the slump, laid off 5,000 workers "indefinitely" during the fourth quarter, most of them in the Phoenix area, where the company's semiconductor production is concentrated. Texas Instruments says it has reduced its work force by more than 10,000 from the 78,000 it employed world-wide at the end of June. Nearly 6,000 have come from layoffs, the rest from attrition.

One of the heaviest personnel cuts was made at Signetics Corp., a Sunnyvale, Calif., integrated-circuit maker that is 70%-owned by Corning Glass Works. Signetics puts its year-end employment at 6,000, down from a midyear world-wide level of more than 11,000.

Capital spending has also fallen, mostly by canceling or stretching-out expansion projects. Some projects have been stopped in their tracks. Intel Corp. of Santa Clara, Calif., an important maker of semiconductor memory devices for computer applications, recently completed a new 44,000-square-foot plant in Oregon. It's standing empty now, guarded by a watchman and a police dog. "It's the fanciest doghouse on the West Coast," says Intel's executive vice president, Gordon Moore. "We haven't equipped it yet, and we certainly won't before very late" in 1975, he says.

Texas Instruments slashed $25 million from the $175 million it had originally budgeted for 1974, and Fairchild Camera & Instrument Corp. cut its capital spending by about $15 million from the $55 million it has proposed to spend last spring. Spending for all companies will be even lower in 1975.

So far the industry has managed to avoid the all-out price wars that characterized the 1970 semiconductor recession. How long this will last, however, is uncertain. "A price war isn't the way to solve the problem," WEMA's Mr. Matthews says. He adds that he hasn't seen much price-cutting yet and doesn't expect to as manufacturers instead reduce production and costs to preserve their already-narrow profit margins.

Others disagree. "The only reason you haven't had major price erosion so far is that there haven't been any new orders," says Mr. Berdell, the analyst. And Patrick Lynch, Motorola's vice president in charge of U.S. semiconductor operations, believes those orders are on the way. "I think there are going to be price wars with specific products," he says. In fact, it has already begun, he says, in the MOS-CMOS integrated-circuit area, where prices have dropped 20% to 30% in the past two or three months. These devices are used chiefly in portable, low-power applications such as electronic watches.

Just how well the industry will weather the current slump depends on how long the nation's economy is depressed. Last year's fourth quarter results have already begun to show the effects of the economic decline. Signetics recently estimated that because of slipping sales and prices, it lost $3 million to $4 million in 1974. The company earned $6 million in 1973.

Other companies are mum about their financial outlook, but some observers feel that even with a general economic recovery in the second half of 1975, the major semiconductor makers will still suffer 30% to 40% profit declines for all 1975 from 1974. As for the smaller firms, many will see red ink, these observers say. And if the recession continues beyond 1975, "there will be some consolidations," Mr. Berdell predicts.

Texas Instruments Inc.

By a WALL STREET JOURNAL *Staff Reporter*

DALLAS—Texas Instruments Inc. said it expects to report net income of 90 cents to $1 a share for the fourth quarter, down from $1.09 a share a year earlier.

In all of 1974, net was $3.90 to $4 a share, up from $3.67 a share in 1973, it said.

Texas Instruments said it expects to post fourth quarter sales of $415 million, up from the year-earlier $369.5 million. Sales in the year rose to about $1.57 billion from $1.29 billion in 1973, it estimated.

Texas Instruments also announced that it will lay off 9,000 workers world-wide during the current quarter. The company said that its world-wide employment already dropped to 66,000 at year-end 1974 from 78,000 at the end of the second quarter.

A spokesman said, "We sincerely hope that this action will establish a stable level of employment, but that is entirely dependent on the rate of incoming orders over the next few months."

The company said a complete earnings report for 1974 will be ready in about four weeks.

Texas Instruments noted that net orders in the fourth quarter were about $280 million, compared with sales of $415 million. As a result, the company said, backlog declined to about $560 million at year-end from $695 million on Sept 30. Year-end 1973 backlog was $679 million, it said.

The company added that despite the "unfavorable" ratio of incoming orders to sales, inventories were reduced to "somewhat over $200 million" at Dec. 31 from a 1974 peak of $255 million.