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ANALYSIS OF SOVIET BLOC FOREIGN TRADE  
IN NON-MILITARY ELECTRONICS

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Foreword

The analysis presented here was completed in August 1965. A report based on this work and summarizing the most significant general trends in Soviet Bloc foreign trade in electronics was published as CIA/RR ER 66-4, March 1966, SECRET. Because the analysts responsible for studying the electronics and telecommunications industries of the Communist countries have an interest in the details of foreign trade in electronics, the Electronics and Telecommunications Subcommittee of the EIC is publishing these notes as a working paper.

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Analysis of Soviet Bloc Foreign Trade in Non-Military Electronics

1. General

This study is concerned with the analysis of the foreign trade in non-military electronics of individual countries of the Soviet Bloc. For the sake of convenience, Tables 1 through 6 have been included to summarize the national data on a Bloc-wide basis. For a discussion of the summary data, the reader is referred to CIA/RR ER 66-4, March 1966, SECRET.

2. USSR

The foreign sales of the Soviet electronics industry neither account for a significant portion of its domestic production nor, with few exceptions, mark the USSR as a leader in this trade in the Bloc. Estimated annual exports of electronic equipment by the USSR during the period 1958-65 never reached one percent of its domestic production. Moreover, Soviet exports of electronic equipment are growing at a rate that is less than half that estimated for the other major exporters in the Bloc. As a result, the Soviet share of total exports by the Bloc of electronic equipment, which amounted to about 22 percent in 1958, probably declined to about 10 percent in 1965. Since 1960, the Soviet Union has ranked fourth in the export of electronic equipment, behind Hungary, East Germany, and Czechoslovakia.

Consumer entertainment equipment and instruments predominate in Soviet exports of electronic equipment (see Table 7). Exports of the former, principally television receivers, accounted for nearly half of all Soviet exports of electronic equipment in most years of the period 1958-63. An increase of almost 100 percent in exports of television receivers was the chief factor in the increase of about 55 percent (from \$27 million in 1961 to \$42 million in 1962)

in Soviet exports of electronic equipment in 1962. Moreover, it was a fall in the exports of entertainment equipment that accounted principally for the decline in exports of electronic equipment in 1964 and 1965. Exports of instruments, which are growing slowly but steadily, account for about a third of Soviet exports of electronic equipment, a share that has not changed significantly since 1958. On the other hand, exports of communications equipment grew from about 10 percent of total electronic exports in 1958 to about 25 percent of the total in 1963. Exports of components are relatively small and not expected to grow in the foreseeable future.

It is estimated that Soviet imports of electronics, which in 1965 amounted to about four times the value of exports, have never exceeded 1.5 percent of domestic output, and, hence, have contributed insignificantly to the total volume of electronic goods available to the USSR. On the other hand, the USSR is the foremost importer of electronic equipment in the Soviet Bloc, and in the period 1962-65 probably received more than a third of the Bloc's total electronic imports.

Communications equipment accounted for over 35 percent and instruments for 49 percent of total Soviet electronic imports in the period 1958-62. In the period 1963-65, however, the percentage share of the total represented by communications equipment probably amounted to about 45 percent, whereas the share represented by instruments probably dropped to about 40 percent. Most of the remainder of Soviet imports of electronic equipment consists of components which probably quadrupled during the period 1961-65.

a. Intra-Bloc Trade

Trade in electronic equipment by the Soviet Union is carried on mainly with the European Satellites. In 1962, for example, an estimated 93 percent of Soviet exports of electronic equipment were shipped to this area and an estimated

80 percent of Soviet imports of such equipment were received from there. Most of the remainder of Soviet trade in electronic goods was conducted with Western Europe (including Finland and Yugoslavia), the Near East, and Japan. Estimated Soviet exports and imports of electronic equipment by area are given in Table 8.

1) Exports

Soviet exports of electronic goods to the Satellites in 1965 probably amounted to about \$30 million and exceeded those of 1958 by about 45 percent. This growth compares poorly with that of the intra-Bloc exports of the major exporters among the Satellites and is accounted for mainly by increases in the exports of communications equipment and instruments.

Almost all Soviet exports of communications gear are received by the European Satellites, primarily Czechoslovakia, Rumania, Poland and Bulgaria. East Germany and Hungary have not purchased significant amounts of Soviet communications gear because their own industries are capable of meeting most of their own requirements. Telephone exchanges and related equipment probably comprised the chief part of the communications equipment exported by the USSR up to the end of 1960. Later, as exports increased, their composition changed to include shipments of transmission equipment for VESNA microwave radio relay installations (exported principally to Czechoslovakia and Rumania, but also to Bulgaria and Poland), as well as repeater equipment for a KL920 coaxial telephone and television transmission system linking Moscow with some of the major cities in Eastern Europe.

Rather steady growth in exports of Soviet instruments has taken place in the period 1958-1965 and is expected to continue in the foreseeable future, with East Germany and Hungary receiving about one fourth of the total

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and the Satellites altogether receiving more than three-fourths.\*

Exports of entertainment equipment, principally television receivers to Czechoslovakia, Rumania and Poland, experienced a temporary increase in 1962 and 1963, but by 1965 appeared to have subsided to about the level of 1958. The fall in exports to the Satellites of Soviet television receivers is directly related to the rise of domestic production in those countries.

Most exports of components, which are small and generally unreported, are sent to the Satellites. It is likely that the USSR exports components to these countries to accommodate specific, short term projects, many initiated at the request of the USSR itself, or to service Soviet-made equipment in Eastern Europe.

## 2) Imports

The share of Soviet imports received from the European Satellites during the period 1958-61 was about 75 percent of the USSR's total foreign purchases of electronic goods. In 1962, this share increased to 80 percent, and may have reached 90 percent by 1965. Until 1961, Soviet imports of electronic equipment from these countries exceeded exports to them by only about 20 percent, but an increase of 37 percent in imports in 1961, resulting from a large increase in receipts of communication equipment, pushed total imports of electronic equipment from the Satellites to a level about twice that of exports. By the end of 1965, Soviet imports of electronics from this area, enlarged by additional imports of components and communication equipment, were expected to be about four times the level of exports to the area. Throughout the period 1958-65, virtually all

\* Roughly 40 percent of Soviet exports of instruments in the period 1958-60 were received by Communist China. After 1960, these exports fell precipitously.

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Soviet imports of electronics equipment from the European Satellites came from Hungary, East Germany, and Czechoslovakia. A distribution of Soviet imports of electronics by country of origin, however, can be made only for the period 1962-65, during which nearly 45 percent of Soviet imports from the Bloc came from Hungary, about 25 percent from East Germany, and 30 percent from Czechoslovakia.

During the period 1962-65, the Soviet Union received about \$165 million worth of electronic goods from Hungary, -- more than half of Hungary's total exports of such goods in that period. Communications equipment, ranging from village telephone exchanges to broadband microwave radio relay equipment, accounted for about 70 percent of these imports, and instruments accounted for about 25 percent. The small remainder is made up of components. Increases in Soviet imports of communications equipment from Hungary are primarily responsible for the tripling in value of Hungary's exports of communications equipment between 1961 and 1963.

Soviet imports of electronics equipment from Czechoslovakia in the period 1962-65 probably exceeded \$110 million, and comprised more than 45 percent of Czechoslovakia's total exports of electronic equipment in that period. Before 1962, components constituted less than 5 percent of the total Soviet imports of electronic equipment from Czechoslovakia. But in 1962, the value of imported Czechoslovak components, chiefly radio receiver tubes, tripled, and by 1965 represented about 20 percent of all imports of electronic equipment from Czechoslovakia. This change was accompanied by an estimated decline in the percentage share (but not in the absolute value) of imports of communications equipment from 70 percent to 50 percent between 1961 and 1965. Soviet imports of instruments from Czechoslovakia have grown steadily and represent 25-30

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percent of total imports of Czechoslovak electronic equipment.

Soviet imports of electronic equipment from East Germany in the period 1962-65, estimated at about \$95 million, accounted for about 35 percent of East Germany's exports of electronic goods and consisted chiefly of instruments and components. Instruments represented more than 75 percent of the electronic equipment imported from East Germany in the period 1958-61, but since 1961 the share of instruments has been declining and by the end of 1965 represented about 60 percent. The share of components, amounting to 10-15 percent in 1961, has been increasing, and may have reached 35 percent in 1965. Although imports of East German communications equipment also may have increased after 1961, the data are inconclusive. However, recently acquired evidence indicates that these imports are likely to have increased beginning in late 1965.

b. Trade with Non-Bloc Countries

In the period 1958-65, the total value of Soviet imports of electronic equipment from outside the Bloc probably reached nearly \$100 million; however, the value of Soviet exports to that area was expected to reach only a total of about \$20 million. If these estimated totals were achieved by the end of 1965, the Soviet Union will have purchased about 17 percent of its imported electronic equipment from the non-Bloc countries and will have sent about 8 percent of its exports to that area.

Exports of Soviet electronic equipment to non-Bloc countries are so small that little significance attaches to their trends. The largest share (more than 50 percent) consists of communications equipment, chiefly telephone apparatus and radio broadcast transmitters sent to the less developed countries. The remaining portions are components (over 20 percent), instruments (nearly 15 percent), and consumer entertainment equipment (about 10 percent). The

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major customers of Soviet goods outside the Bloc are Finland, West Germany, India, Yugoslavia, and Egypt.

Soviet imports of electronic equipment from non-Bloc countries, principally from Western Europe and Japan, have declined since 1961, both as a percentage share and as an absolute value. Although in that year about 30 percent of Soviet imports of electronic goods came from Western Europe and Japan, only about 9 percent were obtained from this source in 1965.\* Instruments comprised almost 60 percent of Soviet imports of electronic equipment from outside the Bloc in the period 1958-62. Consumer entertainment equipment and communications equipment each accounted for about 17 percent, and components accounted for the remainder. The USSR's chief sources of electronic equipment in the Free World are France, West Germany, the UK, Austria, and Japan.

### 3. Hungary

Hungarian exports of electronic equipment, which account for an estimated average of 40 percent of annual production, are larger than those of any other Communist country. The total exported during the period 1958-65 is estimated at almost \$460 million and accounts for about 30 percent of the exports of electronic equipment by the Soviet Bloc. Exports in 1965 are estimated at more than three times those of 1958. The productive capacity of Hungary's electronic industry is larger than required to satisfy domestic requirements for finished end items.

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\* Since early 1963, however, Soviet imports of equipment for the production of electronic components from countries outside the Bloc have risen sharply from the previous level of \$0.7-\$1.2 million per year. In 1963, these imports amounted to \$10 million; \$13-\$14 million worth of this equipment probably was imported in 1964, and \$15 million worth may have been imported in 1965. These imports are not included in the data presented in this report.

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Certain inputs of raw materials and special components, however, are not available from domestic sources.

During the period 1958-61 the composition of Hungarian exports of electronic equipment changed very slowly and in 1961 consisted of communications equipment (25 percent of the total), instruments (25 percent), components (18 percent), and consumer entertainment equipment (30 percent) (See Table 9). Beginning in 1962, this distribution was altered drastically by a sharp emphasis on the exports of communications equipment. Exports of communications equipment in 1965 are estimated at about 5 times those of 1961 and accounted for about 55 percent of total exports of electronic equipment. Exports of instruments also have increased, but at a slower rate, and probably represented about 28 percent of Hungarian exports of electronics equipment in 1965. Exports of consumer entertainment equipment probably declined to about 10 percent of the total in 1965, and exports of components, which showed no significant growth after 1961, probably dropped in 1965 to about 8 percent of the total.

Imports of electronic equipment by Hungary are relatively small, probably amounting to about 10 percent of exports. Components and instruments are the chief imports, but radio receivers also are imported in small but increasing quantities. Components probably account for about 50 percent, and instruments for about 25 percent of Hungary's total imports of electronic equipment. Of the former, imports of television picture tubes, X-ray tubes, radio receiver tubes and specialized resistors and transistors predominated in the period 1958-64. Imports of picture tubes, however, declined steadily as Hungary became more proficient in their production. Imports of X-ray and radio receiver tubes, on the other hand, have steadily increased and are expected to continue to do so.

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Imports of radio receivers appear likely to increase because a lowering in their domestic production is planned. However, radio receivers currently account for only a few percent of the remaining 25 percent of Hungary's imports. Imports of raw materials specifically intended for the electronics industry (e.g., quartz, mica, special quality glass and certain rare metals) cannot be usefully quantified, but they probably represent a significant portion of the unaccounted-for residual.

a. Intrabloc Trade

The principal recipient countries for Hungary's exports of electronic goods are her Communist neighbors, who probably received about 90 percent of these exports in the period 1958-65. Growth of exports to these countries, relatively slow through 1962, achieved rates of 44 percent and 24 percent in 1963 and 1964 respectively, and an increase of 23 percent is estimated for 1965. Estimated trade by area for the period 1958-65 is given in Table 10.

1) Exports

The USSR received 83 percent of Hungary's exports of communication gear in 1963, and receipts in 1964-65 may have been nearly as large. The Eastern European Communist countries and non-Bloc countries shared about equally in the residual. Among these, Czechoslovakia predominated, purchasing mostly broad band microwave radio relay equipment.

Little is known of the distribution of exports of Hungarian instruments other than that the USSR has received about a third of these exports since 1958. The remainder most probably was distributed thinly among a large number of Communist and Free World countries.

About a third of Hungary's exports of electronic components are received by countries in the Soviet Bloc. Principal among these recipients in

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the period 1958-63 were the USSR, Poland, Bulgaria, and Rumania. In 1964, in consequence of an international agreement among Hungary, Poland, Czechoslovakia, and East Germany to specialize in the production of certain radio receiver tubes in order to reduce production costs, East Germany also became a major purchaser of Hungarian-produced components.

More than half of the consumer entertainment equipment exported by Hungary in the period 1958-62 consisted of television receivers, and virtually all of them went to European Satellites. East Germany received about 50 percent, Czechoslovakia and Poland about 20 percent each, and Rumania about 10 percent of these exports. A small quantity was shipped to Bulgaria. Of the rest of Hungary's exports of consumer entertainment equipment, mainly radio receivers, customers in the Bloc received very little. Hungarian exports of consumer entertainment equipment are declining as Hungary reduces output of these goods in favor of increased production of communications equipment for export.

## 2) Imports

About a third of Hungary's imports of electronics equipment and of raw materials for its electronics industry are received from the USSR and the other European Satellites. Radio receivers come chiefly from Bulgaria and instruments are imported from Czechoslovakia, the Soviet Union, and probably East Germany. Czechoslovakia appears to contribute the largest share of these latter imports, followed by East Germany.

## 3) Trade with Non-Bloc Countries

Hungary sells about 10 percent of its exports of electronic equipment to countries outside the Bloc and buys about two thirds of its imports of such equipment from that area. Both exports to and imports from countries outside the Bloc appear to be growing slowly.

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Hungarian exports to countries outside the Bloc in the period 1958-62 were composed of components (about 50 percent), communications equipment (about 30 percent), consumer entertainment equipment (about 20 percent), and instruments (negligible). Most of the exports of components consisted of radio receiver tubes, sent to a large number of countries including Yugoslavia, the United Kingdom, Austria, Sweden, Argentina, and the German Federal Republic. Communications equipment was exported mainly to Yugoslavia, Turkey, Argentina and Cuba. These countries also imported a few instruments to service their Hungarian communications equipment. Beginning in 1962, Cuba was to receive \$10 million worth of communications equipment, spread over a period of several years. Deliveries are being made at a rate of \$2 to \$3 million per year. In the period 1958-62, Yugoslavia was Hungary's primary non-Bloc customer for consumer entertainment equipment, but Morocco and the Netherlands also received shipments regularly.

Imports of electronic equipment from outside the Bloc are chiefly components and instruments, each accounting for about 40 percent of these imports. The remainder of Hungarian imports from this quarter have consisted of small purchases of consumer entertainment equipment and communications gear. Hungary's major sources for electronic equipment are West Germany, the United Kingdom, Switzerland, France and Austria.

#### 4. East Germany

Exports of electronic equipment by East Germany, which are second largest in the Bloc, amounted in 1964 to about 25 percent of the production of the domestic electronic industry according to an official East German announcement. In 1965 these exports may have reached \$88 million, more than four times the level achieved in 1958 (see Table 11).

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An approximate breakdown by major categories of the exports of all electronics from East Germany in 1963 gives communications equipment 24 percent of the total (compared with 14 percent in 1958), instruments 37 percent (compared with 43 percent in 1958), components 17 percent (compared with 14 percent in 1958), and consumer entertainment equipment 22 percent (compared with 29 percent in 1958) (see Table 11). No significant changes in the distribution occurred in 1964, but if the unusually large exports of television receivers (about \$15 million) planned for 1965 were realized, the percentage share of consumer entertainment equipment will have been enlarged.

East German imports of electronic equipment were less than 50 percent of exports in the period 1958-62. Consumer entertainment equipment, mainly television receivers, accounted for the largest portion of these imports (about 40 percent), and imports of components and instruments represented respectively about 22 and 25 percent of the total. Communications equipment comprised the remainder.

Total East German imports of all types of electronic equipment declined in 1962. The decrease in imports of consumer entertainment equipment, which has continued, appears to be the result of achieving a better correlation between domestic supply and demand for television receivers. Domestic production of communications equipment is generally adequate for domestic needs, and imports of such equipment probably are used primarily to satisfy requirements for special varieties. Imports of components from some countries dropped in 1962. Overall, however, these imports increased slightly in 1962, and more increases probably occurred in subsequent years, partly because domestic needs were growing faster than domestic production (particularly for transistors and diodes), and partly in response to agreements with Czechoslovakia, Poland, and Hungary on trade and specialization of production of radio receiver tubes.

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a. Intrabloc Trade

In 1962, East Germany sent an estimated 82 percent of its exports of electronic goods to the other European Satellites and the USSR (compared with 81 percent in 1958), and received at least 75 percent of its imports from them (compared with 43 percent in 1958). By the end of 1965 it is estimated that the share of other countries of the Bloc in East Germany's total exports of electronic equipment may have been risen to about 87 percent, and the share of East Germany's imports supplied by these countries was 85 percent or more. Table 12 shows estimates of East Germany's trade in electronic equipment by area of origin and destination.

1) Exports

In the period 1958-62, about 40 percent of all East German exports of electronic equipment to the USSR and the European Satellites consisted of instruments, about 28 percent consisted of consumer entertainment equipment, about 13 percent were components, and about 19 percent communications equipment. The chief recipients of these exports were the Soviet Union and Czechoslovakia, each receiving about 40 percent of the total. Instruments comprised the majority of the exports to the Soviet Union, but components were also included, and exports of the latter increased greatly in 1963-65. Czechoslovakia received mainly communications equipment (probably the bulk of this East German export), and less significant quantities of instruments. In addition large quantities of components have been exported to Czechoslovakia and Poland based on agreements for the specialization of production beginning in 1962. Consumer entertainment equipment exported by East Germany has consisted chiefly of radio receivers, but there have been a few significantly large shipments of television receivers (to Poland). Large

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exports of television receivers were planned for 1965, however, and may supplant radio receivers as the major part of the exports of consumer entertainment equipment.

2) Imports

Television receivers represented about 60 percent of East Germany's imports of electronic equipment from the USSR and the European Satellites in the period 1958-62. The remaining 40 percent was divided among communications equipment (about 11 percent), instruments (about 13 percent), and components (about 15 percent). After 1962 the share of components probably increased, but the share of consumer entertainment equipment probably dropped sharply.

Czechoslovakia was a major supplier of electronic equipment to East Germany in the period 1958-62, and probably retains that status. Consumer entertainment equipment, principally television receivers, comprised the largest part of East Germany's imports of electronic equipment from Czechoslovakia in that period, followed in importance by communications equipment and instruments. After 1962, imports of components became relatively more important and imports of television receivers relatively less so. Hungary was also an important supplier of television receivers in the period 1958-62, but these imports probably have dropped also since then. Poland joined Czechoslovakia as a significant supplier of electronic components to East Germany in 1962 and this relationship probably continued through 1965.

b. Trade with non-Bloc Countries

In the period 1958-62, East Germany sold nearly 20 percent of its global exports of electronics to non-Bloc countries and obtained almost 40 percent of its imports of electronics from them.

By 1964, exports of electronic goods to non-Bloc countries had declined

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to 15 percent of the total, and are estimated to have declined to about 12 percent in 1965. East Germany's exports to non-Bloc countries consist mainly of instruments (about 65 percent), but consumer entertainment equipment, communications gear, and components are all represented. The principal recipient countries are Yugoslavia, West Germany, Egypt, and Austria, in that order.

Virtually all of East Germany's imports of electronic goods from non-Bloc countries are obtained in Western Europe and Japan. Western Germany, the UK, and Austria are the major Western European sources. In the period 1958-62, imports from outside the Bloc consisted of electronic instruments (about 42 percent of the total), components (about 37 percent), communications equipment (about 15 percent), and consumer entertainment equipment (about 6 percent). The share of non-Bloc countries in the supply of electronics to East Germany declined from 57 percent in 1958 to about 20 percent in 1962, principally as a result of a sharp absolute decline in imports from outside the Bloc in 1962. But it also stemmed in part from a long term upward trend in East German imports of electronics from within the Bloc. Although the evidence is insufficient for positive evaluation, the tempo of importing of components, particularly semiconductors, from non-Bloc countries appears to have quickened since 1962, and may have compensated to some extent for the decline in imports of other kinds of electronics from that area.

#### 5. Czechoslovakia

Czechoslovakia occupies third place in the Soviet Bloc as an exporter of electronic goods. Exports, which have grown rapidly since 1958 when they amounted to \$15 million, probably amounted to \$70 million in 1965, equal to more than 4.5 times their value in 1958 (see Table 13). In 1958, 10 percent of the total domestic output of electronic equipment was exported, and it is estimated that 26 percent of a larger output was exported in 1965. Exports of communications

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equipment in particular, which amounted to only \$3 million in 1958, probably grew to about \$34 million in 1965 and may have represented about half of all exports of Czechoslovak electronics. Exports of components have grown significantly, especially since 1962, while exports of consumer entertainment equipment have been declining. Exports of instruments grew moderately during the entire period 1958-65,

Imports of electronic goods by Czechoslovakia resemble exports of such equipment closely in volume and character. In 1965, imports probably amounted to \$50 to \$60 million, 3 to 4 times the level of \$15 million reached in 1958. By 1962, the last year for which complete data is available, the volume of imports of communications equipment had surpassed all other electronic imports, growing more than 3 times since 1960. Next came imports of consumer entertainment equipment and instruments, both of which had shown moderate-to-slow growth, and lastly components, which expanded 2.5 times since 1961 and appeared to be launched into a period of major growth.

The share of the non-Bloc countries in Czechoslovakia's trade in electronic goods declined steadily compared with the share of the Bloc in the period 1958-64 and probably declined further in 1965.

a. Intrabloc Trade

In the period 1958-65, the exports of electronic equipment from Czechoslovakia to the other European Satellites and the USSR increased nearly 6 times, expanding the percentage share of the Bloc from 73 percent of the total in 1958 to about 93 percent in 1965. Similarly, the percentage share of imports of electronic goods from the USSR and the other European Satellites grew from about 87 percent of total imports of electronic goods in 1958 to about 93 percent in 1962. The estimated geographic distribution of Czechoslovak trade is presented in Table 14.

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1) Exports

During the period 1958-60, the Soviet Union received about 40 percent of the electronics exported by Czechoslovakia to the Bloc. Poland and East Germany each received about 20 percent and Bulgaria, Rumania and Hungary shared the remaining 20 percent. Instruments comprised more than half of the exports to the Soviet Union in this period, components just a few percent, and the remainder consisted of communications equipment. About 40 percent of Czechoslovakia's exports to East Germany and Poland were composed of consumer entertainment equipment, 40 percent were instruments, and about 15 percent were communications equipment. Although the exports of electronic equipment to the other European Satellites are generally unreported, there are indications that they probably were composed principally of instruments, components and communications equipment in that order.

The Soviet share of Czechoslovakia's exports of electronics to the Soviet Bloc amounted to about 50 percent in the period 1961-64. In this period about 60 percent of Soviet imports of Czechoslovak electronics consisted of communications gear and about 30 percent consisted of instruments, compared with about 38 percent for communications gear and about 8 percent for instruments in the period 1958-60. Poland's share of Czechoslovakia's exports to the Soviet Bloc also increased in the period 1961-64 compared with 1958-60, but the shares of East Germany, Hungary, Rumania and Bulgaria declined.

The unusually rapid growth in exports of Czechoslovak electronic equipment between 1960 and 1962 occurred largely as a result of increased Soviet purchases of communications equipment. In 1962, exports of Czechoslovak communications equipment to the Soviet Union grew to more than 5 times those of 1960 and represented nearly 70 percent of the total exports of communications equipment

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to all markets. Czechoslovakia increased exports of communications equipment to Poland at a similar rate. Expansion of exports of components also began in 1962 and developed quickly because of unusually large Soviet orders as well as bilateral barter agreements with Poland and East Germany. Another large expansion of Czechoslovak exports based on increased shipments of consumer entertainment equipment may have occurred in 1965, but evidence of this expansion is incomplete.

2) Imports

In the period 1958-60, Czechoslovakia's imports of electronics from the USSR and the other European Satellites were distributed approximately in the following manner. Television receivers from the USSR and Hungary comprised more than 40 percent of the total; instruments, mainly from the USSR and East Germany, comprised nearly 30 percent; communications equipment, also mainly from the USSR and East Germany, comprised about 20 percent. Components, a small residual, were imported in very small amounts from the USSR, Hungary, and East Germany.

After 1960, the percentage distribution by categories of imports of electronics from the USSR and the European Satellites changed markedly. By 1962 imports of communications equipment had tripled compared with 1960 and, for the period 1961-64, probably comprised 40 percent of the total, largely because of increased deliveries from the USSR, Hungary, and East Germany. Imports of instruments probably declined to about 25 percent, but moderate growth was expected in the share comprising components. During this period the Soviet Union probably supplied more than half of Czechoslovakia's electronic imports from the Soviet Bloc, East Germany about 30 percent and Poland and Hungary probably about 10 percent each.

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b. Trade with non-Bloc Countries

The share of non-Bloc countries in Czechoslovakia's exports of electronic goods declined steadily from about 27 percent in 1958 to only about 7 percent in 1965. Over the period 1958-62 the share of non-Bloc countries in Czechoslovakia's imports of electronic goods declined from about 13 percent to about 7 percent.

Fifty percent of Czechoslovakia's exports of electronic goods outside the Bloc in the period 1958-62 consisted of instruments, about 25 percent consisted of communications equipment and about 12.5 percent each of components and consumer entertainment equipment. The principal recipients were Yugoslavia, Greece, Brazil, Egypt, Turkey, and Argentina.

Nearly 70 percent of Czechoslovakia's imports of electronic goods from outside the Bloc in the period 1958-62 consisted of instruments, 15 percent of components, about 10 percent communications equipment, and about 5 percent consumer entertainment equipment. The primary sources of the imports were West Germany, Switzerland, France and the UK.

6. Poland

a. Exports

Estimated Polish exports of electronic equipment, which grew slowly during the period 1950-60, averaging about \$3 million annually, jumped to \$8 million in 1961. A second large increase occurred in 1962 when exports of electronic equipment grew by about 50 percent, but thereafter, such exports appear to have grown more moderately (about 18-20 percent per year). In 1965, they probably exceeded \$20 million.

In the period 1961-64, about 40 percent of Polish exports of electronic equipment consisted of consumer entertainment gear, principally radio receivers.

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Communications equipment accounted for about 25 percent of the exports in this period and components accounted for nearly 20 percent. Instruments were the least important, representing about 15 percent of the total.

Probably 90 percent or more of Polish exports of electronic equipment in the period 1961-64 were sent to the European Satellites. Czechoslovakia appears to have received over half of these exports, and Rumania received about a third. The remainder was distributed among East Germany, Bulgaria, and Hungary. The chief recipients of Poland's minor exports of electronic equipment outside the Bloc are Yugoslavia, Egypt, and Brazil. Other customers include Greece, Turkey, Iraq, and Morocco.

b. Imports

Estimated Polish imports of electronic equipment in 1965 were two to three times as large as exports. Imports probably ranged from \$15 to \$20 million annually in the period 1958-60 and from \$30 to \$50 million annually in the period 1961-64. In the latter period communications equipment and instruments each accounted for about a third of total imports, consumer entertainment equipment accounted for about 20 percent, and components accounted for the remainder.

During the period 1961-64, about 80 percent of Polish imports of electronic equipment were received from other countries in the Soviet Bloc. Czechoslovakia supplied about 40 percent of these imports. East Germany contributed about 30 percent, and the Soviet Union and Hungary supplied about 20 percent and 10 percent respectively. Imports from the USSR and the European Satellites included the whole range of electronic equipment, compensating for the limited volume and variety of Polish production. The principal suppliers among non-Bloc countries were West Germany, the United Kingdom, France, and Switzerland, and they shipped mainly instruments and communications equipment.



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7. Bulgaria

a. Exports

Bulgaria has exported small quantities of telephone equipment since at least 1955 and radio receivers since 1961. These two items probably constitute the bulk of Bulgaria's limited exports of electronic equipment, which ranged in value from about \$1 to \$6 million per year over the period 1958-64. The major portion of the telephone apparatus was exported to Czechoslovakia, and the radio receivers to Hungary.

b. Imports

Bulgaria imports all the major categories of electronic equipment. In the period 1958-60 imports of this equipment probably ranged from \$5 to \$10 million annually; thereafter imports probably ranged from \$15 to \$25 million annually. Consumer entertainment equipment and instruments each accounted for about a third of electronic imports, and the remaining third was divided nearly equally between components and communications gear.

West Germany, Austria, and Denmark were Bulgaria's chief non-Bloc sources of electronic goods and supplied 10-15 percent of Bulgaria's imports of such equipment in the period 1958-64. The major portion of Bulgaria's imports of electronic equipment, however, came from the other countries in the Soviet Bloc, chiefly the Soviet Union, Czechoslovakia and East Germany. Most of the Soviet goods were television receivers, radio receivers and instruments. East Germany and Czechoslovakia supplied instruments, communications equipment and components.

8. Rumania

a. Exports

In the period 1958-64 Rumanian exports were negligible, consisting of very small amounts of instruments, radio receivers, and telephone gear.

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Recently, however, exports of semiconductors have been reported and they may become more important in the future because of significant French assistance to the Rumanian semiconductor industry.

b. Imports

Rumania's imports of electronic equipment which probably amounted to about \$7 million in 1958 and about \$17 million in 1962, were expected to reach about \$25 million in 1965. Television receivers, principally from the Soviet Union, represented about 35 percent of these imports after 1960, communications equipment accounted for about 25 percent of the total, and the remainder was divided nearly equally between instruments and components.

Probably 20 to 30 percent of Rumania's imports of electronic equipment came from outside the Bloc and were supplied principally by Belgium, France, West Germany, Japan, and Switzerland. Imports of electronics from non-Bloc countries consisted mainly of instruments (about half of the total imports of these) and communications equipment (about a fourth of the total imports of this item).

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APPENDIX A

DEFINITIONS

Communications equipment - includes all electronic signalling apparatus such as broadband microwave carrier equipment (cable and radio relay types), point-to-point radio transmitters and receivers, broadcast transmitters, equipment for telephone and telegraph exchanges, and radar for civil purposes. Wire and cable per se are not considered electronic equipment and are excluded from this study.

Instruments - includes electronic instruments for industry and medicine as defined within commodity classification numbers 170 and 172 of the official Soviet trade handbook, plus computers and test equipment.

Components - includes electron tubes, semiconductors, resistors, ferrites, capacitors and the like.

Consumer entertainment equipment - includes radio and television receivers, phonographs and consumer-type tape recorders.

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APPENDIX B

METHODOLOGY

1. General

The methods employed in the analysis of Soviet Bloc foreign trade in electronics were dictated, of course, by the nature of the available data. It was not possible to develop a complete trade pattern for the Bloc and to show, in matrix form, the amounts imported by each recipient country from each exporting country. The most intensive analysis of the data resulted in an estimate by year of the total amounts of electronic equipment (by major category) exported or imported by each Bloc country. The determination of the direction of trade was restricted to the division of trade into that moving in intra-Bloc trade and that exchanged with non-Bloc countries. Further specificity with respect to country of origin of imports or of destination of exports was seldom possible.

2. The Data and Its Treatment

Trade handbooks, when available, gave useful statistics, but seldom complete statistics. The division of total trade into commodity categories typically is accomplished in trade handbooks in a manner unfavorable to the subsequent summing of all exports or imports of a particular industry, viz., electronics. For example, the Soviet trade handbooks itemize exports of entertainment equipment and instruments, but exports of components and communications equipment are not listed (although known to have occurred). Moreover, the reporting on instruments is imperfect for the purpose of this report because it contains both electronic and non-electronic instruments.\*

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\* See Instruments, page 26.

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Not every Bloc country publishes a statistical handbook on foreign trade, and these handbooks do not appear until the expiration of a year or more after the last year for which data are quoted. Advantage, where possible, was taken of the bilaterality of trade, in order to determine the imports and exports of non-reporting countries from a study of the exports and imports of all the reporting countries that trade with them.

Additional pieces were added to the picture from published official statements of the trade plans and achievements for the electronics industries of the several Bloc countries. These statements sometimes gave export figures as shares of total domestic output, making the accuracy of the export estimate dependent on the accuracy of a production estimate.

Although the best estimates are those based on openly published statistics, intelligence reports provided fragmentary but useful data in some instances. This fragmentary information served principally to weight the interpolations and extrapolations that had to be made for those years for which data from published sources was incomplete.

### 3. Exchange Rates

All values in this study are expressed in US dollars. Where Bloc trade data has been taken from official statistical handbooks, its value has been converted to US dollars by the application of the appropriate official exchange rate (crown/dollar, zloty/dollar, etc.). The procedure is valid because the statistical compilations of Bloc countries present data on trade with non-Bloc countries in values that reflect the actual prices paid converted to domestic currency at the official exchange rate. Moreover, prices set artificially in intra-Bloc trade more or less reflect World market prices converted at official rates. Where Bloc trade estimates have been based on production data and reflect domestic prices,

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exchange rates have been employed that represent the ratio of domestic prices and dollar prices for similar items of electronic equipment.

4. Estimating Trade in Instruments

Unique difficulties attend the estimation of trade in electronic instruments, which in statistical handbooks typically are included in a general category embracing instruments of all types. It was possible to determine that about one-third of the total exports of instruments from Hungary consisted of electronic instruments. Approximately the same proportions were found in the exports of instruments of the US. Hence, when statistical compilations on trade in instruments make no distinction between types of instruments, it has been assumed that one-third of them were electronic.

5. Ranges of Confidence in Estimates

Estimates of the value of trade in electronics equipment of the USSR, Hungary, East Germany, and Czechoslovakia presented in Table 2 are believed to be accurate within a range of confidence of  $\pm 10$  percent for exports and  $\pm 20$  percent for imports. The estimated values of Polish exports are believed accurate within a range of  $+ 10$  percent and  $-20$  percent, and those of Bulgarian exports  $\pm 30$  percent. Estimated values for imports of Poland, Bulgaria, and Rumania are believed accurate within a range of  $\pm 30$  percent.

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APPENDIX C

STATISTICAL TABLES

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Table 1

Soviet Bloc: Estimated Trade in Electronic Equipment,  
by Area of Origin and Destination  
1958-65

	Exports							Imports								
	1958	1959	1960	1961	1962	1963	1964	1965	1958	1959	1960	1961	1962	1963	1964	1965
Total a/	24	105	121	150	201	244	268	325	92	119	143	176	218	262	286	350
Bloc	77	91	102	128	179	219	241	295	77	91	102	128	179	219	241	295
Non-Bloc	16	13	19	21	23	25	27	30	21	27	41	48	40	43	45	55
	Million US \$							Million US \$								
	Percent							Percent								
Annual rate of growth of total	11.7	15.2	24.0	34.0	21.4	9.8	21.3	20.2	20.2	23.1	23.9	20.2	9.2	22.4		

a. Because of rounding, components may not add to the totals shown.



Table 2

Soviet Bloc: Estimated Total Trade in Electronic Equipment, By Country  
1958-65

	Million US \$															
	Exports						Imports									
	1958	1959	1960	1961	1962	1963	1964	1965	1958	1959	1960	1961	1962	1963	1964	1965
Total a/	94	105	121	150	201	244	268	325	92	119	143	176	218	262	286	350
USSR	221	22	25	27	42	42	31	34	30	35	44	57	79	95	115	140
Bulgaria	1	1	1	2	4	5	6	7	5	7	10	15	17	N.A.	N.A.	N.A.
Czechoslovakia	15	20	21	35	48	54	61	70	15	18	22	26	41	N.A.	N.A.	N.A.
East Germany	21	24	29	35	45	60	67	88	7	13	19	21	16	N.A.	N.A.	N.A.
Hungary	33	35	59	43	50	70	85	104	4	9	9	8	8	9	10	10
Poland	2	3	4	8	12	14	17	21	15	17	20	30	35	N.A.	N.A.	N.A.
Rumania	Neg	Neg	Neg	Neg	Neg	Neg	Neg	Neg	7	10	12	15	17	N.A.	N.A.	N.A.
Unallocated									16	10	7	4	5	N.A.	N.A.	N.A.

a. Because of rounding, components may not add to the totals shown.

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Table 3  
 Comparison of Exports of Non-Military Electronics and Production of All Electronics,  
 Selected Soviet Bloc Countries, 1958 and 1965

Country	1958			1965		
	Production Million US \$	Exports Million US \$	Exports in Percent of Production	Production Million US \$	Exports Million US \$	Exports in Percent of Production
USSR	3,500	21	0.6	13,200	34	0.3
Hungary	53	33	62.3	262	104	39.7
East Germany	83	21	25.3	272	88	32.4
Czechoslovakia	150	15	10.0	268	70	26.1
Poland	68	2	2.9	231	21	9.1

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Table 4

Soviet Bloc: Estimated Total Trade in Electronic Equipment, By Category, 1958-65

	Million US \$															
	Exports					Imports										
	1958	1959	1960	1961	1962	1963	1964	1965	1958	1959	1960	1961	1962	1963	1964	1965
Total a/	94	105	121	150	201	244	268	325	99	119	143	176	218	262	286	350
Communication Equipment	21	26	29	41	65	88	105	128	23	28	30	46	65	N.A.	N.A.	N.A.
Instruments	33	35	40	48	59	67	80	94	34	43	54	60	75	N.A.	N.A.	N.A.
Components	13	14	16	17	21	32	37	40	15	17	19	24	23	N.A.	N.A.	N.A.
Consumer Entertainment Equipment	27	30	36	44	56	57	46	63	27	30	39	46	55	N.A.	N.A.	N.A.

a. Because of rounding, components may not add to the totals shown.

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Table 5

Soviet Bloc: Estimated Trade in Electronic Equipment with Non-Bloc Countries, by Bloc Country 1958-65

	Million US \$															
	Exports						Imports									
	1958	1959	1960	1961	1962	1963	1964	1965	1958	1959	1960	1961	1962	1963	1964	1965
Total a/	16	13	19	21	23	25	27	30	21	27	41	48	40	43	45	52
USSR	1	1	1	4	3	3	3	4	7	6	14	17	16	13	13	13
Bulgaria	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	1	1	1	1	1	N.A.	N.A.	N.A.
Czechoslovakia	4	3	3	4	5	5	5	5	2	3	3	3	3	N.A.	N.A.	N.A.
East Germany	5	4	6	7	8	9	10	11	4	6	8	8	3	N.A.	N.A.	N.A.
Hungary	3	3	5	6	7	7	8	9	3	6	6	5	5	6	6	6
Poland	1	N.A.	1	1	1	1	1	1	4	5	8	8	8	N.A.	N.A.	N.A.
Rumania	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	1	1	5	5	N.A.	N.A.	N.A.

a. Because of rounding, components may not add to the totals shown.

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Table 6  
 Soviet Bloc: Estimated Trade in Electronic Equipment with Non-Bloc Countries, by Category  
 1958-65

	Million US \$															
	Exports						Imports									
	1958	1959	1960	1961	1962	1963	1964	1965	1958	1959	1960	1961	1962	1963	1964	1965
Total <sup>a/</sup>	16	13	19	21	23	25	27	30	21	27	41	48	40	43	45	55
Communication Equipment	2	1	4	7	7	7	7	8	4	4	5	12	7	N.A.	N.A.	N.A.
Instruments	9	6	8	8	9	9	10	11	11	14	21	21	25	N.A.	N.A.	N.A.
Components	2	4	3	3	3	4	4	5	4	7	7	10	5	N.A.	N.A.	N.A.
Consumer Enter- tainment Equipment	3	2	4	3	4	5	5	6	2	3	7	5	3	N.A.	N.A.	N.A.

a. Because of rounding, components may not add to the totals shown.

Table 7

USSR: Estimated Trade in Electronic Equipment, by Category  
1958-65

	Million US \$															
	Exports						Imports									
	1958	1959	1960	1961	1962	1963	1964	1965	1958	1959	1960	1961	1962	1963	1964	1965
Total a/	21	22	25	27	42	42	31	34	30	35	44	57	79	95	115	140
Communications Equipment	2	3	4	6	8	10	10	10	12	12	12	23	32	43	52	64
Instruments	7	7	7	8	10	9	11	12	14	18	23	28	38	40	47	55
Components	2	2	2	2	2	2	2	2	4	4	4	5	8	11	15	21
Consumer Enter- tainment Equipment	10	10	12	10	21	21	8	10	1	1	5	2	1	1	1	1

a. Because of rounding, components may not add to the totals shown.

Table 8

USSR: Estimated Trade in Electronic Equipment by Area of Origin and Destination  
1958-65

	Million US \$															
	Exports						Imports									
	1958	1959	1960	1961	1962	1963	1964	1965	1958	1959	1960	1961	1962	1963	1964	1965
Total a/	21	22	25	27	42	42	31	34	30	35	44	57	79	95	115	140
Bloc	21b/	21b/	24b/	23	39	39	28	30	24	28	30	41	63	82	102	127
Non-Bloc	1	1	1	4	3	3	3	4	7	6	14	17	16	13	13	13

a. Because of rounding, components may not add to the totals shown.

b. Because of inadequate data, exports to the Asian Communist countries, principally Communist China, cannot be separated from the value of exports to the Eastern European Communist countries; however, this is of concern only during 1958-60 when Soviet exports of electronic goods to Far Eastern Communist countries probably approached \$7 million per year. After 1960, these exports became insignificant.

Table 9  
 Hungary: Estimated Exports of Electronic Equipment, by Category  
 1958-65

	Million US \$							
	1958	1959	1960	1961	1962	1963	1964	1965
Total a/	33	35	39	43	50	70	85	104
Communications Equipment	12	14	13	11	18	33	44	57
Instruments	8	7	8	11	13	18	23	29
Components	7	7	8	8	8	9	8	8
Consumer Enter- tainment Equipment	7	8	10	13	12	11	11	11

a. Because of rounding, components may not add to the totals shown.



Table 10

Hungary: Estimated Trade in Electronic Equipment, by Area of Origin and Destination  
1958-65

	Million US \$															
	Exports						Imports									
	1958	1959	1960	1961	1962	1963	1964	1965	1958	1959	1960	1961	1962	1963	1964	1965
Total a/	33	35	39	43	50	70	85	104	4	2	2	8	8	9	10	10
Bloc	31b/	32b/	34b/	38	43	62	77	95	1	3	3	3	3	3	4	4
Non-Bloc	3	3	5	6	7	7	8	9	3	6	6	5	5	6	6	6

a. Because of rounding, components may not add to the totals shown.

b. May include up to \$10 million worth of equipment exported to the Far Eastern Communist countries.

Table 11

East Germany: Estimated Trade in Electronics Equipment, by Category  
1958-65

	Million US \$															
	Exports						Imports									
Total a/	21	24	22	35	45	60	67	88	7	13	19	21	16	N.A.	N.A.	N.A.
Communications Equipment	3	4	5	6	9	14	15	16	1	1	3	2	3	N.A.	N.A.	N.A.
Instruments	9	11	12	15	20	22	26	31	2	4	5	4	4	N.A.	N.A.	N.A.
Components	3	3	4	3	5	10	12	13	3	3	3	4	4	N.A.	N.A.	N.A.
Consumer Enter- tainment Equipment	6	6	8	11	12	13	14	28	1	5	8	11	5	N.A.	N.A.	N.A.

a. Because of rounding, components may not add to the totals shown.

Table 12

East Germany: Estimated Trade in Electronic Equipment, by Area of Origin and Destination  
1958-65

	Million US \$															
	Exports					Imports										
	1958	1959	1960	1961	1962	1963	1964	1965	1958	1959	1960	1961	1962	1963	1964	1965
Total a/	21	24	29	35	45	60	67	88	7	13	19	21	16	N.A.	N.A.	N.A.
Bloc	17	20	24	28	37	51	57	77	3	7	11	13	12	N.A.	N.A.	N.A.
Non-Bloc	5	4	6	7	8	9	10	11	4	6	8	8	3	N.A.	N.A.	N.A.

a. Because of rounding, components may not add to the totals shown.

Table 13

Czechoslovakia: Estimated Trade in Electronic Equipment, by Category

1958-65

	Million US \$															
	Exports							Imports								
	1958	1959	1960	1961	1962	1963	1964	1965	1958	1959	1960	1961	1962	1963	1964	1965
Total a/	15	20	21	35	48	54	61	70	15	18	22	26	41	N.A.	N.A.	N.A.
Communications Equipment	3	4	5	14	24	25	29	34	2	3	5	11	17	N.A.	N.A.	N.A.
Instruments	9	10	12	13	14	16	18	19	6	6	7	8	8	N.A.	N.A.	N.A.
Components	1	2	2	2	4	8	11	13	1	1	1	2	5	5	6	7
Consumer Entertainment Equipment	2	4	3	6	5	4	4	4	6	7	8	6	11	N.A.	N.A.	N.A.

a. Because of rounding, components may not add to the totals shown.

Table 14

Czechoslovakia: Estimated Trade in Electronic Equipment, by Area of Origin and Destination  
1958-65

	Million US\$															
	Exports						Imports									
	1958	1959	1960	1961	1962	1963	1964	1965	1958	1959	1960	1961	1962	1963	1964	1965
Total a/	15	20	21	35	48	54	61	70	15	18	22	26	41	N.A.	N.A.	N.A.
Bloc	11	17	18	31	43	48	55	65	13	15	19	23	38	N.A.	N.A.	N.A.
Non-Bloc	4	3	3	4	5	5	5	5	2	3	3	3	3	N.A.	N.A.	N.A.

a. Because of rounding, components may not add to the totals shown.