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Trends in U.S. Trade and Comparative Advantage

IN RECENT YEARS, THE SHRINKING U.S. trade balance has drawn a good deal of attention and caused some concern here and abroad. The balance on merchandise trade reached a peak of $6.8 billion in 1964, and then shrank to about $650 million in 1968 and 1969. This reduction was due to some extent to the excess demand in the United States in 1966–68, and the ensuing inflation. But, as some observers have pointed out, the inflationary boom could explain only part of the story.[1] They suggested that the deterioration was the result mainly of longer-term trends in the basic U.S. competitive position. This view has gained more prominence as the increase in the U.S. trade surplus to $2.1 billion in 1970 was followed by a deficit in the first half of 1971 despite the slowdown in domestic economic activity. Thus, the recession has not been accompanied by an improvement in the trade balance,

* We wish to thank Betty L. Barker, Barbara R. Lowrey, Kathryn A. Morisse, Nicholas Monoyios, and, especially, Raymond D. Hill for assistance. Besides acknowledging assistance from the Brookings panel, we are also indebted to Benjamin J. Cohen, Keith L. R. Pavitt, and staff members of the Board of Governors of the Federal Reserve System for comments on an earlier draft. The views expressed in this paper are those of the authors, and do not necessarily reflect those of the Board of Governors.

1. See, for example, Michael Boretsky, "Concerns about the Present American Position in International Trade" (paper presented at the National Academy of Engineering Symposium on Technology and International Trade, October 14–15, 1970; processed).

mainly because imports have continued to rise well beyond their usual relation to the growth in gross national product (GNP).

In an attempt to illuminate some of the uncertainties concerning the U.S. trade position this paper presents an analytical description of U.S. trade in manufactured goods, drawing on our ongoing research into these topics. It is organized around three questions: What have been the long-term trends in U.S. trade by commodity groups? How has the U.S. trade performance in the 1960s compared with that of other major industrial countries? What is the source of current U.S. comparative advantage in trade?

The first section draws on the trade data broken down by the end-use categories employed by the Office of Business Economics (OBE) to review trends in U.S. trade from 1925 to 1970, by seven major end-use aggregates. The second extends the analysis of the U.S. aggregates, drawing on the data published by the Organisation for Economic Co-operation and Development (OECD) on trade among the major industrialized countries and on national GNP data in order to compare U.S. output, demand, and trade by major end-use categories with those of other industrial countries in the 1960s. The third section turns to disaggregated data on trade in manufactured goods, reviewing trends in disaggregated OBE end-use groups to observe patterns in trade at the three- and four-digit level. The final section studies the source of U.S. comparative advantage in a cross-section of U.S. trade by two- and three-digit standard international trade classification (SITC) categories.

Long-term Trends in U.S. Trade by End-use Categories

A useful perspective on developments in U.S. trade can be obtained by reviewing its longer-run trends by end-use commodity categories. The OBE data on trade are broken down under five summary categories: foods, feeds, and beverages (0); industrial supplies and materials (1); capital goods (2); automotive products (3); and consumer goods (4).[2] This section considers these aggregate end-use categories. Selected three- and four-digit categories are examined below to observe more detailed movements in trade.

2. U.S. Department of Commerce, Office of Business Economics, *U.S. Exports and Imports Classified by OBE End-Use Commodity Categories, 1923–1968*, A Supplement to the *Survey of Current Business* (1970).

INITIAL ASSUMPTIONS AND HYPOTHESES

Two basic questions arise in analyzing and presenting the OBE data: How should the data be disaggregated—in terms of both categories to be used and degree of detail? And how should exports and imports be related to each other?

To a large extent, the answer to the first question involves the way the OBE organizes the data. This disaggregation makes sense if the course of trade in subcategories is more similar *within* major categories than *across* major categories. Thus a decision was made to disaggregate, within the end-use framework, as far as possible to see whether similar trade patterns obtain *within*, and dissimilar patterns *across*, categories.

The second question called for focus on trade balances by commodity groups. This focus, of course, does not suggest that all categories "should" show surpluses, or that categories showing large and growing deficits display "weakness" that necessarily should be corrected by policy action. The net balance of payments should be in equilibrium on whatever basis is thought appropriate, while within it some items show deficits, and others surpluses. Furthermore, the basic notion of comparative advantage implies that the United States should be a net importer of some goods and a net exporter of others.

But even at the finest level of statistical disaggregation that is available, it appears that most goods are subject to two-way trade. Thereby, the notion of comparative advantage becomes the proposition that the United States should be a *net* exporter of goods in which it has a comparative advantage—whether it derives from resource endowment, technological advantage, or education embodied in human capital—and a *net* importer of goods in which it is at a disadvantage.[3] Thus it is natural to focus on net exports by commodity group in an analysis that attempts to reveal something about movements in U.S. comparative advantage and trade.[4]

3. Strictly speaking, in a list of commodities ordered from those with maximum net exports to those with maximum net imports, the United States has a comparative advantage in producing the goods higher on the list relative to those lower on the list.

4. Disaggregation of the end-use data in an analysis focusing on net exports runs into the problem that, beyond the two-digit level, export and import categories do not match. This arises because a major criterion the OBE used for creating subcategories was the contribution of an item to the value total in its major category, and this criterion was

TRENDS IN AGGREGATE END-USE CATEGORIES

Table 1 shows net exports for seven major export end-use categories for the years 1925–70, excluding the war years 1941–45. In the table, total nonagricultural industrial supplies and materials were disaggregated into three parts: fuels and lubricants; chemicals; and a residual component. This disaggregation is necessary for two reasons. Fuels and lubricants include as major subcategories crude petroleum and semifinished petroleum products and natural gas, in which trade is heavily influenced both by natural resource advantages and by government policies. Chemicals are shown separately because they are the only three-digit category among nonagricultural industrial supplies and materials to show a surplus consistently since World War II.

Agricultural goods. From 1925 to 1959, the U.S. trade balance in agricultural goods typically fluctuated in the range from a surplus of $1 billion to a deficit of $1 billion. Then from 1960 through 1967, agricultural trade showed surpluses in the range from $0.7 billion to $1.7 billion. Since 1967, the surplus has been considerably smaller—between $100 million and $500 million. Thus, between 1964 and 1970, a substantial deterioration took place in trade in agricultural goods as the surplus fell from $1.7 billion to $0.5 billion.

Fuels and lubricants. Trade in fuels and lubricants consistently showed a small surplus from 1925 through 1940. At the end of the war, exports jumped beyond the prewar experience, and then maintained a fairly flat trend, around which, however, large swings occurred. On the other hand, just after the war, imports picked up at the prewar level, but grew rapidly thereafter. Thus in fuel and lubricants, what began as a substantial surplus in the late 1940s became a balance in the mid-1950s and a steadily growing deficit in the 1960s. This pattern is frequently seen in industrial supplies and materials and in consumer goods.

Chemicals. A different pattern appears in chemicals (including fertilizers but excluding medicinal preparations). From 1925 to 1937 trade in these products roughly balanced. Then in 1938–40 a small but growing surplus appeared. After the war, exports started off substantially above imports,

applied separately on the export and import sides. In disaggregating beyond the two-digit level, therefore, the analysis here basically follows the export end-use categories, assigning import categories to the relevant export groups. For a discussion of the rationale and structure of the end-use groupings, see *U.S. Exports and Imports*, pp. vii-xviii.

which were roughly at their prewar level, then grew substantially faster than imports throughout the period 1946–70, although imports picked up distinctly in the late 1960s.

Other nonagricultural industrial supplies and materials. The category of other industrial supplies and materials, as shown in Table 1, is a heterogeneous group of products, as can be seen in Table 7. Most of them have shown deficits throughout the period 1925–70. Some of the more interesting subcategories will be discussed in the section on disaggregated trade patterns.

Capital goods. Capital goods have had a surplus in every year of the period 1925–70. As is apparent in Figure 1, imports were very flat before World War II, varying in the range of $10 million to $40 million, while exports generally were in the $400 million to $600 million range. After the war, capital goods exports showed the typical bump in the late 1940s, yielding a much higher surplus than in the prewar years. That surplus has grown rapidly and remarkably consistently to the present, exceeding $10 billion in 1970.

Consumer goods. Consumer goods (excluding food and beverages) describe a pattern completely different from that of capital goods, as Figures 1 and 2 confirm. Before World War II, the United States typically was a net importer of consumer goods by a small margin. Immediately after the war, a sizable surplus emerged as exports quadrupled from around $250 million to $1 billion. After this postwar bulge disappeared, exports grew slowly but steadily. Imports of consumer goods, on the other hand, have expanded at an increasingly rapid pace, overtaking exports in 1959. With the exception of a slight decrease in 1961, the deficit has increased ever since.

The plot of consumer goods trade in Figure 2 suggests two generalizations. First, once the postwar bulge in consumer goods exports had disappeared and the irregularly declining surplus dwindled away, the deficit grew steadily, not settling at one level as it had before the war. Second, the growth in the deficit was not a result simply of excess demand in the late 1960s. The data reveal it in the shrinkage of the surplus beginning in the early 1950s.

Automotive products. In automotive products, the United States had a surplus every year until 1968, but since then has had an increasing deficit. There was a small but steady surplus before World War II, following a pattern quite similar to that of capital goods (see Figure 1). After the war the familiar export bulge appeared, but was eliminated by the early 1950s. Exports grew erratically from 1953 to 1962, and at a smoothly increasing rate

Table 1. Net U.S. Exports by Selected End-use Commodity Categories, 1925–70[a]

Millions of dollars

Year	Total agricultural goods[b]	Nonagricultural industrial supplies and materials			Capital goods	Consumer goods	Automotive products	Other[c]	Total[d]
		Fuels and lubricants	Chemicals	Other					
1925	355	473	−37	−344	399	−107	323	−476	586
1926	52	634	−22	−419	422	−144	326	−558	291
1927	154	484	−14	−352	454	−152	395	−380	588
1928	186	494	−20	−309	516	−138	506	−280	955
1929	−78	517	−6	−370	618	−173	544	−275	778
1930	15	433	3	−272	518	−92	282	−153	735
1931	−45	243	5	−221	312	−63	151	−78	303
1932	54	188	16	−136	123	−40	78	−30	255
1933	67	211	17	−200	127	−45	92	−50	218
1934	23	244	26	−111	207	−28	192	−98	455
1935	−158	260	31	−237	251	−37	232	−127	215
1936	−333	275	26	−310	325	−33	245	−203	−7
1937	−459	395	22	−185	486	−38	353	−292	282
1938	19	403	34	−33	512	16	275	−145	1,079
1939	−267	403	64	−62	570	21	259	−177	810
1940	−399	323	136	217	945	68	258	−320	1,228
1946	1,082	587	262	−101	1,628	592	551	−153	4,449
1947	1,604	1,013	553	889	3,144	958	1,147	−183	9,125
1948	645	713	476	−600	2,523	599	904	−205	5,056
1949	866	379	464	−459	2,456	519	759	−116	4,866
1950	−810	174	354	−1,632	2,033	310	723	−382	770

1951	−499	787	479	−1,494	2,356	445	1,180	−689	2,566
1952	−707	605	376	−1,706	2,585	352	968	−507	1,967
1953	−1,258	274	334	−2,225	2,705	329	945	−198	903
1954	−936	136	533	−1,500	2,699	310	1,019	−122	2,140
1955	−625	102	620	−1,571	2,817	143	1,191	−292	2,382
1956	272	220	746	−1,689	3,470	113	1,250	−223	4,159
1957	495	297	857	−925	4,087	126	1,010	−175	5,771
1958	−202	−544	829	−1,413	4,292	119	568	−59	3,589
1959	−258	−699	914	−2,516	4,026	−261	343	−213	1,337
1960	858	−739	1,128	−1,229	4,949	−505	633	−100	4,997
1961	981	−933	1,133	−1,099	5,217	−448	805	−6	5,652
1962	742	−1,080	1,187	−2,021	5,685	−821	780	−13	4,459
1963	1,068	−956	1,313	−2,010	5,781	−831	882	63	5,309
1964	1,699	−1,069	1,627	−1,791	6,424	−943	962	91	6,998
1965	1,517	−1,264	1,504	−2,989	6,581	−1,506	990	107	4,941
1966	1,571	−1,270	1,627	−3,633	6,756	−1,877	444	147	3,765
1967	1,139	−1,127	1,729	−3,360	7,531	−2,102	150	146	4,106
1968	231	−1,457	2,075	−4,575	8,292	−3,041	−842	115	796
1969	146	−1,645	2,032	−3,531	9,129	−4,020	−1,454	44	703
1970	493	−1,467	2,223	−3,040	10,584	−4,806	−2,303	109	1,791

Sources: U.S. Department of Commerce, Office of Business Economics, *U.S. Exports and Imports Classified by OBE End-Use Commodity Categories, 1923–1968*, A Supplement to the *Survey of Current Business* (1970), Tables 5, 6, and U.S. Bureau of the Census, *Highlights of U.S. Export and Import Trade*, Report FT990, December 1970 (1971), Tables E9, I10.

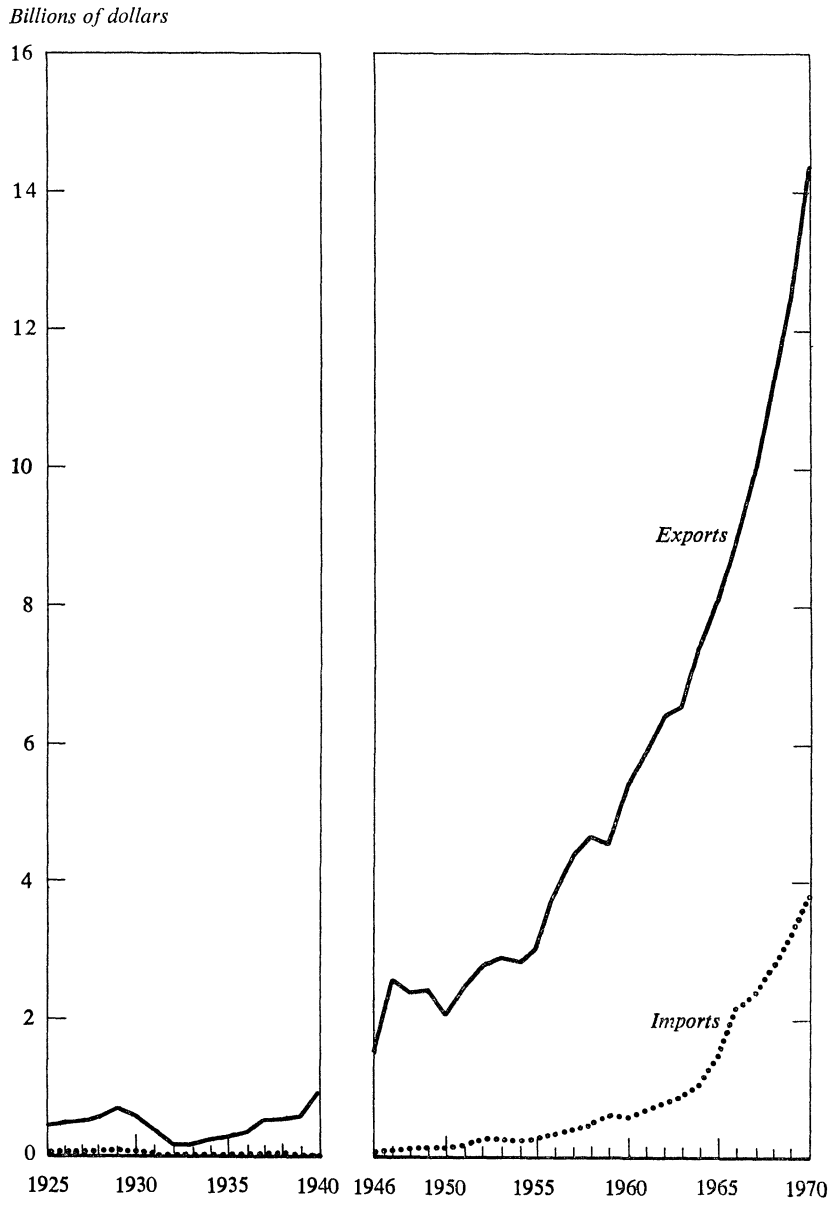
a. The war years 1941–45 are excluded. With the exception of the total agricultural and other categories, the assignment of end-use codes to trade categories is described in Table 7.

b. Total agricultural goods includes both consumer goods and raw inputs for industrial use. The end-use codes are 0 and 10 for exports, and 0, 1200–02, 1204, 1223–24, and 1227–28 for imports.

c. This group is composed of items within industrial supplies and materials for which we could not match exports and imports. The end-use codes are 1273 and 1275–77 for exports, and 1232, 1302, 1310, 1600–01, and 1611 for imports.

d. Details may not add to total due to rounding.

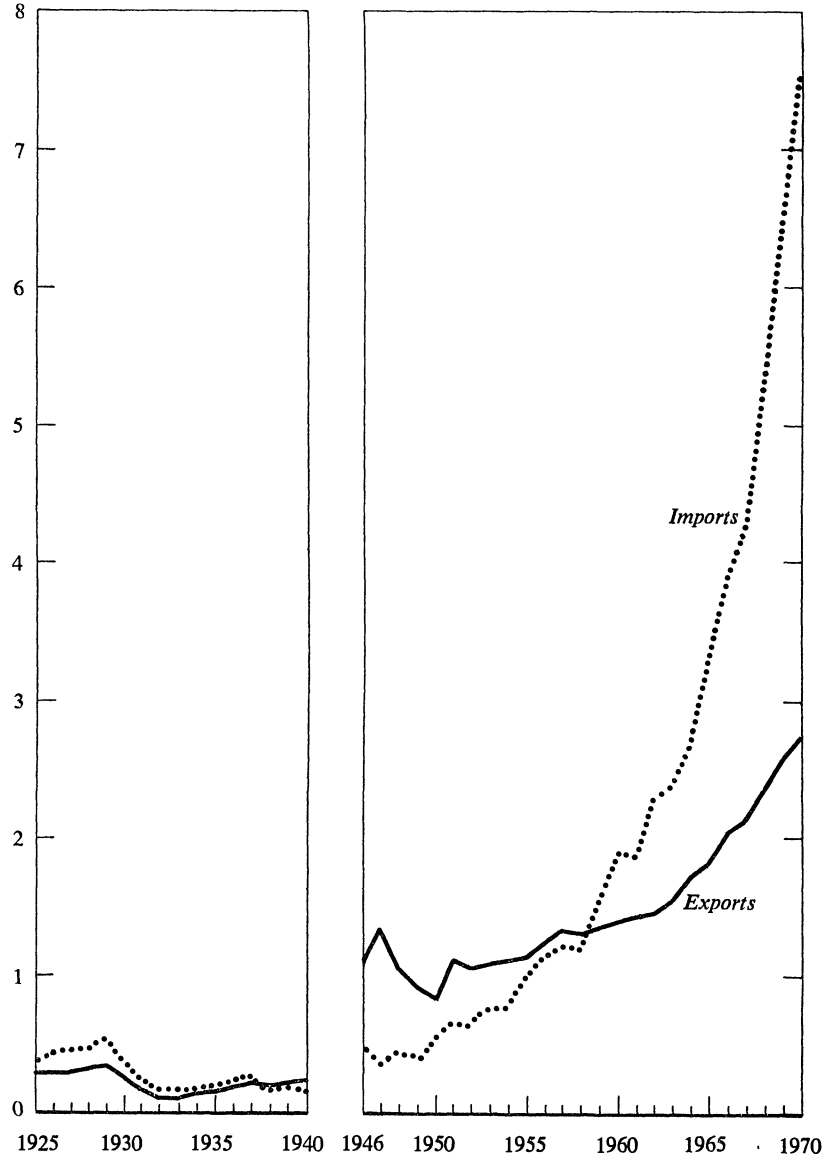
Figure 1. U.S. Imports and Exports of Capital Goods, 1925–70[a]



Sources: Same as Table 1.
a. Excluding the war years 1941–45.

Figure 2. U.S. Imports and Exports of Consumer Goods, 1925–70[a]

Billions of dollars



Sources: Same as Figure 1.
a. Excluding the war years 1941–45.

after that. Imports did not appear at a significant level until about 1955. They then grew at an increasing rate—with a relapse in 1959–61—and overtook exports in 1968, causing a deficit that has been growing ever since.

Some of the recent expansion in both imports and exports has been due to the U.S.-Canadian auto agreement of 1965. On balance, automotive trade with Canada has shifted from a fairly steady surplus ranging from $400 million to $600 million in 1960–65, to a deficit of $1.1 billion in 1970. Nevertheless, the underlying trend in automotive trade is similar to that shown in Table 1. The following data on U.S. trade in automotive products (shown in millions of dollars) suggest that, aside from trade with Canada (which they exclude), the trend has been from surplus to deficit:

1965	*1966*	*1967*	*1968*	*1969*	*1970*
369	90	−6	−602	−701	−1,193

In summary, the data of Table 1 give a strong impression that U.S. trade since World War II has been characterized by growing surpluses in capital goods and chemicals, growing deficits in consumer goods and other industrial materials, and a deteriorating balance in automotive products. The next section compares the trends in U.S. trade in finished goods in the 1960s with those of other industrial countries.

The U.S. Competitive Position in the Industrial World

One important conclusion from the preceding description of longer-run trends in U.S. trade is that the time of stable deficits and surpluses in various categories of trade has passed. The increased dynamism in trade flows is one of the reasons for the difficulty in explaining the current deterioration in the U.S. trade balance. Some observers look to the previous period of excess demand and continuing inflation as a major cause, and conclude that the United States has suffered a once-for-all loss in competitiveness. They propose exchange rate adjustments, accompanied by appropriate demand management policies, both to correct the current imbalance and to prevent new disequilibrium.

Others emphasize the longer-run loss of comparative advantage associated with rigidities in the industrial structure, transmission of technology

abroad, and so on. They recommend additional remedies that directly affect supply factors and that are likely to be of a microeconomic nature.[5]

One way to determine the basic explanation is to identify any great differences in recent demand and output trends between the United States and other industrial countries. For example, a large rise in the import share of domestic consumption does not by itself indicate a shift in comparative advantage.[6] Any judgment needs to take into account whether import penetration of domestic markets had been accompanied by losses of export markets. And if export losses had occurred, the explanation might depend upon whether the composition of world demand had shifted to the disadvantage of U.S. producers. This section, therefore, will examine the trends in U.S. trade in the 1960s in terms of the balance between output and consumption in the United States, and compare them with trends in other industrial countries. These comparisons have no normative implication: There is no reason why one country's output and demand pattern should conform to the average of all industrial countries. Indeed, it would be remarkable if it did. Underlying economic growth rates vary among countries because population trends vary, if for no other reason, and actual growth trends differ, if for no other reason, because policy objectives differ. But international comparisons require some international average (or standard) as a yardstick. In demonstrating *how* developments vary among countries, these comparisons can point to the direction in which answers should be sought.

THE STATISTICAL FRAMEWORK

The analysis in this section rests upon a translation of trade data from SITC definitions into end-use type categories for all countries of the

5. Clearly, the effects of neither of these causes can be termed "temporary." The effects of inflationary excesses on the price structure can no more be reversed by resumption of noninflationary growth than possible past misjudgments about the importance of investing in particular kinds of human or other capital can be reversed by proper allocation of new resources, although both developments would help prevent further deterioration. Given the balance-of-payments constraint and the aim to make the most efficient use of resources, the choice is between different kinds of action, rather than, as is sometimes argued, between inaction and action. On this reasoning it is important to determine the most crucial explanation among those that are being advanced.

6. The word consumption is used here in the widest sense, to cover all levels of demand including capital goods, and thus as a shorthand denotation of resource absorption.

OECD.[7] The trade categories studied correspond to five major demand groups: food, consumer durable goods, consumer nondurable goods, passenger cars, and capital goods. GNP data for fourteen industrial countries were broken down into matching categories, making it possible to compare, across countries and by categories, the shifts in shares of domestic output absorbed by domestic consumption, the shares of domestic consumption satisfied by foreign production, and so forth.[8] Exports by the fourteen countries in these five product groups, which together constitute, roughly, a finished goods category, amount to about 50 percent of all OECD exports. Exports of industrial supplies and materials, an end-use grouping for which no matching GNP category exists, are 40 percent, and the remaining 10 percent are accounted for by exports in unallocated categories and by trade of the smaller OECD countries not included in this study.

The data cover the period from 1961 to 1968, so that, unfortunately, the divergent cyclical developments between the United States and the rest of the industrial world from late 1969 onward cannot be analyzed. However, the period is sufficiently long to throw some light on relative demand and supply trends among industrial countries in the 1960s. For this purpose, the second half of the decade is contrasted with the average for 1961–64. Although the U.S. economy was operating below full employment in 1961–64, the gap was being narrowed, prices were relatively stable, and the trade balance was in large surplus, around $5 billion or so annually. By the first half of the 1960s, other countries, except perhaps Japan, had fully completed their postwar reconstruction. Germany and the Netherlands had made some upward adjustment of their exchange rates in recognition of this fact, and quantitative trade restrictions had been largely removed (again with the exception of those applied by and against Japan). Thus, the period pro-

7. These data were developed by Kathryn A. Morisse at the Board of Governors of the Federal Reserve System. A qualitative description of the data problems is available from her on request. It should be noted that this classification follows the general lines of the OBE categories, but the results are not strictly comparable mainly because the export and import classification schemes are not identical for certain categories. This leads occasionally to wide divergences from the published OBE data.

8. For a description of the data and their adequacy, see Betty L. Barker and Barbara R. Lowrey, "Gross National Product Data, by Selected Components, for Fourteen Industrial Countries," Board of Governors of the Federal Reserve System, "Review of Foreign Developments," No. 662 (November 30, 1970; processed). GNP data were converted to U.S. dollars at 1967 rates of exchange.

vides a relatively good base for comparisons of changes in competitive performance. Comparisons in this section are generally made with the year 1968. That year was not an ideal one, in terms of cyclical balance. But using a 1967–68 average would have prejudiced the results even more, since 1967 saw a recession in Germany and low growth in the United States. Whenever possible, abrupt changes in trend in 1968 are noted. The basic data on which subsequent tables in this section are drawn, are summarized in Table 2.

OUTPUT AND DEMAND PATTERNS IN THE INDUSTRIAL WORLD

The changes in the structure of output and consumption of industrial countries mark the sixties as a decade of growing trade involvement. Imports and exports of industrial countries expanded much faster than their domestic output, as is shown in Table 3. Of course, this development is bound up with the creation of the European Economic Community (EEC) and the European Free Trade Association (EFTA). But the rapid expansion of trade among the EEC, EFTA, North America, and Japan suggests that the interchange of goods among industrial nations would have grown rapidly anyway. Thus, it is not surprising, and should be no a priori cause for alarm, that the share of domestic markets supplied by domestic producers has declined almost everywhere in almost every category. For all categories and all fourteen countries together, it fell from an average of 92.7 percent in 1961–64 to 91.3 percent in 1968, a 1½ percent decrease. In other words, consumption has become increasingly cosmopolitan.

A better test of changes in competitive position than the degree of penetration of domestic markets by foreign producers is the relationship between domestic output and domestic consumption. This ratio, shown in Table 4, includes changes in exports as well as in imports. It reflects both shifts in trade balances and the relation of the size of the trade balance to total output.[9] Thus, the extent of the improvement in the trade positions of Belgium,

9. The absolute level of (as distinct from the change in) the ratio of domestic output to domestic consumption is not very meaningful. The adequacy of the share of consumption covered by domestic output depends upon a country's balance-of-payments structure in general, and upon its need to import industrial materials in particular (since the ratios given here capture trade in finished goods only). But *changes* in the ratio of domestic output to domestic consumption readily demonstrate shifts in the trade position.

Table 2. Shares of Individual Countries in Output and Consumption of Industrial Countries and in Export and Domestic Markets, 1968 and Percentage Change from 1961–64 Average

Percentage and percentage change

Country and economic organization	1968 shares						Percentage changes from 1961–64 average					
	Food	Durable consumer goods	Non-durable consumer goods	Passenger cars	Capital goods	Total	Food	Durable consumer goods	Non-durable consumer goods	Passenger cars	Capital goods	Total
A. Domestic output as percent of total output of industrial countries												
United States	44.6	54.1	51.3	62.0	42.6	48.4	−6.1	+0.8	−3.2	−5.6	+2.6	−2.8
Canada	4.1	2.4	3.7	5.6	2.1	3.5	−2.0	−8.2	+11.0	+8.4	+20.9	+3.4
Japan	9.4	5.6	8.9	5.7	13.9	9.5	+30.4	+36.1	+31.2	+157.7	+37.3	+35.8
European Economic Community	28.7	24.6	23.1	18.5	28.2	25.8	+1.8	−2.4	−0.1	+2.8	−11.0	−2.3
Belgium-Luxembourg Economic Union (BLEU)	1.4	1.8	1.2	1.5	0.9	1.3	+0.1	−3.3	−3.8	+23.0	−10.9	−2.2
France	10.2	9.2	7.6	4.2	8.6	8.6	+6.1	−2.3	+1.6	−8.7	−0.3	+1.5
Germany	7.6	7.1	7.8	9.6	13.1	8.8	−9.4	−6.0	−9.5	*	−17.5	−9.8
Italy	7.6	4.1	5.4	3.2	3.9	5.5	+9.0	−4.9	+17.7	+19.6	−18.2	+4.1
Netherlands	1.9	2.4	1.1	*	1.7	1.6	+7.5	+21.6	−5.5	*	+11.2	+6.9
European Free Trade Association[a]	13.2	13.3	13.0	8.2	13.2	12.8	+0.8	−10.7	−7.1	−8.9	−12.6	−6.6
Austria	0.9	0.6	0.7	0.1	0.8	0.7	−5.0	−4.1	−10.0	*	−16.2	−9.1
Denmark	1.2	1.2	0.9	0.5	0.8	1.0	+12.0	+8.2	+7.2	−1.6	−10.3	+5.0
Norway	0.6	0.5	0.5	0.2	0.5	0.5	+5.2	−1.5	−7.0	−16.2	−23.2	−6.5
Sweden	1.7	1.2	1.5	1.2	1.5	1.5	+6.8	−16.3	+0.3	+23.5	−2.6	+0.9
Switzerland	1.0	1.5	0.7	0.1	1.4	1.0	+8.5	−2.4	−8.8	*	+1.6	+2.2
United Kingdom	7.8	8.3	8.7	6.1	8.2	8.1	−3.0	−13.9	−9.4	−18.8	−14.7	−9.4

	B. Domestic consumption as percent of total consumption											
United States	43.8	57.1	51.8	67.7	42.5	48.9	−4.9	+2.5	−3.0	−2.3	+6.3	−1.3
Canada	3.7	3.0	3.9	5.4	3.6	3.8	+0.5	−5.2	+10.4	−6.4	+8.7	+3.6
Japan	9.6	3.3	8.6	5.0	14.3	9.2	+31.7	+19.9	+32.2	+122.7	+29.5	+32.7
European Economic Community	28.9	23.5	22.6	13.8	26.7	25.0	+0.7	−2.1	−0.4	*	−15.5	−3.8
BLEU	1.5	1.8	1.2	0.9	1.1	1.3	−2.2	−3.4	−3.2	−7.9	−16.9	−5.8
France	9.9	9.6	7.5	3.6	9.5	8.6	+3.8	+1.5	+2.4	−4.7	+0.2	+1.6
Germany	8.5	6.1	7.8	6.1	10.4	8.2	−9.8	−6.2	−9.9	−4.5	−23.4	−12.6
Italy	7.5	3.3	4.9	2.6	3.7	5.3	+10.8	−18.9	+14.5	+12.0	−29.3	+0.4
Netherlands	1.5	2.7	1.2	0.6	2.0	1.6	+5.9	+25.9	−2.1	+89.1	*	+7.0
European Free Trade Association[a]	14.0	13.1	13.1	8.1	12.9	13.1	−3.4	−10.3	−7.1	−10.0	−8.5	−6.4
Austria	0.9	0.6	0.7	0.4	0.9	0.8	−5.3	−6.1	−8.3	+29.4	−19.0	−8.9
Denmark	0.9	1.2	0.9	0.7	0.9	0.9	+25.5	+4.7	+6.3	−12.1	−11.2	+7.8
Norway	0.6	0.6	0.5	0.3	0.8	0.6	+5.9	−1.2	−2.8	−15.6	−20.2	−4.5
Sweden	1.7	1.4	1.7	1.1	1.5	1.6	+5.5	−10.4	+1.8	−15.7	−7.7	−1.0
Switzerland	1.1	1.1	0.7	0.6	1.1	1.0	+3.5	−8.0	−7.4	+45.6	−10.8	−3.0
United Kingdom	8.8	8.2	8.6	5.0	7.7	8.2	−8.5	−12.7	−9.6	−13.9	−5.6	−9.6
	C. Exports of individual countries as percent of total exports of industrial countries											
United States	27.5	10.8	13.8	12.8	26.4	21.3	−16.4	−16.4	−20.2	+41.5	−10.3	−15.8
Canada	10.3	1.0	1.4	16.4[b]	3.5	5.5	−17.4	+15.0	+40.7	[c]	+58.5	+27.7
Japan	3.1	19.7	11.5	6.0	6.0	8.2	−0.9	+25.3	−1.4	+331.2	+86.5	+46.0
European Economic Community	41.9	42.5	51.9	53.1	42.0	44.4	+24.3	−7.4	+11.1	−20.3	+6.6	+6.7
BLEU	3.8	7.3	4.7	6.7	2.3	4.1	+68.1	−2.5	+5.3	+37.8	+5.4	+22.6
France	13.8	5.4	11.0	9.0	6.8	8.6	+25.5	−27.1	−9.2	−36.6	+13.8	−0.7
Germany	4.0	16.7	14.1	29.4	22.8	18.1	+75.3	−15.9	+19.2	−24.4	−1.0	+3.4
Italy	6.4	9.1	16.9	7.3	6.5	8.2	−3.2	+36.8	+23.9	−8.7	+34.3	+21.6
Netherlands	13.9	4.0	5.2	0.7	3.6	5.4	+20.9	−10.7	+9.7	+6.0	+6.7	0.0

Table 2 (*continued*)

Country and economic organization	1968 shares						Percentage changes from 1961–64 average					
	Food	*Durable consumer goods*	*Non-durable consumer goods*	*Passenger cars*	*Capital goods*	*Total*	*Food*	*Durable consumer goods*	*Non-durable consumer goods*	*Passenger cars*	*Capital goods*	*Total*
European Free Trade Association[a]	17.2	26.0	21.4	11.6	22.1	20.6	−2.8	−0.4	−8.2	−47.5	−14.3	−11.6
Austria	0.4	1.5	1.8	*	1.1	1.0	+11.7	+0.9	+15.0	*	−7.2	+2.5
Denmark	7.1	1.8	2.1	0.1	1.5	2.5	−13.5	+12.1	+20.6	−61.0	−2.7	−19.2
Norway	1.4	0.6	0.4	*	0.4	0.6	−11.8	+14.9	+ 2.2	*	+23.2	−11.4
Sweden	0.9	1.3	1.6	2.7	3.8	2.5	−7.0	−25.8	+21.0	+17.6	+3.0	+4.0
Switzerland	1.2	7.2	4.6	*	3.9	3.6	+20.7	−19.0	−9.4	*	+3.3	−1.2
United Kingdom	6.2	13.6	10.9	8.8	11.4	10.4	+10.3	+14.0	−17.4	−54.8	−26.5	−17.7
	D. Domestic output for domestic consumption as percent of domestic consumption											
United States	95.2	93.3	98.3	90.9	94.7	95.5	−0.5	−2.6	−1.6	−6.8	−2.8	−1.7
Canada	91.1	75.9	93.2	58.6	41.1	78.8	+1.4	−6.0	−0.4	−36.5	−3.8	−5.3
Japan	92.8	92.3	98.7	99.1	95.5	95.4	−0.1	−2.4	−0.6	+1.9	+2.5	+0.5

European Economic Community	88.9	82.6	94.1	77.1	78.3	87.2	+0.1	−6.0	−2.2	−8.9	−4.6	−2.3
BLEU	79.1	49.8	83.9	53.5	36.2	68.3	−3.6	−21.9	−5.2	−31.5	−15.5	−8.7
France	93.0	90.3	96.4	80.1	82.0	91.0	+1.5	−4.2	−1.7	−8.6	−4.3	−1.5
Germany	84.9	81.8	93.8	84.6	86.6	87.5	−0.7	−7.4	−2.7	−8.0	−4.2	−2.9
Italy	92.8	90.1	97.7	84.0	73.6	91.2	−0.7	−2.3	−0.6	−2.7	−6.4	−0.7
Netherlands	75.0	70.8	77.2	*	51.2	67.1	−3.0	−4.1	−9.6	*	+9.2	−4.2
European Free Trade Association[a]	84.7	76.8	93.3	78.8	72.4	83.9	+4.9	−11.0	−2.0	+0.8	−5.6	−1.1
Austria	90.6	63.2	88.0	30.4	66.2	80.0	+0.3	−11.6	−6.3	+81.2	−2.9	−3.7
Denmark	89.5	83.1	91.5	70.4	57.7	82.7	+5.5	−3.4	−2.1	+11.4	−7.8	+0.7
Norway	86.7	73.1	84.8	51.4	62.7	77.6	+3.0	−6.6	−5.4	−2.1	−11.0	−3.3
Sweden	90.3	72.4	89.1	70.2	54.0	81.1	+2.0	−9.6	−3.1	+22.5	−6.4	−1.2
Switzerland	80.9	52.4	77.1	18.8	54.0	68.2	+4.6	−10.6	−7.2	*	+1.6	−0.9
United Kingdom	82.8	81.2	96.6	95.0	81.9	87.3	+5.8	−12.4	−0.8	−2.3	−6.5	−0.7
Total	91.5	88.1	96.5	86.7	85.7	91.3	+0.4	−4.2	−1.1	−7.5	−1.9	−1.5

Sources: Basic data are from computer tapes provided by the Organisation for Economic Co-operation and Development. These data appear in OECD, *Trade by Commodities: Detailed Analysis by Products, Imports*, Series C (OECD), relevant issues: OECD, *Commodity Trade, Exports, Detailed Analysis by Products*, Series C (OECD), relevant issues.

a. Excluding Finland and Portugal.

b. Less than 0.05 percent in 1961–64; increase to 16.4 percent in 1968 mainly due to U.S.-Canadian automobile agreement.

c. Domestic production was nil in 1961–64.

* Less than 0.05 percent. No percentage change is shown if share in 1961–64 was less than 0.1 percent.

Table 3. Growth of Output, Demand, and Trade in Selected Finished Goods, from 1961–64 Average to 1968, All Industrial Countries and the United States

Percentage change

Countries and goods	*Domestic output*	*Exports*	*Domestic output for domestic consumption*	*Imports*	*Domestic consumption*
Industrial countries, including the United States					
Food	39	33	39	32	38
Consumer durables	55	108	49	132	56
Consumer nondurables	50	81	49	132	51
Passenger cars	68	151	59	245	71
Excluding U.S.-Canadian trade	68	94	65	148	71
Capital goods	63	73	60	87	64
Total	50	74	48	79	50
Excluding U.S.-Canadian auto trade	50	70	48	74	50
United States					
Food	30	11	31	46	32
Consumer durables	57	78	56	153	60
Consumer nondurables	45	46	45	131	46
Passenger cars	56	258	53	511	64
Excluding U.S.-Canadian trade	60	57	60	225	64
Capital goods	67	55	69	74	74
Total	46	48	46	131	48
Excluding U.S.-Canadian auto trade	46	42	46	112	48

Sources: Same as Table 2.
Note: Domestic output minus exports equals domestic output for domestic consumption; the latter plus imports equals domestic consumption (GNP).

Germany, Italy, Japan, and Switzerland that took place between 1961–64 and 1968 is reflected clearly in the movement of this ratio. The deterioration in the U.S. trade position over the period becomes equally apparent. Extension of the data through 1969 probably would sharpen this picture.

The dwindling of the U.S. overall trade surplus, from over $5 billion annually in 1961–64 to virtually zero in 1968, is paralleled by the change in the surplus on finished goods: Over the period this surplus fell from 1.3 percent of domestic expenditures on finished goods to just below zero. To what ex-

Table 4. Domestic Output of Finished Goods in Industrial Countries as a Percent of Domestic Consumption, Selected Periods, 1961–68

Country	*Average, 1961–64*	*1964*	*1966*	*1968*
United States	101.3	101.4	100.7	99.6
Austria	92.4	93.8	90.4	92.2
BLEU	94.1	94.0	95.5	97.6
Canada	92.9	93.7	92.7	92.6
Denmark	111.1	109.5	109.2	108.1
France	100.7	100.1	100.4	100.5
Germany	105.3	106.0	106.4	108.7
Italy	102.4	102.4	104.9	106.1
Japan	101.6	101.6	103.4	104.0
Netherlands	99.6	97.6	97.9	99.5
Norway	88.7	89.9	87.6	86.8
Sweden	94.5	94.7	95.4	96.4
Switzerland	99.2	98.4	102.3	104.4
United Kingdom	99.2	99.2	99.6	99.4
Total	100.9	100.9	100.9	100.8

Sources: Same as Table 2.

tent can this change be explained by shifts in the structure of U.S. output and demand, compared with those in the rest of the industrial world? And can any conclusions be drawn about the permanence of this change?

COMPARATIVE ANALYSIS OF OUTPUT AND DEMAND PATTERNS

Over the 1960s the output of finished goods grew somewhat more slowly in the United States than in the rest of the industrial world, as Table 3 demonstrates. The share of U.S. output consumed at home remained almost stable. But, as imports approximately doubled, the share of the home market supplied domestically was reduced from 97.1 percent in 1961–64 to 95.5 percent in 1968, a fall of 1½ percent. This was more or less in line with the home-market shares given up by domestic producers in the EEC countries (their share of their domestic market was reduced from 88.3 percent to 87.2 percent over the period).[10] Unlike the United States, however, these countries experienced increases in production for export that more than offset

10. When U.S.-Canadian automobile trade is excluded, the U.S. loss in its domestic market was exactly in line with that of other industrial countries.

losses in home-market sales, so that in these countries the ratio of output to domestic final demand increased. In the United States, export sales barely outpaced the growth of domestic deliveries to the home market, which in turn fell short of the growth of domestic demand. Consequently, with the much faster expansions of export sales by foreign producers, the share of U.S. producers in foreign markets as well as in the U.S. market was reduced, as can be seen in part C of Table 2 above.[11]

To what extent have shifts in the commodity structure of production and demand played a role in the losses in U.S. market shares at home and abroad, and to what extent can these changes be attributed to excess demand? At least partial answers to these questions can be found by comparing actual developments in U.S. output, demand, and trade for each of the product categories with those that would have occurred if they had matched those of the rest of the industrial world. Under this hypothesis, U.S. producers would have maintained their share in the industrial world's output in each category from 1961–64 onward and they would have claimed a constant share of export markets. At the same time, purchasers in the United States would have absorbed a constant share of the industrial world's supply of goods in each category, and that part of U.S. consumption that is satisfied by foreign goods would have expanded in line with the growth of total imports of industrial countries.

Whenever domestic demand expanded significantly above the world trend without a commensurate increase in supply, excess demand is taken to be the likely explanation. Whenever growth in supply fell short of demand and demand did not grow faster than the world trend, the explanation is assumed to lie primarily in structural factors. The dollar figures given in Table 5 suggest the extent of the major factor that underlies the trade balance changes; but they can indicate general magnitudes only. Nevertheless, they are a useful guide to the correct answers and will be employed as such in further work. The comparisons between actual developments and those calculated on the basis of the constant-share hypothesis, given in Table 5, demonstrate clearly that the overall change in the U.S. trade posi-

11. The table shows the exports of individual countries as a share of total exports by industrial countries. This share would be expressed more properly as a percentage of the export sales of all countries excluding those to the country for which comparisons are made. The data will be adjusted accordingly, pending the completion of a trade matrix by end-use categories. The global conclusions drawn here, however, are not likely to be materially affected by this correction.

Table 5. Changes in U.S. Output, Demand, and Trade, 1968, Actual and Estimated on Hypothesis of Maintenance of 1961–64 Shares in Total for All Industrial Countries

Billions of dollars

Commodity group	*Domestic output*[a]	*Exports*	*Domestic output for domestic consumption*	*Imports*	*Domestic consumption*
Food					
Actual	113.3	3.7	109.6	5.5	115.1
Calculated	120.6	4.4	116.2	4.9	121.1
Difference	−7.3	−0.7	−6.6	+0.6	−6.0
Consumer durable goods					
Actual	46.3	1.2	45.1	3.2	48.3
Calculated	46.0	1.4	44.6	2.6	47.2
Difference	+0.3	−0.2	+0.5	+0.6	+1.1
Consumer nondurable goods					
Actual	117.1	1.2	115.9	2.0	117.9
Calculated	121.0	1.5	119.5	2.1	121.6
Difference	−3.9	−0.3	−3.6	−0.1	−3.7
Capital goods					
Actual	64.4	8.5	55.9	3.1	59.0
Calculated	62.7	9.5	53.2	2.4	55.6
Difference	+1.7	−1.0	+2.7	+0.7	+3.4
Total					
Actual	341.1	14.6	326.5	13.8	340.4
Calculated	350.3	16.8	333.5	12.0	345.5
Difference	−9.2	−2.2	−7.0	+1.8	−5.2

Sources: Same as Table 2. Figures are rounded and may not subtract to differences.

a. Domestic output less exports equals domestic output for domestic consumption; the latter plus imports equals domestic consumption.

tion was brought about by quite divergent movements among the product categories.[12] In addition, they point to rather different explanations of the movements for the various categories.

12. Since the U.S.-Canadian automobile agreement is a fact of life, it does not seem worthwhile to speculate about what would have happened in its absence. Therefore, no constant-share calculations were made for passenger cars.

Food. The trade balance for the food group, according to the constant-share comparison, was adversely affected by a shortfall in exports, as well as by an excess of imports, totaling about $1½ billion. This development does not appear to be associated with excess demand, however. In fact, demand for food products rose rather less in the United States than elsewhere. But output fell even further short of the world trend. This decline in the U.S. output share reflects the acceleration of output growth elsewhere, stimulated, as noted earlier, by agricultural policies in various countries. As a result, the trade deficit in food products that the industrial countries have generally run with the rest of the world has not expanded as fast as food consumption; that deficit rose from $6.8 billion to $8.9 billion between the 1961–64 average and 1968.

The changes in output and trade in food products for the United States also reflect the slower rate in the expansion of U.S. consumption demand, compared with other countries. The rise in U.S. imports above the trend probably reflects taste changes as well as price competition. Consequently, the trends that have become apparent in the changes in this product category appear to be largely of a longer-run structural nature.

Durable consumer goods. Unlike food, the constant-share comparison for durable consumer goods clearly shows the effects of excess demand in the United States. Although U.S. supply of these goods rose faster than that of the industrial world, it did not match the even larger deviations from the world trend in consumption demand. The accompanying loss in export and domestic markets compared with the constant-share hypothesis totaled about $¾ billion.

Nondurable consumer goods. Trends in nondurable consumer goods appear superficially much like those in food products. However, the basic situation is quite different. Unlike food products, nondurable consumer goods are generally produced and traded in nonregulated markets. Furthermore, U.S. producers have not had a relative advantage in producing consumer goods, as they have in food products.

Growth of both output and consumption of nondurable consumer goods in the United States fell short of industrial-world trends. But they did so to about an equal extent, so that, in theory, the trade position could have remained unchanged. In fact, the loss of domestic market shares sustained by U.S. producers was more or less in line with that of foreign producers in their own home markets. But U.S. producers were unable to make up for this loss in foreign markets, so that the constant-share calculation shows a

slight deterioration in the trade position. In this respect, the United States is not very different from many other industrial countries. The EFTA countries (except Sweden), Belgium, Germany, and the Netherlands all show the same trend. The increase in the U.S. trade deficit in nondurable consumer goods thus seems to be affected less by demand pressures than by the longer-run structural fact that many highly industrialized countries do not have a comparative advantage in producing many of the goods included in this category.

Capital goods. The changes in supply and demand of capital goods are much like those for durable consumer goods, except that the trends stand out even more clearly. The similarity is not surprising since many durable consumer goods are near-capital goods. Production expanded appreciably faster in the United States than elsewhere. But the U.S. capital investment boom in the second half of the 1960s pushed demand even further above the industrial-world trend. The shortfall in output relative to demand was made up in part by a reduction below the trend in the expansion of export sales, allowing domestic deliveries to the home market to increase considerably above their trend. As a result, only a relatively small part of the excess demand was satisfied by extra imports.

CONCLUSIONS FROM THE COMPARATIVE DATA

The changes in the pattern of U.S. output and demand during the second half of the 1960s sum to a shift in the trade balance on finished goods from a surplus of $3.4 billion in 1961–64 to a deficit of $1.2 billion in 1968 (the deficit is $0.4 billion when U.S.-Canadian trade in passenger cars is excluded). This $4½ billion swing arose from the combined workings of longer-run basic trends and the excess demand that existed through 1968.

The larger part of the deterioration is attributable to shifts in competitiveness rather than to an adverse composition of U.S. output. The increase in the relative importance of the demand of other countries for imported capital goods almost offset the relative decline in their demand for imported food; these two categories accounted for 70 to 72½ percent (depending upon inclusion or exclusion of U.S.-Canadian automobile trade) of U.S. industrial exports in 1968. Furthermore, changes in the commodity structure of U.S. output paralleled these changes in the composition of world demand. Thus, only a relatively small part—perhaps $½ billion—of the deterioration in the U.S. trade balance on finished goods is explained in this way.

Table 6. U.S. Trade Balance, 1968, and Changes from the 1961–64 Average
Billions of dollars

Category	1968		Change from 1961–64 average			
	Actual	*Calculated*	*Actual*	*Calculated*	*Actual less calculated*	*Major factor*
Food	−1.8	−0.5	−1.3	0.0	−1.3	Structural factors
Consumer durables	−2.0	−1.2	−1.4	−0.6	−0.8	Excess demand
Consumer nondurables	−0.8	−0.6	−0.8	−0.6	−0.2	Structural factors
Capital goods	+5.4	+7.1	+0.8	+2.5	−1.7	Excess demand
Total	+0.6	+5.0	−2.7	+1.3	−4.0	. . .

Sources: Same as Table 2. Figures are rounded and may not add to totals.

More important than shifts in the commodity composition of world demand were aggregate demand developments in the United States itself. Inflationary pressures and excess demand cut into the U.S. trade position in consumer durables and capital goods. As shown in Table 6, the trade surplus on capital goods, at $5.4 billion in 1968, had grown by $¾ billion from 1961–64. In the absence of excess demand, it might have been roughly $2½ billion above the 1961–64 level. And the deficit on consumer durables, which widened by almost $1½ billion in the interval, would have grown by less than half this amount. Thus, on the basis of these two categories, excess demand may have accounted for roughly $2½ billion of the decline in the trade balance for finished goods.[13]

The rise in the import surplus in nondurable goods and food, however, cannot be ascribed primarily to the failure of demand management policies in the second half of the 1960s. To be sure, part of the change was associated with the worsening of the relative price position of U.S. producers. But it appears that underlying trends, reflecting structural factors, were also pushing in a downward direction: Structural changes in the supply of, and market regulations for, food products in industrial countries adversely affected

13. These dollar figures can indicate only rough magnitudes of the relative importance of each of these factors in the total change in the U.S. trade position. The difference in percentage changes shown in Table 3 probably gives a slightly better, though also rough, indication of these magnitudes.

U.S. exports; at the same time, there was an accentuation of the longer-run tendency for the United States to be a net importer of nondurable consumer goods. The trend toward import surpluses in the latter category reflected largely the failure of U.S. producers to retain the export markets that they had secured immediately after the war but that were not traditionally theirs.

Probably about $1 billion—or one-half of the deterioration between 1961–64 and 1968 in the trade position in food and nondurable consumer goods—reflected structural factors in export markets. And about $½ billion of the rise in imports over the period can be ascribed to changes in taste and other underlying trends. Some of these trends are world-wide; others, however, arise from factors peculiar to the structure of U.S. industrial output. The next two sections seek to identify commodity groups for which longer-run tendencies—whether toward surplus or deficit—seem to be most clearly defined and then to explore the possibility of explaining them by production characteristics.

Disaggregated Patterns of Trade in Manufactured Goods

Patterns of U.S. trade in manufactured goods, disaggregated into thirty-one end-use commodity groups, are outlined in Table 7.[14] The table attempts to summarize the movements of exports and imports of manufactured goods down to the level represented by four-digit end-use codes. Selected commodities serve as illustrations of four general points.

FROM RAW INPUTS TO FINISHED PRODUCTS: STEEL

Within a given industry, such as steel or petroleum, the U.S. trade balance tends to move from deficit to surplus along the industrial scale from

14. The subsequent analysis focuses on trade in manufactured goods, for several reasons. First, and perhaps most important, trade in agricultural goods is greatly affected by nonmarket activities, mainly government subsidy and import programs in all the developed countries, and the P.L. 480 agricultural aid program in the United States. This general intervention is much more extensive in agricultural trade than in trade in manufactured goods, and could easily obscure underlying trends in comparative advantages. In addition, the cross-section data used below to assess the basis for U.S. comparative advantage in the mid-1960s relate only to trade in nonagricultural goods, although it includes trade in goods from the mining industry.

Table 7. U.S. Foreign Trade in Manufactured Goods, 1970, and Trade Patterns, 1925–70

Dollar amounts in millions

Commodity[a]	*End-use code number*		*1970 trade*			*Trade pattern, 1925–70*
	Exports	*Imports*	*Exports*	*Imports*	*Surplus*	
Fuels and lubricants	11	10	$ 1,596	$ 3,063	−$1,467	Surplus to 1957; growing deficit since 1958.
Nonagricultural industrial supplies and materials, except fuels	12 less 1273, 1275–77[b]	11, 1203, 121, 1220–22, 1225–26, 1230–31, 1300–01, 1311, 14, 15, 1603–05, 1610	9,878	10,695	−817	Steady deficit except 1938–40, 1947 and 1949; slightly increased 1965–70.
Chemicals, excluding medicinal preparations	125	1225–26, 1230–31	3,059	836	2,223	Balance prewar; surplus since 1946, growing since 1953.
Nonagricultural industrial supplies and materials less chemicals and fuels	12 less 125, 1273, 1275–77[b]	11, 1203, 121, 1220–22, 1300–01, 1311, 14, 15, 1603–05, 1610	6,819	9,859	−3,040	Deficit throughout except1940 and 1947; fairly steady 1950 to mid-1960s, growing since.
Basic material for iron and steel	120	1400–01	547	509	38	Surplus 1933–40; deficit since 1947 except 1955–57, 1961, and 1970.

Iron and steel products excluding advanced manufactures	121	141, 150	1,389	2,193	−804	Surplus to 1962 (except 1959); growing deficit since 1963.
Other primary metals, crude and semimanufactured	122	142–43, 1402–03	1,444	2,408	−964	Deficit throughout the period.
Finished metal shapes and advanced manufactures	123	151, 152	428	464	−36	Surplus narrowing to balance in 1966–70.
Lumber, wood, pulp, and paper, including newsprint	124	11, 1300–01, 1311	1,782	2,434	−652	Deficit throughout the period, steady since early 1950s.
Industrial textile fibers, yarn, fabric	126	121, 1203	674	1,008	−334	Deficit prewar, except 1932 and 1940; surplus 1946–64, except 1963, showing post-war bulge; deficit since 1965.
Other nonagricultural industrial materials	127 less 1273, 1275–77[b]	1220–22, 1603–05, 1610	555	843	−288	Deficit throughout the period.
Capital goods, less automotive[c]	2	2	14,366	3,782	10,584	Surplus throughout the period, growing since 1951.
Electrical machinery	20	200	2,078	1,017	1,061	Surplus throughout; rapid import growth since 1964.
Construction and contracting machinery less nonfarm tractors	210 less 2104	2011	1,379	536	843	Surplus throughout; rapid import growth since 1960.
Nonelectrical industrial machinery	211	2010, 2012	4,823	939	3,884	Surplus to 1956; deficit in growing since early 1950s with import growth since mid-1960s.
Machine tools and metal working machinery	2112	2010	528	194	334	Surplus throughout, rapidly port growth since 1965.
Industrial machinery less machine tools and metal working machinery	211 less 2112	2012	4,295	745	3,550	Surplus throughout with small import growth since 1963.

Table 7 (*continued*)

Commodity[a]	End-use code number		1970 trade			Trade pattern, 1925–70
	Exports	Imports	Exports	Imports	Surplus	
Capital goods, less automotive (*continued*)						
Agricultural, scientific, and business machinery less tractors	212 less 2120	2015–16, 2018	$ 2,521	$ 887	$ 1,634	Surplus throughout, growing since mid-1950s; rapid import growth since 1962.
Agricultural machinery, except tractors	2121	2015	180	177	3	Surplus except 1958–59; near balance since 1966.
Business machinery	2122	2016	1,703	471	1,232	Surplus throughout, growing since 1955; imports picking up since 1965.
Scientific and medical instruments and equipment and equipment and tools for photo and other service industries	2123, 2124	2018	638	239	399	Surplus throughout; imports picking up steadily since 1960.
Tractors, nonfarm, and farm and garden tractors and parts	2104, 2120	2013, 2014	763	212	551	Surplus throughout; rapid import growth since 1958, especially 1966.
Civilian aircraft, engines, and parts	220	21	2,661	191	2,470	Little trade to 1952; rapidly growing surplus since.
Complete aircraft, civilian	220	2100	1,529	48	1,481	Surplus since 1958 (trade began in late 1950s); growing rapidly.

Civilian aircraft, engines, and parts, except complete aircraft	220 less 2200	2101	1,132	143	989	Surplus throughout, growing rapidly since 1952.
Automotive vehicles, parts and engines	3	3	3,652	5,955	−2,203	Surplus to 1967, shrinking irregularly 1947–67; growing deficit since 1968.
Passenger cars, new and used	300	300	837	3,730	−2,893	Surplus 1953–57; deficit since 1958, growing with rising imports since 1962.
Trucks, buses, and special-purpose vehicles	301	301	560	729	−169	Substantial surplus ($300 million) to 1965; import growth brought deficit by 1968.
Automotive parts	31	302	2,255	1,496	759	Surplus throughout; imports picking up rapidly since 1965.
Consumer goods, less automotive	4	4	2,745	7,551	−4,806	Deficit to 1938; tiny surplus 1938–40 and large surplus 1946–49 dwindling to balance in 1958; growing deficit since 1959.
Consumer durables, manufactured	400	41	1,007	4,069	−3,062	Deficit to 1933, balance 1934–36, surplus 1937–40; postwar surplus 1946–54; deficit since 1955, growing rapidly since 1958.

Table 7 (*continued*)

Commodity[a]	End-use code number		1970 trade			Trade pattern, 1925–70
	Exports	Imports	Exports	Imports	Surplus	
Electrical household appliances and radios and so forth	4000, 4001	4103, 4104	$ 404	$1,455	$−1,051	Surplus to 1961; deficit since 1962 with rapid import growth since 1955. Example of product cycle.
Nonelectric cooking and heating equipment	4002	4101, 4102	141	587	−446	Deficit before war; surplus 1946–51; deficit since 1952, growing rapidly.
Clocks, watches, jewelry, and antiques	4003	4108, 4109	116	614	−498	Deficit throughout, growing rapidly since 1950.
Toys and sporting goods	4004	4100, 4105, 4107	169	1,129	−960	Little trade before 1946; growing deficit since.
Other consumer durables, manufactured	4005	4106, 410A	177	284	−107	Surplus to 1956; deficit in 1957, balance in 1958, deficit since 1959, except 1964. Example of postwar export bulge.
Consumer durables, nonmanufactured[d]	401	421	123	495	−372	Deficit throughout the period, growing since 1950.

Consumer nondurables—textiles, except rugs	410	400	247	1,246	−999	Deficit 1925–40; postwar export bulge and surplus 1946–54; growing deficit since 1955.
Consumer nondurables, except textiles	411	401	1,367	1,711	−344	Prewar surplus; postwar bulge and diminishing surplus to deficit, growing since 1968.
Footwear, luggage, apparel of leather, fur, rubber, plastic	4110	4010, 4011	38	793	−755	Balance prewar; postwar export bulge and surplus 1946–54; growing deficit since 1955.
Medicinal and pharmaceutical preparations	4113	4012	545	150	395	Surplus throughout; large surplus opened in 1946, maintained since 1947.
Other consumer nondurables	4111–12, 4114	4013	784	768	−16	Surplus throughout; export bulge in 1946–50; surplus steady 1950–65, shrinking since 1965.

Source: *U.S. Exports and Imports*, Table 5 (exports) and Table 6 (imports). Data for 1969–70 are from *Highlights of U.S. Export and Import Trade*, Tables E9, I10. OBE's criterion for splitting off end-use categories below the one-digit level is generally the volume of trade in a category. For this reason, export and import categories do not generally match one for one. The development of the trade balances by commodity, described in the table, followed the export end-use breakdown, and matched imports to exports as closely as possible. Thus the first two columns of the table give the export end-use description and code number, and the third column gives the import end-use code numbers covering the same commodity as the second column's export end-use code number.

a. Commodity descriptions are for export end-use code numbers, as described in *U.S. Exports*.

b. Groups 1273 and 1275–77 are subgroups of other nonagricultural industrial commodities that are a heterogeneous group and very difficult to match to an import category. In 1968, these groups accounted for $686 million of exports.

c. Total includes other transportation equipment, not shown separately below.

d. This nonmanufactured category is included in the table because of its relative importance in foreign trade.

raw materials to semifinished products to finished products. Iron and steel and finished metals provide a good example.

The trade balance in iron and steel is depicted in Figure 3. In basic materials, a surplus appears in the 1930s, but almost continuous deficits existed after 1946, widening significantly in the 1960s. In iron and steel products, except advanced manufactures, a prewar surplus widened after the war, and then narrowed, giving way to balance in the early 1960s, but a deficit opened from 1963 onward. Finally, in finished metal shapes and advanced metal manufactures the surplus that began to shrink in the late 1950s disappeared in the late 1960s.[15]

This description makes clear that the United States has become basically a net importer of steel, with all three levels of the industry net importers by 1970. While the United States has steadily lost its comparative advantage in iron and steel in general, the figure also suggests that, the more advanced the stage of production, the longer the U.S. trade advantage was maintained.[16]

THE POSTWAR EXPORT BULGE: TEXTILES

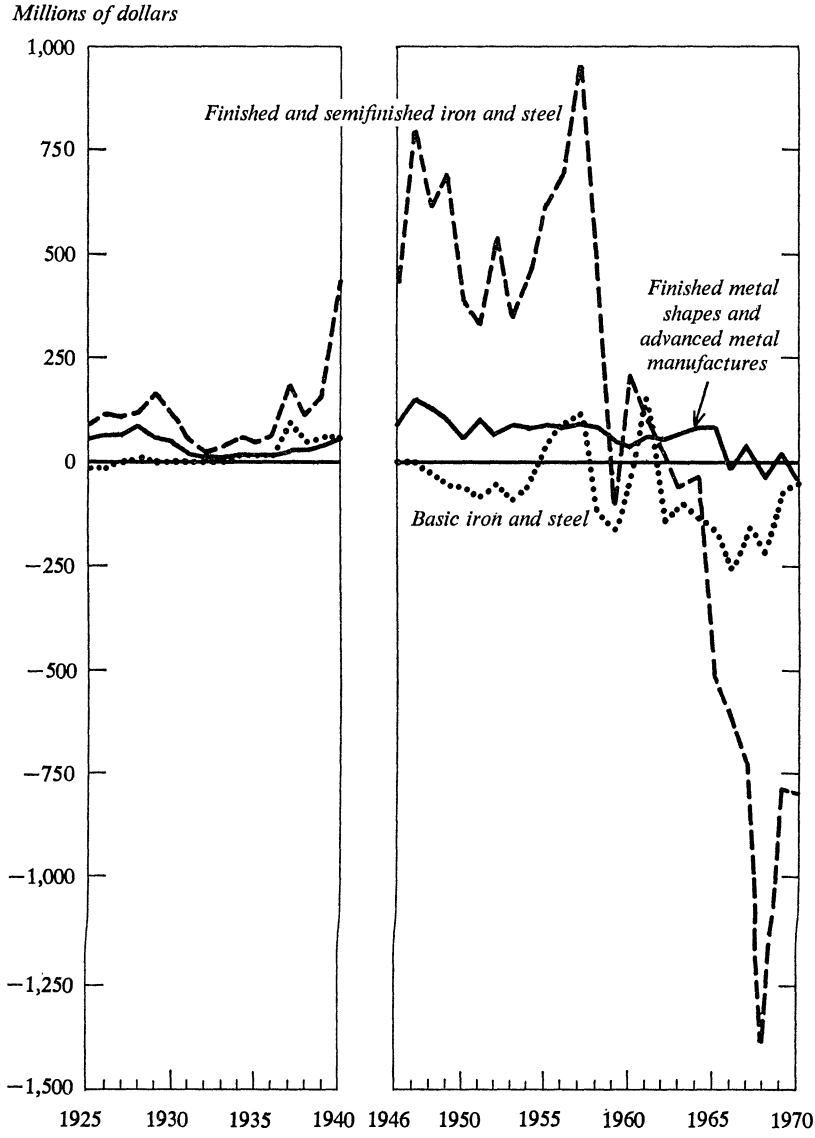
In several commodities the United States characteristically had a balanced or deficit trade position before World War II, enjoyed a substantial surplus with a major increase in exports just after the war, and then lost it in a growing deficit since 1950. A good example of this pattern is presented by textiles, both industrial and consumer textiles, as reflected in the trade balances shown in Figure 4.

The postwar export bulge in textiles disappeared by 1949, leaving exports essentially flat at $500 million to $600 million in industrial textiles and $150 million to $200 million in consumer textiles from 1950 on, with little growth in the latter in the 1960s. Imports, however, grew in both cases. Consumer textile imports rose slowly from 1947 through 1954 and increasingly rapidly after 1954, while industrial textile imports grew irregularly from 1949 to

15. A similar pattern can be seen in the petroleum industry. The United States has had a deficit in crude petroleum trade since 1946, a deficit in semifinished petroleum products since 1949, and a surplus in finished petroleum products that has been shrinking from a $520 million peak in 1951 to $71 million in 1970.

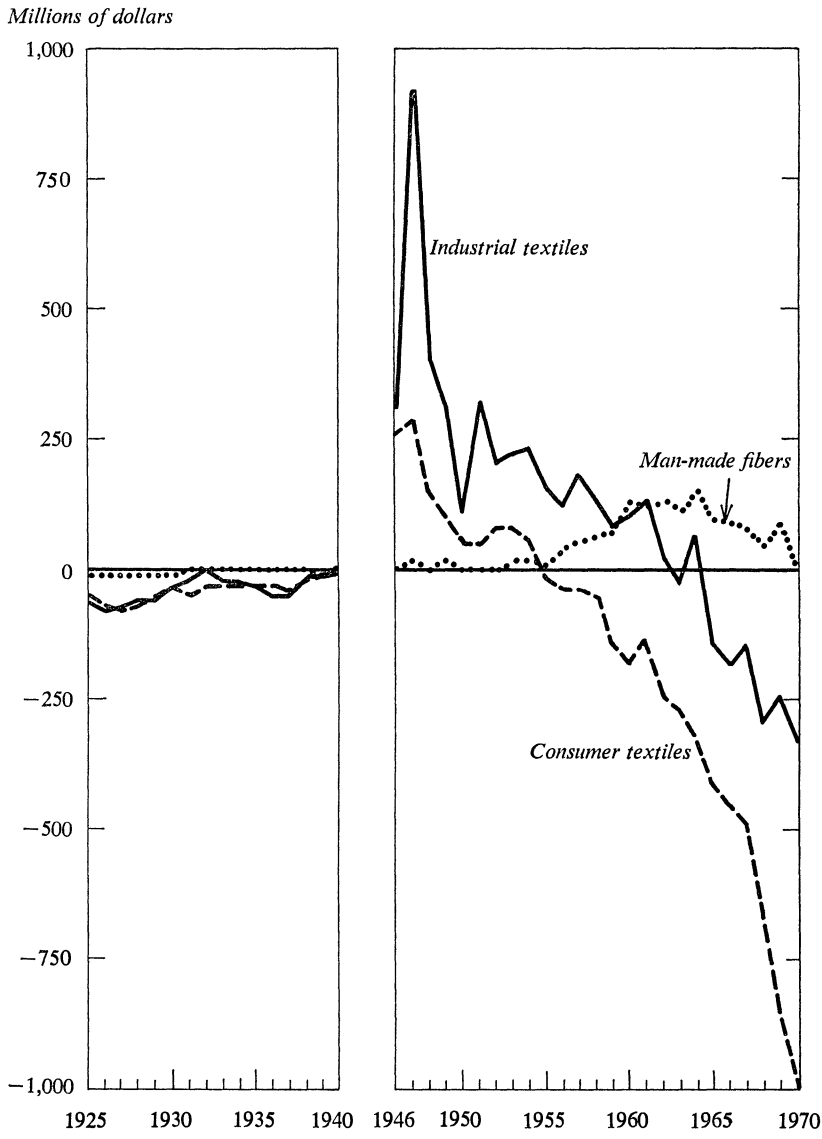
16. This could, of course, be due either to a basic U.S. comparative advantage in more advanced manufacturing, or to an effective tariff structure that favors it.

Figure 3. U.S. Trade Balance in Iron and Steel, 1925–70[a]



Sources: Same as Figure 1.
a. Excluding the war years 1941–45.

Figure 4. U.S. Trade Balance in Textiles and Man-made Fibers, 1925–70[a]



Sources: Same as Figure 1.
a. Excluding the war years 1941–45.

1961 and extremely rapidly after that. The United States became a net importer of consumer textiles in 1955 and of industrial textiles in 1963.[17]

THE PRODUCT CYCLE: MAN-MADE FIBERS

Disaggregation to the four-digit level makes it possible to determine the pervasiveness of the product cycle phenomenon. In his seminal paper, Raymond Vernon suggested that trade in manufactured goods typically follows a cycle in which the United States is first a net exporter as a good is introduced and "shaken down," and then becomes a net importer as production of the good becomes standardized and moves abroad to minimize production costs.[18] Since the product cycle involves patterns of trade in individual commodities, the likelihood that it can be observed increases with disaggregation of the data.

Man-made fibers constitute a good illustration of the product cycle (see Figure 4). From 1925 to 1940, the United States was typically a net importer; then, after World War II to 1952, trade was roughly balanced. A substantial export surplus appeared in 1956, and grew rapidly to 1964 under the impetus of export growth; imports fluctuated in the range of $20 million to $50 million from 1950 to 1963. After 1962, export growth slowed, and beginning in 1963, imports picked up, so that by 1970 the product cycle was approaching the net importing stage, with imports at $228 million and the surplus down to $6 million.[19]

The product cycle is, of course, a microeconomic phenomenon, observable at the four-digit level at best. That it *can* be observed at that level of aggregation suggests, however, that it is a fairly widespread phenomenon and should be taken into account in trade projections. At any point in time,

17. Trade in footwear, luggage, and apparel of leather, fur, rubber, or plastic has followed a pattern quite similar to that of consumer textiles.

18. Raymond Vernon, "International Investment and International Trade in the Product Cycle," *Quarterly Journal of Economics*, Vol. 80 (May 1966), pp. 190–207.

19. The same product cycle can also be observed in electrical household appliances and in synthetic rubber. By 1962 the United States was a net importer of electrical household appliances, and by 1966 trade in synthetic rubber was roughly balanced. For examples of the product cycle at a disaggregated level, see Seev Hirsch, "The United States Electronics Industry in International Trade," *National Institute Economic Review*, No. 34 (November 1965), pp. 92–97; and Louise T. Wells, Jr., "Test of a Product Cycle Model of International Trade: U.S. Exports of Consumer Durables," *Quarterly Journal of Economics*, Vol. 83 (February 1969), pp. 152–62.

commodities in which a substantial trade surplus exists may be in the maturing phase of the cycle with shrinking surpluses, while products just entering it may be at trade levels too small to seem significant. Thus the existence of the product cycle may tend to bias trade projections made on a commodity-by-commodity basis in a pessimistic direction (in the sense of small surpluses).

CONSISTENCY WITHIN AGGREGATES: CAPITAL AND CONSUMER GOODS

Finally, the disaggregated data on trade in capital goods and in consumer goods exhibit strikingly similar patterns within the aggregate categories. Throughout the period 1925–70, in each category of capital goods, the United States typically has had a surplus, which has grown substantially since the early 1950s. The only exception is agricultural machinery. In the consumer categories, the United States typically had a deficit before the war and a surplus just after it. The surplus then shrank to balance in the middle or later 1950s and a growing deficit developed in the 1960s. Thus the patterns of trade are similar within end-use aggregates, and dissimilar across them, confirming the usefulness of the OBE categorization.

CONCLUSIONS FROM THE LONG-TERM DATA

From this survey of the long-term data, it appears that the United States has a growing comparative trade advantage in capital goods and chemicals, but is at a disadvantage in consumer goods and other industrial supplies and materials. In consumer goods, the United States typically had a deficit from 1925 to 1938, and after a postwar surplus, returned to a deficit position starting in 1959. In some industrial supplies and materials—fuels and lubricants, basic materials for iron and steel, and their products—the United States was a net exporter before World War II and became a net importer thereafter.

Part of the movement from surplus to deficit in consumer goods and nonchemical industrial supplies and materials since the late 1940s has been due to the loss of a temporary advantage after World War II. This seems to be the case in consumer goods and textiles, although the trade deficit continued to increase even after the postwar advantage disappeared in the mid-1950s. In these areas, as well as in steel and petroleum, the loss of the postwar ad-

vantage merely reinforced the more fundamental loss of competitive advantage.

U.S. Comparative Advantage in Manufactured Goods

As the last section shows, since the early 1960s at latest the United States has been a net exporter of capital goods and chemicals and a net importer of consumer goods and other nonagricultural industrial supplies and materials, with automotive products on the margin. This pattern of trade holds even after allowance for the effects of excess demand since 1965. Thus it presumably results from underlying relative advantages the United States has in production of capital and chemical goods and disadvantages in production of consumer goods and other industrial supplies and materials. What then is the source of the U.S. comparative advantage? Is the production of net export goods relatively intensive in its use of physical or human capital? Does the U.S. comparative advantage lie in goods that exhibit economies of scale in production?

To begin a study of the sources of U.S. comparative advantage, a 1964 cross-section of U.S. trade in manufactured goods by SITC classifications is employed. Nineteen sixty-four is chosen because it was the last year before the appearance of excess demand and inflation in the United States; while the conclusions concerning the trends in U.S. trade advantage are not changed in any fundamental way by adjusting for the effects of aggregate demand associated with the Vietnam war, it seems useful to focus on a recent year that does not suffer from this qualification. More importantly, there is a full set of data on production characteristics by SITC three-digit categories for the mid-1960s, developed by Hufbauer.[20]

This preliminary study of the sources of comparative advantage essentially consolidates work that has appeared in the last few years, relating a number of production characteristics to net exports across commodities. There is nothing particularly new in the techniques used here, or in the re-

20. G. C. Hufbauer, "The Impact of National Characteristics and Technology on the Commodity Composition of Trade in Manufactured Goods," in Raymond Vernon (ed.), *The Technology Factor in International Trade*, A Conference of the Universities-National Bureau Committee for Economic Research (Columbia University Press for the National Bureau of Economic Research, 1970). See Hufbauer's Table A-2 for the data on production characteristics, and his many references to the recent literature on the sources of comparative advantage beyond those given below.

sults. The aim has been rather to use data that are readily available to summarize studies that have been done to date, present some illustrative results that are typical of this literature, and provide a starting point for further research on the question.[21]

DATA ON PRODUCTION CHARACTERISTICS

The analysis relates U.S. net exports in 1964, by 101 three-digit SITC categories, to four production characteristics: physical capital per man, human capital per man, a measure of economies of scale in production, and the date at which the commodity first entered international trade in a significant way. On a more restricted subset of 61 three-digit SITC industries, research and development expenditures are introduced into the analysis as a fraction of value added. Finally, at the two-digit SITC level, which permits only 28 observations, the analysis incorporates the ratio of skilled (professional, technical, and scientific) workers to total employment by commodity.

Factor endowments: physical and human capital. The classical factor-endowments theory of international trade, generally associated with Heckscher and Ohlin, predicts that a country will export goods whose production is intensive in the use of primary input factors with which it is relatively well endowed, and import goods whose production intensively uses factors in which it is relatively poor. In the usual two-goods, two-factors, two-countries models, this dictum means simply that a country better endowed with capital than with labor should export goods whose production is capital-intensive, and import goods that are labor-intensive. Since the United States has a high ratio of capital per employee, this proposition was generally taken to mean that its exports would be more capital-intensive than its imports.

This assumption was refuted by Leontief in 1953, when, using the 1947 input-output coefficients, he showed that U.S. exports are less capital-intensive in production than are the goods it imports.[22] Leontief's findings have been recently confirmed by Hufbauer and Baldwin, who used the 1963

21. A cross-section for only one year is used here because of data availability. One obvious extension of this preliminary study is to obtain cross-sections for several years spanning a reasonably long period.

22. Wassily Leontief, "Domestic Production and Foreign Trade; the American Capital Position Re-examined," in Richard E. Caves and Harry G. Johnson, Selection Committee, *Readings in International Economics*, Vol. 11 (Richard D. Irwin for the American Economic Association, 1968).

input-output coefficients, and Hufbauer shows that they also hold for manufactured goods separately.[23] Leontief's paradoxical findings stimulated a huge output of research. Most of this work involved first articulating all the assumptions underlying the Heckscher-Ohlin result, and then showing that relaxing one or more of the assumptions invalidated the result. Among the key articles in this vast literature was one by Robinson, which critically reviews the two-input factor proportions hypothesis, and one by Vanek, who studies the natural resource content of trade.[24] Here the focus is on the explanation, initially suggested by Leontief in his 1953 article and the subject of attention recently, that the usual two-factor version of the Heckscher-Ohlin model is too simple. An analysis of trade in manufactured goods must be couched in terms of at least three inputs: physical capital, human capital, and raw (or uneducated) labor.[25] In this case, the United States, because of its higher levels of education and training, may be relatively better endowed with human capital than with physical capital. In a two-factor model this situation would lead to U.S. exports of labor-intensive goods; a three-factor model might reveal that the United States exports goods that embody a high amount of human capital per man.

Since 1965, work on the human capital approach to Leontief's paradox has followed two tracks. One assumes that, in a cross-section, wage differentials reflect differences in human capital, following the spirit of Kenen's article. Thus Bharadwaj and Bhagwati, as well as Hufbauer, find a role for wage differentials as representing human capital in explaining trade.[26] The other approach attempts to measure differences in human capital across in-

23. Hufbauer, "Impact of National Characteristics," especially pp. 168–70; Robert E. Baldwin, "Determinants of the Commodity Structure of U.S. Trade," *American Economic Review*, Vol. 61 (March 1971), pp. 126–46.

24. See Romney Robinson, "Factor Proportions and Comparative Advantage: Part 1," *Quarterly Journal of Economics*, Vol. 70 (May 1956), pp. 169–92; and Jaroslav Vanek, *The Natural Resource Content of United States Foreign Trade, 1870–1955* (M.I.T. Press, 1963).

25. Leontief suggested that the United States exports labor-intensive goods because its labor is more productive than that abroad. If this were so because the United States is as rich in physical capital as in the two-factor model, then his paradox would not have appeared. Rather, he implies that there is a third factor at work that also affects (raw) labor productivity. This third factor is human capital. The basic article developing the role of human capital in trade is Peter B. Kenen, "Nature, Capital, and Trade," *Journal of Political Economy*, Vol. 73 (October 1965), pp. 437–60.

26. See Ranganath Bharadwaj and Jagdish Bhagwati, "Human Capital and the Pattern of Foreign Trade: The Indian Case," *Indian Economic Review*, Vol. 2, New Series (October 1967), pp. 117–42; and Hufbauer, "Impact of National Characteristics," pp. 172–76.

dustries by proportions of employees in various skill classifications. This is the route taken recently by Baldwin, cited above, and earlier by Keesing.[27] In a recent article, Gruber and Vernon use both kinds of measures, but on two separate sets of data, so that they do not compare their relative effectiveness or discuss their relative merits.[28]

The first approach should be preferable if human capital is, in fact, reflected in earned income. If human capital is correctly valued, and this value accrues as earned income, wage differentials should fully capture the effects on productivity of differences in human capital per person. The presence of, say, a high proportion of scientists in an industry should make that a high-wage industry, with the capitalized value of the excess of that wage rate over the wage of an uneducated person measuring the human capital input. In this event, the wage, or human capital, differential should capture the contribution of the input of human capital to production, or to trade advantage. Only if the scientists contribute something extra, in excess of their wage, to production should a "skill ratio" of scientists to total employees add to the ability of the human capital measure to explain variations in output or trade advantage.

Thus if wage rates accurately reflect differences in human capital, the capitalized value of the average wage above the wage of raw labor can serve as a measure of human capital in explaining net exports. If, in addition, a skill ratio is significant, it reveals that the skilled personnel are, in a sense, contributing more to comparative advantage than their market-determined wage indicates.

At the three-digit SITC level, Hufbauer's measure of physical capital per man ($\bar{K}$) was taken from Leontief's base-line 1947 measures, updated by capital expenditure data from the *Census of Manufactures*. Hufbauer calculated wages per man by dividing the wage bill for 1963 (in 1963 dollars) by total employees, with data from the *Census of Manufactures* for that year. Here, human capital estimates have been computed by subtracting the 1963 value of median income for persons with less than eight years of education ($2,500, taken from the *Current Population Reports* of the Bureau of the Census) from Hufbauer's average wage estimates, and then capitalizing

27. See Donald B. Keesing, "Labor Skills and Comparative Advantage," in American Economic Association, *Papers and Proceedings of the Seventy-Eighth Annual Meeting, 1965* (*American Economic Review*, Vol. 56, May 1966), pp. 249–58.

28. See William H. Gruber and Raymond Vernon, "The Technology Factor in a World Trade Matrix," in Vernon (ed.), *Technology Factor in International Trade.*

that wage differential at a 10 percent rate. Thus the human capital measure used here is

$$H_i = \frac{W_i - 2{,}500}{0.1},$$

where W_i is Hufbauer's average wage in production of commodity i.

At the two-digit SITC level, Hufbauer calculated the ratio (T) of professional, technical, and scientific personnel to total personnel in each industry, using the 1960 Census as his source of basic data. The analysis here examines the data at the three-digit level, then aggregates to the two-digit level and introduces the skill ratio, T, to assess its significance in explaining variations in net exports across commodities independently of the human capital measure, H. In the work of Keesing and of Baldwin, cited earlier, the skill distribution of employment was significant in explaining trade patterns. But neither Keesing nor Baldwin introduced a measure of wages or human capital into the same equation.

Scale economies. In addition to physical and human capital per man, a measure of economies of scale in production within industries is tested for significance in explaining the pattern of U.S. trade. Basically the scale economy hypothesis suggests that with a large domestic market, U.S. producers can obtain the cost-reducing advantages of large production runs more readily than can producers in smaller markets. Thus the United States may have a price advantage in goods whose production entails significant economies of scale and these might be expected to show relatively large trade surpluses, holding other factors constant.

Hufbauer calculated a measure of scale economies by relating value added per employee to the number of employees across size classes of establishments within three-digit SITC categories. For each SITC category, Hufbauer estimated the equation

$$\frac{q_j}{\bar{q}} = aN_j^S,$$

where

q_j = value added per employee in establishment j
$\bar{q}$ = average value added per man in the SITC category
N_j = number of employees in establishment j
S = scale economy measure for production of that SITC commodity
a = a constant.

A value of S of 0.1, for example, means that doubling establishment size—measured by employment—raises value added per man by 10 percent. These S values are the measure of economies of scale; in general they run from -0.05 to $+0.15$.

The Vernon product cycle. Another variable tested for its influence on international trade is a rather imperfect measure designed to reflect the product cycle hypothesis. As noted above, it states that the United States, as the country with highest income per capita and wage rates, should typically export manufactured goods that are in the early stage of the product cycle, and import goods that are in later stages. One measure of the "age" of a good that is particularly appropriate as a proxy for the product cycle is the date at which it first entered international trade. The earlier the date, the older the good, in the sense that is relevant here.

Starting with 1909, when the U.S. Census Bureau's export classification list, Schedule B, was first published, Hufbauer found the date at which each seven-digit SITC category first appeared in the export schedule. He then averaged these dates within three-digit categories to arrive at a first-trade date (in years and tenths of years—for example, 1947.8) at that level. These data serve as a (clearly imperfect) proxy (P) for the product cycle.[29]

Research and development expenditures. Closely related to the product cycle hypothesis and to the human capital explanation of U.S. comparative advantage, especially in its skill ratio variant, is the research and development (R&D) explanation of U.S. trade advantage. In a 1967 article Keesing noted the relationship of R&D expenditures, as a percent of value added, to net exports by industry.[30] This finding could supplement both the human capital and product cycle hypotheses: A firm with a high R&D ratio probably employs more than the average number of scientists and technicians, who in turn are paid wages above the average. Thus research-intensive industries would be human-capital-intensive industries as well.

29. An obvious question may be raised concerning Hufbauer's use of U.S. export data alone to measure first-trade dates. If the product cycle hypothesis does not hold in general, the first date of U.S. export of a commodity is not likely to pinpoint the date when the good entered international trade. But in that event the variable P should not significantly improve the explanation of variations of U.S. net exports in the cross-section. On the other hand, if the product cycle hypothesis does hold, the U.S. first-export dates should be a good approximation to dates of first international trading and P should be significant.

30. See Donald B. Keesing, "The Impact of Research and Development on United States Trade," *Journal of Political Economy*, Vol. 75 (February 1967), pp. 38–48.

At this point the R&D explanation blends into the skill ratio case.[31] If such expenditures are only a proxy for human capital, the inclusion of an R&D measure along with human capital in a regression equation explaining net exports should not significantly improve the explanation.

But research expenditures also fit into the product cycle hypothesis. Presumably the production of new consumer and capital goods involves, on the average, a greater R&D ratio than does the production of mature, standardized goods. If the product cycle hypothesis is correct, then production of goods in which the United States has a trade surplus should involve higher research ratios than does production of goods with net trade deficits.

Keesing's data on R&D ratios for 1960 are used to observe the relationship of the cross-section of U.S. net exports, by SITC commodity, to R&D expenditures.[32] As a function of value added in production, the values run from 0.01 to a high of 0.24 for office machinery. Their use narrows the sample to sixty-one three-digit SITC categories to which R&D ratios can be assigned.

ANALYSIS OF THREE-DIGIT SITC DATA

Simple correlation coefficients between the three-digit cross-section variables are shown in the correlation matrix of Table 8. The first column reveals that net exports (X) have a small negative correlation with physical capital per man (K), and larger positive correlations with human capital per man (H), scale economies (S), and the first-trade date (P). The second column demonstrates that physical and human capital are fairly strongly correlated, while physical capital per man has a negative correlation with scale economies. Human capital per man is weakly correlated with scale economies, according to the data in the third column.

The positive correlation across commodities between human and physical capital per man, taken by itself, would be consistent with a two-input production model. In this case one would argue that, across industries, high ratios of capital per man lead to high wage rates and high estimates of human capital. But, since the United States has a high ratio of capital per man in the entire economy relative to other countries, this two-input model would

31. In fact, both Gruber and Vernon, "Technology Factor," and Baldwin, "Determinants of the Commodity Structure of U.S. Trade," use skill ratios to measure the technology intensity of production.

32. See Keesing, "Impact of Research and Development," App. 2, p. 47.

Table 8. Correlations of U.S. Net Exports and Selected Production Characteristics, Manufactured Goods, by Three-digit SITC Commodity Groups, 1964[a]

Variable	*Net exports* (*X*)	*Physical capital* (*K*)	*Human capital* (*H*)	*Scale economies* (*S*)	*First-trade date* (*P*)
Net exports (*X*)	1.000	−0.085	0.214	0.204	0.216
Physical capital (*K*)	−0.085	1.000	0.591	−0.227	0.118
Human capital (*H*)	0.214	0.591	1.000	0.069	0.245
Scale economies (*S*)	0.204	−0.227	0.069	1.000	−0.065
First trade date (*P*)	0.216	0.118	0.245	−0.065	1.000

Sources: Based on data developed by G. C. Hufbauer, "The Impact of National Characteristics and Technology on the Commodity Composition of Trade in Manufactured Goods," in Raymond Vernon (ed.), *The Technology Factor in International Trade*, A Conference of the Universities–National Bureau Committee for Economic Research (Columbia University Press for the National Bureau of Economic Research, 1970), especially Table A-2; and on median income data from U.S. Bureau of the Census, *Current Population Reports*, Series P-60, No. 43, "Income of Families and Persons in the United States: 1963" (1964).

a. Standard international trade classification groups 5–8.

mean that (a) U.S. net exports should be physical-capital-intensive goods; (b) X and K thus should be positively correlated, and (c) X and H would also be positively correlated, but only because high K causes both high X and high H.

This set of implications of a two-input model is clearly inconsistent with Table 8, in which a negative (but very small) correlation appears between physical capital and net exports. A more consistent story can be told with a three-input model: Industries producing with high ratios of physical capital per man (raw labor), relative to other domestic industries, also use high ratios of human capital per man, which leads to high average wage rates. This could account for the 0.59 correlation between human and physical capital. But, as Leontief suggested long ago, while the U.S. economy has a high ratio of physical capital per man, relative to other countries, it is even better situated with respect to human capital per man, so that its net exports are intensive in the latter, as Table 8 suggests.

These impressions from the simple correlation matrix are supported by the regression analysis relating net exports to the four production characteristics, K, H, S, and P.[33] These results are summarized in Table 9, which

33. Multiple regression is used here strictly as a descriptive device; it shows the relationship of the cross-section of net exports to the production characteristics in this set of data. To show the regression coefficients in the following tables is not, however, to imply that they can be used as partial derivatives, or policy multipliers. Rather, the point is to see whether net exports are positively or negatively related to the various characteristics within the framework of a multivariate analysis.

Table 9. Cross-section Regressions Explaining U.S. Net Exports of Manufactured Goods, by Three-digit SITC Commodity Groups

Equation and dependent variable[a]	*Coefficients of independent variables*				*Summary statistics*	
	Physical capital per man (K) (thousands of dollars)	*Human capital per man (H) (thousands of dollars)*	*Scale economies measure (S) (percent)*	*First-trade date (P) (year)*	R^2	F[b]
9-1, 1964 net exports	−8.63	81.82	3.44	9.22	0.21	6.65
	(2.7)	(3.1)	(1.3)	(2.3)		
9-2, 1964 net exports	...	37.73	5.88	9.91	0.15	5.92
		(1.8)	(2.3)	(2.4)		
9-3, 1964 net exports	−2.42	...	5.74	12.17	0.13	5.02
	(0.9)		(2.2)	(3.0)		
9-4, 1964 net exports	−10.23	102.90	...	...	0.16	9.73
	(3.3)	(4.1)				
9-5, 1967 net exports	−9.24	95.13	4.26	9.29	0.19	5.86
	(2.5)	(3.1)	(1.4)	(2.0)		
9-6, 1964 gross exports divided by sum of 1964 exports and imports	−1.08	11.84	0.25	0.90	0.26	8.43
	(3.2)	(4.3)	(0.9)	(2.1)		
Mean value of variable	12.2	4.3	3.1	1945.2	...	...

Sources: Same as Table 8.

Note: Here and in subsequent tables, figures in parentheses are t-statistics.

a. The dependent variable in equations 9-1 through 9-5 is expressed in millions; in equation 9-6, it is in percent. Its mean is $74.8 million for 9-1 through 9-4, $50.2 million for 9-5, and 56.7 percent for 9-6.

b. With 101 observations and four independent variables, the F statistic must be above 2.46 to be significant at the 5 percent confidence level and 3.51 to be significant at the 1 percent level.

displays the coefficients of the four variables, with their t-ratios in parentheses, in several regressions explaining variations in net exports.[34] Equa-

34. The regression equation across commodities i ($i = 1, \ldots, 101$) is

$$X_i = a_0 + a_1K_i + a_2H_i + a_3S_i + a_4P_i + e_i,$$

where the coefficients $a_1, \ldots, a_4$ are shown in Table 9, along with their t-statistics. The constant term a_0 is simply the difference between the mean X_i and the sum of the means of K_i, H_i, S_i, and P_i, each multiplied by the relevant a, and is of no particular interest here. This form of equation is traditional in the literature. See, for example, Baldwin, "Determinants of Commodity Structure." The equation is not fully consistent with a three-factor production model, which would suggest deflating net exports by employment in each commodity group. Failure to deflate in this way may lend undue weight to industries that have large trade flows due to size of industry alone. Inefficient parameter estimates may result. But at this time data on neither employment nor output by

tion 9-1 shows the coefficients of the explanatory variables when the full set is included. Human capital per man has a positive and significant coefficient, while physical capital per man has a significantly negative coefficient. While K and H are positively correlated across industries, as human capital increases (holding K, S, and P constant across commodities) net exports increase, while the opposite is true if H is constant and K increases. Thus industries with large export surpluses seem to use a large amount of human capital relative to physical capital (or to have high wage rates relative to their physical capital-labor ratios).[35]

The next two equations in Table 9 show, respectively, what happens when physical or human capital is dropped from the equation. Since they are positively correlated, but work in different directions on net exports, the omission of one of them, which requires the other to represent both, reduces the size of the coefficient of the included variable.

In equation 9-1 the product cycle variable P is marginally significant. All other things constant, newer products (in terms of first-trade dates) will

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SITC commodities are available. Furthermore, as noted above, these results are not especially new, but simply consolidate past studies that use the form shown here. A more rigorous specification of the correct equation for exploring the sources of comparative advantage, and collection of the data required to estimate that equation, is clearly the next step after the purely descriptive initial regressions shown in Tables 9, 10, and 11. In response to suggestions from the panel that some form of scale variable be added to the analysis, the basic regression was also run with the ratio of gross exports to gross trade as the dependent variable. This variable is bounded by zero and unity. The results, shown as equation 9-6 in Table 9, do not differ appreciably from the basic results reported below.

35. A further technical point is brought out by the regressions of Table 9: Trade surpluses across commodities are positively related to human capital per man and negatively related to physical capital per man in production. Thus it would make little sense to add together human and physical capital in explaining trade patterns. In fact, if this is done, and equation 9-1 is rerun with "total capital," R^2 falls to 0.12 and the "total capital" coefficient has a t-ratio of 0.6.

These results suggest that human and physical capital are not perfect substitutes in production and cannot be summed simply to "total capital." This is contrary to the suggestion by Kenen to use precisely that method to demonstrate that U.S. trade is capital intensive, after all. See Kenen, "Nature, Capital, and Trade," p. 457. This rescue of the two-factor model has also been hinted at in Harry G. Johnson, "The State of Theory in Relation to the Empirical Analysis," in Vernon (ed.), *Technology Factor in International Trade*, p. 14. It is also implicit in Lary's use of value added per man as a measure of capital intensity. Value added is simply profits plus wages, so value added per man is physical plus human capital per man times a common discount rate. See Hal B. Lary, *Imports of Manufactures from Less Developed Countries* (Columbia University Press for the National Bureau of Economic Research, 1968), Ch. 2.

show larger surpluses. This is consistent with the product cycle hypothesis for U.S. trade, and suggests that it is visible at the three-digit SITC level. This evidence, combined with the earlier observations on the long-term OBE end-use data, confirms the product cycle as a fairly good general description of the life of products in trade in manufactured goods.

The scale economy variable is marginally insignificant in equation 9-1. Industries that exhibit scale economies (again, all other things equal) may have larger surpluses than those that do not, but the evidence is faint. When both S and P are eliminated from the equation (equation 9-4), the significance of the basic physical and human capital variables is increased. Thus the three-factor version of the classical trade model may serve as a good basic description of the source of U.S. comparative advantage in trade in manufactured goods.

According to equation 9-5, the basic results are not particularly sensitive to choice of year for the trade data. The measurements for the independent variables are taken from various years in the period 1960–65, and they relate in similar ways to U.S. trade data for any of the years 1964–68. These are fundamental relationships of trade advantage, and they are unlikely to change very rapidly over time.[36]

Finally, the introduction in equation 9-6 of a scaled version of the dependent variable, exports divided by the sum of exports and imports, improves the results somewhat, raising R^2 and the t-ratios of human and physical capital. Thus there appears to be no reason to assume that the basic results of equations 9-1 and 9-4 are changed substantially by this modification.

THE ROLE OF R&D EXPENDITURES

Narrowing the three-digit sample from 101 to 61 commodities permits introduction of Keesing's 1960 R&D expenditure ratios into the analysis. The simple correlations of the ratios of R&D expenditure to total value added (RD) with the other variables introduced in the previous section are as follows:

X	K	H	S	P
0.43	−0.10	0.15	0.26	0.14

36. When the equations are reestimated excluding SITC category 68, which is mainly basic metals and thus could be natural resource-intensive, the results do not change at all.

There is a high correlation of the R&D ratio with net exports in the sample. *RD* is negatively correlated with physical capital per man *K* and positively correlated with the scale economies measure *S*. This is consistent with the evidence on the full 101-commodity sample in Table 8, which indicates that *K* and *S* are negatively correlated. The *RD* variable is positively correlated with both the human capital measure *H* and the first-trade date measure of the product cycle *P*, and the strength of the correlations is about the same. Thus R&D-intensive industries do tend to have wage rates above the average and to produce relatively new products.

In Table 10, which follows the format of Table 9, the R&D variable is introduced into the regression analysis in two steps: First, with a 61-observation subsample, equations 10-1 and 10-2 reestimate the basic equations 9-1

Table 10. Cross-section Regressions Explaining U.S. Net Exports of Manufactured Goods, Including Research and Development Expenditures as an Explanatory Variable, by Three-digit SITC Commodity Groups, 1964

	Coefficients of independent variables						
	Physical capital per man (K) (thousands of dollars)	*Human capital per man (H) (thousands of dollars)*	*Scale economies measure (S) (percent)*	*First-trade date (P) (year)*	*Ratio of research and development expenditures to value added, 1960 (RD) (percent)*	*Summary statistics*	
Equation[a]						R^2	F[b]
10-1	−9.92	84.70	2.24	17.21	...	0.29	5.72
	(2.5)	(1.7)	(2.6)	(1.9)			
10-2	−12.99	127.95	...	...	...	0.16	5.53
	(4.1)	(2.5)					
10-3	−8.47	60.23	4.75	15.71	21.22	0.37	6.45
	(2.2)	(1.3)	(1.2)	(2.5)	(2.7)		
10-4	−10.47	92.79	...	...	25.15	0.28	7.39
	(2.6)	(1.9)			(3.1)		
Mean value of variable	12.2	4.3	3.1	1945.2	3.37	...	...

Sources: Same as Table 8, and, for research and development variable, Donald B. Keesing, "The Impact of Research and Development on United States Trade," *Journal of Political Economy*, Vol. 75 (February 1967), pp. 38–48.

a. The dependent variable is 1964 exports; its mean is $74.8 million.

b. With sixty-one observations and four independent variables, the *F* statistic must be above 2.52 to be significant at the 5 percent level and 3.65 to be significant at the 1 percent level.

and 9-4, respectively. A comparison of the pairs of equations reveals that restricting the sample moderately changes the size and significance of some coefficients, as would be expected.

Next, in equations 10-3 and 10-4, *RD* is added to equations 10-1 and 10-2, respectively. In both equations the coefficient of *RD* is quite significant, the fit of the equation is increased substantially, and the significance of both the human and physical capital measures is reduced. The comparison of equations 10-1 and 10-3 suggests that introduction of R&D spending increases the significance of the product cycle measure and reduces that of the scale economies measure.

The most interesting result here is that the R&D measure is a significant variable in explaining variations in net exports of manufactured goods even when variations in human capital have been accounted for. This result comes in a subsample that is, in a sense, biased against the human capital explanation of U.S. comparative advantage. But it does appear that the role of the R&D expenditure ratio in explaining U.S. comparative advantage is not simply that of a proxy for human capital or for the product cycle.

ANALYSIS OF THE SKILL RATIO

The skill ratio *T* can enter the analysis at the two-digit SITC level to reveal whether this source of variation in average wage rates across industries adds to the explanation of net exports once human capital, in general, is included in the equation. Table 11 displays the results of this addition.

Equation 11-1 simply reestimates equation 9-1 on the two-digit data, yielding only twenty-eight observations. The results are essentially the same, although aggregation tends to blur the analysis, reducing the significance of all the coefficients.[37] The entire equation does not explain a statistically significant fraction of the variation in net exports at the two-digit level. Thus equation 11-2 eliminates *S* and *P*, raising the significance of physical and human capital.

The next two equations show the results of adding the skill ratio *T* to the equation and excluding the scale economies and first-trade date variables. In equation 11-3 *T* substitutes for human capital. This results in a drop in

37. Note that, in aggregating, three-digit net export data have been summed to the two-digit level, while the three-digit data on the explanatory variables were averaged by Hufbauer, using 1965 exports as weights. Thus the Table 11 coefficients are larger than those of Table 9.

Table 11. Cross-section Regressions Explaining U.S. Net Exports of Manufactured Goods, Including the Skill Ratio as an Explanatory Variable, by Two-digit SITC Commodity Groups, 1964[a]

	Coefficients of independent variables						
Equation	*Physical capital per man (K) (thousands of dollars)*	*Human capital per man (H) (thousands of dollars)*	*Scale economies measure (S) (percent)*	*First-trade date (P) (year)*	*Ratio of professional, scientific, and technical employees to total (T) (percent)*	*Summary statistics* R^2	F^b
11-1	−55.71	39.01	27.52	28.96	...	0.33	3.00
	(2.4)	(2.1)	(1.0)	(1.1)			
11-2	−60.34	50.39	...	...	...	0.28	5.05
	(2.6)	(3.0)					
11-3	−31.59	...	...	...	60.77	0.15	2.30
	(1.5)				(2.0)		
11-4	−61.74	42.85	...	...	25.74	0.30	3.57
	(2.6)	(2.2)			(0.8)		
Mean value of variable	12.2	4.1	4.2	1944.5	9.0	...	...

Sources: Same as Table 8, and for the skill ratio variable, data from U.S. Bureau of the Census, *U.S. Census of Population: 1960*, Subject Reports, *Occupation by Industry*, Final Report PC(2)-7C (1963).

a. The dependent variable is 1964 exports; its mean is $270.2 million.

b. With twenty-eight observations, the 5 percent levels of F are as follows:

Number of independent variables			
2	*3*	*4*	*5*
3.37	2.99	2.78	2.64

the explanatory power of the entire regression and T is less significant in 11-3 than H is in 11-2. When human capital and the skill ratio are allowed to compete directly in equation 11-4, H is significant, while T has a t-ratio of only 0.8. Thus, as far as the two-digit data reveal, once human capital in general, as reflected by high wage rates (relative to the base wage for uneducated labor), is entered into the explanation of net exports, the inclusion of the skill ratio does not improve the explanation.

Summary and Conclusions

This paper reports an attempt to draw various strands of information into a coherent pattern of the trends in U.S. trade in manufactured goods.

As such, it is mainly descriptive, not analytical. The effort has been to describe past patterns with a minimum application of implicit theory, rather than to explain them in any detailed way or to provide a mechanism for predicting future trends.

TRENDS IN U.S. TRADE

Before World War II, from 1925 to 1937 or so, the United States generally had surpluses in trade in capital goods, automotive products, fuels and lubricants, and iron and steel products. Deficits typically appeared in consumer goods, textiles, and industrial materials based on natural resources, such as primary metals and wood products. Trade in chemicals was roughly balanced. These surpluses and deficits did not show major trends nor did trade of commodity groups at this level of aggregation fluctuate between surplus and deficit.

The period 1946–49 witnessed a great expansion in U.S. exports, virtually across the board, while imports remained initially at prewar levels. By the middle or late 1950s, the temporary surpluses had disappeared, and a new set of trends emerged. In no case did trade revert to the stable pattern of the 1925–37 period. Rather, rapid change dominated the pattern, with growing surpluses in capital goods and chemicals, growing deficits in other industrial supplies and materials, and a shrinking surplus turning into a growing deficit in consumer goods.

The net result of all this movement in commodity trade balances is shown in Table 1 as the total balance on trade. Once the postwar bulge was eliminated, the trade surplus grew erratically to 1964. The excess demand of the late 1960s obscured the trend of fast-growing surpluses in capital goods and substantially increased the deficit in durable consumer goods. But while aggregate demand factors were important in the late 1960s, a structural movement underlies the changing U.S. trade position, operating independently of the state of aggregate demand.

THE BASIS FOR U.S. COMPARATIVE ADVANTAGE

The results reported here suggest that U.S. net exports are not intensive in physical capital. This conclusion is by now commonplace. Net exports of the United States seem to be intensive in human capital, as measured by average wage differentials across commodity production, and to be posi-

tively related to expenditures on research and development across industries. In addition, the Vernon product cycle appears in both the analysis of trade by four-digit OBE end-use categories and the cross-section regressions on three-digit SITC categories, reported above.

IMPLICATIONS FOR TRADE POLICY

The analysis of U.S. trade, taken by itself, permits no definitive statement about what policy *should* be followed. If the subject is balance-of-payments policy, the appropriate trade balance can be determined only in light of decisions on the overall balance of payments and its composition. Even with a trade deficit, the United States might run a substantial surplus on current account with net income on investment and other services. In 1970 the U.S. trade surplus was $2.1 billion (including military items, which are excluded from Table 1), while the surplus on investment income was $6.2 billion. Thus a current account surplus that finances a capital account deficit can be consistent with a small trade surplus or deficit.[38]

On the other hand, if the subject is policy concerning employment and the composition of industrial output, trade policy cannot be fixed without decisions on the level and distribution of output and employment in general. The United States should not look to trade to achieve high levels of employment: Suitable policies regarding aggregate demand are capable of maintaining full employment. And it is hard to see why particular industries that are suffering from competition should be aided if the competitors are foreign, but not if they are domestic. Foreign competition is only one reason—and a minor one, at that—why industries that were once strong die out.

This analysis does, however, throw light on the current problem of exchange rates. The tendency for imports to supply an increasing share of the U.S. domestic market is explained largely by the fact that trade has become more dynamic in the postwar world. Consumption everywhere is more cosmopolitan and this development must be recognized in any analysis of trade positions. As noted before, the United States is highly self-sufficient

38. The growing role of investment income in the current account has been emphasized recently by Lawrence B. Krause, who suggests that the United States may be shifting from the role of an exporter of goods to that of an exporter of capital services. See Lawrence B. Krause, "Trade Policy for the Seventies," *Columbia Journal of World Business*, Vol. 6 (January–February 1971), pp. 5–14.

in the supply of finished goods. In today's world this fact alone might tend to attract foreign competitors eager to increase import penetration of the U.S. domestic market. But, through 1968, the U.S. degree of self-sufficiency fell almost exactly in line with the decline in that of other industrial countries.

Since 1968, however, the share of the domestic market supplied by foreign sources has probably grown rather faster in the United States than elsewhere. In part, the inflation of the late 1960s is responsible. Although excess demand has disappeared, relative price positions today reflect the changes of the past five years, and the rate of inflation in the United States has not yet moderated sufficiently to bring about significant improvement in this situation.

The differential movements in price positions over the past few years by themselves point to the need for some exchange rate adjustments. But the fact that the current exchange rate structure still reflects vestiges of the early postwar distortions in competitive positions and industrial potential supports the need for more far-reaching adjustments. Indeed, the events of late summer 1971 demonstrated clearly the extent of the existing disequilibria.

Furthermore, if exchange rate adjustments are to be used to maintain a given long-run trade balance in a world of growing surpluses and deficits, they probably will have to be frequent. Before World War II, with static balances, a one-time change in rates might have yielded the desired change in the trade balance. But in a more dynamic world, "equilibrium" rates will be continuously changing, so that actual parity changes will have to be made with some frequency.

Moreover, this study can suggest what kinds of policies might work, if a prior decision to "do something" concerning the trade balance is taken. Given the already numerous trade restrictions that exist, U.S. trade policy should aim at increasing exports, not at protecting or subsidizing domestic import-competing industries, a course that can be followed only at the expense of the welfare of U.S. consumers. Exaggerating somewhat from the findings on the sources of U.S. comparative advantage, one might say that the United States does not export mass-produced, physical-capital-intensive goods; it exports custom-made, human-capital-intensive goods. Thus a policy undertaken by the United States to improve its trade advantage ought to focus on increasing the input of human capital into the production process by promoting a more highly skilled labor force and improving its

distribution, and perhaps by encouraging more expenditure in research and development. The results would tend to improve export performance, which is the proper objective for U.S. trade policy in today's world. To attempt to insulate the country from the natural trend toward expanding trade among all industrial countries would not be in the interest of the United States.

Comments and Discussion

R. A. Gordon: This paper deals with two separate but related topics. The first is concerned with long-term trends in foreign trade. Here the time dimension is important and the authors look at the entire spectrum of trade. In the second, the authors search for the sources of this country's comparative advantage in foreign trade. The analysis of that portion is entirely cross-sectional, and is limited to trade in manufactures; it is enlightening and makes a contribution, but I regret its lack of a time dimension. The authors have put their fingers on at least some of the major sources of comparative advantage in American foreign trade in manufactures in the 1960s, but what have been the major changes over the last half-century, and what do these changes portend for the future?

In their historical analysis of trends in net exports since 1925, the authors utilize the end-use classification developed by the Department of Commerce. I am not sure that this is the best classification for their purposes. If our chief concern is with the changing competitive position of the American economy in world trade, characteristics of the production process and the market for inputs, not end uses, are the essential bases for classifying exports and imports. The authors recognize this in their subsequent analysis of the source of comparative advantage.

Table 1 of the paper deserves careful study. Of the groupings shown there, only in chemicals and capital goods, as was pointed out, has the United States had a growing export surplus since the early fifties. Among the other categories, the chief differences are in the amount of the deteriora-

tion and when it began. In the recent deterioration, an outstanding element is the decline in net exports of consumer goods of approximately $3.9 billion. This component is far more important than the $1.2 billion drop in net agricultural exports, which the authors emphasize. In contrast, the rapid increase in net exports of capital goods has not decelerated. That export surplus in 1970 was nearly enough to balance the total import surplus in those categories that show trade deficits.

The second section of the paper, comparing domestic output and expenditures in foreign trade among the various industrial countries, covers ground that is largely familiar. Although the authors combine the figures in a different way, they offer little that is new. While the method of analysis in that section leaves much to be desired, I accept the conclusion that the American boom of the late sixties explains only a part of the deterioration of our trade balance during that period. In view of the highly simplified treatment, however, I have no confidence in their quantitative estimates of the actual effect. Among the factors ignored or slighted are relative prices, income elasticities, and the nature of underlying structural changes.

In the authors' comparative analysis, I missed any use of trade matrices, particularly trade matrices over time by broad commodity groups such as the International Monetary Fund is developing for its own use and for the LINK project, which seeks to connect the econometric models of major countries.

On the whole, I have little quarrel with the last part of the paper which deals with the sources of comparative advantage in manufactured goods. In general, I accept the conclusions as valid with respect to the very short interval of time that is covered. The authors look for the sources of America's comparative advantage in manufacturing, particularly capital goods and chemicals, in terms of the following factors: capital-labor ratios, investment in human capital, economies of scale, the product cycle, research and development expenditures, and the ratio of highly skilled workers to total employment. They regress net manufacturing exports by commodity groups on various combinations of these variables. The results confirm both the Leontief paradox and his explanation for it, in emphasizing the importance of human capital as a source of U.S. comparative advantage. The authors encounter problems of getting appropriate measures of the variables they want to use, and they wind up explaining a rather low proportion of the variation in net exports among commodities. But the evidence does support the general conclusion that U.S. comparative advantage in manu-

factured goods tends to be associated with relatively heavy investment in human capital, research and development expenditures, and the age of the industries concerned.

Finally, to return to the issue I raised earlier about the lack of a time dimension in the study of comparative advantage, I am reminded of Edward Denison's study, *Why Growth Rates Differ*.[1] In his last chapter Denison emphasizes the catching-up process that helps to explain the faster growth rate in most other industrial countries compared with the United States. These trends also apply to American exports of manufactures. I would add that the catching-up of other countries in productivity has not been matched by a fully comparable process on the wage side. The difference is clearest in the case of Japan.

Lawrence Krause: Branson and Junz argue that, if trade positions change over time, the shifts point toward the need for changing exchange rates. But, in fact, the balance of trade is only one element of the balance of payments, and no reasonable man—not even a reasonable government official—should have a target for a particular trade surplus. Trade balances should be expected to change. The strange fact is the fixity of these balances in the prewar period, rather than their variability in the postwar period.

I would like to underline the authors' own warnings that, in the comparison of the United States with other countries, no one should expect that it will be or should be exactly like other countries. One is nonetheless tempted because the authors focus on differences as though they need explaining or as though they help provide an explanation for what happened to the overall balance. The differences are presented unfortunately in some normative sense.

Finally, the authors' own presentation and analysis do not point to anything "bad" that requires correction in the trade balance. I find it puzzling to see a policy conclusion that favors expenditures on research and development.

William Branson: I agree with Krause that no policy recommendations can be made as a result of the study. It was aimed purely at informing ourselves and our readers about what has happened to U.S. trade. Surely, we

1. Edward F. Denison, assisted by Jean-Pierre Poullier, *Why Growth Rates Differ: Postwar Experience in Nine Western Countries* (Brookings Institution, 1967).

cannot say whether the trade surplus should be increased, but if a policy decision is made to increase it for whatever reason, we can say something about how that might be done.

In response to Aaron Gordon, a time dimension certainly should be added to the analysis in the latter part of the paper. This paper reports an initial set of impressions based on a first inspection of data—largely data assembled by other researchers. I certainly agree that the next step should be a collection of cross-section data through the 1960s, or at least for the census years, to permit a more detailed investigation.

Helen Junz: R. A. Gordon noted our emphasis on the decline in the agricultural trade balance, which was a smaller deterioration than the change in the consumer goods balance. I believe that this relative stress is appropriate because the shift toward deficit, or into larger deficit, in nonfood consumer goods is a trend common to all industrial countries. Although the United States has done a bit worse in this area than most other industrial countries, its performance is not outstandingly bad. In my view, this trend in the consumer balance suggests mainly that highly industrialized countries ought not to pour resources into, or to make large investments in, industries producing consumer goods for export.

General Discussion

Warren Smith questioned whether the analysis supported the policy conclusion that, to increase the trade surplus, heavier investment in human capital produced more results than the investment tax credit on machinery. The former did seem more important for increasing exports, but the latter might be as effective on the net balance by strengthening domestic industries that compete with imports. He expressed his personal opposition to resumption of the investment tax credit, and his preference for investment in human capital, but the consequences for the trade balance had no relevance to that choice.

Smith suspected that the authors were showing a tendency (common to many experts on trade) to endorse anything that increases the volume of trade. Since the world is marked by barriers to trade, there is a case for stimulating exports rather than restraining imports, when the objective is to improve the trade balance. On the other hand, if the world had no trade

restrictions, there would be no argument whatsoever for preferring measures to expand exports over measures to contract imports. Either would distort trade patterns from their optimum.

Lawrence Klein said that the investment tax credit proposal had so many dimensions and so many effects that it was really quite irrelevant to tie it to international trade considerations. He supported the authors' position in focusing on the trade surplus and on export stimulation in their comments on policy issues. Even though Krause was right that what matters is the overall balance of payments and not simply the balance on goods, Klein found it hard to imagine an appropriate adjustment of the U.S. balance of payments unless the trade balance improves. Concentrating on export stimulation rather than import restriction makes sense in the present context, despite Warren Smith's reservations. Holding down imports entails a negative restriction policy, while promoting exports can be positive and liberalizing, Klein concluded.

In further discussion of the policy implications, Joseph Pechman expressed strong reservations about the wisdom of any tax credit for research and development expenditures. Arthur Okun felt that the huge U.S. trade surplus on capital goods argued strongly against a "buy American" provision in the proposed investment tax credit; if other countries followed such a precedent in their investment incentives, the United States would have to be a loser.

Robert Hall was puzzled by the conceptual distinction in the paper between something called "competitive position," on the one hand, and relative prices, as influenced by inflation and exchange rates, on the other. He understood the authors' desire to discuss structural changes affecting U.S. comparative advantage in different categories of goods, as distinct from relative prices. But he wondered whether the framework incorporated adequately the role of price effects.

R. J. Gordon also wondered how and to what extent relative prices played a role in the changing patterns of trade. He cited a comparative study of unit labor costs recently published in the *Monthly Labor Review*, which showed that certain countries—Germany, for example—gained in world trade in comparison with the United States, even though their unit labor costs rose more rapidly. British exports continued to drop, even though the prices or unit labor costs of Britain's main competitors were rising as fast as their own. There is a real puzzle about the effects of differential inflation rates on world trade.

David Fand wondered whether the loss of comparative advantage by some U.S. industries might be accounted for in part by increased industrial concentration or by increased union power that limits their effectiveness in world markets. He was also struck by the sizable discontinuities that appear when the categories are classified by comparative advantage. Changes over time seem to intensify the net surpluses or net deficits of various sectors, but do not shift them from one side of the ledger to the other. He asked whether that was surprising or whether it was a consequence of the OBE classification.

Helen Junz responded that she doubted it was a matter of how the data were sliced. In the SITC data, which are essentially commodity or product type classifications, the same sort of thing is evident. She agreed that relative price movements among countries and across commodities would lead one to expect that various goods ought to move from surplus to deficit categories and vice versa. But that is not what the data reveal.

Klein was concerned that the cross-section analysis of U.S. comparative advantage looked at American technology alone. Unless overseas technology is considered at the same time, much ambiguity remains about what really moves net exports.

R. J. Gordon made a point related to Klein's. Any projection of comparative advantage in various sectors must consider developments both here and abroad. The United States cannot count on maintaining or strengthening its comparative advantage in those industries where it has heavy investment of human capital unless it can be sure to stay ahead of such investment by other countries. Human capital seems to be gaining rapidly in some industries in Germany and in Japan. It would be interesting to compare shares of exports of major countries with ratios of human capital in different industries, to see whether that comparison improved the explanation.

Charles Schultze suggested that, given the strongly positive simple correlation between human and physical capital, the key to the differences in the multiple regression must be industries that combined low intensity of physical capital with high intensity of human capital. Identifying and analyzing that group of industries might give some insight into the forces that are actually at work.

Several participants were concerned that the dependent variable was not scaled in the regression analysis of the sources of comparative advantage. With net exports expressed in dollars while the independent variables were

taken largely as dollars per man, big industries received undue weight and spurious correlations with the size of industry might be introduced. A number of suggestions were offered: to scale the independent variables by the size of the industry; to use as the dependent variable net exports per man, the ratio of exports to imports, the ratio of exports to the sum of exports and imports, or the ratio of net exports to total output.

Branson agreed that some scaling was desirable but noted that he lacked comparable data on total output or employment to implement some of the suggestions. He felt that relationships might be blurred but would not be biased by his procedure. He reiterated that the regression coefficients should not be interpreted as structural partial derivatives. Equation 9-6 (in Table 9) reflects additional work Branson did in response to this discussion.

Franco Modigliani, however, offered an illustration of how results might become biased and distorted by the absence of scaling. If young industries tend to be small industries, the variable on the initial date of trade would become a negative proxy for industry size and an adverse bias against that variable would mar the regression analysis. However, Branson pointed out that new products are not necessarily associated with young industries—the chemical industry is continuously producing new products, for example—so that a negative relationship between industry size and the first-trade-date variable is not necessarily implied.