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1 Measuring U.S. International Goods and Services Transactions

Robert E. Baldwin and Fukunari Kimura

1.1 Introduction

One of the roles of economists concerned with organizing national and international economic data into meaningful accounting formats is to ask periodically whether existing sets of accounts adequately describe important economic trends and are as useful to public and private policymakers as possible. The Panel on Foreign Trade Statistics established under the auspices of the National Academy of Sciences (NAS) in 1989 (which Baldwin chaired) considered addressing this question to be an important part of its task. In particular, it focused on whether existing ways of presenting data on firms' cross-border trading activities and the sales and purchasing activities of their foreign affiliates adequately captured the close relationship between these two types of international economic transactions.

The panel concluded that the present system of economic accounting could be improved in this regard and recommended that cross-border sales (exports) and purchases (imports) of goods and services as well as net sales of foreign affiliates of U.S. firms (FAUSFs) and net sales to U.S. affiliates of foreign firms (USAFFs) be presented on an ownership basis to supplement the residency approach followed in the balance-of-payments accounts (National Research Council 1992).¹ In the net sales calculations, the selling and purchasing activities of firms are measured as those undertaken by the firms' capital own-

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1. It should be emphasized that the panel did not propose that the existing framework for the balance of payments be changed but rather that additional information on international transactions be presented in supplementary accounting formats.

ers and employees, that is, by the productive factors used directly to create value added by the firm. Thus, net sales of foreign affiliates are defined as sales less purchases of intermediate goods and services.² This suggested supplemental framework combines net cross-border sales of Americans to foreigners, net sales by FAUSFs to foreigners, and net sales of U.S. firms to USAFFs to yield a figure that shows net sales of Americans to foreigners. The panel report also estimated value added on this basis, and we believe that measuring cross-border and foreign affiliate activities on a value-added basis is also a useful accounting format for representing international transactions. However, fundamentally, the usefulness of these as well as existing or other formats depends on the purpose for which the information is utilized.

The outline of the paper is as follows. Section 1.2 discusses the need for a supplementary framework and its benefits to both private and public officials. Section 1.3 considers various conceptual and practical issues that arise in measuring cross-border and foreign affiliate activities on a net sales basis and also discusses some of the key relationships brought out in the tables measuring international transactions on an ownership basis over the period 1987–92. Measurements of cross-border and direct investment activities on a value-added basis for this period are presented in section 1.4, and important relationships based on this approach are discussed. Section 1.5 presents net sales figures on an industry basis and includes an analysis of the international structure and relative competitiveness of American industries that these figures reveal. Section 1.6 briefly summarizes the main argument of the paper.

1.2 The Need for a Supplementary Framework

A key aspect of the increasing internationalization of economic activities is that firms have found they can profitably exploit their unique technological and managerial knowledge by establishing production units in foreign countries as well as by exporting to or importing from foreign firms or permitting foreign firms to use their specialized knowledge. Thus, when supplying goods and services to foreign markets, business decision makers consider the alternatives of producing the goods and services domestically and exporting them or undertaking direct foreign investment and producing them in their facilities abroad. If they do choose to produce abroad, firms must also decide on the extent to which they will export components for further processing in their overseas facilities or purchase the needed intermediate inputs abroad. To compare the economic importance of these alternative means of serving foreign markets, it is necessary to have comparable data with respect to these different activities.

2. Consequently, purchases from foreigners by FAUSFs, e.g., include purchases by the firms of intermediate goods and services from foreign-owned firms located abroad but do not include the cost of foreign labor hired directly by the affiliates of U.S. firms.

The current set of accounts documenting the international activities of U.S. and foreign firms does not provide such comparability. The balance of payments summarizes international transactions between residents of one country and residents of other countries. Total merchandise and service exports and imports of firms residing in the United States and in other countries are recorded, but no information is provided concerning whether the exports are shipped from U.S.-owned firms to FAUSFs or USAFFs to their foreign parents. Imports also are not distinguished on an ownership basis. Furthermore, since total exports include imported inputs, one is not able to compare properly the relative importance of value added through export activities with value added through affiliate activities or with total value added (GDP).

More important, the only measure of the level of activity of FAUSFs or USAFFs in the balance of payments is the income earned on U.S. direct investment abroad and on foreign direct investment in the United States. Comparing these income receipts and cross-border merchandise and service trade leads to an apples-and-oranges adding problem. The balance-of-payments framework measures the participation of U.S.-owned firms located in the United States in cross-border activities by their sales but measures their participation in direct investment activities abroad by the income earned on these direct investment activities. Since exports and direct investment income are not comparable (the first is a sales figure, while the second represents factor income), one does not get an adequate picture of the nature of firms' international activities from the balance of payments.

Economic data on sales and purchases of foreign affiliates of domestic firms and domestic affiliates of foreign firms are available for the United States and Japan, but these are presented in other sets of accounts constructed by these governments.³ The U.S. government, for example, annually publishes data on the operations of U.S. parent companies and their foreign affiliates and the operations of USAFFs. These reports provide information on the cross-border trade between parent firms and their foreign affiliates as well as on the foreign sales and purchases of foreign affiliates. However, prior to the work of DeAnne Julius (1990, 1991) and an earlier study by Evelyn Lederer, Walter Lederer, and Robert Sammons (1982), no effort apparently had been made to integrate information in both sets of accounts as a means of better understanding the nature of the increasing globalization of economic activities.

Not only are supplementary statistical summaries of cross-border and foreign-based transactions of firms needed to improve our understanding of the evolving international economy, but such accounting frameworks would be helpful to government officials in reaching policy decisions. As the various papers in this conference volume indicate, ownership as well as geography matters for economic behavior. For example, the domestic content of foreign-

3. Purchases by FAUSFs can only be estimated indirectly.

owned firms in the United States, though high, is substantially lower than that of domestic U.S.-owned firms. Similarly, plants owned by foreign multinational companies are more capital intensive, more technology intensive, and more productive and pay higher wages than the average U.S. plant. Moreover, the output of these firms is generally growing at a different (sometime faster, sometime slower) pace than is output of domestically owned firms. National tax rules also affect the way in which foreign-owned firms report taxable income, price their products, and locate their production activities in a manner that differs from the behavior of domestic firms. Furthermore, foreign affiliates may respond differently to domestic monetary policies than domestically owned firms do because their access to international capital markets is likely to be better. Since these various differences are important for a variety of macroeconomic and microeconomic policy decisions by governments, it is useful to have an accounting framework that facilitates the comparison and interpretation of the differences. However, quite aside from the various differences in economic behavior between domestically owned and foreign-owned firms, it seems prudent on national security grounds to measure the cross-border and affiliate activities of U.S.-owned and foreign-owned firms on a comparable basis.

Expressing cross-border and affiliate activities in comparable terms can also be helpful to trade negotiators. Increasingly, it is the objective of governments not only to reduce the restrictive effects of traditional border measures but to reduce the discriminatory effects of various rules and regulations imposed by other governments that restrict the selling and buying activities of foreign affiliates within foreign markets. To determine the extent to which a country's negotiators have achieved both objectives, it is necessary to assess the liberalization achieved in both areas in a comparable manner, a goal that is not attained by only utilizing the information available in the balance of payments. Furthermore, the proposed accounting frameworks are helpful in informing the ongoing debate on American competitiveness in the world economy. By providing data on the extent to which U.S. firms compete against foreign firms through sales and purchases from their foreign-based operations as well as through their cross-border sales and purchases, government officials can better inform the public on this issue.⁴

Of course, for most public policy and research issues, the relevant relationships are the level of domestic activity, regardless of whether it is undertaken by domestically owned or foreign-owned firms, and the income accruing to U.S.-owned firms from their foreign investment activities rather than the level of activities of their foreign affiliates. The traditional residency approach followed in the balance of payments remains the appropriate accounting framework to utilize under these circumstances.

4. However, as Guy Stevens points out in his comment on this paper, no simple accounting measure can accurately measure the many different meanings of international competitiveness.

1.3 Measuring Cross-Border and Direct Investment Activities on a Net Sales Basis

1.3.1 Some Conceptual Issues

The first issue that arises in estimating net sales of goods and services by Americans to foreigners is how to define U.S.-owned and foreign-owned firms. For balance-of-payments purposes, the Bureau of Economic Analysis (BEA) regards a business located abroad (in the United States) as representing U.S. (foreign) direct investment if one U.S. (foreign) person, in the legal sense that includes a firm, controls 10 percent or more of the voting securities of the business. Under such a practice, two or more countries can treat the same firm as a foreign affiliate. This will lead to double counting of total sales and purchases for the world if an affiliate is assigned to each country. One way of avoiding this problem would be to allocate the sales and purchases of affiliates in proportion to the ownership interests of the different countries. Another would be to include only those affiliates that are majority owned, that is, affiliates in which the combined ownership of those persons individually owning 10 percent or more of the voting stock from a particular country exceeds 50 percent. One could assign all sales and purchases of affiliates to countries with majority ownership interests or only the proportions equal to the ownership interests.

The procedure followed here is to treat only majority-owned affiliates as U.S.-owned or foreign-owned firms and assign all the sales and purchases to either the United States or foreigners, depending on who has the majority ownership interest. Unfortunately, while data on the sales and purchases of goods and services are available for majority-owned FAUSFs, data on majority-owned USAFFs, although collected, are not published. In the tables included in this paper, figures on these affiliates cover firms in which the ownership interest is only 10 percent or more.⁵

Another problem in identifying U.S.-owned and foreign-owned firms is that some FAUSFs may belong to U.S. firms that are themselves USAFFs, and some USAFFs may belong to foreign firms that are themselves FAUSFs. Unfortunately, the data for identifying such firms and properly classifying them as foreign-owned and domestically owned firms are not available. Still another issue in estimating net sales of Americans to foreigners is the lack of data on sales and purchases of U.S. citizens living abroad and households of foreign citizens living in the United States. Because of this problem, it is necessary to classify households on a country-of-residence basis, as in the balance-of-payments statistics. That is, the household of a private foreign citizen in the United States (not employed by a foreign government) is combined with house-

5. An exception is service data from DiLullo and Whichard (1990) and Sondheimer and Bargas (1992, 1993, 1994), which cover majority-owned USAFFs.

holds of U.S. citizens living in the United States and the U.S. government and regarded as an American unit. Similarly, the household of a private U.S. citizen living abroad (not employed by the U.S. government) is combined with households of foreign citizens living abroad and foreign governments and regarded as a foreign unit.

The focus is on identifying the selling and purchasing activities of FAUSFs and USAFFs. Thus, the term “Americans,” as used here, refers to U.S.-owned firms in the United States and abroad, households of U.S. and private foreign citizens residing in the United States (U.S.-resident households), and U.S. government units. Similarly, the term “foreigners” refers to foreign-owned firms in the United States and abroad, households of foreign and U.S. citizens residing abroad (foreign-resident households), and foreign governments.

In comparing the net sales of Americans to foreigners over time, it is, of course, necessary to deflate the value figures by appropriate price indexes. Cross-border sales should be deflated by U.S. export and import price series, while the appropriate deflator for net sales to USAFFs is an index of U.S. producer prices. Net sales of FAUSFs should be deflated by a weighted average of foreign producer prices, where the weights reflect the relative importance of the sales of FAUSFs across the countries.⁶

1.3.2 Estimates of Net Sales of Americans to Foreigners

Estimates of the net balance of sales by Americans to foreigners for 1987–92 are presented in table 1.1. The net sales figure is the sum of three parts: (1) cross-border sales to and purchases from foreigners by Americans, (2) sales to and purchases from foreigners by FAUSFs, and (3) sales to and purchases from USAFFs by Americans. Panel I of the table indicates cross-border sales (exports) to and purchases (imports) from foreigners only. Cross-border sales to foreigners are obtained by subtracting from total exports of goods and services both U.S. exports to FAUSFs and U.S. exports shipped by USAFFs.⁷ Since the first export figure represents sales by U.S.-owned firms and U.S. private residents to U.S.-owned firms located abroad and the second represents sales of foreign-owned firms to foreigners abroad, both must be excluded in estimating sales by U.S.-owned domestic firms and U.S. private residents in the United States to foreigners abroad. In 1987 exports of U.S. firms to their foreign affiliates equaled 25 percent of total exports, while exports of U.S. affiliates of foreign firms amounted to another 15 percent. In 1991 these figures

6. A problem of growing importance with regard to measuring cross-border trade is that many goods and services now pass across borders with no transactions taking place. Consequently, cross-border flows are increasingly imputations, akin to those for the services of owner-occupied housing. Moreover, for many internationally traded goods and services, there are no markets comparable to the rental market for homes from which to draw prices in imputing the value of trade.

7. These subtractions exclude both intrafirm exports and exports to FAUSFs by nonaffiliated U.S.-owned firms and by USAFFs to nonaffiliated foreigners. The BEA surveys on U.S. investment abroad collect the data needed to divide exports into these different categories, if such a breakdown is desired.

were 23 and 18 percent, respectively. The estimate of cross-border sales (exports) to foreigners by Americans in 1991 is \$344,725 million. (Data for 1991 rather than 1992 are cited in the text, since the figures for 1992 are preliminary.)

The \$344,725 million figure is only an approximate estimate for several reasons.⁸ For example, since exports by USAFFs to FAUSFs are included in both U.S. exports to FAUSFs and in U.S. exports shipped by USAFFs, this amount is subtracted twice from total exports of goods and services. Also, data on U.S. exports of services to FAUSFs, which should be subtracted from total exports of services, are not available except for the sales of some services by U.S. parent companies to their foreign affiliates. These divergences between the desired and actual figures are not likely to be large, however.

Cross-border purchases (imports) of goods and services from foreigners are estimated in a manner similar to cross-border sales. U.S. imports from FAUSFs and U.S. imports shipped to USAFFs are both subtracted from total imports of goods and services in order to obtain just the trade between Americans and foreigners.⁹ In 1987 U.S. imports from FAUSFs amounted to 15 percent of total imports, while imports shipped to USAFFs were equal to 29 percent of total imports. By 1991 the first ratio had risen to 17 percent and the second to 31 percent. As before, the \$320,364 million estimate of purchases by Americans from foreigners for 1991 is only approximate because of the double subtraction of U.S. imports from FAUSFs going to USAFFs and the absence of data on service imports shipped to USAFFs, except for some services obtained by USAFFs from their foreign parent companies.

A more serious problem concerns the subtraction of merchandise imports going not just to USAFFs where the ownership interest is 50 percent or more but to USAFFs with an ownership interest of 10 percent or more. This causes the import figure of \$320,364 million to be too small compared to the export figure and thus the estimate of the surplus in net cross-border sales, namely, \$24,361 million, to be too large.

Estimates of sales and purchases by FAUSFs are presented in panel II of table 1.1. To obtain net sales of these firms to foreigners, it is necessary to subtract both sales among themselves and sales to the United States from their total sales. This yields sales to foreigners of \$898,046 million. This figure also is only an approximation of the desired number, since it improperly excludes the sales of FAUSFs to USAFFs. But, again, this exclusion is likely to be comparatively small.

No direct data are available on the purchases of intermediate goods and services by FAUSFs, let alone their purchases of these goods and services from foreigners. A rough estimate of purchases of goods from foreigners by

8. For a detailed discussion of the differences between the estimate of net sales by Americans to foreigners and the conceptually correct measure, see National Research Council (1992, app. A).

9. The same point about intrafirm and arm's-length transactions made in n. 7 also applies here.

– U.S. exports shipped by USAFFs	51,843	73,520	92,024	99,185	104,120	108,166
Total	672,113	786,517	930,139	1,040,607	1,038,783	1,073,467
Net sales to USAFFs	–246,198	–263,199	–283,543	–312,619	–303,765	–316,223
IV. <i>Net sales by Americans to foreigners</i>	–71,902	–26,058	–5,697	12,796	59,592	46,362
Reference						
Cross-border merchandise trade balance	–159,557	–126,959	–115,249	–109,033	–73,802	–96,138
Cross-border trade balance of merchandise and services	–151,981	–114,824	–90,345	–78,381	–27,920	–39,727

Estimation Procedure and Data Sources: Cross-border trade data are on a calendar-year basis, while data on FAUSFs and USAFFs are on a financial-year basis. Data on FAUSFs are for majority-owned nonbank affiliates, while data on USAFFs are for nonbank affiliates with an ownership of 10 percent or more, except for data from DiLullo and Whichard (1990) and Sondheimer and Bargas (1992, 1993, 1994). In the following, figures in parentheses are for 1987, 1988, 1989, 1990, 1991, and 1992, respectively.

U.S. exports of merchandise and services: U.S. merchandise exports (250,208; 320,230; 362,116; 389,303; 416,937; 440,138) and U.S. service exports (97,816; 109,986; 126,839; 148,302; 164,260; 179,710) are from Murad (1993, 71, table 1).

U.S. exports to FAUSFs: U.S. exports of goods to FAUSFs (74,907; 90,780; 97,488; 100,232; 108,839; 114,139) are from FAUSF87, 88 (table 51), 89, 90, 91, 92 (table III.H.2). U.S. exports of services to FAUSFs are not directly available; royalties and license fees (7,400; 8,893; 10,613; 12,867; 13,819; 15,226) and other private services (5,340; 6,363; 9,117; 9,532; 9,694; 10,222) received by U.S. parent companies from their foreign affiliates, obtained from Sondheimer and Bargas (1992, tables 4.2, 4.3, 6.1, 6.2) for 1987 and 1988 data; Sondheimer and Bargas (1993, tables 4.1, 6.1) for 1989 data; and Sondheimer and Bargas (1994, tables 4.1, 4.2, 4.3, 6.1, 6.2) for 1990, 1991, and 1992 data.

U.S. exports shipped by USAFFs: U.S. exports of goods shipped by USAFFs (48,091; 69,541; 86,316; 92,308; 96,933; 100,615) are from USAFF87, 88, 89, 90, 91, 92 (table G-1). U.S. exports of services shipped by USAFFs (3,752; 3,979; 5,708; 6,877; 7,187; 7,551) are from DiLullo and Whichard (1990, table 11) for 1987 and 1988 data; Sondheimer and Bargas (1992, table 10) for 1989 data; Sondheimer and Bargas (1993, table 10) for 1990 data; and Sondheimer and Bargas (1994, table 10) for 1991 and 1992 data.

U.S. imports of merchandise and services: U.S. merchandise imports (409,765; 447,189; 477,365; 498,336; 490,739; 536,276) and U.S. service imports (90,240; 97,851; 101,935; 117,650; 118,378; 123,299) are from Murad (1993, 71, table 1).

U.S. imports from FAUSFs: U.S. merchandise imports from FAUSFs (65,542; 75,578; 84,298; 88,641; 90,512; 98,850) and U.S. service imports (10,444; 10,475; 10,405; 12,080; 12,367; 12,089) are from FAUSF87, 88 (tables 51, 42), 89, 90, 91, 92 (tables III.H.2, F.18).

U.S. imports shipped to USAFFs: U.S. merchandise imports to USAFFs (143,537; 155,533; 171,847; 182,936; 178,702; 182,152) are from USAFF87, 88, 89, 90, 91, 92 (table G-1). U.S. service imports are not directly available; royalties and license fees (1,141; 1,285; 1,632; 1,967; 2,830; 3,069) and other private services (2,307; 2,582; 3,128; 3,784; 4,342; 4,628) paid by USAFFs to their foreign parents, obtained from Sondheimer and Bargas (1992, tables 4.2, 4.3, 6.1, 6.2) for 1987 and 1988 data; Sondheimer and Bargas (1993, tables 4.1, 6.1) for 1989 data; and Sondheimer and Bargas (1994, tables 4.1, 4.2, 4.3, 6.1, 6.2) for 1990, 91, 92 data.

(continued)

Table 1.1 (continued)

Sales by FAUSFs: Sales of goods by FAUSFs (718,086; 816,597; 889,875; 1,051,484; 1,069,729; 1,113,043) and sales of services by FAUSFs (97,455; 111,289; 109,631; 133,339; 143,990; 153,674) are from FAUSF87, 88 (tables 40, 42), 89, 90, 91, 92 (tables III.F.14, F.18).

Sales among FAUSFs: Sales of goods by FAUSFs to other foreign affiliates (110,606; 128,425; 137,587; 173,671; 181,112; 200,761) and sales of services by FAUSFs to other foreign affiliates (14,501; 15,976; 12,805; 12,756; 13,021; 15,036) are from FAUSF87, 88 (tables 40, 42), 89, 90, 91, 92 (tables III.F.14, F.18).

Sales to the United States by FAUSFs: Sales of goods by FAUSFs to the United States (78,479; 90,969; 100,701; 108,357; 109,173; 114,289) and sales of services by FAUSFs to the United States (10,444; 10,475; 10,405; 12,080; 12,367; 12,089) are from FAUSF87, 88 (tables 40, 42), 89, 90, 91, 92 (tables III.F.14, F.18).

Purchases abroad from foreigners by FAUSFs: Purchases of goods abroad from foreigners by FAUSFs (309,941; 340,400; 378,908; 472,906; 483,272; 495,883) are estimated as follows: subtract from cost of goods sold (629,137; 705,845; 779,024; 934,474; 970,398; 1,021,043; FAUSF87 [table 28], 88 [table 33]—see below for calculation of 1989, 1990, 1991, and 1992 figures) employee compensation (105,452; 117,418; 132,565; 151,051; 160,082; 169,623; FAUSF87, 88 [table 49], 89 [table III.G.2], 90, 91, 92 [table III.G.7]), depreciation, depletion, [and like charges] (24,847; 26,245; 29,191; 33,190; 33,542; 37,095; FAUSF87 [table 28], 88 [table 33], 89 [table III.D.2], 90, 91, 92 [table III.E.2]), production royalty payments (3,384; 2,677; 3,285; 3,424; 3,551; 3,542; FAUSF87 [table 28], 88 [table 33], 89 [table III.J.2], 90, 91, 92 [table III.E.2]), purchases from other FAUSFs (equal to sales among FAUSFs; see above for data sources), and U.S. exports shipped to FAUSF (74,907; 90,780; 97,488; 100,232; 108,839; 114,139; see above for data sources).

For 1989, 1990, 1991, and 1992, first sum up “cost of goods sold and selling, general, and administrative expenses” (913,308; 1,080,482; 1,126,092; 1,183,876; FAUSF89, 90, 91, 92 [table III.E.2]) and “other costs and expenses” (41,317; 64,634; 63,046; 67,322; FAUSF89, 90, 91, 92 [table III.E.2] and multiply it by the 1988 ratio of “cost of goods sold” (705,845; FAUSF88) to the sum of “cost of goods sold” and “other costs and expenses” (705,845 + 159,106; FAUSF88) to obtain cost of goods sold in 1989, 1990, and 1991 (779,024; 934,474; 970,398; 1,021,043). Then follow the same procedure as for 1987 and 1988.

Purchases of services abroad from foreigners by FAUSFs (48,774; 55,573; 52,977; 68,849; 75,778; 79,382) are estimated as follows: major sectors for service sales are finance, insurance, and services. Thus, estimate purchases/sales ratio of 0.78 from the sales and purchases data of these sectors of USAFFs from Lowe (1990, table 6). Then multiply total sales of services by FAUSFs (97,455; 111,289; 109,631; 133,339; 143,990; 153,674; see above for data sources) by 0.78 to obtain total purchases of services (76,015; 86,805; 85,512; 104,004; 112,312; 119,866). Subtract U.S. exports of services to FAUSF (7,400 + 5,340; 8,893 + 6,363; 10,613 + 9,117; 12,867 + 9,532; 13,819 + 9,694; 15,226 + 10,222; see above for data sources) and sales of services by FAUSFs to other foreign affiliates (14,501; 15,976; 12,805; 12,756; 13,021; 15,036; see above for data sources) from total purchases of services (76,015; 86,805; 85,512; 104,004; 112,312; 119,866).

The sum of local purchases of goods abroad by FAUSFs (309,941; 340,400; 378,908; 472,906; 483,272; 495,883) and those of services (48,774; 55,573; 52,977; 68,849; 75,778; 79,382) is local purchases abroad by FAUSFs (358,715; 395,973; 431,885; 541,755; 559,050; 575,265).

U.S. sales to USAFFs: U.S. sales of goods to USAFFs or local purchases of goods by USAFFs (356,963; 434,310; 533,167; 604,544; 602,465; 622,597) are

estimated as follows: subtract from cost of goods sold (616,310; 733,908; 877,203; 984,080; 993,949; 1,024,825: USAFF87 [table E-1]—see below for 1988–91), employee compensation (96,009; 119,588; 144,158; 163,592; 175,969; 181,709: USAFF87, 88, 89, 90, 91, 92 [table F-1]), depletion and depreciation (19,801; 24,477; 28,031; 33,008; 36,813; 38,367: USAFF87, 88, 89, 90, 91, 92 [table D-8]), and U.S. merchandise imports shipped to USAFFs (143,537; 155,533; 171,847; 182,936; 178,702; 182,152: see above for data sources).

For 1988–91, first multiply “cost of goods sold and selling, general, and administrative expenses” (859,963; 1,027,871; 1,153,105; 1,164,669; 1,200,848: USAFF88, 89, 90, 91, 92 [table E-1]) by the 1987 ratio of “cost of goods sold” (616,310: USAFF87 [table E-1]) to the sum of “cost of goods sold” and “selling, general, and administrative expenses” (616,310 + 105,857: USAFF87 [table E-1]) to obtain cost of goods sold in 1988–91 (733,908; 877,203; 984,080; 993,949; 1,024,825). Then follow the same procedure as for 1987.

U.S. sales of services to USAFFs or local purchases of services by USAFFs (68,952; 89,008; 113,429; 123,444; 132,553; 134,647) are estimated as follows: major sectors for service sales are finance, insurance, and services. Thus, use again the estimate of purchases/sales ratio of 0.78 calculated above. Multiply total sales of services by USAFFs (92,820; 119,071; 151,524; 165,634; 179,135; 182,492: USAFF87, 88, 89, 90, 91, 92 [table E-12]) by 0.78 to obtain total purchases of services (72,400; 92,875; 118,189; 129,195; 139,725; 142,344). Subtract U.S. imports of services shipped to USAFFs (1,141 + 2,307; 1,285 + 2,582; 1,632 + 3,128; 1,967 + 3,784; 2,830 + 4,342; 3,069 + 4,628: see above for data sources) from total purchases of services (72,400; 92,875; 118,189; 129,195; 139,725; 142,344).

The sum of U.S. sales of goods to USAFFs (356,963; 434,310; 533,167; 604,544, 602,465; 622,597) and those of services (68,952; 89,008; 113,429; 123,444; 132,553; 134,647) is U.S. sales to USAFFs (425,915; 523,318; 646,596; 727,988; 735,018; 757,244).

Sales by USAFFs: Sales of goods by USAFFs (631,136; 740,966; 870,639; 974,158; 963,768; 999,141) and sales of services by USAFFs (92,820; 119,071; 151,524; 165,634; 179,135; 182,492) are from USAFF87, 88, 89, 90, 91, 92 (table E-12).

Sales among USAFFs: Not available.

Cross-border merchandise trade balance: From Murad (1993, 71).

Cross-border trade balance of merchandise and services: From Murad (1993, 71).

Note: FAUSFs: foreign affiliates of U.S. firms abroad; USAFFs: U.S. affiliates of foreign firms in the United States.

FAUSFs is obtained by subtracting employee compensation, depreciation, depletion, and other charges, production royalty payments, purchases from other FAUSFs, and U.S. exports shipped to FAUSFs from the cost of goods sold. Purchases of services from foreigners are estimated by applying the ratio of total purchases of USAFFs by the finance, insurance, and service sectors to the total sales of these sectors, namely, 0.78 (as calculated from Lowe 1990), to the total sales of services by FAUSFs to yield a total purchases estimate. A part of imports of services from the United States and purchases from other FAUSFs are then subtracted from the total purchases figure to yield the estimate of local purchases of services from foreigners. Adding this to the sum for goods yields a total of \$559,050 million for local purchases for goods and services by FAUSFs. Since these calculations only approximate the purchases of intermediate goods and services, the figure of net sales to foreigners by FAUSFs (\$338,996 million) must be interpreted carefully.

Panel III of table 1.1 presents the estimates of net sales by Americans to USAFFs. Again, the data on U.S. sales of goods and services to USAFFs, or, in other words, local purchases of intermediate goods and services by USAFFs, are not available directly. The estimate of U.S. sales of goods to USAFFs is obtained by a procedure similar to the one used in estimating local purchases by FAUSFs, except that there are no data on production royalty payments and purchases from other USAFFs. U.S. sales of services to USAFFs are also estimated in a manner similar to local purchases of services by FAUSFs. The sum of U.S. sales of goods and services is \$735,018 million. U.S. purchases of goods and services from USAFFs, or, in other words, sales to Americans by USAFFs, are estimated by subtracting U.S. exports shipped by USAFFs from total sales by USAFFs. The 1991 estimate of this figure is \$1,038,783 million. Data on sales among USAFFs are not available. Thus, the estimate of net U.S. sales of goods and services to USAFFs is $-\$303,765$ million.

By summing up the three components, we obtain an estimate of net sales of goods and services by Americans to foreigners in 1991 of \$59,592 million (panel IV of table 1.1). The conventional cross-border trade balance in 1991 was $-\$27,920$ million, as shown at the bottom of the table. The estimates of net sales by Americans to foreigners for 1987, 1988, 1989, 1990, and 1992 are $-\$71,902$, $-\$26,058$, $-\$5,697$, $\$12,796$, and $\$46,362$ million, respectively. These net sales figures have not been deflated but, instead, are expressed in current dollars.

As the table shows, in 1987 net sales to foreigners by FAUSFs were about 16 percent greater than export sales by Americans to foreigners. However, this margin gradually declined between 1987 and 1991 so that by the latter year, net sales to foreigners by FAUSFs were 2 percent less than exports by Americans to foreigners. Cross-border purchases by Americans from foreigners in 1987 were about 13 percent greater than net purchases by Americans from USAFFs. In 1991 this margin was 5 percent.

1.4 Measuring Cross-Border and Direct Investment Activities on a Value-Added Basis

Although the volume of firms' sales is widely used to compare the relative importance of their different economic activities, a comparison more closely related to national accounting procedures is based on the value added by the primary productive factors involved in these economic activities. By rearranging the data presented in table 1.1, the value added by FAUSFs and by USAFFs can easily be estimated. These estimates are presented in table 1.2. The value added by FAUSFs (\$328,184 million in 1991, e.g.) is calculated by subtracting from sales of goods and services by FAUSFs the sum of local purchases abroad by FAUSFs, imported goods and services by FAUSFs, and purchases from other locally located FAUSFs.¹⁰ The value added of USAFFs (\$222,011 million in 1991) is derived in the same manner.¹¹

To help readers understand the economic significance of affiliates, ratios of value added by FAUSFs to value added by all U.S.-owned firms (the latter being defined as U.S. GDP minus value added by USAFFs plus value added by FAUSFs) are also presented in table 1.2, as well as ratios of value added by USAFFs to the GDP of the United States. The former ratios indicate that in 1991 5.6 percent of the value-adding activities of U.S.-owned firms were performed by their foreign affiliates, whereas 3.9 percent of the country's GDP was contributed by USAFFs.

Another relationship brought out in the table is the lower ratio of value added to total sales for USAFFs (19 percent in 1991) than for FAUSFs (27 percent in 1991). This asymmetry could be due to several factors. One may simply be that foreign firms in the United States choose to produce products with a low value-added component. However, another may be the existence of low profits for USAFFs (see Lipsey 1993). Profits for these firms may be low because foreign firms are forced to move their production sites to the United States by the threat of formal or informal American protectionism, even if these operations are not very profitable. Or the relatively recent rapid increase in foreign direct investment in the United States may simply mean that many production plants of USAFFs are in their initial stages of activity and have not been able to earn significant profits thus far. Other possibilities are the existence of pervasive transfer pricing practices to avoid U.S. taxation and the greater concentration of USAFFs compared to FAUSFs in trading activities as opposed to manufacturing.

10. Inventory changes should be included in the calculation of value added by FAUSFs, but information on these changes is not available. However, this information is available for USAFFs in 1987 and is taken into account in estimating value added by these firms.

11. In the absence of any change in inventories, value added by USAFFs will exceed (fall short of) net sales of USAFFs to Americans by the amount by which imports of intermediate goods and services falls short of (exceeds) sales of goods and services by USAFFs to foreigners.

Table 1.2 Value Added by FAUSFs and USAFFs, 1987–92 (in millions of dollars)

Transaction	1987	1988	1989	1990	1991	1992
I. Value added by FAUSFs						
+ Sales by FAUSFs	815,541	927,886	999,506	1,184,823	1,213,719	1,266,717
– Purchases abroad from foreigners by FAUSFs	358,715	395,973	431,885	541,755	559,050	575,265
– U.S. goods and services imported by FAUSFs	87,647	106,036	117,218	122,631	132,352	139,587
– Purchases from other FAUSFs	125,107	144,401	150,392	186,427	194,133	215,797
Total	244,072	281,476	300,011	334,010	328,184	336,068
In goods and services sold to						
Americans	64,054	74,578	78,491	86,507	85,357	90,781
Foreigners	180,018	206,898	221,520	247,503	242,827	245,287
Received by						
Americans	n.a.	n.a.	n.a.	n.a.	50,820	n.a.
Foreigners	n.a.	n.a.	n.a.	n.a.	277,364	n.a.
Value added/sales ratio (%)	29.93	30.34	30.02	28.19	27.04	26.53
II. U.S. value added in exports of U.S.-owned firms^a						
In exports to FAUSFs	278,410	335,294	373,115	412,115	448,452	480,981
In exports to foreigners	82,388	99,674	110,185	115,273	124,411	131,212
	196,022	235,620	262,930	296,842	324,042	349,769
III. Value added by USAFFs						
+ Sales by USAFFs	723,956	860,037	1,022,163	1,139,792	1,142,903	1,181,633
– Purchases within the United States by USAFFs	425,915	523,318	646,596	727,988	735,018	757,244
– Imported goods and services by USAFFs	146,985	159,400	176,607	188,687	185,874	189,849
– Purchases from other USAFFs	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
+ Inventory changes by USAFFs	4,671	n.a.	n.a.	n.a.	n.a.	n.a.
Total	155,727	177,319	198,960	223,117	222,011	234,540

In goods and services sold to						
Americans	144,575	162,161	181,048	203,701	201,785	213,070
Foreigners	11,152	15,158	17,912	19,416	20,226	21,470
Received by						
Americans	n.a.	n.a.	n.a.	n.a.	223,461	n.a.
Foreigners	n.a.	n.a.	n.a.	n.a.	-1,450	n.a.
Value added/sales ratio (%)	21.51	20.62	19.46	19.58	19.43	19.85
IV. Value added in exporting country by foreign-owned firms ^a	398,578	431,448	455,521	484,349	475,864	515,718
In exports to Americans	260,412	281,612	289,511	306,983	301,142	337,260
In exports to USAFFs	138,166	149,836	166,011	177,366	174,722	178,458
Reference						
GDP of the United States	4,539,900	4,900,400	5,250,800	5,546,100	5,724,800	6,020,200
Ratio of value added of FAUSFs to that of U.S.-owned firms (%)	5.27	5.62	5.61	5.90	5.63	5.49
Ratio of value added of USAFFs to U.S. GDP (%)	3.43	3.62	3.79	4.02	3.88	3.90

Data Sources: Inventory changes by USAFFs, Lowe (1990, 51, table 6). GDP of the United States, ERP95 (274, table B-1). See table 1.1 for the other figures.

Note: "Gross product" of FAUSFs in *Survey of Current Business* 74 (February 1994): 42-63: 319,994 (1989), 356,033 (1990), and 356,069 (1991). "Gross product" of USAFFs in *Survey of Current Business* 72 (November, 1992): 47-54: 157,869 (1987), 191,728 (1988), 226,031 (1989), and 241,182 (1990).

^aFigures in panels II and IV are estimated using the share of imported outputs in exports (6 percent). See the text for details.

Since value added is a more fundamental measure of economic activity than net sales, an alternative approach for measuring the international activities of a country's firms is to measure both cross-border and affiliate activities on a value-added basis.¹² This approach involves combining the value added abroad by FAUSFs (\$328,184 million in 1991) and the U.S. value added by U.S.-owned firms embodied in their cross-border sales (exports) to obtain a measure of the international activities of American firms. The export figure can be calculated by subtracting exports of USAFFs from total cross-border exports and then subtracting the import component in the remaining exports. (One would also have to estimate the U.S. affiliate component in these exports to avoid double counting.) Unfortunately, good data on the use of imports as intermediate inputs do not exist, but a rough estimate can be made by utilizing information in the U.S. input-output table. A special unpublished BEA study (Planting 1990) of the use of imports as intermediate goods indicates that the share of imported inputs in U.S. exports in 1977 was about 6 percent. Using this import ratio, the estimate of the U.S. value added in exporting by U.S.-owned firms is \$448,452 million for 1991, as reported in table 1.2. Thus, the estimated value added by U.S.-owned firms through their export and foreign affiliate activities is \$776,636 for 1991.

In calculating the foreign value-added component in the exports of foreign-owned firms of goods and services to the United States, input-output tables of these countries should be used to net out the imported input component in these exports. Unfortunately, the lack of such tables for many countries makes it impossible to measure adequately the imported input component in the exports of foreign countries to the United States. The 6 percent share of imported inputs in U.S. exports is probably smaller than the figure for most other countries because of the large size of the United States. However, for lack of an adequate estimate for foreign countries, the U.S. figure is used to obtain an estimate of the net value added abroad through the exports of foreign-owned firms to the United States. This net value-added figure was \$475,864 million in 1991. Combining this with the 1991 value added by USAFFs (\$222,011 million) yields a figure of \$697,875 for the 1991 total value added by foreign-owned firms in exporting to the United States and in undertaking affiliate activities in this country.

The value-added approach can also be used in focusing on transactions between Americans and foreigners, as under the net sales approach. The value added by FAUSFs can be divided into the value-added components in the goods and services sold by FAUSFs to foreigners and in the goods and services sold by these firms to Americans by assuming that the value-added share in the sales to the United States by FAUSFs is the same as in total sales. The 1991 breakdown of value added on this basis yields figures of \$242,827 and \$85,357

12. As Lois Stekler (1993) has pointed out, except for net changes in inventories, net sales of Americans to foreigners are equal to the trade balance plus the value added by FAUSFs minus the value added by USAFFs.

million, respectively. Similarly, the U.S. value-added component in the exports of U.S.-owned domestic firms can be divided into the value-added components in their exports to FAUSFs and in their exports to foreigners by assuming the same fraction of imported inputs in these exports. In 1991, the value-added components in these two types of exports were \$124,411 and \$324,042 million, respectively.

The breakdown of value added in the goods and services sold by USAFFs both to Americans and to foreigners as well as the value added in goods and services imported both by Americans and by USAFFs from foreign-owned firms located abroad can be estimated in a similar fashion. For 1991, the estimates for the first breakdown are \$201,785 and \$20,226 million, respectively, and for the second \$301,142 and \$174,722 million, respectively. The value-added component in the net sales of Americans to foreigners is the sum of the value-added components in the net cross-border trade (exports less imports) between Americans and foreigners (\$22,900 million for 1991), in the net sales of FAUSFs to foreigners (\$242,827 million in 1991), and in the net sales of Americans to USAFFs ($-\$201,785$ million in 1991), or \$63,942 million in 1991. As indicated in table 1.1, under the net sales approach the net sales figure for 1991 is \$59,592 million.

The value-added approach indicates that in 1991 the economic activity (as measured by value added) embodied in the goods and services purchased by foreigners located abroad and produced by U.S.-owned firms in the United States (\$324,042 million) exceeded the value added embodied in goods and services purchased by foreigners located abroad and produced by U.S. firms abroad (\$242,827 million) by 33 percent. With regard to purchases by Americans from foreigners, the value-added approach indicates that the value added embodied in goods and services produced by foreign firms abroad (\$301,142 million) exceeded the value added in goods and services produced by foreign firms in the United States (\$201,785 million) by 49 percent.

The value-added data can also be arranged to show the contribution of foreign affiliates and domestic firms engaged in international trade to a nation's output and the income of its citizens. The value added in exporting by domestic U.S.-owned firms plus the value added by USAFFs (\$448,452 million plus \$222,011 million, or a total of \$670,463 million, in 1991) measures the contribution of these activities to the GDP of the United States. Similarly, the importing and foreign affiliate activities of Americans contributed \$804,048 million to the GDP of foreign countries. Furthermore, combining the portion of the value added by FAUSFs that represents the net receipts of the U.S. owners of these affiliates (\$50,820 million in 1991; see Landefeld, Whichard, and Lowe 1993, table 4), the value added by USAFFs less the net receipts of the foreign owners of these firms (\$222,011 million minus $-\$1,450$ million, or \$223,461, in 1991; Landefeld et al. 1993, table 4), and the value added in the United States by the export activities of U.S.-owned firms (\$448,452 million in 1991) yields the income earned by Americans in these international activities,

namely, \$722,733 million in 1991. These relationships bring out the point that exporting activities by American firms are still twice as important as a source of income for Americans than the activities of USAFFs and that the income earned by Americans from FAUSFs is only about 11 percent of the income earned through exporting.

The sum of the income earned by foreigners from the activities of FAUSFs (\$277,364 million in 1991), from the earnings of USAFFs (−\$1,450 million in 1991), and from exporting to the United States (\$475,864 million in 1991) amounted to \$751,778 in 1991. Thus, although international activities between the United States and foreign firms contributed 20 percent more to the GDP of foreign countries than to the GDP of the United States in 1991, the division of the total value added from these activities into income shares yields a figure for foreigners only 4 percent higher than the income earned by Americans.

One argument often made in support of using only the balance-of-payments accounts to depict international economic transactions is that this accounting framework is integrated with the broader national accounts. The current account balance (exports minus imports) taken from the balance of payments (with minor adjustments) is added to the expenditures on goods and services by consumers, business, and the government, that is, $C + I + G$, to yield GDP. Exports minus imports (rather than just exports) are added to the other three components because these expenditures are measured inclusive of imports. In other words, in calculating GDP, the current account balance is used mainly to correct the other three expenditure components. The only items in the balance of payments that are direct measures of domestic or national product are the net receipts of FAUSFs and of USAFFs. In contrast, calculating trading and direct investment activities in value-added terms measures both types of international transactions in terms of standard national accounts concepts. By separating value added by firms engaged in international transactions on a nationality and geography basis, the value-added approach supplements the traditional national accounts framework under which the GDP accounts divide aggregate production activities on the basis of geography and the GNP accounts allocate value added by primary factors on the basis of nationality. The value-added approach can easily be presented in a form that yields the current account balance needed for estimating aggregate domestic and national product. Consequently, this advantage of the balance-of-payments approach could be incorporated into the value-added accounting framework.

1.5 A Sectoral Approach

1.5.1 Sectoral Net Sales

Net sales balances by nationality can be measured for individual industrial sectors as well as for the entire economy. These net sales figures provide a rough idea of the relative international performance of American and foreign

firms by industry. If technological know-how and managerial ability are major determinants of firms' competitiveness in international markets, these data may be more appropriate for analyzing international activities by nationality than cross-border trade balances alone.

Nationality-adjusted sales for individual sectors are calculated by subtracting U.S. exports shipped by USAFFs, U.S. exports to FAUSFs, sales to the United States by FAUSFs, and sales to other FAUSFs by FAUSFs from the sum of U.S. cross-border exports and sales by FAUSFs. Nationality-adjusted purchases are estimated by subtracting U.S. imports from FAUSFs, U.S. imports shipped to USAFFs, U.S. exports shipped by USAFFs, and sales to other USAFFs by USAFFs from the sum of U.S. cross-border imports and sales of USAFFs. Data on sales among USAFFs or between FAUSFs and USAFFs are unfortunately not available.

A major difficulty in estimating nationality-adjusted net sales balances by industry arises in trying to estimate purchases of FAUSFs and USAFFs. Sectoral intermediate input purchases by industry origin are not available. One possible way to estimate such purchases would be to use input-output tables and assume identical input-output structures for U.S.-owned firms in the United States, FAUSFs, and USAFFs. Instead, it is assumed here that each industry purchases intermediate inputs only from its own industry. Such an assumption greatly simplifies the derivation of nationality-adjusted net sales by sector: nationality-adjusted net sales are simply cross-border net sales (net exports) plus value added by FAUSFs minus value added by USAFFs.

Another problem is that the value-added estimates for FAUSFs are classified by industry, while those for USAFFs are disaggregated on an establishment basis. As Lipsey (1993) points out, this could generate biases in the estimation procedure. In addition, the U.S. cross-border exports and imports only include merchandise trade, while value added by FAUSFs and USAFFs contains both merchandise and service transactions. However, this is unlikely to cause serious measurement errors, since the machinery industry (except electrical) is the only manufacturing sector that has large service sales (about 10 percent of total sales).

Table 1.3 shows both net cross-border sales (net exports) and estimated nationality-adjusted net cross-border plus affiliate sales for individual manufacturing sectors from 1988 through 1991. The ratios of net cross-border sales to total sales in the United States and nationality-adjusted net cross-border sales to total sales of U.S.-owned firms are also presented as indicators of firms' "revealed" international competitiveness. To discuss comparative advantage across industries, it would be necessary to adjust the net export data for macroeconomic trade balances by using some method such as the one in Bowen and Sveikauskas (1992). Table 1.3, however, presents unadjusted figures only.

Despite significant problems with the estimation process, the figures provide a number of useful insights about the competitiveness of U.S. industries. For the total manufacturing sector, the ratios of nationality-adjusted net cross-

Table 1.3 Cross-Border and Nationality-Adjusted Sales by Manufacturing Sector

SIC Code and Sector		Cross-Border Net Sales (Net Exports) ^a				Nationality-Adjusted Net Sales ^a			
		1988	1989	1990	1991	1988	1989	1990	1991
	Manufacturing total	-147,002	-132,163	-100,833	-69,246	-312,073	-81,733	-89,922	-68,153
22	Food and kindred products	-3,989	-3,613	-3,750	-1,754	-18,178	-9,550	-7,887	-4,311
21	Tobacco products	2,918	3,646	5,045	4,588	3,758	5,736	7,534	7,600
22+23	Textile products and apparel	-23,986	-26,446	-26,293	-26,305	-24,079	-27,094	-27,310	-27,658
24+25	Lumber and furniture	-5,570	-5,257	-4,505	-3,596	-5,369	-4,999	-4,091	-3,302
26	Paper and allied products	-4,831	-4,649	-3,896	-2,338	-5,022	-2,361	-482	-316
27	Printing and publishing	268	1,085	1,535	1,921	-6,192	-6,988	-7,469	-7,135
28	Chemicals and allied products	7,463	10,601	10,569	11,650	-28,453	-1,896	-2,454	-1,626
29	Petroleum and coal products	-10,169	-10,850	-12,318	-8,046	-67,246	36,771	-8,263	-3,764
30	Rubber and plastics products	1,326	596	2,283	4,281	2,648	-1,121	-446	1,443
32	Stone, clay, and glass products	-7,397	-7,084	-5,844	-5,364	-9,837	-14,717	-10,454	-9,865
33	Primary metal industries	-16,868	-14,203	-11,888	-8,217	-24,213	-21,163	-20,544	-16,612
34	Fabricated metal products	-5,711	-4,868	-3,488	-2,817	-2,514	-5,314	-3,758	-4,283
35	Industrial machinery and equipment	-2,158	-2,155	4,357	10,087	-16,870	18,407	29,654	31,026
36	Electronic and other electric equipment	-23,775	-21,889	-16,088	-14,847	-29,323	-25,607	-18,269	-19,032
37	Transportation equipment	-33,998	-29,156	-19,676	-11,414	-41,262	-3,143	5,661	11,993
38	Instruments and related products	744	2,765	3,224	3,617	-16,483	1,980	2,968	3,201
31+39	Other manufacturing industries	-21,268	-20,685	-20,099	-20,689	-21,385	-21,745	-20,880	-21,344

SIC Code and Sector		Cross-Border Net Sales/Total Sales of Firms in the U.S. (%)				Nationality-Adjusted Net Sales/Total Sales of U.S.-Owned Firms (%)			
		1988	1989	1990	1991	1988	1989	1990	1991
	Manufacturing total	-5.48	-4.75	-3.51	-2.45	-10.76	-2.73	-2.88	-2.21
20	Food and kindred products	-1.13	-0.94	-0.98	-0.45	-5.00	-2.44	-1.98	-1.06
21	Tobacco products	12.24	14.13	16.86	14.32	12.71	15.85	17.90	16.60
22+23	Textile products and apparel	-18.48	-21.91	-20.17	-20.07	-18.57	-22.60	-21.14	-21.48
24+25	Lumber and furniture	-5.01	-4.55	-3.88	-3.25	-4.81	-4.30	-3.50	-2.95
26	Paper and allied products	-3.94	-3.54	-2.96	-1.81	-3.95	-1.70	-0.34	-0.23
27	Printing and publishing	0.19	0.72	0.98	1.23	-4.53	-5.05	-5.15	-4.91
28	Chemicals and allied products	2.87	3.81	3.67	3.99	-10.01	-0.64	-0.80	-0.51
29	Petroleum and coal products	-7.74	-7.55	-7.14	-5.09	-42.50	20.32	-3.96	-1.87
30	Rubber and plastics products	1.41	0.67	2.25	4.25	2.71	-1.25	-0.44	1.45
32	Stone, clay, and glass products	-11.73	-11.13	-9.21	-9.00	-17.09	-27.29	-18.62	-18.50
33	Primary metal industries	-11.31	-9.29	-8.14	-6.19	-18.36	-16.44	-17.07	-15.32
34	Fabricated metal products	-3.60	-3.20	-2.14	-1.79	-1.55	-3.44	-2.26	-2.71
35	Industrial machinery and equipment	-0.89	-0.85	1.70	4.14	-5.50	5.70	8.73	9.54
36	Electronic and other electric equipment	-12.72	-11.36	-8.26	-7.50	-15.11	-12.88	-8.87	-9.22
37	Transportation equipment	-9.60	-7.97	-5.34	-3.14	-9.27	-0.69	1.22	2.62
38	Instruments and related products	0.65	2.33	2.60	2.84	-13.38	1.57	2.23	2.34
31+39	Other manufacturing industries	-47.76	-45.27	-42.68	-44.71	-47.59	-47.84	-43.57	-45.18

Data Sources: FAUSF88 (tables 33, 40, 42, 49), 89 (tables III.D.2, E.2, F.3, F.14, F.18, G.2, J.2), 90, 91 (tables III.E.2, F.3, F.14, F.18, G.7); UN90, 92; USEST88, 89, 90, 91 (table 1.1).

Notes: Nationality-adjusted net sales = cross-border net exports + value added by FAUSFs - value added by USAFFs.

We are assuming that purchases by an industry are all from own industry since by-origin purchases data are not available.

*In millions of dollars.

border and affiliate sales are larger than the ratios for cross-border trade alone from 1989 through 1991.¹³ This suggests that U.S. industries have a greater “revealed” comparative advantage than indicated by the cross-border trade balance alone.¹⁴ Industries where the total ratios are larger than those for trade alone include industrial machinery and transportation equipment. Thus, considering only cross-border import penetration for these industries may be misleading in appraising their international competitiveness. Industries where the combined ratio is lower than the trade ratio are stone, clay, and glass and primary metal products. In particular, cross-border net exports indicate that the chemical industry is a leading export industry of the United States, while nationality-adjusted total net sales are negative.

1.5.2 Sectoral Significance of FAUSFs and USAFFs

Ratios of value added by FAUSFs and USAFFs relative to value added for the U.S. economy as a whole are given in table 1.2. Since the activities of FAUSFs and USAFFs are concentrated in the manufacturing industries and the wholesale trade sector, the impact of multinational enterprises on those sectors is generally more significant than at the macroeconomic level.

Table 1.4 indicates for the various manufacturing sectors the share of sales of FAUSFs in total sales of U.S.-owned firms and the share of sales by USAFFs in total sales of firms in the United States from 1988 through 1991.¹⁵ In addition, comparable shares in employment terms are shown in the table. Note that the data for USAFFs and firms in the United States are on an establishment basis, while those for FAUSFs are on an industry basis.¹⁶ Also note that the data for USAFFs are again for affiliates in which the foreign ownership interest is 10 percent or more. The sales, value added, and employment ratios of FAUSFs to U.S.-owned firms in the total manufacturing sector in 1991 were 22, 14, and 17 percent, respectively. Considering the size of the whole U.S. manufacturing sector, the magnitude of the activities of FAUSFs was surprisingly large. The sales, value added, and employment ratios of USAFFs to firms in the United States in total manufacturing were also significant, namely, 15, 14, and 11 percent, respectively, for 1991. Thus, more than 10 percent of manufacturing activity in the United States was accounted for by foreign companies.

It is in the chemicals, petroleum and coal, industrial machinery, electronics

13. Nationality-adjusted net sales in 1988 are much smaller than those in other years because the estimated value added earned by FAUSFs is small. In 1988, sales of FAUSFs were smaller than usual, while purchases were larger.

14. Kravis and Lipsey (1987) agree with the view that taking the activities of FAUSFs into consideration is useful in appraising the international competitiveness of U.S. firms.

15. Lipsey (1993) examines the shares of USAFFs in all U.S. firms in terms of assets, employment, and plant and equipment expenditures.

16. The definition of value added in the establishment data is also slightly different from the one used here, although the difference does not seem to cause large estimation errors. See the detailed note in U.S. Department of Commerce, Economics and Statistics Administration (1994b, M-6).

Table 1.4 Sales, Value Added, and Employment Shares of FAUSFS and USAFFS (percent)

SIC Code and Sector		Share of FAUSF in U.S.-Owned Firms				Share of USAFF in Firms in the U.S.			
		1988	1989	1990	1991	1988	1989	1990	1991
Sales									
	Manufacturing total	17.95	19.44	21.25	22.04	11.31	13.36	14.53	14.97
20	Food and kindred products	13.42	12.91	15.36	16.66	10.44	11.17	12.20	12.29
21	Tobacco products	19.37	28.70	28.89	30.04	0.00	0.00	0.00	0.00
22+23	Textile products and apparel	3.21	4.28	4.82	4.14	3.29	4.94	5.69	5.79
24+25	Lumber and furniture	1.71	2.26	2.89	3.20	1.46	1.63	1.99	2.09
26	Paper and allied products	11.49	12.69	15.34	14.99	8.16	7.84	8.67	9.03
27	Printing and publishing	2.27	2.77	3.08	3.38	7.08	10.18	10.51	10.36
28	Chemicals and allied products	31.43	32.17	35.01	35.93	24.97	28.24	30.42	30.70
29	Petroleum and coal products	36.52	40.58	39.56	41.90	23.57	25.18	26.87	26.07
30	Rubber and plastics products	16.73	17.43	17.35	16.92	13.53	16.34	17.55	17.73
32	Stone, clay, and glass products	10.72	8.13	16.17	15.70	18.50	22.16	25.85	24.59
33	Primary metal industries	4.77	4.43	5.13	5.44	15.77	19.58	21.84	22.82
34	Fabricated metal products	9.51	9.93	10.36	10.27	7.70	8.64	8.57	9.76
35	Industrial machinery and equipment	27.34	30.88	33.64	34.65	8.46	11.93	12.10	12.69
36	Electronic and other electric equipment	17.41	19.96	22.16	23.02	14.27	17.41	17.76	19.71
37	Transportation equipment	24.55	25.02	26.73	27.82	5.16	6.35	7.84	9.09
38	Instruments and related products	16.45	17.34	18.85	19.05	10.09	11.78	12.80	12.76
31+39	Other manufacturing industries	8.61	8.13	10.41	11.10	7.79	8.62	8.84	9.24

(continued)

Table 1.4 (continued)

SIC Code and Sector		Share of FAUSF in U.S.-Owned Firms				Share of USAFF in Firms in the U.S.			
		1988	1989	1990	1991	1988	1989	1990	1991
Value Added									
	Manufacturing total	-3.03	15.63	14.08	14.04	10.44	12.38	13.37	13.97
20	Food and kindred products	0.71	9.45	11.23	12.55	11.65	13.52	13.83	14.08
21	Tobacco products	4.67	9.95	9.94	10.95	0.00	0.00	0.00	0.00
22+23	Textile products and apparel	2.87	3.12	3.61	3.43	3.02	4.17	5.26	5.60
24+25	Lumber and furniture	1.80	1.99	2.48	2.29	1.40	1.50	1.68	1.69
26	Paper and allied products	7.35	10.54	12.85	11.29	7.66	7.19	7.87	8.22
27	Printing and publishing	-0.53	1.39	1.49	1.54	6.37	9.53	10.09	10.13
28	Chemicals and allied products	-0.98	23.53	25.58	25.85	25.32	30.08	31.91	32.21
29	Petroleum and coal products	163.73	71.27	26.10	30.35	19.84	18.74	15.09	17.94
30	Rubber and plastics products	15.65	11.25	12.78	12.89	13.26	14.44	17.55	17.80
32	Stone, clay, and glass products	11.81	-0.13	13.01	11.37	18.10	22.05	24.75	23.90
33	Primary metal industries	-0.22	3.29	3.67	3.61	12.81	15.41	19.30	20.97
34	Fabricated metal products	10.26	7.30	7.63	7.58	6.67	7.81	7.94	9.35
35	Industrial machinery and equipment	-4.03	21.98	24.68	24.12	7.80	10.04	10.26	11.33
36	Electronic and other electric equipment	7.28	12.54	13.86	14.11	12.25	15.60	15.61	17.48
37	Transportation equipment	-1.89	17.67	18.87	18.02	3.27	3.74	4.88	5.40
38	Instruments and related products	-16.87	10.02	11.63	11.40	9.59	10.92	11.90	11.85
31+39	Other manufacturing industries	7.60	4.42	6.00	6.38	8.06	8.60	8.98	8.90

Employment

	Manufacturing total	15.25	16.29	16.95	17.28	8.06	9.53	10.64	11.10
20	Food and kindred products	18.46	18.99	20.01	20.83	8.44	10.09	10.84	10.63
21	Tobacco products	44.19	48.44	51.88	52.95	0.00	0.00	0.00	0.00
22+23	Textile products and apparel	3.95	4.82	5.02	5.41	2.50	3.40	4.33	4.43
24+25	Lumber and furniture	1.48	3.04	3.82	3.74	1.08	1.21	1.44	1.51
26	Paper and allied products	15.67	18.08	19.57	18.66	7.57	7.47	7.74	7.98
27	Printing and publishing	2.07	2.25	1.97	2.00	5.08	6.22	6.76	6.76
28	Chemicals and allied products	42.68	42.81	44.50	44.94	22.58	25.27	28.41	27.49
29	Petroleum and coal products	53.73	54.14	40.37	38.86	18.83	20.69	22.91	22.51
30	Rubber and plastics products	15.29	14.93	15.59	14.90	10.22	11.32	13.90	14.09
32	Stone, clay, and glass products	12.44	13.31	13.71	13.56	15.47	18.44	20.74	20.16
33	Primary metal industries	5.19	5.08	6.78	6.69	11.16	13.44	16.73	17.83
34	Fabricated metal products	9.28	9.53	9.50	9.29	5.33	6.17	6.49	7.49
35	Industrial machinery and equipment	19.43	22.77	23.36	23.08	7.57	9.96	10.20	10.86
36	Electronic and other electric equipment	24.40	25.64	28.21	28.90	12.21	14.96	15.24	16.49
37	Transportation equipment	24.44	25.69	26.36	27.93	3.60	4.40	5.87	6.54
38	Instruments and related products	14.67	15.73	16.81	17.44	9.86	11.16	12.81	12.50
31+39	Other manufacturing industries	8.43	8.55	10.13	10.11	5.87	6.62	6.44	6.81

Data Sources: FAUSF88 (tables 33, 40, 42, 47, 49), FAUSF89 (tables III.D.2, E.2, F.3, F.14, F.18, G.2, G.7, J.2), FAUSF90, 91 (tables III.E.2, F.3, F.14, F.18, G.4, G.7); USEST88, 89, 90, 91 (table I.1).

and electrical equipment, and transportation equipment sectors that the sales, value added, and employment shares for FAUSFs are particularly high. The presence of USAFFs is large in chemicals, petroleum and coal, rubber and plastics, stone, clay, and glass, primary metal, and electronics and electrical equipment. The chemical industry looks special in that its shares are very large for both FAUSFs and USAFFs.

1.6 Conclusions

This paper has argued that the increasing internationalization of firms' economic activities has brought about the need for supplementary accounting formats to document these activities better. In particular, because of the close relationship between firms' international trade and international investment decisions, the paper argues for sets of accounts that provide comparable data on both the cross-border trading activities of firms and the selling and purchasing activities of their foreign affiliates. In providing such comparability, the net sales and value-added approaches set forth provide information about the nature of the economic globalization process that can assist government officials in reaching decisions on a variety of international economic policy issues. Fortunately, much of the data required for constructing such accounts already exists, although certain relationships must be investigated more carefully before the figures in the accounts presented here can be regarded as more than rough estimates.¹⁷

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17. In particular, there is a need for sales and purchases data for FAUSFs and USAFFs on the same basis in terms of the degree of domestic ownership and for better estimates of the share of imported inputs in exports.

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Comment Guy V. G. Stevens

Much of what appears in the present paper and in Robert Baldwin's related work in the book *Behind the Numbers* I agree with and support (National Research Council 1992). This includes agreement that balance-of-payments data are not adequate to answer many internationally oriented questions in an era when multinational firms are important; in fact, as Baldwin and Kimura make clear throughout their paper, virtually no question involving the activities of multinationals or their impact on the U.S. economy is answerable using balance-of-payments data alone. One result of this agreement has been our long-standing advocacy, along with that of numerous other researchers and public servants, of a large number of improvements in the data on multinational corporations collected by the Bureau of Economic Analysis (BEA).

In this paper the authors do many things. They refine and extend the work, begun by Baldwin in *Behind the Numbers*, on the net sales balance of Ameri-

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cans to foreigners and on the measurement of trade and direct investment activity in value-added terms. They also break the net sales balance down by industrial sector. Finally, in detailing the drawbacks of balance-of-payments data for examining such policy questions as the degree of U.S. international competitiveness, they challenge and invite us to examine all the existing international data and the interrelationships among them.

In this comment, I would like to focus on two topics. The first is whether, in advocating more emphasis on the role of multinational firms in international economic activities, we should also be advocating changes in, a revamping of, or, as the authors say, a “supplementing” of the balance-of-payments accounts. The second is what the merits might be of the net sales balance, particularly as a measure of U.S. international performance or competitiveness.¹

An Ownership-Based Balance of Payments?

Baldwin and Kimura (B&K) in this and their earlier work challenge us to reflect on the adequacy of our present *residence-based* balance-of-payments accounting system. Does the fact that much of the important data on multinational firms are not to be found in the balance of payments mean that the latter should be altered?

The authors agree that we need certain balances derived from balance-of-payments data—for example, the trade and current account balances—because of their role in national income and product calculations. Thus, they usually talk in terms of “supplementing” the balance-of-payments accounts. However, they also suggest at the end of section 1.3 in their discussion of value-added data that a value-added accounting approach that emphasizes directly the contributions of direct investment activities would also, as a by-product, contain the trade and current account balances.

In response to B&K’s challenge, I have played around with the construction of an ownership-based balance of payments. By grouping transactions on the ownership principle and making use of some of the direct investment identities, along with the normal balance-of-payments identity, I have convinced myself that such a beast can be constructed. As B&K indicate for the value-added approach, I agree that the trade and current account balances fall out as by-products. Moreover, all trade and service flows can be divided into those that pass through foreign subsidiaries and those that flow directly from the United States. But what of this? If one has complete and accurate data on all transactions—between affiliated and unaffiliated parties—one can group them in any way desired. However, we do not have this complete and accurate data set, as B&K’s calculations make clear. Does the answer to the question of whether

1. See table 1-1 in *Behind the Numbers* (National Research Council 1992) for the use of the net sales balance as an alternative to the trade balance as a measure of “U.S. international performance.” In section 1.1 of Baldwin and Kimura’s present paper, this balance is called “net sales of Americans to foreigners”; in table 1.3, it is called “nationality-adjusted net sales.”

we push for an altered balance-of-payments accounting system depend, then on how such a system would promote the collection of certain data that now are either unavailable or inaccurate?

B&K's Net Sales Balance and What It Might Be Good For

Although all of us agree that some of the concepts and data developed within the U.S. balance-of-payments accounting system are crucially important, B&K argue forcefully that these concepts need to be supplemented. In this section we would like to focus on one of the major new concepts they propose, the *net sales of Americans to foreigners*, examining the purposes for which it was created and the degree to which the concept achieves these purposes (see section 1.2 in this volume; National Research Council 1992, 37–45).

The major issues the authors hope this concept will illuminate are the competitiveness of U.S. firms, the impact of U.S. international transactions on U.S. employment, and the proper measurement of the impact of policy proposals dealing with trade and other international issues. An impetus to their attempt to develop new measures to analyze these questions is their view that the change in the trade balance has been given undue weight as a measure of the severity of international problems in these three areas. It seems reasonable and compelling to argue, as they do, that a balance-of-payments measure like the trade balance, which necessarily focuses only on transactions between U.S. and foreign *residents*, cannot possibly be a relevant indicator; this seems obvious because the trade balance does not capture the effects of U.S.-owned, but nonresident foreign subsidiaries (FAUSFs in the terminology of the authors)—sales of which now amount to over 21 percent of the total sales of U.S.-owned firms in manufacturing, and as much as 35 percent for important industries such as chemicals (see table 1.4).

But what about their measure? However a measure may be constructed—and I will get to that below—I would interpret it as a good measure to the degree that (1) it moves in the same direction as the concept it purports to measure and (2), better still, it is *linearly* related to the underlying concept (at least within a relevant range). Since it may be quite difficult to determine analytically the relationship between a given measure and the underlying concept or condition, I have constructed a small simulation model, laid out in the appendix, of a country like the United States that has a multinational-based economy, featuring domestic firms with related foreign subsidiaries (but, for simplicity, no domestic U.S. firms that are owned by foreigners). The production interdependencies among the parent firms and the related foreign affiliates are developed far enough in the model, I believe, to exhibit most of the flow that B&K take pains to measure: for example, in addition to traditional export and imports to or from unrelated parties, flows of intermediates from the United States to the foreign subsidiary, flows of intermediates and labor from the foreign economy to the foreign subsidiary, and flows of final goods from the subsidiary either to foreign consumers or to the United States.

The Baldwin and Kimura Measure

B&K make it clear that they are after, conceptually, a measure of *net sales of goods and services by Americans to foreigners*. By nearly heroic efforts, they manage to combine balance-of-payments data with BEA data on the operations of U.S. foreign affiliates and, in my opinion, get very close to an accurate measure. If this or other similar measures were eventually agreed to be of paramount value, B&K's calculations indicate some of the important flows that might be collected in the context of an ownership-based accounting system.

In my little model, because data availability is no problem, transactions may be grouped in any way that is useful, subject to the usual adding-up identities. B&K's net sales concept, what I call below the "Baldwin balance," is fairly easily defined. It can be shown to be equal to the value of foreign citizens' demand for the (single) U.S. good minus final goods imports to U.S. citizens minus intermediate purchases by U.S. foreign affiliates from foreign citizens.²

In passing, I might note one potential problem with the B&K definition. Their net sales balance does not subtract labor payments by U.S. foreign subsidiaries to foreign citizens, although it does subtract payments to foreign *firms* for goods and services. To me this poses a conceptual puzzle, for if what is a foreign labor payment today is turned into a payment for foreign goods and services tomorrow by a (mere) change in corporate organization, the Baldwin balance changes, but American GDP, employment, and, perhaps, competitiveness do not.³ For this reason, I also define an alternative, Baldwin balance*, in which intermediate imports to U.S. foreign subsidiaries from foreigners are not subtracted.⁴

2. This is a somewhat simplified version of B&K's concept, but I believe that it retains the essential elements. The first element, foreign demand for the (single) U.S. good, equals the sales to foreigners from U.S. plants and U.S. foreign affiliates (FAUSFs); exports from the United States of intermediate goods to the FAUSFs cancel in this expression (although not in alternative concepts like the trade balance)—they appear in total U.S. exports but are subtracted by B&K in getting to their *net sales* concept. My version of their balance is simplified by the nonexistence of foreign-owned multinationals in the United States.

3. An example of a "mere" change in corporate organization, in my view, would be the case in which a foreign laborer employed by the foreign subsidiary became an independent contractor. Even if all production relations and productivity remained constant, the value of the Baldwin balance would fall. This seems like a contradiction to me, since all agents would be in exactly the same position before and after the change.

4. Because I did not identify separately in the models payments to foreign firms and foreign labor, to distinguish between the two Baldwin balances I have arbitrarily assumed that 50 percent of the bill for foreign labor is paid to foreign firms, which can be looked at as foreign contractors.

While ostensibly a small point, whether labor payments to foreign workers are subtracted from the various balances turn out to be important. In an analysis of an earlier, related construct by DeAnne Julius (1990), in which labor payments were subtracted, I showed in Stevens (1990) that the Julius concept could be reduced to the effect of multinational corporations on the U.S. current account, as traditionally defined. On the basis of this earlier work, I would conjecture that if labor payments to foreigners were treated symmetrically to payments to foreign firms for goods and services (some of which may be labor services), the Baldwin balance would simplify to that part of the current account that is affected by the multinational firm in question. For similar questions and reservations, see Stekler (1993).

Baldwin Balances in Performance

Employment has a straightforward definition in simple models of this kind, but competitiveness, I submit, does not. My musings on this latter concept take up part of the next (and last) section of this comment. To avoid getting bogged down, I will carry out a set of simulations that trace the effects of changes that I believe everyone would agree represent improvements in U.S. competitiveness. Each simulation begins with a shift in one or more production functions that unambiguously represents an improvement in U.S. technical capabilities. In all cases, more output of the U.S. good can be produced for any given allocation of resources; similarly, the U.S. cost function for any level of output shifts downward. I trust that, however one may want to define U.S. competitiveness, such shifts represent positive movements. Technically, I accomplish the shifts as follows: in the model, production operations in the U.S. and the foreign subsidiary are both described as the assembly, with an increasing cost technology, of intermediates supplied from outside the firm.⁵ The cost of assembly is exclusively the cost of labor input. For the U.S. operation, this cost of assembly equals $W_{us}A_hO_h^2$, where W_{us} is the U.S. wage rate, A_h the intercept of the home (h) labor cost function, and O_h , the level of output produced in the home (U.S.) country; symmetrically, the cost of assembly in the FAUSF is $W_fA_fO_f^2$. Positive technical change is represented by a fall in the coefficient A_h , for U.S. assembly, or, for foreign subsidiary assembly, a fall in A_f .

Table 1C.1 shows the effects of technical change of this general type for three alternative variants of the model: (1) a model in which the firm prices competitively (price equal to marginal cost), (2) a model in which the firm prices monopolistically, and (3) a classical variant in which the foreign subsidiary is removed from the model and all sales to foreigners are exports from the United States. The last in each set of columns lists the baseline equilibrium solution for the model in question, prior to the improvement in competitiveness; thus, for example, for the competitive pricing model, the price of the U.S. good in equilibrium is \$5.71 and the exchange rate, 0.236 dollars per unit of foreign currency; output of the U.S. good is 12.027 units, 11.839 units produced in the United States and 0.188 units of the identical good produced in U.S.-owned subsidiaries abroad. Capital flows are excluded from the model, so the current account must be zero in equilibrium; because of positive direct investment profits abroad (D.I. receipts), in equilibrium there is a small trade

5. The cost functions for both the home production operation and the foreign subsidiary are of the same basic form: cost is made up of two parts, the cost of an intermediate good (a part), A_p units of which (at price P_p) are assembled by labor, and, possibly, other foreign inputs into the final product. So that we will have production in both home and foreign locations by the multinational, the labor costs of assembly are assumed to be increasing with the square of output (W_{us} is the home cost of labor, the U.S. wage rate). A typical cost function, in this case for the U.S. production operation, looks like the following:

$$C(O_h) = P_p A_p O_h + W_{us} A_h O_h^2.$$

Table 1C.1 Effects of Improvements in U.S. Competitiveness for Alternative Models

Variable	Competitive Pricing Model				Monopoly Pricing Model				Classical Model	
	Change in A_h	Change in A_f	Change in Both	Level Baseline	Change in A_h	Change in A_f	Change in Both	Level Baseline	Change in A_h	Level Baseline
Trade balance (\$)	0.035	-0.033	0.019	-0.067	0.141	-0.218	-0.007	-0.435	0.000	0.000
Baldwin balance	-0.033	0.027	-0.020	0.063	-0.005	0.005	-0.006	0.010	0.000	0.000
Baldwin balance*	-0.035	0.033	-0.019	0.067	-0.011	0.010	-0.006	0.020	0.000	0.000
D.I. receipts	-0.035	0.033	-0.019	0.067	-0.141	0.218	0.007	0.435	0.000	0.000
Current account	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Price, exports (\$)	-0.229	-0.005	-0.232	5.710	-0.169	-0.002	-0.170	10.962	-0.235	5.721
Exchange rate (\$/f)	-0.010	0.000	-0.010	0.236	-0.006	0.000	-0.006	0.436	-0.009	0.236
Price, imports (f)	0.000	0.000	0.000	10.000	0.000	0.000	0.000	10.000	0.000	10.000
MNC profits (\$)	-1.349	-0.028	-1.363	4.272	-0.197	0.007	-0.193	50.941	-2.055	67.695
U.S. labor	-1.310	-0.055	-1.340	4.200	-0.748	-0.019	-0.752	2.359	-1.375	4.326
Total output	0.130	0.009	0.134	12.027	0.097	0.001	0.098	8.944	0.138	12.009
U.S. output	0.185	-0.085	0.123	11.839	0.121	-0.036	0.096	8.867	0.138	12.009
Foreign subsidiary output	-0.055	0.011	0.011	0.188	-0.024	0.039	0.003	0.076	0.000	0.000
Imports (\$)	-0.201	-0.002	-0.202	7.827	-0.011	0.000	-0.011	10.115	-0.202	7.830
Imports (real)	0.046	0.000	0.046	3.322	0.031	0.000	0.031	2.321	0.046	3.321

deficit. The Baldwin balance, defined above, is positive at 0.063 dollars, while the alternative, the Baldwin balance*, which does not subtract off the value of goods and services purchased by the foreign subsidiary from foreigners (exclusive of direct wages), is slightly higher at 0.067 dollars.

The preceding columns in each set detail the *changes* from the baseline solution caused by three alternative combinations of technical progress in the assembly operations of U.S.-owned firms. For the column labeled “change in A_h ,” technical progress is limited to U.S. domestic operations; the labor requirement in assembly operations is reduced by one-third (a change in the coefficient A_h of 33 percent, from 0.03 to 0.02). The simulation reported in the column labeled “change in A_f ” is based on a similar one-third reduction in needed assembly labor for the foreign subsidiary only; the third column in the first two sets presents the results for the case of a one-third reduction of labor requirements for both production locations simultaneously.

Fortunately for explanatory purposes, the results do not depend on the pricing policy of the U.S. firm; the results in the first two models are qualitatively identical. Focusing on the competitive pricing model for clarity, we note that the general pattern of price and output changes corresponds to theory: no matter where the technical change occurs within the multinational firm, either at home or in the foreign subsidiary, the price of the U.S. good falls and its overall output rises; this makes intuitive sense because the technical change in all cases implies a downward shift in the supply curve for the U.S. good, with the demand curve unchanged (all of the above assuming that the exchange rate does not change). To me the logical necessity of the observed effect on the exchange rate—an appreciation in all cases—is quite unclear, but nonetheless appealing from an intuitive point of view. For a given fall in the price of the U.S. good, there seems to be an increase in the real demand for exports that outweighs the negative effect of the fall in price, sending the *ex ante* balance of payments into surplus. Another way of looking at the comparative statics is to plot in price and exchange rate space, the U.S. goods market equilibrium locus along with the balance-of-payments (BOP) equilibrium; we will observe the pattern of price and exchange rate changes of table 1C.1 if, as in figure 1C.1, the BOP locus slopes upward more steeply than the goods market equilibrium locus. Although the Marshall-Lerner conditions hold for this model, they alone do not seem to necessitate these loci.

Although the changes induced in major endogenous variables—the equilibrium prices and quantities—do not seem surprising, those induced in some of the balances do. Here we will concentrate on the trade balance and the Baldwin balance. The change in neither is uniformly of the same sign. The trade balance improves in two out of the three cases of technical improvement, but in the case where technical progress is limited to the foreign subsidiary, the trade balance deteriorates. However, neither of the Baldwin balances performs better; in two of the three cases, the clear improvement in U.S. competitiveness leads to a *lower* Baldwin balance—even the clearest of the cases, where tech-

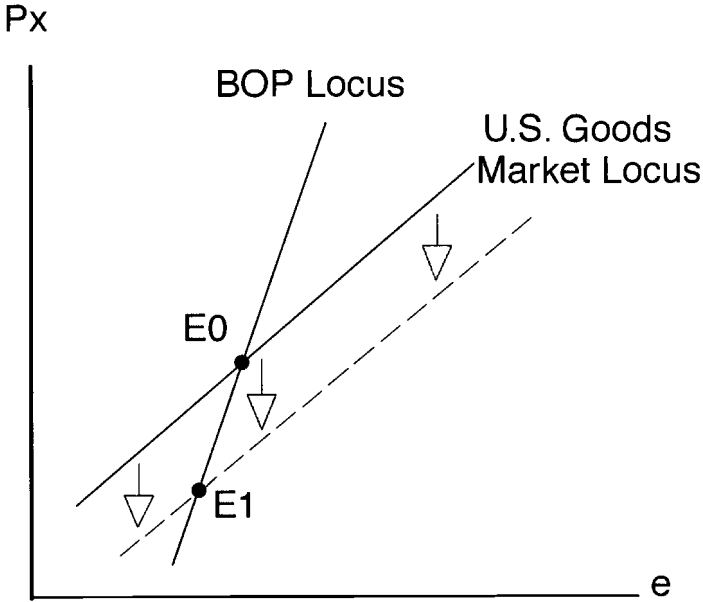


Fig. 1C.1 Shift in initial equilibrium (E_0) as result of technical progress in production of U.S. good

nical progress is spread over all U.S.-owned production facilities, the balance deteriorates.

What intuitively seemed to me to be a possible key to the disappointing performance by both the trade balance and the Baldwin balance was that they are *nominal* measures, while changes in competitiveness can cause quantities and prices to change in opposite directions. The lower price of the U.S. good, certainly to be expected in this sort of case, may more than offset any increase in the real quantity of U.S. exports, thus leading to a fall in the dollar value of U.S. sales. Moreover, some of these measures, particularly those that are related to the balance of payments *and are nominal*, naturally tend to zero or some other limit; thus, in the simple model I developed above, the current account could never be used as a measure of competitiveness because it always tends to zero as a condition of equilibrium; whether the United States is technically very progressive or the exact opposite, prices and exchange rates will change in our model to leave the current account at zero.

In order to examine the truth of this intuition, I construct a real version of the Baldwin balance by dividing the nominal balance by the (endogenous) price of the U.S. export good (P_x). To my surprise, when the simulations were rerun, the results for the real Baldwin balance did not improve the situation: the signs turned out to be identical to those for the other versions of the Baldwin balance in table 1C.1.

Conclusions and Further Musings on “Competitiveness”

The previous section focused on the effects of technical progress in U.S.-owned production facilities—it is hoped a universally accepted instance of an improvement of U.S. competitiveness—on alternative quantities that might be used as indicators of changes in competitiveness. In the context of the simple models developed there, neither the trade balance nor the variants of Baldwin’s net sales balance were closely correlated with this sort of change in competitiveness. These negative results invite us to reflect on what is wrong and what might be done to improve the situation.

I have come to the opinion that defining and measuring competitiveness is a very difficult, if not impossible, enterprise because the term is used as a sort of a conceptual suitcase. A good example is the definition offered by the Competitiveness Policy Council, chaired by Fred Bergsten: “Competitiveness is defined as our ability to produce goods and services that meet the test of international markets while our citizens earn a standard of living that is both rising and sustainable over the long-run” (Competitiveness Policy Council 1993, 4). The council’s definition is then elaborated to include growth in per capita income, such growth to be financed by national saving, as opposed to foreign capital inflows. Such an elaborate and slippery definition has not been adopted for nothing, however: the more precise and specific measures of competitiveness that I have seen, such as those considered in the last section, seem invariably to lead to inconsistencies.

Consider, for example, the implications of adopting a definition that included only the first part of the council’s definition: “our ability to produce goods and services that meet the test of international markets.” A seemingly reasonable indicator of our ability to meet this goal would be the ability to produce a current account in balance; but we have seen above that, in some worlds at least, a current account balance is an equilibrium condition that *always* will be produced, whatever a country’s level or rate of change of technology may be. Price changes, in particular a depreciating exchange rate, may compensate for lagging technical progress. An equilibrium current account in this latter case probably would not meet the council’s supplementary competitiveness criteria of a rising and sustainable standard of living over time.

For this and the reasons discussed in the previous section, it seems that any relevant measure of competitiveness will have to be in real, not nominal, terms. But, so far, I have searched in vain for an adequate real measure—other than those that are direct measures of the underlying changes in technology that we think enhance competitiveness.⁶

6. It might be noted that even losses in competitiveness can contribute to the rising standard of living featured in the definition of the Competitiveness Policy Council. A technical innovation adopted by foreign-owned firms abroad would make foreign firms relatively more technically advanced and would generally be viewed as loss of competitiveness by U.S. firms. However, normally

If these musings are correct, we should not base our calls for a better integration of balance-of-payments and multinational firm data on searches for the best, or even better, measures of competitiveness. Rather, it would seem, such a call should be based on the demonstrated need for specific data concepts required to investigate specific international questions. Baldwin and Kimura have shown that many, and possibly most, interesting international questions require an analysis that includes the impact of multinational firms.

Appendix

Listed below are the equations for the three models on which the results in table 1C.1 are based. In table 1C.1, the models labeled “competitive pricing model” and “monopoly pricing model” feature a multinational firm that has the possibility of producing a single good at home or in a subsidiary located abroad; these two models differ only by the pricing equation for the (export) good. Both contain all of the other equations listed below. The third model, the “classical model,” eliminates all equations dealing with the foreign subsidiary and also assumes competitive pricing.

The two models containing the foreign subsidiary require the firm to produce the last unit of output in the most cost-efficient way; thus, total costs for the firm as a whole are minimized—implying that, for any level of output, marginal costs are equalized in both locations. Such an equilibrium exists because marginal costs of assembly are assumed to be increasing (quadratic) in both production locations. The total cost functions for both of the models are identical, independent of the firm’s pricing rule. Costs in both locations are made up of two parts: (1) the cost of components or parts, which are linearly related to both the level of output and the price of parts (e.g., $A_p P_p O_h$; see below for the definition of all symbols), and (2) the quadratic costs of labor and, possibly, other inputs into the assembly of the components (e.g., $A_h W_{us} O_h^2$). The optimality condition for cost minimization can be shown to be $O_h = \text{RATIO} * O_f$, where $\text{RATIO} = e W_f A_f / (W_{us} A_h)$. As noted above, the two multinational models differ only because of their different pricing rules. In the competitive pricing model, price is set equal to marginal cost. In the monopoly pricing model, marginal revenue, rather than price, is set equal to marginal cost.

Two market-clearing conditions are required to determine all the endogenous variables. The first is a market-clearing condition equating demand and supply for the U.S. good (i.e., the export good with price P_x). In addition, there

this technical advance abroad would make Americans, as well as foreigners, better off; if the U.S. terms of trade improved, U.S. consumers would share in the benefits of the innovation. The analysis in Caves and Jones (1973, sec. 25.4) suggests, I believe, this outcome.

is an ex ante balance-of-payments clearing condition, which can be justified as a linear combination of the other market-clearing conditions in the model (e.g., Stevens et al. 1984, 64–67).

Symbols

Coefficients

A_p, A_h, A_f : Technical coefficients in cost function for, respectively, parts, home labor, and foreign labor.

j, k, r, s, t, u : Coefficients, respectively, for demand (D_h, D_f) and import functions (M).

Exogenous Variables

P_p, P_m : Price of parts (for assembly) and price of imports (in foreign currency).

W_{us}, W_f : Wage rates in United States and foreign country.

CPI_{us}, CPI_f : Consumer price indexes in United States and foreign country.

Y_{us}, Y_f : Real disposable income in United States and foreign country.

Endogenous Variables

CO_h, CO_f, CO_i : Total costs in home (U.S.) plant, total costs in foreign subsidiary, and optimal total costs.

O_h, O_f, O_i : Output produced at home, output produced abroad in foreign subsidiary, and sum of the two (O_i).

D_h, D_f : Demand at home and by foreign citizens for U.S. good (whose price is P_x).

P_x, e : Price of U.S. final good and nominal exchange rate (dollars per unit of foreign currency).

M : Import demand (real).

$X_{final\$}$: Value in dollars of exports of U.S. good for final demand (whose price is P_x).

$X_{interm\$}$: Value in dollars of exports of U.S.-produced intermediate good (whose price is P_p).

$M_{final\$}$: Value in dollars of imports to the United States.

R_{di} : Direct investment receipts (profits of U.S.-owned foreign subsidiary).

$MNC_{Revenue}, MNC_{Profits}$: Total revenue for and total profits of U.S.-based multinational firm.

$BAL_{Baldwin}, BAL_{Baldwin*}, BAL_{BaldwinReal}$: Various measures of the Baldwin balance.

Equations

Goods Market

Building the total cost function:

$$\begin{aligned} CO_h &= A_p P O_h + A_h W_{us} O_h^2, \\ CO_f &= A_p P O_f + A_f W_f O_f^2, \\ \text{RATIO} &= e W_f A_f / (W_{us} A_h), \\ O_h &= \text{RATIO} * O_f, \\ O_t &= O_h + O_f. \end{aligned}$$

The total cost function for a multinational firm producing optimally in two locations:

$$\begin{aligned} CO_t &= A_p P O_t + A_h W_{us} [\text{RATIO} / (\text{RATIO} + 1)] O_t^2 \\ &+ e A_f W_f [1 / (\text{RATIO} + 1)] O_t^2. \end{aligned}$$

Home and foreign demand for U.S. good:

$$\begin{aligned} D_h &= j Y_{us} - k P_x / \text{CPI}_{us}, \\ D_f &= r Y_f - s P_x / (e \text{CPI}_f). \end{aligned}$$

Alternative price functions:

Competitive pricing:

$$P_x = A_p P + 2 A_h W_{us} \left[\frac{\text{RATIO}}{(\text{RATIO} + 1)} \right]^2 O_t + 2 e A_f W_f \left[\frac{1}{(\text{RATIO} + 1)} \right]^2 O_t.$$

Monopoly pricing:

$$\begin{aligned} P_x &= A_p P + 2 A_h W_{us} \left[\frac{\text{RATIO}}{(\text{RATIO} + 1)} \right]^2 O_t + 2 e A_f W_f \left[\frac{1}{(\text{RATIO} + 1)} \right]^2 O_t \\ &+ \frac{D_h + D_f}{k / \text{CPI}_{us} + s / (e \text{CPI}_f)}. \end{aligned}$$

Goods market clearing condition for U.S. good:

$$O_t = D_h + D_f.$$

Balance-of-Payments Equations

Exports and imports:

$$X_{\text{final}\$} = P_x(D_f - O_f),$$

$$X_{\text{interms}\$} = P_p A_p O_f,$$

$$M = tY_{\text{us}} - u * eP_m / \text{CPI}_{\text{us}},$$

$$M_{\text{final}\$} = eP_m M,$$

$$R_{\text{di}} = P_x O_f - CO_f.$$

BOP equilibrium condition:

$$X_{\text{final}\$} + X_{\text{interms}\$} + R_{\text{di}} - M_{\text{final}\$} = 0.$$

Balances and Definitions

$$\text{BAL}_{\text{trade}} = X_{\text{final}\$} + X_{\text{interms}\$} - M_{\text{final}\$},$$

$$\text{BAL}_{\text{Baldwin}^*} = P_x D_f - M_{\text{final}\$},$$

$$\text{BAL}_{\text{Baldwin}} = \text{BAL}_{\text{Baldwin}^*} - 0.5A_1 W_1 O_f^2,$$

$$\text{BAL}_{\text{BaldwinReal}} = \text{BAL}_{\text{Baldwin}} / P_x,$$

$$\text{MNC}_{\text{Revenue}} = P_x(D_h + D_f),$$

$$\text{MNC}_{\text{Profits}} = \text{MNC}_{\text{Revenue}} - CO_f.$$

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