# MODELLING U.S. SERVICES TRADE FLOWS: A COINTEGRATION-ECM APPROACH

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## Abstract

The U.S. service surplus soared from near zero in 1985 to about $60 billion in 1992, offsetting about two thirds of the goods trade deficit. Could this merely reflect improvement in data collection? Or does this mean U.S. services industries are more competitive internationally than goods industries? Is the services surplus likely to continue to rise?

This paper estimates a forecastable model of U.S. services trade to address the above questions. We find that data improvement actually had a negative net impact on the services surplus, since it affected imports more than exports. Instead, the surge in the services surplus was mainly due to strong foreign growth and, to a lesser extent, dollar depreciation. An increase in either outward or inward foreign direct investment asset (FDIA) has a significant and positive impact on both exports and imports of other private services, but has only a modest net effect on the U.S. services balance. Thus, the outlook for the U.S. services balance largely depends on the growth prospect of foreign economies.



*Keywords:* Services trade; Tourism trade; Other private services; Royalties and license fees; Merchandise trade; Foreign direct investment

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## I. Introduction

As services industries grow more important to national economies, they also feature more prominently in international transactions and negotiations.[1] U.S. services industries, in particular, have complained loudly in recent years about foreign trade barriers. Despite the perception of trade barriers, however, the U.S. services **surplus** has soared since 1985, both in nominal and real terms (Charts 1). Rising from near zero in 1985, the services surplus reached about $60 billion in 1992, offsetting about two-thirds of the merchandise trade deficit. Since 1992, the services surplus has managed to stabilize around $60 billion, while the merchandise trade deficit has deteriorated sharply as a result of weak foreign demand and a robust U.S. economy.

In contrast to merchandise trade flows, which are the subject of voluminous studies, U.S. services trade flows have received relatively little empirical analysis.[2] Prior to the mid-1980s, research on U.S. services trade may have been scarce because of the noneventful movement and small magnitude of such trade. The unprecedented surge in the U.S. services surplus since 1985, however, has changed the scenario completely. Given the present

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[1] For example, the subject of removing barriers to trade in financial services featured prominently in the Uruguay Round world trade negotiation and continues to be a central issue confronting the World Trade Organization.

[2] The services model run by the staff at the Board of Governors of the Federal Reserve System is one of the rare exceptions. See Helkie and Stekler (1987) and (1992).

magnitude of the services surplus, a comprehensive study of services trade flows enhances not only our overall understanding of U.S. international competitiveness, but also our ability to forecast U.S. external balances.

This paper uses data since the advent of the floating exchange rate (1973) to estimate a forecastable model of real nonmilitary and nontransportation services trade between the United States and the rest of the world. The services account consists of five components: military, transportation, tourism, other private services, and royalty and license fees (Table 1). Among them, tourism, other private services, and royalty and license fees are the fastest-growing components. Consequently, our study focuses on identifying the determinants of tourism, and other private services (including royalty and license fees).[3] Military and transportation services are briefly described in the appendix.

One question often raised regarding the rapid rise of the services surplus has been whether it mainly reflects better data collection. There is no question that, because of improvements made by the Bureau of Economic Analysis (BEA) in recent years, services trade data has frequent breaks. Unlike merchandise trade data, which are collected when goods enter and leave a country, services data largely rely on surveys or estimates and thus are subject to frequent revisions. Moreover, these revisions tend to be carried back over a

[3] Because the distinction between other private services and royalty and license fees is not clear in some areas, we decided to combine the two subaccounts in our analysis. For example, beginning in 1986, certain management fees received from or paid to unaffiliated foreigners--amounting to less than $25 million for receipts and less than $5 million for payments--have been removed from royalties and license fees and included in other private services.

limited number of years, thereby causing data discontinuity.[4] On the whole, the revision of a service subaccount tends to expand its scope of coverage, causing an upward break.

To account for the impact of data improvement, we examine the BEA's data documentation and include a dummy variable for each data break in our regression analysis. Our analysis uses the two-step (cointegration and Error Correction Model (ECM)) approach suggested by Granger and Engle (1978) to avoid spurious regressions, since both (real) service exports and imports appear to be nonstationary variables. We find that tourism trade is primarily driven by economic activities and the real exchange rate. The movements in other private services are mainly a function of economic activities, the real exchange rate, outward direct foreign investment assets (FDIA), and inward FDIA. Overall, our models fit the data very well within sample and out of sample.

Data improvement is estimated to have applied more to imports than to exports. Thus, it has had a negative net impact on the services surplus. Had the data coverage and estimation method remained the same as in 1982 over the entire sample period, the services surplus rise would have been even greater than what is reported. Once data breaks are accounted for, the surge in the U.S. services surplus since 1985 appears to be mainly the result of strong foreign growth and, to a lesser extent, dollar depreciation. An increase in outward or inward FDIA has a positive impact on both exports and imports of other private services. Consequently, the net effect of inward and outward FDIA was much more modest than that of economic activity, even though inward FDIA grew dramatically in the second

[4] Typically, in June of each year, estimates of U.S. international transactions are revised to incorporate new source data, improved methodologies, and changes in definitions. In addition, a new benchmark survey is usually conducted every five years.

half of the 1980s.

The next section of the paper describes the stylized developments in the fastest-growing components of services trade since the mid-1980s. Section III estimates the fundamental determinants of the trade flows of tourism and other private services (including royalty and license fees). Section IV presents conclusions.

## II. The Stylized Facts

This section examines developments in the three fastest growing service components since the mid-1980s: *tourism*, *other private services*, and *royalties and license fees*.

### II.A. Tourism[5]

On the export side, tourism has surpassed all other services components since 1986, accounting for about 40 percent of total service receipts in 1993 (Table 1). The rise in tourism imports has been somewhat less spectacular. Nevertheless, tourism imports remain the largest component of service imports since the late 1970s, accounting for roughly 40 percent of total service imports in 1993.

In net, tourism has been the fastest growing component of the services balance since 1986, reaching $22 billion, or 38 percent of net U.S. service exports in 1993 (Table 1). According to reported data, however, the prominence of net tourism is a relatively recent phenomenon. Until 1989, U.S. net tourism had been running a deficit (Chart 2).

The rise in U.S. tourism exports occurred mainly vis-a-vis Western Europe, Canada, Japan, and Mexico (Table 1). In 1986, Japan was the only country with which the United

[5] The tourism trade is the sum of two accounts: travel and passenger fare.

States ran a bilateral tourism trade surplus. However, Western Europe and Canada have been catching up rapidly since the late 1980s. In fact, the United States has been running a tourism surplus with the other three regions as well since 1992.

II.B. Other private services

"Other private services" (OPS) is a conglomerate account that covers transactions with both *affiliated* and *unaffiliated* foreigners in services that are not related to either tourism, military, transportation, or royalties and license fees (Table 3).[6]

Net OPS was the largest surplus component of U.S. services balance before the late 1980s; however, mainly because of the surge in net tourism, its share of total services balance has gradually declined. Nevertheless, net OPS continues to account for about 39 percent of total services balance in 1993, exceeding all other services components.

Net OPS has continued to rise steadily since the late 1980s, albeit not as strikingly as net tourism. This rise reflects the persistence of net exports to unaffiliated foreigners. Most of the unaffiliated accounts have run a surplus since 1986, with telecommunications, insurance, and advertising being the only exceptions. Net exports of the "business, professional and technical services" account have been the fastest-growing since 1986, accounting for roughly half of total net exports to unaffiliated foreigners in 1992. Net exports of education services have also risen steadily since 1986. In comparison, net exports of financial services, which grew solidly during 1986-89, have declined modestly since 1989.

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[6] Exports of "other private services" to *affiliated* foreigners refers to the services of *tangible* property supplied by U.S. parent companies to their foreign affiliates and by U.S. affiliates to their foreign parents. Exports of other private services to unaffiliated foreigners refer to a host of services listed in Table 3: education, financial services, insurance, telecommunications, and business, professional, technical services.

Net OPS exports to affiliated foreigners have also been steadily running a surplus, even though their importance has been declining (relative to net exports to unaffiliated foreigners). It is not surprising that U.S. parent companies' exports to their foreign affiliates have constantly exceeded their imports from their foreign affiliates. Interestingly, foreign companies' affiliates in the United States have also been net exporters of services to their parents. U.S. parents' net exports to their foreign affiliates accounted for about 80 percent of total net OPS exports to affiliated foreigners since 1986, while U.S. affiliates' net exports to their foreign parents made up the remaining 20 percent.

II.C. Royalties and license fees

Similar to the "other private services" account, the "royalties and license fees" (RLF) account covers transactions with affiliated and unaffiliated foreigners in a number of services (Table 4).[7] Net RLF ran a steady and solid surplus not only throughout the 1980s but also into the 1990s. Over the 1992-93 period, net RLF reached an average of $14.6 billion -- about 26 percent of the U.S. services balance.

Over the 1990-92 period, net receipts from affiliated foreigners accounted for about 83 percent of total net RLF, while net receipts from unaffiliated foreigners accounted for the remaining 17 percent. Table 4 shows that in 1992 the bulk of net receipts from unaffiliated foreigners (71 percent) came from industrial processes.

Foreign parents have generally been net exporters of royalties and license services to

[7] Receipts from affiliated foreigners stem from the sale and rental of proprietary rights and intangible assets supplied by U.S. parents to their foreign affiliates and by U.S. affiliates to their foreign parents. Receipts from unaffiliated foreigners stems from sales of patterns, trade secrets (related to industrial processes), and copyrights (for books, records and tapes), royalties on broadcasting and recording of live events, and franchise fees.

their U.S. affiliates. Similarly, U.S. parent companies have been net exporters to their foreign affiliates. However, net RLF received by U.S. parents (from their foreign affiliates) have far exceeded that received by foreign parents (from their U.S. affiliates). Indeed, mainly because of the substantially higher net receipts by U.S. parents (than that by foreign parents), the United States has historically run a persistent surplus of royalties and license fees.

Given the less-than-ideal state of intellectual property right protection so far, it is perhaps of no surprise that net RLF on "books, records, and tapes" have only registered a dismal $0.1 billion over the 1989-92 period. More surprising is that the United States has been a net payee of "broadcasting and recording of live events" fees to unaffiliated foreigners, not a net recipient as commonly held. This puzzling phenomenon may have to do with the fact that the sales of "broadcasting and recording of live events" to foreigners are largely transacted by foreign affiliates of U.S. companies. While the size of these transactions is potentially large, they are not recorded in the balance of payment accounts because they are not cross-border transactions.

## III. Empirical Analyses

This section estimates the fundamental determinants of trade flows of tourism and other private services (including royalty and license fees). Because all the dependent and independent variables are I(1) variables (Table 5), we use the two-step estimation method suggested by Granger and Engle (1987) to avoid spurious regression analysis.

In the first step, long-run equations are estimated using ordinary least squares (OLS) regression. The residuals of these regressions are tested to see if they are stationary. If the

null hypothesis that the residuals are nonstationary can be rejected, the long-run equation is considered to be cointegrated.[8] In the second step, after long-run cointegrated equations are estimated, an error correction model (ECM) is estimated to study short-run dynamics between the variables. In each regression, we use a constant dummy for each documented data break.

III.A. Tourism

Demand for tourism is assumed to be determined primarily by economic activity and the real exchange rate, much in the same way as demand for goods. That is, demand for exports is expected to increase as foreign economies grow and/or as the real dollar depreciates; demand for imports is expected to increase as the U.S. economy grows and/or the real dollar appreciates.

Regression analyses of both real tourism exports and imports are conducted over the 1973Q4-1993Q4 period. To deal with data breaks, two constant dummies are included in both exports and imports regressions. The first one, for the 1984Q1-1993Q4 period, accounts for the effect of new estimates introduced for passenger fares (for both payments and receipts) and travel (only receipts).[9] The second, for the 1991Q1-1993Q4 period, accounts for the effect of improved estimates for travel from Canada.[10]

For real exports, two measures of the real exchange rate are used: the relative export

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[8] In a cointegrating regression equation, the nonstationary dependent variable and nonstationary independent variables drift together over time, so that the unexplained "residuals" of the regression equation are stationary over time.

[9] See Survey of Current Business, June 1993.

[10] See Survey of Current Business, June 1994.

price (= U.S. service export deflator in foreign currency terms/foreign GDP deflator)[11] and the relative CPI (foreign CPI/US CPI in foreign currency terms). The regression results using both measures are reported in Table 6a. Regression 1 (first column) shows the regression results using the relative export price, while regression 2 (second column) shows the results using the relative CPI.

Table 6a shows that different measures of the real exchange rate do not make a marked difference in the regression results. Both long-run regressions are reasonably cointegrated: one has an Augmented-Dickey-Fuller (ADF) statistic of 4.92, the other has an ADF of 4.67. Both equations have an Adjusted-$R^2$ = 0.99. A 1 percent increase in foreign domestic demand raises real tourism exports by about 2.2 percent in regression 1, and by about 2.3 percent in regression 2. A 1 percent increase in the relative export price lowers real tourism exports by about 0.42 percent, while a 1 percent *decrease* in the relative CPI (or real dollar appreciation) lowers real tourism exports by about 0.36 percent, in the long run.

For forecasting purposes, we also estimate the error correction mechanism (ECM) for both regressions. To see which regression has better forecasting performance, we reestimate each equation using data over the 1973Q4-1991Q4 period, and use the resulting coefficient estimates to make out-of-sample forecast (over 1992Q1-1993Q4). We then compute both the (out-of-sample) root-mean-square error (RMSE) and Theil's inequality coefficient (*Theil's*

[11] Ideally, one should use the relative tourism export price (= U.S. tourism export deflator in foreign currency terms/foreign GDP deflator). However, tourism export deflator is not reported.

*U*)[12] for each model--the combination of the long-run equation and ECM. The results indicate that the two models' forecasting performances are equally good by *Theil's U* standard, although model 2 forecasts slightly better than model 1 by the RMSE standard. The in-sample and out-of-sample forecasts of model 2 are plotted in the upper panel of Chart 3.

For real imports, two measures of the real exchange rate are also used: the relative import price (= U.S. service import deflator/U.S. GDP deflator), and the relative CPI (foreign CPI/US CPI in foreign currency terms). The regression results using both measures are reported in Table 6b. Regression 1 shows the regression results using the relative import price, while regression 2 shows the results using the relative CPI.

Table 6b shows that, in contrast to tourism exports, using different measures of the real exchange rate does make a noticeable difference in the regression results of tourism imports. Although the two regressions do not differ notably in terms of cointegration statistics and goodness of fit,[13] the coefficient estimates of the fundamental variables in the two regressions are quite different. A 1 percent increase in U.S. domestic demand raises real tourism imports by about 1 percent in regression 1, and by about 0.8 percent in regression 2. A 1 percent increase in the relative import price lowers real tourism imports by about 1 percent, while a 1 percent increase in the relative CPI (or real dollar depreciation) lowers real tourism imports by about 0.4 percent, in the long run.

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[12] Theil's inequality coefficient (Theil's *U*), which always falls between 0 and 1, can be considered as the normalized RMSE. If U = 0, there is a perfect fit. If U = 1, the predictive performance of the model is as bad as it possibly can be.

[13] Regression 1 has an ADF = -5.62 and adjusted-$R^2$ = 0.99, while regression 2 has an ADF = -5.17 and adjusted-$R^2$ = 0.98.

Again, we estimate the ECM for both import regressions, and reestimate each equation using data over the 1973Q4-1991Q4 period to forecast over 1992Q1-1993Q4. Both the RMSE's and *Theil's U's* indicate that model 2 forecasts slightly better than model 1. The in-sample and out-of-sample forecasts of model 2 are plotted in the lower panel of Chart 3.

To ascertain why the two measures of the real exchange rate make a greater difference on the import regressions, we estimate the following two typical exchange-rate-pass-through equations:

**(1) The tourism export price equation:**

$$ln(P^xS) = \underset{(1.38)}{0.11} + \underset{(62.98)}{0.98}\, ln(S) + \underset{(34.40)}{1.04}\, ln(P) \underset{(0.96)}{-0.02}\, ln(P^*)$$

Adjusted-$R^2$ = 0.999; Phillips-Perron ($Z_t$) = -3.34, ADF = -2.97.

**(2) The tourism import price equation:**

$$ln(P^m) = \underset{(14.8)}{1.78} \underset{(21.6)}{-0.52}\, ln(S) + \underset{(21.89)}{1.03}\, ln(P) + \underset{(4.81)}{0.13}\, ln(P^*)$$

Adjusted-$R^2$ = 0.995; Phillips-Perron ($Z_t$) = -5.16, ADF = -4.95.

Where,

$P^xS$= U.S. service export deflator in foreign currency terms;

S= the effective foreign currency/dollar exchange rate based on tourism export weights;

P= U.S. GDP deflator;

$P^*$= tourism-export-weighted foreign GDP deflator; and

$P^m$= U.S. service import deflator.

The tourism export price equation suggests that, holding U.S. and foreign prices constant, a 1 percent dollar appreciation will raise the relative export price by about 1 percent over time. Such an estimate suggests that nominal exchange rate changes are nearly completely passed through to tourism export prices in the long run. It also helps explain why the relative CPI and the relative export price are estimated to have roughly the same impact on tourism exports over time.

The tourism import price equation suggests that, holding U.S. and foreign prices unchanged, a 1 percent dollar appreciation will raise the relative import price by about 0.5 percent over time. The low exchange-rate-pass-through coefficient in the import price equation helps explain why the relative CPI is estimated to have much less impact on tourism imports than the relative import price.

Several features of the tourism trade regressions are worth noting. First, foreign income elasticity for exports is twice as large as U.S income elasticity for imports in tourism trade. This favorable asymmetry of income elasticities suggest that real net tourism exports will have a tendency to grow unless the U.S economy sufficiently outgrows its trading partners' economies.

Second, compared with merchandise trade, tourism trade seems to be less sensitive to exchange rate changes.[14] Tourism exports, however, respond much more strongly to foreign growth than merchandise exports. Indeed, the favorable income elasticity asymmetry in tourism trade is the opposite of the case in merchandise trade, which is known to have a

[14] The average estimate is about 1 for both U.S. merchandise export price elasticity and import price elasticity.

larger income elasticity (of demand) for imports than for exports.[15]

Third, U.S. import price elasticity is more than two-times larger than export price elasticity, suggesting U.S. tourists are much more price conscious than their foreign counterparts. However, because export prices (in foreign currency terms) respond more completely to dollar exchange rate changes than do import prices, the net effect of a dollar exchange rate change on tourism exports is roughly equal to that on tourism imports (in absolute terms).

III.B. Other private services

This subsection estimates equations of real other private services (including royalty and license fees) exports and imports. For easy reference, real other private services (including royalty and license fees) will be referred to as OPS in the subsequent discussion.

OPS had three major data breaks since 1973. The first occurred in 1982Q1, when receipts and payments of royalty and license fees began to be reported on a gross basis rather than on a net basis.[16] The second occurred in 1986Q1 when (1) coverage of education services and business, professional, and technical services were included for the first time, and (2) certain portfolio incomes were reclassified to other private services.[17] The third occurred in 1991Q1, when benchmark survey results led to new estimates for other private services receipts and payments.[18]

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[15] See Goldstein and Khan (1985) for a survey of price and income elasticities of demand for U.S. merchandise exports and imports.

[16] See Survey of Current Business, September 1994, footnote 5.

[17] See Survey of Current Business, June 1989.

[18] See Survey of Current Business, September 1994.

Among the three data breaks, the first one is potentially the most difficult to deal with. We thus run both real OPS exports and imports regressions over the 1982Q1-1993Q4 period. A constant dummy is used to account for each of the remaining two data breaks.

We assume that demand for OPS is a function not only of economic activity and the real exchange rate, as in tourism, but also of outward and inward FDIA. OPS exports is expected to be a positive function of both outward and inward FDIA. Growth in outward FDIA is expected to increase OPS exports, since exports of professional, insurance, and legal services may tend to rise as U.S. parent firms expand the facility and operation of their foreign subsidiaries; growth in inward FDIA is also expected to increase OPS exports, since U.S. affiliates of foreign companies may tend to export cutting-edge technology and services know-how to their companies.[19] By the same token, OPS imports are also expected to be a positive function of both outward and inward FDIA.[20]

Consequently, we run four regressions for both OPS exports and imports (Tables 7a and 7b). Each regression contains the same set of dummy variables, but a different set of other independent variables. On the export side, regression 1 includes only the relative export price and foreign domestic demand as explanatory variables. Regression 2 has the same specification as regression 1 but uses the relative CPI rather than the relative export price as the real exchange rate measure. Regression 3 includes outward FDIA and inward FDIA, in

[19] As discussed in Section II.B, exports to affiliated foreigners is the sum of (1) U.S. parents' exports to foreign affiliates, and (2) U.S. affiliates' exports to their foreign parents.

[20] As discussed in section II.C, imports from affiliated foreigners is the sum of (1) U.S. parents' imports from their foreign affiliates, and (2) U.S. affiliates' imports from their foreign parents.

addition to the relative export price and foreign domestic demand. Regression 4 drops foreign domestic demand but keeps outward and inward FDIA and the relative export price.

The regression results of real OPS exports are reported in Table 7a. None of the four regressions appear to be cointegrated, even at a 20 percent significance level. These poor cointegration results suggest that the relationships being analyzed have not been sufficiently stable. Of course, the relatively short sample period may have contributed to the finding of a lack of cointegrated equation for OPS exports. In any case, the high adjusted-$R^2$ in all four regressions suggest that the four included variables -- foreign domestic demand, the real exchange rate, outward FDIA, and inward FDIA -- are pretty much the main variables driving the movements in real OPS exports, once data improvements are taken into account.

Regressions 1 and 2 show that different measures of the real exchange rate make little difference on the estimation results. Both long-run regressions are not cointegrated, and have an Adjusted-$R^2$ = 0.98. A 1 percent increase in foreign domestic demand raises OPS exports by 1.57 percent in regression 1, and by 1.62 percent in regression 2. A 1 percent increase in the relative export price lowers OPS exports by about 0.23 percent, while a 1 percent *decrease* in the relative CPI (or real dollar appreciation) *lowers* OPS exports by about 0.22 percent, in the long run.

Regression 3 shows that, when inward and outward FDIA are included as regressors along with the relative export price and foreign domestic demand, foreign domestic demand is estimated to have a wrong sign: A 1 percent increase in foreign domestic demand *decreases*

OPS exports by 1.11 percent.[21] The coefficient on the relative export price is estimated to be somewhat greater (=0.31) than in the case of regressions 1 and 2. The coefficient estimate on outward FDIA is estimated to be 0.61, slightly higher than the coefficient estimate on inward FDIA (=0.56).

Regression 4 drops foreign domestic demand from the list of regressors included in regression 3. The coefficient estimates on outward FDIA and the relative export price in regression 4 do not differ much from that in regression 3. However, the coefficient estimate on inward FDIA in regression 4 (=0.25) is less than that in regression 3 (=0.56).

To compare the forecasting performances of these four regressions, we estimate an ECM for each long-run exports equation. We then estimate RMSE and *Theil's U* for each model--the combination of the long-run equation and ECM. Both in terms of RMSE and *Theil's U*, model 2 appears to outperform the other three models. The in-sample and out-of-sample forecasts of model 2 are plotted in the upper panel of Chart 4.

On the import side, we also run four regressions that parallel those on the export side. The regression results of real OPS imports are reported in Table 7b.

Regressions 1 and 2 show that different measures of the real exchange rate do make a noticeable difference on the estimation results. Regression 1 is not cointegrated at a 15 percent significant level, while regression 2 is cointegrated at a 10 percent significant level. A 1 percent increase in U.S. domestic demand raises OPS imports by 2.47 percent in

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[21] Such a finding may be caused by the high correlations between foreign domestic demand and inward FDIA. In a regression of inward FDIA on a constant term and foreign domestic demand, foreign domestic demand is found to be positively correlated with inward FDIA (coefficient estimate = 3.71; t-statistic = 79.68).

regression 1, and by 2.16 percent in regression 2. The coefficient estimate is larger on the relative import price (=0.78) than on the relative CPI (=0.43), but both are estimated to have a wrong sign: A real dollar *depreciation* is estimated to *increase*, not *decrease*, OPS imports.

Regression 3 shows that, when inward and outward FDIA are included as regressors along with the relative import price and U.S. domestic demand, the relative import price becomes insignificant. As a result, the coefficient estimate on U.S. domestic demand becomes much smaller (=0.59) than in regression 1. The coefficient estimate on outward FDIA (=0.87) is estimated to be much higher than on inward FDIA (=0.21).

Regression 4 drops U.S. domestic demand as a regressor, but keeps all the other regressors included in regression 3. As in regression 3, both inward and outward FDIA are found to have a positive impact on OPS imports; the coefficient estimate on outward FDIA is noticeably greater in regression 4 (=1.14), while the coefficient estimates on inward FDIA are nearly the same as in regression 3.

Two results of regressions 3 and 4 are worth noting: (1) both inward and outward FDIA have a positive impact on OPS imports, and (2) the coefficient on the real exchange rate has a right sign when inward and outward FDIA are included. These results help explain the finding that the real exchange rate has a wrong sign in regressions 1 and 2. A dollar depreciation may have three effects on OPS imports. The first is the direct and negative (price) effect: A dollar depreciation will raise the import price and thus lower U.S. demand for OPS imports. The second is the indirect and positive effect: A dollar depreciation may cause inward FDIA to rise, thereby increasing OPS imports. The third is the indirect and negative effect: A dollar depreciation may cause outward FDIA to fall, thereby lowering OPS

imports. The finding that a real dollar depreciation has a positive impact on OPS imports suggests that the net indirect effect was positive and outweighed the negative direct effect over the sample period.[22]

To compare forecasting performances of these four regressions, we estimate an ECM for each long-run imports equation. We then estimate the out-of-sample RMSE and *Theil's U* for each model over the 1991Q4-93Q4 period. The results show that model 2 appears to outperform the other three models, both in terms of RMSE and *Theil's U*. The in-sample and out-of-sample forecasts of model 2 are plotted in the lower panel of Chart 4.

We estimate the following two typical exchange-rate-pass-through equations to find out why the two measures of the real exchange rate make a greater difference on the import regressions. The specifications of both equations are the same as in tourism, but the effective nominal exchange rate and foreign GDP deflator are constructed based on OPS trade weights.

**(3) The OPS export price equation:**

$$ln(P^{x}S) = \underset{(0.16)}{0\ 015} + \underset{(65.94)}{0.98\ ln(S)} + \underset{(16.97)}{1.17\ ln(P)} \underset{(2.39)}{-0.12\ ln(P^{*})}$$

Adjusted-$R^2$ = 0.999; Phillips-Perron ($Z_t$) = -3.53, ADF = -3.14.

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[22] In a regression of inward FDIA on a constant term and the real exchange rate, a 1 percent real dollar depreciation is estimated to be positively correlated with inward FDIA (coefficient estimate = 2.69; t-statistic = 12.82). In a regression of outward FDIA on a constant term and the real exchange rate, a 1 percent real dollar depreciation is also estimated to be positively correlated with outward FDIA (coefficient estimate = 0.85; t-statistic = 9.67). Inward FDIA grew 118 percent, while outward FDIA grew 51 percent over the 1982-93 period.

**(4) The OPS import price equation:**

$$ln(P^m) = \underset{(16.38)}{1.79} - \underset{(27.17)}{0.51}\, ln(S) + \underset{(20.09)}{1.00}\, ln(P) + \underset{(4.85)}{0.15}\, ln(P^*)$$

Adjusted-$R^2$ = 0.997; Phillips-Perron ($Z_t$) = -6.44, ADF = -6.32.

Where variables are as defined for equations (1) and (2) except:

S = the effective foreign currency/dollar exchange rate based on OPS export weights;

$P^*$ = OPS-export-weighted foreign GDP deflator.

Equations (3) and (4) show that the elasticities of OPS export and import prices with respect to exchange rate changes basically do not differ from those for tourism exports and imports prices. This finding helps explain why the two measures of the real exchange rate make little difference in both tourism and OPS exports, but result in noticeable difference in both tourism and OPS imports.

Several features of the OPS trade regressions are worth discussing. First, both import and export price elasticities are low--below 0.5 (in absolute terms), which is not only lower than the price elasticities for merchandise imports and exports but also lower than those for tourism exports and imports.

Second, a 1 percent increase in outward FDIA is estimated to cause U.S. OPS imports to grow faster than exports. This unfavorable asymmetry, of course, may be a result of the fact that U.S. exports have been larger than imports.

Third, the coefficient on inward FDIA in the imports equation is about the same size as that in the exports equation. This finding suggests that a 1 percent increase in inward FDIA will cause U.S. OPS imports to grow at about the same rate as exports. Given that U.S. OPS

exports were larger than imports in the early 1980s, this symmetry suggests that the dramatic growth in inward FDIA since the mid-1980s may be partly responsible for the recent surge in the services surplus.

III.C. Identifying the forces behind the service surplus surge

This subsection identifies the factors driving the services surplus rise by netting out each individual factor's *direct* contribution to the rise. To do so, we use coefficient estimates of regression 1 for tourism exports and imports (Tables 6a and 6b),[23] and estimates of regression 4 for OPS exports and imports (Tables 7a and 7b).[24]

The computation is done in two steps. First, we multiply the coefficient estimate of each variable with the actual growth rate of that variable over 1984-92 to see what contribution each factor makes to the growth in each *dependent variable* -- namely, tourism exports, tourism imports, OPS exports, and OPS imports. Second, based on the share of each component in exports and imports, we net out each factor's contribution to the services balance over the period.

Table 8 shows that strong foreign growth was the main driver behind the surge in the services surplus, followed by dollar depreciation. The seven major services trading partners grew about 28 percent over 1984-92, contributing 62 percentage points to the 114 percent

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[23] We choose regression 1 (which uses the relative export price as the real exchange rate measure), rather than regression 2 (which uses the relative CPI as the real exchange rate measure), to avoid the complication arising from incomplete exchange-rate-pass-through.

[24] We choose regression 4 for three reasons: (1) it uses the relative export price as the relative price measure and thus avoids the complication arising from incomplete exchange-rate-pass-through; (2) it does not contain an economic variable that is estimated to have a "perverse" effect on demand for OPS; (3) it enables one to estimate the "direct" effect of each independent variable on OPS movements.

predicted growth in tourism exports, or 29 percentage points to the 93 percent predicted growth in total (tourism and OPS) exports. **If we normalize the predicted growth in total net exports to be 100 percent over the period, then foreign domestic demand's contribution to net exports amounts to 118 percentage points.**

The contribution of the 34 percent decline in the relative export price amounted to about 45 percentage points, while the contribution of the 9 percent increase in the relative import price equals about 26 percentage points. Together, **the real exchange rate changes** -- mainly a result of the dollar depreciation over the period -- **contribute nearly 71 percentage points to the (normalized) 100 percent rise of the services surplus.**

Because U.S. OPS exports have been larger than OPS imports over the period, the dramatic growth in inward FDIA (102 percent) did contribute modestly to the services surplus surge, even though inward FDIA was estimated to have roughly the same percent impact on OPS exports as imports. For the same reason, the unfavorably asymmetric percent impacts of outward FDIA growth on OPS did not result in a major drag on the net services exports.

The two major drags on net services exports were growth in U.S. domestic demand and, surprisingly, data improvement. Mainly because data improvement related to a larger extent to imports than exports, it actually had a negative net impact on the services surplus.

## IV. Conclusion

This paper estimates a forecastable model of U.S. nonmilitary and nontransportation services trade. Because the dependent and independent variables appear to be nonstationary variables, we use the two-step (cointegration and ECM) approach suggested by Granger and

Engle (1978) to avoid spurious regressions. The models appear to fit the data very well both within and out of the sample.

Using the coefficient estimates of the models and the past growth rates of the main determinants of services trade flows, we find that the surge in the services trade surplus since the mid-1980s is largely attributable to movements in traditional macroeconomic variables. Robust economic growth abroad and the substantial depreciation of the dollar in the second half of the 1980s are the primary factors driving the rapid rise in the services surplus. Growth in either outward or inward foreign direct investment asset has had only a modest net effect on the services balance. The finding that data improvement has a negative net impact on the services surplus suggests that the services surplus surge may in fact reflect a comparative advantage in favor of the U.S. services industries.

## Appendix: Transportation and Military Service Trade

Both transportation and military services command a relatively small share of total services trade, and have remained relatively stable over time (Chart 2). Together, they run a small deficit. The surge in the services surplus would have been higher were these two accounts not included.

Transportation

The transportation account includes receipts and payments for services involving the transport of merchandise goods via water, air, rail and pipeline. The primary transportation services are (1) freight charges, (2) operating expenses at foreign ports, and (3) vessel charters and rentals.

Freight charges are incurred when the vessel operators and aircraft carriers of one country carry goods to a foreign country and between foreign ports. Also included are the expenses of rail carriers for transporting goods between Canada, the United States, and third countries and the costs to pipeline companies for moving gas and oil from the United States to Canada. Port services cover the expenditures of shipping, air, and rail carriers at foreign ports, including fuel, port call and cargo expenses, wages paid to foreign residents, repair and maintenance fees, and terminal services. Charter hire and rentals are the expenses for the charter of vessels and the leasing of aircraft and freight car to foreigners.

An important factor in estimating transportation receipts and payments is determining the residency of a vessel operator, since it may differ from the vessel's country of registry. U.S. companies, for example, commonly operate tankers that are registered in flag-of-convenience countries (for example, Panama, Liberia, Honduras), either directly or indirectly through foreign subsidiaries. If directly operated, U.S. companies are treated as U.S. residents. If indirectly operated, the foreign subsidiaries of U.S. companies are treated as foreign residents.

Military

The activity recorded in military services is based on who conducts the transaction, not on what is traded. Commercial transactions between private firms and governments involving military type of goods or services are not included, unless a U.S. military agency participates.

The transfer of goods and services to foreign governments are recorded as receipts, and direct defense expenditures abroad are recorded as payments. Because military installations abroad are considered part of the U.S. economy, the accounts include the receipts and payments of U.S. military installations abroad. Receipts are mostly transfers under foreign military sales programs. Payments cover a broad spectrum of activity: (1) expenditures by U.S. personnel abroad, (2) wages paid to foreign residents, (3) construction expenses, (4) foreign contractual services, (5) foreign goods and services purchased for military assistance programs, (6) NATO support project payments, and (7) foreign goods and services purchased by the U.S. Coast Guard.

## Data Appendix

### Tourism

*U.S. real tourism export* is nominal tourism exports divided by the service export deflator (1985=100). Nominal tourism exports and the service export deflator are obtained from the U.S. Department of Commerce (Survey of Current Business, various issues).

*U.S. real tourism import* is nominal tourism imports divided by the service import deflator (1985=100). Nominal tourism imports and the service import deflator are obtained from the U.S. Department of Commerce (Survey of Current Business, various issues).

*Foreign Domestic Demand* is a weighted index of the real domestic demand of the seven major U.S. trading partners, based on share of tourism exports. Real domestic demand for six trading partners is obtained from the Bank of International Settlements. Mexico's real domestic demand is obtained from the Banco de Mexico. (Country shares of tourism exports are shown in Table A1 below.)

*U.S. Domestic Demand* is obtained from the U.S. Department of Commerce, Bureau of Economic Analysis.

*The relative export price* is the U.S. services export deflator (in foreign currency terms) divided by the foreign GDP deflator. The U.S. export price deflator in foreign currency terms is the product of the U.S. export price deflator and the effective nominal exchange rate (foreign currency/dollar). The *effective nominal exchange rate* is a weighted index of the bi-lateral exchange rates between the US and each of its seven trading partners, based on share of tourism exports. *Foreign GDP deflator* used in the relative price term is a weighted index of the GDP deflators of the seven major trading partners. Foreign GDP deflator and bilateral nominal exchange rate for six trading partners are obtained from the Bank of International Settlements. Mexican data are obtained from the Banco the Mexico and the International Monetary Fund.

*The relative import price* is the U.S. service import deflator divided by the U.S. GDP deflator.

*U.S. GDP deflator* is obtained from the U.S. Department of Commerce.

### Other Private Services and Royalties & License Fees (OPS&RLF)

*U.S. real ops&rlf export* is nominal ops&rlf exports divided by the service export deflator (1985=100). Nominal ops&rlf exports are obtained from the U.S. Department of Commerce (Survey of Current Business, various issues).

*US real ops&rlf import* is nominal ops&rlf imports divided by the service import deflator (1985=100). Nominal ops&rlf imports are obtained from the U.S. Department of Commerce (Survey of Current Business, various issues).

*Outward FDIA* is the total real U.S. foreign direct investment assets abroad, obtained by cumulating real U.S. FDI outflows. Real U.S. FDI outflows are obtained by deflating nominal U.S. direct investment abroad by the weighted foreign producer price index based on the share of U.S. FDIA (1985=1). Nominal U.S. direct investment abroad is obtained from the U.S. Department of Commerce (Survey of Current Business, various issues).

*Inward FDIA* is the total real foreign direct investment assets in the United States, obtained by cumulating real U.S. FDI inflows. Real U.S. FDI inflows are obtained by deflating nominal foreign direct investment in the U.S. by the U.S. producer price index (1985=1, U.S. Department of Labor). Nominal foreign direct investment in the U.S. is obtained from the U.S. Department of Commerce (Survey of Current Business, various issues)

*The relative export price* is the U.S. services export deflator (in foreign currency terms) divided by the foreign GDP deflator. The U.S. export price deflator in foreign currency terms is the product of the U.S. export price deflator and the effective nominal exchange rate (foreign currency/dollar). The *effective nominal exchange rate* is a weighted index of the bilateral exchange rates between the United States and each of its seven trading partners, based on share of ops&rlf exports. *Foreign GDP deflator* used in the relative price term is a weighted index of the GDP deflators of the seven major trading partners. Foreign GDP deflator and bilateral nominal exchange rate for six trading partners are obtained from the Bank of International Settlements. Mexican data are obtained from the Banco the Mexico and the International Monetary Fund. (Country shares of ops&rlf exports are shown in Table A1 below.)

The *relative import price* is the U.S. service import deflator divided by the U.S. GDP deflator.

*US GDP deflator* is obtained from the U.S. Department of Commerce.

Table A1. Share of US services exports by country

| US Major Trading Partners | Tourism | OPS&RLF |
|---|---|---|
| Canada | 0.22 | 0.23 |
| France | 0.06 | 0.10 |
| Germany | 0.08 | 0.12 |
| Italy | 0.03 | 0.05 |
| Japan | 0.32 | 0.23 |
| Mexico | 0.12 | 0.05 |
| United Kingdom | 0.16 | 0.22 |

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TABLE 1.
THE U.S. SERVICES ACCOUNT BY COMPONENT

| | (Percent Share) Exports | | Imports | | (Billions of $) Net | |
|---|---|---|---|---|---|---|
| | 1986 | 1993 | 1986 | 1993 | 1986 | 1993 |
| **Total Services (billions of $)** | **85.5** | **184.0** | **78.2** | **125.6** | 7.4 | 58.4 |
| Tourism | 30.4 | 40.3 | 41.5 | 41.4 | -6.4 | 22.2 |
| Military | 10.0 | 6.2 | 17.6 | 9.7 | -5.2 | -0.8 |
| Transportation | 18.4 | 12.6 | 21.4 | 19.5 | -0.9 | -1.4 |
| Other Private Services | 31.9 | 29.8 | 17.8 | 25.6 | 13.4 | 22.8 |
| Royalties & License Fees | 9.3 | 11.1 | 1.8 | 3.9 | 6.5 | 15.6 |

**Memorandum:**
**(billions of $)**

| | Exports | | Imports | | Net | |
|---|---|---|---|---|---|---|
| | 1986 | 1993 | 1986 | 1993 | 1986 | 1993 |
| Merchandise Trade | 223.3 | 456.9 | 368.4 | 589.4 | -145.1 | -132.6 |
| Current Account | | | | | -151.2 | -103.9 |

TABLE 2
U.S. TOURISM TRANSACTIONS, BY REGION
(billions of dollars, balance of payments basis, annualized rates)

| | 1986 | 1989 | 1992 | 1993 |
|---|---|---|---|---|
| **Tourism Exports** | **26.0** | **46.9** | **71.3** | **74.2** |
| Western Europe | 7.6 | 14.7 | 24.0 | 24.6 |
| of which, U.K. | n.a. | 4.8 | 7.6 | 8.2 |
| of which, Germany | n.a. | 2.4 | 4.9 | 5.3 |
| Canada | 3.3 | 6.2 | 9.3 | 8.6 |
| Japan | 4.3 | 9.6 | 13.8 | 14.4 |
| Latin America, and Other Western Hemisphere | 6.9 | 10.0 | 15.0 | 16.3 |
| of which, Mexico | 2.2 | 4.3 | 6.2 | 5.7 |
| Other | 3.9 | 6.0 | 8.8 | 9.7 |
| **Tourism Imports** | **32.4** | **41.7** | **49.6** | **52.0** |
| Western Europe | 12.1 | 15.9 | 18.2 | 19.6 |
| of which, U.K. | n.a. | 4.5 | 4.8 | 6.0 |
| of which, Germany | n.a. | 3.2 | 3.0 | 3.3 |
| Canada | 3.3 | 3.6 | 3.8 | 4.0 |
| Japan | 1.8 | 2.4 | 3.0 | 3.4 |
| Latin America, and Other Western Hemisphere | 8.2 | 11.2 | 13.5 | 14.2 |
| of which, Mexico | 2.9 | 4.8 | 5.8 | 5.8 |
| Other | 7.1 | 8.4 | 10.3 | 10.4 |

TABLE 3
OTHER PRIVATE U.S. SERVICES TRANSACTIONS
(billions of dollars, seasonally adjusted)

| | EXPORTS (RECEIPTS) | | | | IMPORTS (PAYMENTS) | | | |
|---|---|---|---|---|---|---|---|---|
| | 1986 | 1989 | 1992 | 1993 | 1986 | 1989 | 1992 | 1993 |
| **Total other private services exports (imports)** | **27.3** | **36.5** | **51.0** | **54.9** | **13.9** | **19.9** | **26.6** | **32.1** |
| To (from) affiliated foreigners | 8.2 | 12.3 | 16.1 | 16.0 | 3.9 | 7.9 | 10.0 | 10.6 |
| US parents' exports to (imports from) their foreign affiliates | 5.4 | 9.1 | 10.2 | 10.5 | 2.4 | 4.8 | 5.3 | 5.6 |
| US affiliates' exports to (imports from) their foreign parents | 2.8 | 3.2 | 5.9 | 5.5 | 1.5 | 3.1 | 4.6 | 5.0 |
| To (from) unaffiliated foreigners | 19.1 | 24.2 | 34.9 | 38.9 | 10.0 | 12.0 | 16.7 | 21.5 |
| Education | 3.5 | 4.6 | 6.2 | 6.8 | 0.4 | 0.6 | 0.7 | 0.8 |
| Financial Services | 3.3 | 5.0 | 5.5 | 6.5 | 1.8 | 2.1 | 3.5 | 5.6 |
| Insurance | 2.0 | 0.5 | 1.2 | 1.5 | 2.2 | 0.8 | 1.3 | 2.9 |
| Telecommunications | 1.8 | 2.5 | 3.0 | 3.2 | 3.3 | 5.2 | 6.1 | 6.5 |
| Business, Professional, Technical services | 4.4 | 6.2 | 12.1 | 13.3 | 1.3 | 2.0 | 3.4 | 3.9 |
| Advertising | 0.1 | 0.1 | 0.3 | 0.3 | 0.1 | 0.2 | 0.5 | 0.6 |
| Computer & data processing services | 1.0 | 1.0 | 1.8 | 2.1 | 0.0 | 0.0 | 0.1 | 0.3 |
| Data base and other information services | 0.1 | 0.2 | 0.6 | 0.7 | 0.0 | 0.0 | 0.1 | 0.1 |
| Research, development and testing services | 0.3 | 0.4 | 0.7 | 0.6 | 0.1 | 0.1 | 0.3 | 0.3 |
| Management, consulting, and public relations services | 0.3 | 0.3 | 0.7 | 0.8 | 0.1 | 0.1 | 0.2 | 0.3 |
| Legal services | 0.1 | 0.4 | 1.4 | 1.5 | 0.0 | 0.1 | 0.3 | 0.3 |
| Construction,engineering, architectural & mining | 0.8 | 0.9 | 1.9 | 2.3 | 0.3 | 0.4 | 0.3 | 0.3 |
| Industrial engineering | 0.1 | 0.2 | 0.2 | 0.2 | 0.1 | 0.1 | 0.1 | 0.1 |
| Installation, maintenance, and repair of equipment | 1.0 | 1.7 | 2.8 | 3.1 | 0.5 | 0.7 | 0.7 | 0.8 |
| Medical services | 0.5 | 0.6 | 0.7 | 0.7 | n.a. | n.a. | n.a. | n.a. |
| Other | 0.2 | 0.3 | 0.9 | 0.9 | n.a. | n.a. | n.a. | n.a. |
| Other | 4.1 | 5.4 | 6.9 | 7.5 | 1.1 | 1.4 | 1.6 | 1.8 |
| Addendum: | | | | | | | | |
| Film and tape rentals | n.a. | 2.3 | 2.5 | n.a. | n.a. | 1.8 | 0.1 | n.a. |

*: Exports include mainly expenditures of foreign governments and international organizations in the US.
Imports include mainly wages of foreign residents temporaily employed in the US, and of Canadian and Mexican commuters in the US border area.

TABLE 4 U.S. ROYALTIES AND LICENSE FEES
(billions of dollars)

| | 1986 | 1989 | 1992 | 1993 |
|---|---|---|---|---|
| **Exports (Receipts)** | **7.9** | **13.8** | **19.9** | **20.4** |
| To Affiliated Foreigners | 6.0 | 11.0 | 15.9 | 16.0 |
| U.S. parents' exports to foreign affiliates | 5.8 | 10.6 | 15.2 | 15.2 |
| U.S. affiliates' exports to their foreign parents | 0.2 | 0.3 | 0.7 | 0.8 |
| To Unaffiliated Foreigners | 1.9 | 2.9 | 4.0 | 4.4 |
| Industrial processes | n.a. | 2.1 | 2.5 | 2.8 |
| Books, records, and tapes | n.a. | 0.1 | 0.2 | 0.2 |
| Broadcasting and recording of live events | n.a. | 0.1 | 0.1 | 0.2 |
| Franchise fees | n.a. | 0.2 | 0.3 | 0.4 |
| Other | n.a. | 0.4 | 0.8 | 0.8 |
| **Imports (Payments)** | **1.4** | **2.5** | **5.0** | **4.8** |
| From Affiliated Foreigners | 0.9 | 1.7 | 3.3 | 3.5 |
| U.S. parents' imports from their foreign affiliates | 0.1 | 0.1 | 0.2 | 0.2 |
| U.S. affiliates' imports from their foreign parents | 0.8 | 1.6 | 3.1 | 3.2 |
| From Unaffiliated Foreigners | 0.5 | 0.8 | 1.7 | 1.4 |
| Industrial processes | n.a. | 0.6 | 0.8 | 1.0 |
| Books, records, and tapes | n.a. | 0.1 | 0.1 | 0.1 |
| Broadcasting and recording of live events | n.a. | 0.1 | 0.6 | 0.0 |
| Franchise fees | n.a. | 0.0 | 0.0 | 0.0 |
| Other | n.a. | 0.1 | 0.2 | 0.2 |

**Table 5. Tests of Order of Integration**

**(Sample Period: 1974:Q1 to 1993:Q4)**

| Variable | ADF(k=1) test statistic | |
|---|---|---|
| US domestic demand | 0.52 | |
| ΔUS domestic demand | 4.97 | |
| foreign domestic demand | 1.30 | |
| Δforeign domestic demand | 3.57 | |
| relative import price | 1.74 | |
| Δrelative import price | 4.49 | |
| relative export price | 1.04 | |
| Δrelative export price | 6.06 | |
| outward FDIA | 2.57 | (k=0) |
| Δoutward FDIA | 7.13 | (k=0) |
| inward FDIA | 0.88 | |
| Δinward FDIA | 3.67 | |

Notes:

1. Variables are in log terms.

2. K is the number of lags in the ADF regression of variable X:

$$\Delta X_t = \alpha + \beta X_{t-1} + \gamma_1 \Delta X_{t-1} + \gamma_2 \Delta X_{t-2} + \ldots + \gamma_K \Delta X_{t-K}$$

3. Relative import price = $\frac{\text{US service import deflator}}{\text{US GDP deflator}}$

4. Relative export price = $\frac{\text{US service export deflator}}{\text{foreign GDP deflator}}$

## Table 6a. Real U.S. Tourism Exports

(t-statistics in parenthesis, sample period: 1973Q4 - 1993Q4)

| Long-Run Equation | (1) | (2) |
|---|---|---|
| Regressor | Coefficients | Coefficients |
| Constant | -3.59 (-5.87) | -4.32 (-6.81) |
| Foreign domestic demand | 2.19 (24.01) | 2.28 (24.25) |
| Relative export price | -0.42 (6.06) | |
| Relative CPI | | 0.36 (4.83) |
| D84 | 0.20 (7.64) | 0.18 (6.69) |
| D90 | 0.18 (7.44) | 0.19 (7.59) |
| Adjusted-R2 | 0.99 | 0.99 |
| ADF | 4.92 | 4.67 |
| Phillips-Perron(Zt) | 5.16 | 4.89 |

### Error Correction Mechanism

| Regressor | Coefficients | Coefficients |
|---|---|---|
| Residual(t-1) | -0.51 (-4.56) | -0.46(-4.42) |
| ΔForeign domestic demand(t-1) | 2.45 (3.63) | 2.57 (3.81) |
| Adjusted-R2 | 0.28 | 0.27 |
| DW | 2.10 | 2.15 |
| RMSE | 1.07 | 1.03 |
| Theil U | 0.019 | 0.019 |

Notes: (all the variables are in log terms, except the dummy variables)

1. D84 = a constant dummy for 1984:1-1993:4.
2. D90 = a constant dummy for 1990:1-1993:4.
3. Relative export price = USd service export deflator in foreign currency terms/foreign GDP deflator.
4. Real CPI = foreign CPI/US CPI in foreign currency terms.
5. RMSE & Theil U measure out-of-sample forecast based on regression using 1973Q-91Q4 sample period.
6. $\Delta x(t) = x(t)-x(t-1)$.

## Table 6b. Real U.S. Tourism Imports

(t-statistics in parenthesis, sample period: 1973Q4 - 1993Q4)

| Long-Run Equation | (1) | (2) |
|---|---|---|
| Regressor | Coefficients | Coefficients |
| Constant | -4.11 (-5.71) | -4.90 (-5.21) |
| US domestic demand | 0.99 (11.18) | 0.82 (8.04) |
| Relative import price | -1.07 (-9.26) | |
| Relative CPI | -0.40 (-6.02) | |
| D84 | 0.36 (12.44) | 0.44 (14.66) |
| D90 | 0.07 (4.40) | 0.10 (4.41) |
| Adjusted-R2 | 0.99 | 0.98 |
| ADF | -5.62 | -5.17 |
| Phillips-Perron(Zt) | -5.91 | -5.30 |

## Error Correction Mechanism

| Regressor | Coefficients | Coefficients |
|---|---|---|
| Residual(t-1) | -0.38 (-2.66) | -0.30 (-2.49) |
| ΔUS domestic demand(t-1) | 1.11 (2.20) | 1.31 (2.55) |
| Adjusted-R2 | 0.09 | 0.08 |
| DW | 1.92 | 2.09 |
| RMSE | 1.50 | 1.45 |
| Theil U | 0.018 | 0.017 |

Notes: (all the variables are in log terms, except the dummy variables)

1. D84 = a constant dummy for 1984:1-1993:4.
2. D90 = a constant dummy for 1990:1-1993:4.
3. Relative import price = US service import deflator/US GDP deflator in foreign currency terms.
4. Real CPI = foreign CPI/US CPI in foreign currency terms.
5. RMSE & Theil U measure out-of-sample forecast based on regression using 1973Q-91Q4 sample period.
6. $\Delta x(t) = x(t)-x(t-1)$.

## Table 7a. Real US Exports of Other Private Services (including royalty & license fees)

(t-statistics in parenthesis, sample period: 1982Q1 - 1993Q4)

| Long-Run Equation | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| Regressor | Coefficients | Coefficients | Coefficients | Coefficients |
| Constant | -1.49 (-1.60) | -1.74 (-1.92) | -4.02 (-2.16) | -5.58 (-3.41) |
| Outward FDIA | | | 0.61 (3.32) | 0.66 (3.55) |
| Inward FDIA | | | 0.56 (2.82) | 0.25 (3.89) |
| Relative export price | -0.23 (2.40) | | 0.31 (3.77) | 0.33 (3.92) |
| Relative CPI | | 0.22 (2.17) | | |
| Foreign domestic demand | 1.57 (11.21) | 1.62 (12.00) | -1.11 (-1.66) | |
| D86 | 0.11 (3.84) | 0.10 (3.53) | 0.11 (4.92) | 0.10 (4.55) |
| D91 | 0.15 (8.55) | 0.14 (7.85) | 0.05 (2.27) | 0.07 (3.04) |
| Adjusted-R2 | 0.98 | 0.98 | 0.99 | 0.99 |
| ADF | -3.12 | -3.10 | -3.80 | -3.42 |
| Phillips-Perron(Zt) | -3.24 | -3.22 | -3.63 | -3.52 |

### Error Correction Mechanism

| Regressor | Coefficients | Coefficients | Coefficients | Coefficients |
|---|---|---|---|---|
| Residual(t-1) | -0.36 (-2.80) | -0.38 (-2.97) | -0.42 (-2.24) | -0.48 (-2.81) |
| ΔOutward FDIA(t-1) | 0.87 (2.11) | 0.87 (2.14) | 0.78 (1.83) | 0.80 (1.95) |
| ΔOPS exports(t-1) | 0.14 (1.22) | 0.14 (1.27) | 0.20 (1.62) | 0.19 (1.63) |
| Adjusted-R2 | 0.02 | 0.04 | -0.03 | 0.02 |
| DW | 1.80 | 1.81 | 1.83 | 1.82 |
| RMSE | 1.79 | 1.76 | 1.96 | 1.89 |
| Theil U | 0.014 | 0.013 | 0.015 | 0.014 |

Notes: (all the variables are in log terms, except the dummy variables)

1. D86 = a constant dummy for 1986:1-1993:4.
2. D91 = a constant dummy for 1991:1-1993:4.
3. Relative export price = US service import deflator in foreign currency terms/foreign GDP deflator.
4. Real CPI = foreign CPI/US CPI in foreign currency terms.
5. RMSE & Theil U measure out-of-sample forecast based on regression using 1973Q-91Q4 sample period.
6. $\Delta x(t) = x(t)-x(t-1)$.

## Table 7b. Real US Exports of Other Private Services (including royalty & license fees)

(t-statistics in parenthesis, sample period: 1982Q1 - 1993Q4)

| Long-Run Equation | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| Regressor | Coefficients | Coefficients | Coefficients | Coefficients |
| Constant | -17.24 (9.87) | -12.37 (-8.89) | -15.29 (-6.40) | -14.33 (-6.09) |
| Outward FDIA | | | 0.87 (2.98) | 1.14 (4.81) |
| Inward FDIA | | | 0.21 (2.89) | 0.25 (3.57) |
| Relative import price | 0.78 (3.09) | | -0.14 (-0.54) | -0.44 (2.62) |
| Relative CPI | | 0.43 (3.74) | | |
| US domestic demand | 2.47 (11.84) | 2.16 (13.42) | 0.59 (1.58)) | |
| D86 | 0.11 (2.52) | 0.11 (2.59) | 0.18 (4.90) | 0.22 (7.88) |
| D91 | 0.14 (5.49) | 0.14 (6.25) | 0.02 (0.63) | 0.00 (-0.13) |
| Adjusted-R2 | 0.98 | 0.98 | 0.99 | 0.99 |
| ADF | 3.45 | 4.77 | 3.69 | 3.76 |
| Phillips-Perron(Zt) | 3.69 | 3.45 | 3.83 | 3.89 |

### Error Correction Mechanism

| Regressor | Coefficients | Coefficients | Coefficients | Coefficients |
|---|---|---|---|---|
| Residual(t-1) | -0.29 (-2.83) | -0.28 (-2.67) | -0.43 (-3.31) | -0.39 (-2.95) |
| ΔInward FDIA(t-1) | 0.60 (3.59) | 0.35 (1.60) | 0.64 (3.90) | 0.64 (3.84) |
| ΔOutward FDIA(t-1, t-2) | | 1.01 (1.65) | | |
| ΔOPS imports(t-1) | 0.07 (1.53) | 0.07 (1.38) | 0.09 (1.92) | 0.09 (1.95) |
| Adjusted-R2 | 0.03 | 0.06 | 0.08 | 0.04 |
| DW | 1.87 | 1.93 | 1.85 | 1.86 |
| RMSE | 0.81 | 0.70 | 0.85 | 0.89 |
| Theil U | 0.016 | 0.014 | 0.017 | 0.017 |

Notes: (all the variables are in log terms, except the dummy variables)

1. D86 = a constant dummy for 1986:1-1993:4.
2. D91 = a constant dummy for 1991:1-1993:4.
3. Relative import price = US service import deflator/US GDP deflator.
4. Relative CPI = foreign CPI/US CPI in foreign currency terms.
5. RMSE & Theil U measure out-of-sample forecast based on regression using 1973Q-91Q4 sample period.
6. $\Delta x(t) = x(t)-x(t-1)$.

## Table 8. Explaining the Surge in Real U.S. Services Surplus, 1984-92

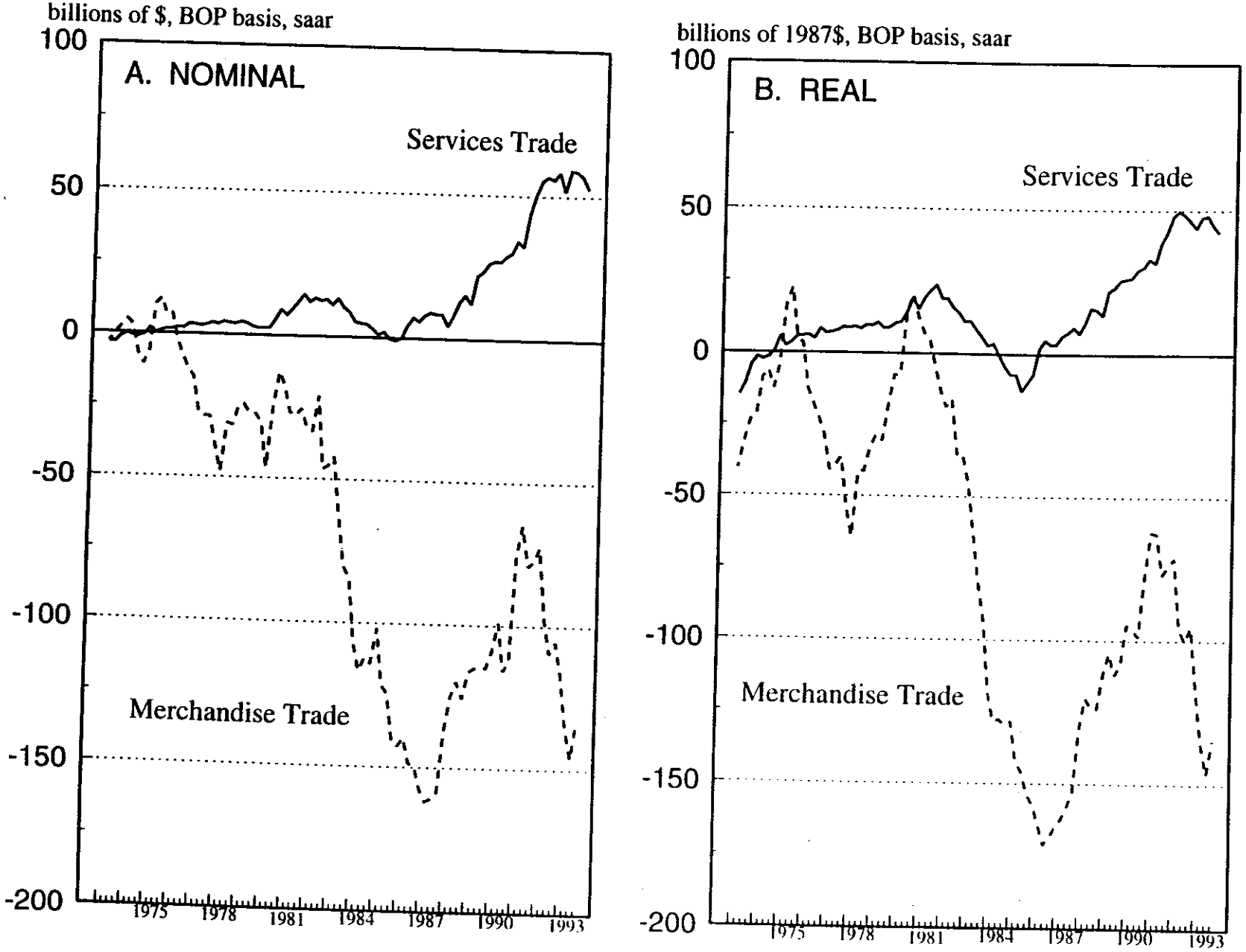
(nonannualized, percent)

| | Other Private Services & RLF | | Tourism | | Total Tourism OPS & RLF | | | Percentage of Predicted Total Service Growth | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Exports | Imports | Exports | Imports | Exports | Imports | Balance | Exports | Imports | Balance |
| **Actual growth** | **73** | **85** | **128** | **55** | **99** | **66** | **33** | | | |
| **Predicted Growth** | **75** | **85** | **114** | **60** | **93** | **68** | **25** | **100** | **100** | **100** |
| foreign domestic demand (28) | | | 62 | | 29 | | 29 | 31 | | 118 |
| U.S. domestic demand (22) | | | | 26 | | 17 | -17 | | 25 | -68 |
| relative export price (-34) | 9 | | 14 | | 11 | | 11 | 12 | | 45 |
| relative import price (9) | | -4 | | -8 | | -7 | 7 | | -10 | 26 |
| data improvement | 17 | 21 | 38 | 42 | 27 | 35 | -8 | 29 | 51 | -33 |
| outward FDIA (37) | 24 | 42 | | | 13 | 14 | -2 | 14 | 21 | -6 |
| inward FDIA (102) | 25 | 26 | | | 13 | 9 | 4 | 14 | 13 | 18 |

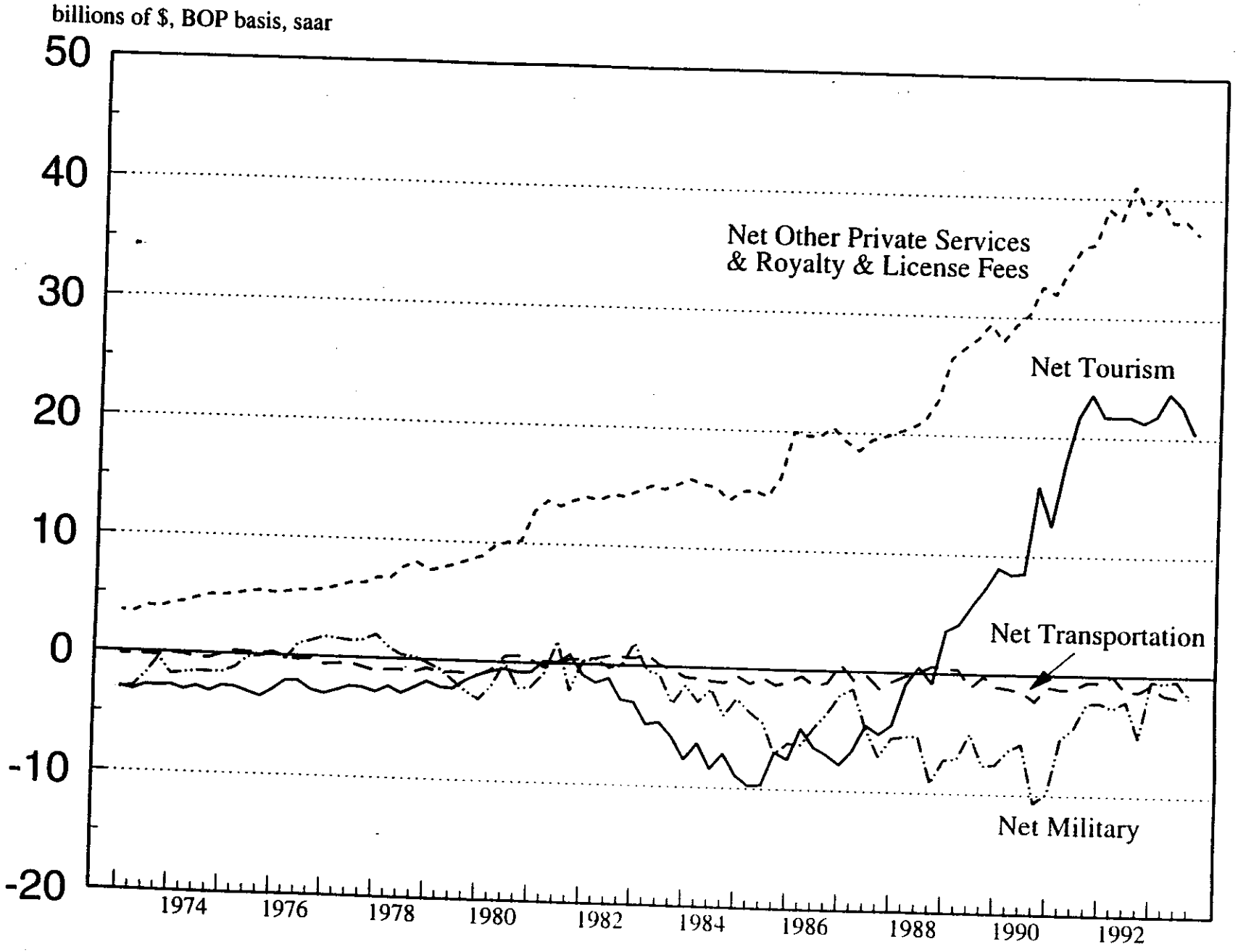
**otes:**

Growth rates of explanatory varibles over 1984-92 are shown in parenthesis.
relative export price = export price deflator x exchange rate/foreign GDP deflator.
relative import price = import price deflator/U.S. GDP deflator.
Average share of tourism exports in total (tourism, OPS & RLF) services exports is 47% over 1984-92,
Average share of tourism imports in total (tourism, OPS & RLF) services imports is 66% over 1984-92.
A 1 percent dollar appreciation is estimated to increase relative export price by about 1 percent,
and decrease relative import price by 0.5 percent over time, holding US and foreign prices unchanged.

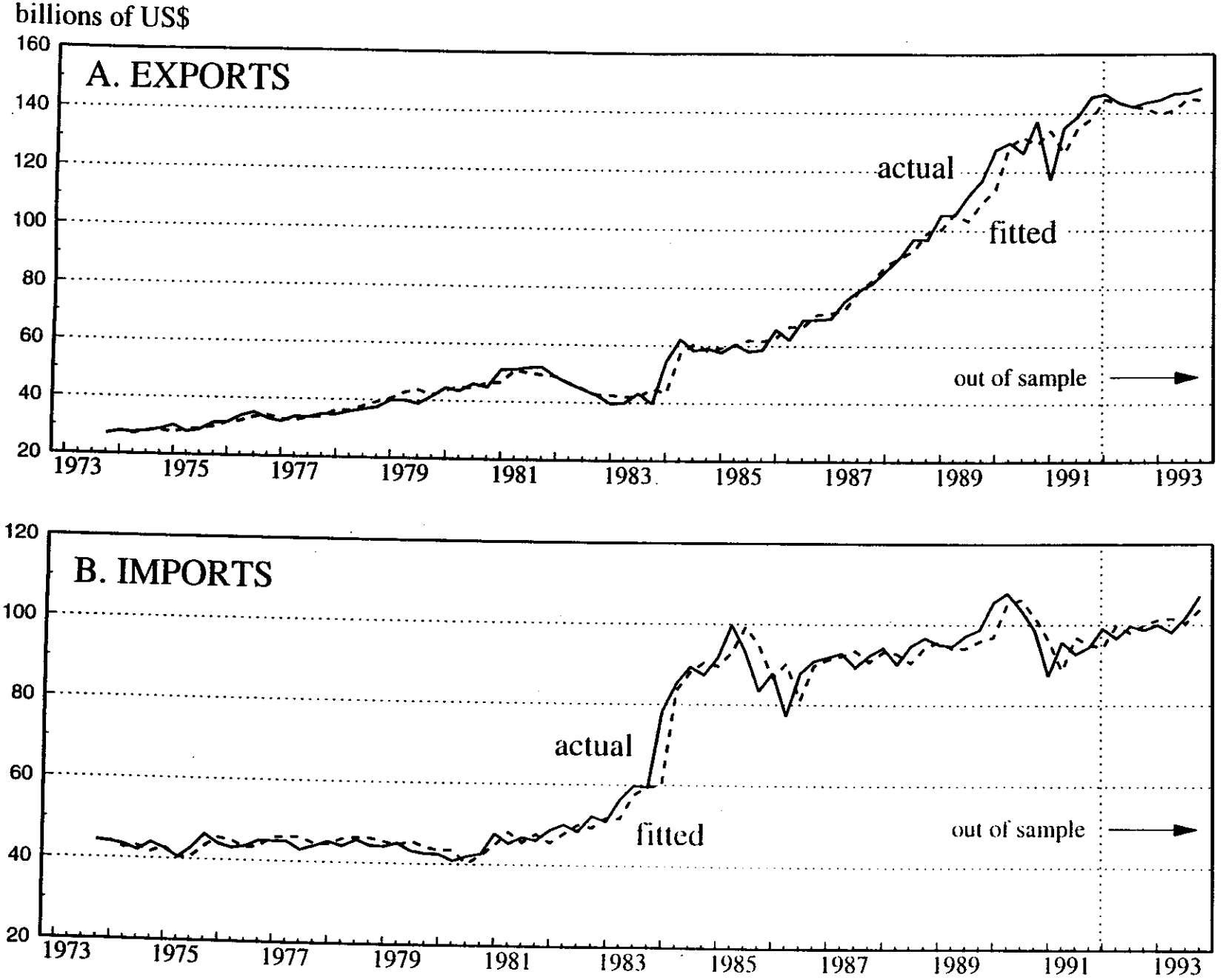
# CHART 1: U.S. GOODS AND SERVICES TRADE BALANCE



# Chart 2: U.S. SERVICE ACCOUNT BY COMPONENT



# Chart 3: Actual and Fitted Tourism Exports and Imports



# Chart 4: Actual and Fitted OPS&RLF Exports and Imports