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EXPLAINING THE PATTERN OF TRADE IN PRODUCER SERVICES

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In this paper, I examine the pattern of U.S. trade in producer services, emphasizing the significance of two-way trade in services. Evidence is presented that the pattern of trade in producer services can be explained by some of the same factors used to explain the pattern of trade in goods. Viewed in the context of the recent literature on increasing returns and trade in services, the results presented here suggest gains from liberalization due to increased product differentiation and global specialization. [F14, F10]

1. INTRODUCTION

In this paper, I examine the pattern of U.S. trade in producer services, emphasizing the significance of two-way trade in services. The policy debate regarding extension of the GATT to cover trade in services has emphasized factor endowment-based arguments for trade liberalization. However, actual trade patterns are characterized by substantial two-way trade. Evidence is presented that the prevalence of two-way trade and the volume of trade in services can be explained, in part, by the same factors often used to explain two-way trade in goods. Relative country size and per-capita income levels, as well as geographic and cultural measures of country similarity such as common language variables, all have some role to play. These results suggest that the potential gains from liberalization of trade in services may be related to product differentiation and global specialization of production.

The recent literature on trade in services suggests several determinants for the pattern of trade in services. Deardorff (1985) and Francois (1990a) emphasize the traditional argument of factor intensity differences as a basis for trade, while Markusen (1989) and Francois (1990b, 1990c) offer explanations grounded in the imperfect competition and product differentiation literature. Markusen's paper examines trade in specialized intermediate services, in the spirit of Ethier's (1982) model of international returns to scale. Francois emphasizes the role of services in the coordination and control of specialized, globally integrated production processes. Rugman (1987) has also argued that producer or intermediate services are a critical aspect of internal transactions within multinationals, serving in part to meet intra-firm

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transaction costs like the coordination activities emphasized by Francois. LDC concerns regarding liberalization of trade in services are often expressed in terms of scale economies and the perceived scale advantages of more established OECD service providers. However, as service sectors evolve from national to global industries, many of the justifications of LDCs to subsidize or otherwise protect increasing returns sectors evaporate (see Francois 1992). Finally, Hoekman and Karsenty (1991) find that the poorer developing countries are more likely to be specialized in labor-intensive commercial services, implying revealed comparative advantage for such countries in certain service categories.

In this paper I rely on data on U.S. bilateral service flows which have only recently been made available. These data have several advantages over that utilized in previous studies of trade in services. Prior to current efforts to revise statistics on the service sector, official data available on international service flows have in general been highly aggregated. Hence, Sapir and Lutz (1980, 1981) were limited by necessity to analysis of trade in shipping, transport, insurance, and a basket "other" services category. The sectors typically lumped into such basket categories are some of those most likely to benefit from a liberalized services regime under the GATT.

The remainder of the paper is organized as follows. Section 2 details the data and discusses overall U.S. trade patterns, highlighting the significance of two-way trade in services. Section 3 then examines the empirical relationship of U.S. bi-lateral trade to measures of country similarity such as relative income levels and relative country size. To the extent that services trade is driven by factors similar to those used to explain two-way trade in goods, these particular country characteristics are expected to be important explanatory variables. The paper is summarized and conclusions are made in Section 4.

2. THE DATA

The data cover U.S. exports and imports with 28 countries in 1986 for eleven composite service sectors, and are drawn from the Bureau of Economic Analysis' benchmark survey.¹ The BEA benchmark survey for trade in services was conducted for 1986 by the Special Surveys Branch of the International Investment Division of BEA, and represented a response to U.S. initiatives related to extension of the GATT to cover trade in services (see Wichard, 1988 and Ascher and Wichard, 1989). The benchmark survey will be conducted every five years. Revisions to this data were published in June 1989 and September 1990 (see Krueger 1989 and DiLullo and Wichard, 1990).

The benchmark survey covers those services bought or sold by businesses.

¹The countries in the sample are: Canada; Belgium; France; West Germany; Italy; the Netherlands; Spain; the United Kingdom; Norway; Sweden; Switzerland; Austria; New Zealand; South Africa; Argentina; Brazil; Mexico; Venezuela; Egypt; Israel; Saudi Arabia; Hong Kong; India; Indonesia; Malaysia; the Philippines; Singapore; and South Korea.

However, the survey does not cover transportation, banking, or other financial services. In addition, because the survey covers inter-firm transactions, it does not include transactions between affiliates. Transactions with affiliates are covered by direct investment surveys. However, the data on transaction with affiliates are only reported in a highly aggregate form. The services sectors covered by the data used here are: telecommunications; advertising; computers and data processing services; database and information services; research, development, and testing services; management, consulting, and public relations; legal services; industrial engineering; industrial maintenance, repair, training, and installation; royalties and licensing fees; and other services. The last category is a composite that includes agricultural services, management of health care facilities, and accounting, auditing, and bookkeeping services.

The data have a number of limitations. All transactions relate to trade with the United States. In addition, the BEA data contain a number of holes due to suppression of confidential business information, due to rounding of trade levels less than \$500,000, and due to lack of data. As a result, the coverage of the data varies by service category, with the data for computer and data processing and database and information services having the most data points.

3. EMPIRICAL RESULTS

One of the dominant features of world trade is the importance of two-way trade between similar industrialized countries. The modern theories of international trade provide theoretical underpinnings for this stylized fact, predicting that two-way trade in similar products tends to take place between similar countries (see Dixit and Norman 1980, Helpman and Krugman 1985, Lancaster 1981, and Markusen, 1986). For countries that differ significantly in terms of factor endowments and income levels, trade will instead be driven by the traditional determinants of comparative advantage.² In this context, Balassa and Bauwens (1987, 1988) have examined empirically the importance of country and industry characteristics in explaining two-way trade in goods. In this paper I perform a similar exercise for two-way trade in services.

A. Aggregate Trade Patterns

U.S. trade in services is characterized by a high degree of two-way trade. To illustrate the importance of two-way trade, Table 1 presents two-way trade indexes for total U.S. trade in 18 non-factor service categories and temporary labor services, based on the detailed BEA data discussed above, as well as published aggregate BEA data for certain other non-factor service categories and for temporary labor. Formally,

²For example, see the discussion in Chapters 7 and 8 of Helpman and Krugman. Similar results can be obtained for trade in specialized intermediates (see Ethier 1982).

trade-weighted indexes are calculated as follows:

$$INDEX_i = 100 \times \left[1 - \frac{(X_i / X) - (M_i / M)}{(X_i / X) + (M_i / M)} \right] \quad (1)$$

where X_i represents the value of exports of services in category i , M_i represents the value of imports of services in category i , X represents the total value of exports of services, and M represents the total value of imports of services.

The indexes presented in the table for the detailed business service categories are for trade with unaffiliated foreigners, and are calculated as in Balassa and Bauwens (1987). In addition to trade between unaffiliated firms, an index is also presented for aggregate services trade between the affiliates of multinationals. While more detailed data are generally available only for trade between free-standing service providers and their customers, trade within multinationals in aggregate is characterized by the same pattern of two-way trade as is trade between unaffiliated agents. From the Table, it can be seen that several of the service categories, including accounting, advertising, insurance, and telecommunications, are characterized by a high degree of two-way trade.

Table 1. Two-Way Trade as a Percent of Total U.S. Services Trade:1986
(Trade-Weighted Two-Way Trade Indexes)

Accounting	75.44
Advertising	98.96
AEC	69.17
Computer & Data Processing	7.48
Data Base & Information	36.30
Education	27.35
Film Rentals	23.49
Financial Services	78.10
Installation & Maintenance	72.82
Insurance	87.36
Legal Services	66.05
Management & Consulting	37.98
Medical Services	0.00
Multinationals	67.34
Other Intermediates	75.17
Royalties & Licenses	23.49
R & D and Laboratory Testing	48.74
Telecommunications	63.93
Temporary Labor	18.91

B. Bilateral Trade

To assess two-way trade, trade-weighted two-way trade indexes are first calculated on a country basis as follows:

$$INDEX_{ij} = \left[1 - \frac{(X_{ij} / X_j) - (M_{ij} / M_j)}{(X_{ij} / X_j) + (M_{ij} / M_j)} \right] \quad (2)$$

where X_{ij} represents the value of exports to country j in service category i , M_{ij} represents the value of imports from country j in service category i , X_j represents the total value of service exports to country j , and M_j represents the total value of service imports from country j . The variable defined by equation (2) represents an index that varies between 0 and 1. For estimation purposes, a logistic transformation is therefore specified, where

$$INDEX_{ij} = \frac{1}{1 + e^{G_i Z_j + \varepsilon_{ij}}} \quad (3)$$

with ε_{ij} representing the error term. The term Z_j represents trading-partner specific exogenous variables, and G_i represents the relevant set of parameters applied to those variables. Taking logs yields

$$\theta_{ij} = \log \left(\frac{1}{INDEX_{ij}} - 1 \right) = G_i Z_j + \varepsilon_{ij} \quad (4)$$

Based on the hypothesis that trade between similar countries (in terms of factor endowments, income levels, etc.) tends to be dominated by two-way trade within service categories, it is expected that the relative importance of two-way trade between the U.S. and individual countries, as measured by the index defined in equation (2), will be positively correlated with income levels (relative to those of the United States), geographic proximity, and a common language. To formally test for this relationship, I specify the following specific form for equation (4):

$$\theta_{ij} = \gamma_0 + \gamma_1 PCY_j + \gamma_2 PROXIMITY_j + \gamma_3 LANGUAGE_j \quad (5)$$

where PCY_j is per-capita income in country j , $Proximity_j$ is a dummy variable for having a common border with the U.S. (for Canada and Mexico), and $Language_j$ is a dummy variable for English language countries. The first row of Table 2 presents EGLS results for equation (5).³ Both γ_1 and γ_2 are significant and have the expected

³Given the logistic specification, zero observations imply that the error term was arbitrarily large such that θ_{ij} could not be discernably measured. To allow for these zero observations,

sign. Somewhat surprisingly, the common border variable is significant at the 0.1 level, with the "wrong" sign (in the sense that it violates my own stated priors). Within categories, U.S. trade in services is characterized by a greater degree of two-way trade, the more similar the trading partner as measured by per-capita income levels.

In addition to the extent of two-way trade, relatively recent two-way trade models, when combined with a more traditional factor-intensity framework, also generate theoretical predictions regarding the level of trade that are consistent with empirical gravity models of trade. In particular, within such frameworks, the level of bilateral trade in differentiated goods and services is a function of relative per-capita income levels and the relative size of the economies involved. Again, other measures of similarity (such as a common language or border) may also be important. When this framework is expanded to include trade in differentiated intermediate products and globalization of production, trade in intermediate services may also be explained, in part, by such factors.

The last two rows of Table 2 present an analysis of the level of trade, based on a stylized gravity model. Formally, I examine the level of trade by specifying the gravity equation

$$T_{ij} = \gamma_0 + \gamma_1 PCY_j + \gamma_2 PROXIMITY_j + \gamma_3 LANGUAGE_j + \gamma_4 POP_j \quad (6)$$

where T_{ij} represents the value of trade (either exports or imports) in services in category i with country j (in log form), POP_j is the population of country j (again in log form), and all other variables are the same as defined above.⁴ Population has been added as a proxy for country size.

The second and third row of Table 2 present OLS results for equation (6). Both country size and income levels are significant determinants of the level of trade in services. In fact, almost half of the sample variation in trade levels can be explained through this simple gravity model. The estimate of the parameter γ_1 (per-capita income) is significantly greater than zero at the .05 level for both the imports and exports specification of the equation. Strong positive results are obtained for the relative country size variable, with the estimate of γ_4 significantly greater than zero at

sample zeros are set to a positive number very close to zero (1*E-20). In principal, while $INDEX_{ij}$ is bounded by zero and one, and cannot have a normal distribution, this would be consistent with a normally distributed random error term in equations (3) and (4) (see Kmenta, Chapter 11). However, a number of diagnostic tests, including the park and Glejser tests, point toward a strong correlation between the error term and the exogenous variables in equations (4) and (5). Given the apparent relationship between the exogenous variables and the error term, an EGLS estimator has been employed. See Judge *et al* (1985, Chapter 11, part 2.3).

⁴The BEA data contain "zero" observations for exports and imports that actually correspond to positive values of less than \$500,000. These non-zero observations have been included in the regressions as 1*E-20.

the .05 level for both specifications. However, the results for the common border and language variables are somewhat mixed, with the expected sign in three of four cases, but only two of these being significant. Overall, as in the assessment of two-way trade indexes, the level of bi-lateral trade in services can also be explained, in large part, by the same basic variables cited in the empirical literature on trade in goods.

Table 2

	Per-Capita Income		Language		Proximity		Population		Adjusted R-Squared		
	γ_1	γ_2	γ_3	γ_4	γ_5	γ_6	γ_7	γ_8	γ_9	γ_{10}	
Two-Way Trade Index	γ_1	-1.15 (-3.91)	-8.81 (-3.81)	3.10 (1.68)						0.71	207
	F (Pr > F)	15.25 (0.00)	14.54 (0.00)	2.82 (0.09)							
Exports	γ_1	3.98 (7.45)	0.18 (0.12)	6.23 (2.77)	2.88 (7.68)					0.41	293
	F (Pr > F)	55.54 (0.00)	0.02 (0.90)	7.65 (0.01)	59.03 (0.00)						
Imports	γ_1	5.79 (10.78)	4.49 (3.09)	-1.21 (0.60)	3.79 (10.54)					0.50	289
	F (Pr > F)	116.18 (0.00)	9.56 (0.00)	0.35 (0.55)	111.09 (0.00)						

Note: t-ratios are given in parentheses under parameter values. F-statistics are based on the partial sums of squares, with probability of not rejecting the hypothesis $H_0: \gamma_i = 0$ given in parentheses.

4. SUMMARY AND CONCLUSIONS

In this paper, I have examined the pattern of U.S. trade in producer services. U.S. trade in intermediate or producer services, like trade in goods, is characterized by a high degree of two-way trade. At the bilateral level, this pattern is observed for both industrial and developing country trading partners. The relative importance of two-way trade at the bilateral level and the level of bi-lateral trade have been shown to depend on many of the same factors frequently cited as determinants of two-way trade in differentiated manufactured products, including relative country size and the level of income.

The role of two-way trade at an intermediate input level suggests that the gains from trade in producer service sectors may be related to returns due to specialization. For this reason, the results presented here have some relevance for the policy debate on extending the GATT to cover trade in services. Much of the early debate focused, almost exclusively, on factor intensity-based arguments for trade liberalization in

these sectors. (See Gibbs, 1985 and Hindley, 1988). The results of this paper suggest that differentiation of intermediates goods and services and international returns to scale also are likely to be the basis for gains from such liberalization.⁵

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⁵While this paper has been focused on the pattern of trade in services, narrowly defined, a somewhat different question, the relationship of such service flows to trade in goods, also merits empirical examination. Boatman (1992) offers important evidence in this regard. As industries become regionally or globally integrated, trade in subcomponents and the coordination of geographically disparate production stages hinges on information flows and related coordination activities. For this reason, it is likely that LDC restrictions on cross border service transactions limit their ability to participate in globally integrated industries. Such restrictions may limit the competitive strengths of such sectors in industrial countries as well. On a national level, information-related infrastructure may also be important, particularly in LDCs.

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