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# IMPACT OF TRADE IN GOODS ON TRADE IN SERVICES: A COUNTRY LEVEL PANEL DATA ANALYSIS

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**Abstract**

*Economists in general paid less attention towards international trade in services on the presumption that services are non tradable and hence do not matter in international trade. However, in recent years, international trade in services has got lot of attention from the researchers. The international trade in services has flourished in recent years outstripping the growth of trade in goods. The present paper tries to analyse the impact of trade in goods, along with some other factors, on trade in services of different countries in different income groups. The study uses panel data for a period of 19 years from 1985 to 2003. The analysis of data has been undertaken using fixed effect and random effect modeling framework. The major findings of the study are: i) trade in goods determines the trade in services, ii)FDI is not an important factor in determining trade in services, iii) the impact of trade in goods on trade in services relatively high for developed countries as compared to developing countries.*

## I. INTRODUCTION

Recent years have witnessed a rapid growth of international trade in a category that had been considered largely nontradable i.e., the services. Services are being exchanged across national boundaries in large volumes, with growth rates exceeding those for trade in merchandise. The range of traded service activities is wide, ranging from software to health to telecommunications to construction and engineering, among others. Trade in services today is an integral part of the total developmental effort and national growth of many economies. Due to the importance of the service sector and the emphasis placed on trade in services during the Uruguay round of trade negotiations, issues related to international trade in services has got lot of attention from the researchers, in recent years.

It would seem that economist have paid less attention to services in the context of international trade. This neglect has been due to the following reasons. Firstly, there is a presumption that services can be treated in exactly the same manner as goods so that

the existing theories of international trade are perfectly adequate. Secondly, there is a presumption that services are non-traded and hence do not matter in international trade.

## II. BACKGROUND OF THE STUDY

International trade in services can be divided into four categories, namely, (i) those in which the producer moves to consumer, (ii) those in which consumer moves to producer, (iii) those in which either producer or consumer moves to other, and (iv) those in which neither producer nor consumer moves to each other. In first three categories, physical proximity of the producer and consumer is essential, if the international service transaction has to take place. The above classification is in conformity with the characteristics of the services traded in those categories (Sampson and Snape, 1985). Though there are four categories of trade in services, broadly, the trade in services may be defined as international transactions in services between the residents of one country and the residents of another country, irrespective of where the transaction takes place (Nayyar, 1995).

The WTO secretariat has divided all services into following 12 sectors. They are business services (including professional and computer services), communication services, construction and engineering services, distribution services (e.g. commission agents, wholesale & retail trade and franchising), education service, environment services, finance (including insurance & banking) services, health services, tourism & travel services, recreation, cultural & sporting services, transportation services, other services not included elsewhere (Goyal, 2000).

International trade in services is critical to economic growth. It creates significant new job opportunities, stimulates gains in productivity and provides consumer benefits. It is essential to and inseparable from international trade in goods. International trade in traditional services like shipping, aviation, communications, banking and insurance have always been important to trade in goods and in fact trade in goods could not take place without these services. Where the flow of services is hampered trade in goods is hampered too and where restrictions increase the cost of providing these services, trade in goods is reduced. Trade in services is becoming a vital factor in the world economy and there is an increasing, even an urgent need for public policies to take this development into account.

It is almost impossible to conduct trade without the help of service industries. Trade must be financed, cargo insured and goods transported, distributed and marketed. All these involve inputs from service industries. Such services however can also be traded i.e. provided to a resident of a foreign country without a link to goods. For example (i) Banks and huge companies transact huge volumes of business every day, (ii) Managing financial resources and providing insurance coverage, without reference to physical products, (iii) Planes, ships and railways transport people as well as merchandise. These activities are part of growing segment of world trade, which is quaintly described as 'invisible trade' (Schott, 1983). Though, trade in service could take place independently, there is every reason to think that the trade in goods could promote trade in services.

Many service industries also have become more international in scope as the economic advantages of specialization and greater economies of scale have become

apparent at an international level. Trade in services provides the same mutual economic gains made possible by trade in goods. It permits international specialization on the basis of comparative advantage. It increases efficiency of domestic industries through increased competition and it enriches consumer choice by widening the range of available services. International trade in services is also essential for the functioning of international business of multinational enterprises, which are important agencies of development in world economy. The unhampered international movement of services is thus critical to the operation of multinational enterprises (Brock, 1982). The growth of MNCs could also to establish the link between the trade in good and trade in services.

It is in this context the present study is undertaken. The following research studies have provided the base for the present study.

Fieleke (1995) conducted a study on US bilateral trade with its 17 major trade partners using simple regression log-log equation model. As expected, the study showed that trade in services clearly rises with rise in trade in merchandise. However, there was no enough evidence to accept the hypothesis that trade in services is positively influenced by use of common language (English) between the trading nations.

The study conducted by Deardorff (2001) examines the special role that trade liberalization in service industries can play in stimulating not only trade in services itself, but also in enhancing gains from trade in goods. International trade in goods requires inputs from several services industries such as transportation, insurance, and finance in order to complete and facilitate international transactions. Restrictions on the ability of national service providers to provide these services across borders and within foreign countries create additional costs and barriers to international trade above those that would arise in otherwise comparable intra-national exchange. As a result, trade liberalization in services can yield benefits, by facilitating trade in goods, which are larger than one might expect from analysis of the services trade alone. The study also shows that, trade liberalization in services can also stimulate fragmentation of production of both goods and services, thus increasing international trade and the gains from trade even further.

Blyde and Sinyavskaya (2007) opines that liberalization of trade in services could impact international trade in goods. International trade in goods requires inputs from several service industries. They admit that the liberalization of trade in goods could also impact the flow of trade in services. However, their study focused on the causality that trade in services could impact on trade in goods on the ground that trade in goods has been liberalized over the last several decades with only few restrictions remaining in place. Trade in services, on the other hand has been highly protected and the process of removing its barriers world wide has started only recently. The study by Blyde and Sinyavskaya (2007) empirically verified to what extend international trade in goods depends on international provision of services. The study found empirical evidence supporting the notion that a liberalization of trade in services can be beneficial for international trade in goods.

The present study hypothesizes that the trade in goods impact upon trade in services. The basic argument behind the above hypothesis is that the trade in goods requires lot of service inputs. Therefore, the growth of trade in goods would result in the growth of

trade in services. Increase in trade in goods would pull the trade in services. The objective of the study is to measure the extend of impact of trade in goods and FDI on trade in services of countries in different income groups. The study uses country level panel data and employs fixed and random effects estimation procedure.

## III. METHODOLOGICAL FRAMEWORK

### 1. The Data and Variables

The study uses country level panel data for different income groups for a period of 19 years i.e. from 1985 to 2003. The countries are divided in to four income groups, viz, high income countries, upper middle income countries, lower middle income countries and low income countries. The classification of the countries in different income groups is based on the classification of World Bank in their annual reports. The data has been collected from WTO Annual Reports, World Bank Development Report, IMF World Economic Outlook, UNCTAD Statistical Yearbook and Internet sites of WTO, World Bank, IMF and UNCTAD. The variables included in the study are: (i) trade in services, (ii) trade in goods, and, (iii) foreign direct investment inflows. The variables are expressed in million dollars.

### 2. The Regression Model

The panel data regression model based on OLS estimate is expressed in following way

$$Y_{it} = \beta_1 + \beta_2 X_{1it} + \beta_3 X_{2it} + U_{it}$$
$$i = 1, 2 \ldots\ldots\ldots N$$
$$t = 1, 2, \ldots\ldots\ldots N$$

where, $i$ stands for $i^{th}$ cross-sectional unit and $t$ for the $t^{th}$ time period. In this type of estimation the intercept term ($\beta_1$) is assumed to be constant across the cross sectional units. Panel data may have group effects, time effects or both. These effects are either fixed effects or random effects. A fixed effect model assumes differences in intercepts across groups or time periods, where as random effect model explores differences in error variances(Gujarati, 2003, Wooldridge, 2000)

#### *(i) Fixed Effects Model*

The term 'fixed effects' are due to the fact that, although intercept may differ across individuals, each individuals intercept does not vary over time, i.e, it is time invariant.

$$Y_{it} = \beta_{1i} + \beta_2 X_{1it} + \beta_3 X_{2it} + U_{it}$$

Subscript $i$ on the intercept term suggest that the intercepts of the individual units (country or firm) may be different for different individual units due to certain special features. To estimate the fixed effects model, we can use dummy variables. Fixed effects model assumes that individual specific factors are correlated with regressors. In fixed effects model with individual specific intercept it is possible to capture unobservable country specific heterogeneity.

### *(ii) Random Effect Model*

In random effects model, instead of treating $\beta_{1i}$ as fixed, we assume that it is a random variable with a mean value $\beta_1$. And the intercept value of an individual unit can be expressed as

$\beta_{1i} = \beta_1 + \varepsilon_i$, where $\varepsilon_i$ is a random error term.

Therefore, we obtain random effects model

$$Y_{it} = \beta_1 + \beta_2 X_{1it} + \beta_3 X_{2it} + \varepsilon_i + U_{it}$$
$$= \beta_1 + \beta_2 X_{1it} + \beta_3 X_{2it} + w_{it}$$
$$w_{it} = \varepsilon_i + U_{it}$$

Here $\varepsilon_i$ is the cross section or individual specific error component and Uit as the combined time series and cross section error component.

The Random Effects Model or Error Components Model assumes that the individual specific factors are uncorrelated with the regressor. The rationale behind using this model is that the lack of knowledge about the true model should be expressed through the disturbance term $u_{it}$. In this model, the individual differences in the intercept values of each country are reflected in the error term. The error term in random effect model is also called composite error term, as it comprises of two parts. The one representing cross section or individual-specific error component and the other is the combined time series and cross section error component. The country specific error component is not directly observable, and is also known as unobservable variable. A random effect model is estimated by GLS, where the variance structure is known and by feasible GLS (FGLS) where the variance is unknown.

The fixed effects and random effects models may be classified in to one way and two way effects models.

### *(iii) One Way and Two-way Effects Models*

A one way effect model includes only one set of dummy variables (eg. country). Two way model considers two sets of dummy variables (eg. country and year). One way fixed group model examines group differences in intercepts. One way fixed time effects model investigates how time affects the intercept, using dummy variables. Two way fixed effect model considers both group and time effects. Similarly there is one way random effects model and two way random effects model.

In general, group effects model create dummies using grouping variables (eg. country). If only grouping variable is considered it is called one way fixed or random group effects model. Two way models have two sets of dummy variables one for a grouping variable and the other for a time variable.

### *(iv) Hausman's Specification (H) Test*

As one way and two way effects model can be analysed with the help of fixed and random effect estimates the task of selection of fixed effect estimate over random effect estimates is done with the help of Hausman's Specification Test. If the effects are uncorrelated

with the explanatory variables, then the random effect estimator is consistent and efficient. If the effects are correlated with the explanatory variables, the fixed effects estimator is consistent and efficient but the random effect is now inconsistent.

Hausman test is defined as

$$H = \frac{[\beta_{RE} - \beta_{FE}]^2}{\text{var}(\beta_{FE}) - \text{var}(\beta_{RE})} \sim \chi_1^2$$

The Hausman test ($H$) statistics will be distributed asymptotically as $\chi^2$ with $K$ degrees of freedom under the null hypothesis that the random effects estimator is correct. If computed H-value is less than the table ($\chi^2$) value for appropriate degrees of freedom and level of significance, then the null hypothesis (of individual effects are uncorrelated with other regressors) cannot be rejected. i.e. accepted. In this case, the Random Effect model is relevant (not the Fixed Effect Model). Larger H value favors for Fixed effect model and lower value for random effect model (Dinardo and Johnston, 1997).

### *(v) Breuch and Pagan's Lagrangian Multiplier Test*

This test help to choose between OLS and Random Effect estimates. It is based on the OLS residuals. The null hypothesis suggests that OLS estimator is consistent. Rejection of null hypothesis suggests the use of random effect estimates.

- Null Hypothesis: $s^2v = 0$
- Alternate Hypothesis: $s^2v \neq 0$
- Let e'e be the RSS from.OLS
- LMc = $[nT/(2(T-1)] = [(T^2e'e/e'e)-1]^2 \sim c^2(1)$

If LMc > LMT, reject the null hypothesis and choose the random effect model (Dinardo and Johnston, 1997).

### *(vi) Analytical Design*

For the purpose of analysis, the study uses log-log Multiple Regression models. It is depicted as

Model: Log $TS = \beta_0 + \beta_1 \log TG + \beta_2 \log FDI + u_t$

Where: $TS$ = Trade in services

$TG$ = Trade in goods

$FDI$ = Foreign Direct Investment Inflows

In the model, independent variables are log of trade in goods and log of foreign direct investment. The β values are expected to be positive with respect to all independent variables in the models.

The above given basic econometrics model is expressed separately in the form of pooled data model, one way effect and two way effect models as follows.

Pooled Data Model

$$\text{Model I: Log } TS_{it} = \beta_0 + \beta_1 \log TG_{it} + \beta_2 \log FDI_{it} + U_{it}$$

One Way Effect Model

$$\text{Model II: Log } TS_{it} = \beta_i + \beta_1 \log TG_{it} + \beta_2 \log FDI_{it} + U_{it}$$

Two Way Effect Model

$$\text{Model III: Log } TS_{it} = \beta_{it} + \beta_1 \log TG_{it} + \beta_2 \log FDI_{it} + U_{it}$$

## IV. RESULTS AND DISCUSSION

The results of Model under estimated are given in tables (1), (2) and (3) for OLS estimates, one way effect and two way effect estimates. The result in Table (1) shows that for all income categories, trade in goods determines the Trade in Services as all the regression coefficients pertaining to the variable Trade in Goods (TG) are statistically significant at 1% level. The effect of 1% change in trade in goods on trade in services varied between 0.94% in the case of all countries to 0.78% in the case of upper middle income countries. The value of the coefficient does not vary much revealing that the effect of trade in goods on trade in services is not much different for different income categories.

**Table 1**
**Regression Results of Model-I: OLS Estimate**

| *Countries* | *Constant* | *Coefficient (TG)* | *Coefficient (FDI)* | *F* | $R^2$ |
|---|---|---|---|---|---|
| All Countries | -0.73 | 0.94 | 0.01 | 15816.56 | 0.95 |
| | (-12.51) | (124.46)*** | (1.20) | | |
| Developed Countries | - 0.20 | 0.89 | 0.02 | 3181.79 | 0.93 |
| | (-1.36) | (60.77)*** | (3.36)*** | | |
| Developing Countries | -0.34 | 0.88 | 0.01 | 5504.80 | 0.91 |
| | (-4.07) | (80.92)*** | (1.03) | | |
| High Income Countries | - 0.36 | 0.91 | 0.02 | 3389.06 | 0.94 |
| | (-2.48) | (62.96)*** | (2.97)** | | |
| Upper Middle Income Countries | 0.55 | 0.78 | 0.02 | 1165.84 | 0.88 |
| | (2.95)*** | (35.80)*** | (2.36)*** | | |
| Lower Middle Income Countries | 0.06 | 0.86 | 0.003 | 1029.63 | 0.85 |
| | (0.32) | (32.93)*** | (0.25) | | |
| Low Income Countries | -0.65 | 0.92 | -0.003 | 2037.59 | 0.90 |
| | (5.50) | (55.55)*** | (0.426) | | |

Values in parenthesis are t-values: ***, **, * imply statistical significance at 1%, 5% and 10% level respectively

With regards to FDI, only three income categories, namely, developed countries, high income countries, upper middle income countries showed statistically significant relationship with trade in services. Even in the above three cases, the value of regression coefficient is abysmally low at 0.02%. The result therefore shows that FDI is not an important factor that determines the trade in services. This may be due to the fact that FDI has started increasing in most of the countries only in recent years. For all the above groups the models exhibit high $R^2$ and F statistics value showing a good fit and

overall significance of the model. In general, the result show that for all income categories, trade in goods is an important factor in determining trade in services. Foreign direct investment influences only developed, high and upper middle-income countries. However, its influence is very little.

The table (2) shows the results of the one-way effect model. Based on LM test and H-test, models on developed countries and high income countries favoured the fixed effects estimation procedure. For all the remaining categories, the random effects models have been found suitable.

**Table 2**
**Regression Results of one way Effect Model-II: Fixed/Random Effect Estimates**

| *Countries* | *Constant* | *Coefficient (TG)* | *Coefficient (FDI)* | *F* | *H* | *LM* |
|---|---|---|---|---|---|---|
| All Countries | -0.67 | 0.93 | 0.01 | 55.67 | 0.34 | 7660.75 |
| | (-5.42) | (71.53)*** | (3.73)*** | | | |
| Developed Countries | | 1.14 | 0.001 | 45.32 | 26.10 | 1497.89 |
| | | (49.51)*** | (0.16) | | | |
| Developing Countries | -0.15 | 0.86 | 0.01 | 57.15 | 0.63 | 5470.92 |
| | (-1.01) | (50.81)*** | (3.70)*** | | | |
| High Income Countries | | 1.11 | 0.01 | 44.49 | 16.96 | 1465.02 |
| | | (47.39)*** | (1.03) | | | |
| Upper Middle | -0.32 | 0.88 | 0.02 | 49.43 | 1.99 | 1410.72 |
| Income Countries | (-1.02) | (27.79)*** | (2.61)*** | | | |
| Lower Middle | -0.30 | 0.89 | 0.01 | 61.09 | 0.63 | 1806.22 |
| Income Countries | (-1.14) | (31.23)*** | (1.56) | | | |
| Low Income Countries | -0.06 | 0.83 | 0.01 | 50.30 | 2.45 | 2050.40 |
| | (-0.23) | (27.20)*** | (1.56) | | | |

Values in parenthesis are t-values: ***, **, * imply statistical significance at 1%, 5% and 10% level respectively.

The results of one way effect model is somewhat similar to the result of the OLS model. The trade in goods determines trade in services for all categories of income groups, as the regression coefficients are statistically significant. The result showed that in the case of developed countries 1% increase in trade in goods leads to 1.14% increase in trade in services. The FDI determines trade in services only for three categories, that too with very low regression coefficient.

The table (3) shows the result of two way effect model. LM tests and H tests are used to decide whether to apply fixed effects model or random effect model. The tests revealed that except for the category of high income countries and lower middle income countries, the fixed effects model is best suited. For high income countries and lower middle income countries the study used the random effects model. The results of the model are not much different from the OLS models and one way effect models.

In this modeling framework also trade in goods is a statistically significant variable that determines the trade in services for all categories of countries. Two way effect model shows slight difference in the impact of trade in goods on trade in services between developed countries and developing countries. In the case of developed countries 1%

**Table 3**
**Regression Results of Two way Effect Model-III: Fixed/Random Effect Estimates**

| *Countries* | *Constant* | *Coefficient (TG)* | *Coefficient (FDI)* | *F* | *H* | *LM* |
|---|---|---|---|---|---|---|
| All Countries | 0.54 (2.29)*** | 0.80 (32.13)*** | 0.01 (2.47)*** | 6.41 | 23.76 | 7661.04 |
| Developed Countries | –1.94 (–2.73) | 1.05 (17.48)*** | –0.00 (–0.04) | 1.78 | 9.02 | 1509.53 |
| Developing Countries | 0.68 (2.78)*** | 0.76 (27.11)*** | 0.01 (2.79)*** | 4.31 | 12.10 | 5471.18 |
| High Income Countries | –1.99 (7.18) | 1.05 (43.52)*** | 0.01 (1.67)* | 24.95 | 4.13 | 1468.22 |
| Upper Middle Income Countries | 2.35 (3.63)*** | 0.61 (9.35)*** | 0.01 (0.98) | 1.90 | 10.46 | 1413.67 |
| Lower Middle Income Countries | -0.13 (-0.41) | 0.87 (25.80)*** | 0.01 (1.45) | 2.46 | 2.00 | 1807.65 |
| Low Income Countries | 0.72 (2.08)** | 0.73 (15.98)*** | 0.01 (1.21) | 1.81 | 7.88 | 2054.07 |

Values in parenthesis are t-values: ***, **, * imply statistical significance at 1%, 5% and 10% level respectively.

increase in trade in goods leads to 1.05% increase in trade in services, whereas in the case of developing countries, the impact is only 0.76% increase. Among the other income categories, high income categories showed higher coefficient. The result indicates that the relationship between trade in goods and trade in services is stronger among high income countries as compared to the low income countries.

The results of the above analysis of the Models for different group of countries suggest that in all the cases a two effect model is better suited to analyse the present data as compared to one way effect or simple classical regression model based on Ordinary Least Square estimates. Models tried to study the influence of two variables namely trade in goods and foreign direct investment on trade in services for different income groups. The study suggest that the trade in goods have positively influenced the trade in services of all the countries, developed and developing group of countries and also the four different income groups, though the proportion of influence varies for different income groups. As far as group of developed countries which comprises mainly of all the high income countries the proportion of change is more than 1% (elastic), whereas for developing and other income countries are concerned the proportion is less than 1% (inelastic) but quite high. The other factor, which is foreign direct investment, have not shown uniform pattern in influencing the trade in services. The analysis thus suggest that it is trade in goods which is more important when compared to foreign direct investment in increasing trade in services. Thus, countries should focus on increasing their trade in goods so as to increase their trade in services at a faster pace. One of the reason why foreign direct investment is not a important determinant of trade in services can be that the inflow of foreign direct investment in most of the countries have been very low prior to 1990, even below one million in most of the cases, it has started increasing only after the 1990 but the pace of increase is not very fast. The study shows a strong relationship between trade in goods and trade in services for all the income groups.

## V. CONCLUSION

The model estimation has been done using panel data for a period of 19 years from 1985-2003 and the results of the Model that analyzed the relationship between trade in services as dependent variable and trade in goods and foreign direct investment as independent variable revealed that it is the trade in goods which is an important determinant of trade in services across all the income groups and the extent of influence on trade in services by trade in goods is higher incase of developed and high income groups. The positive influence of foreign direct investment on trade in services is seen only in the case of developing countries but that too is very marginal.

The selection and application of fixed effect or random effect techniques over OLS estimates shows that the country specific effects did affect trade in services and also it varied over time.

It may be concluded from the panel data regression analysis on different income groups that (i) the trade in goods is a major determinant of trade in services, (ii) the impact of trade in goods on trade in services is relatively high for developed countries and high income group as compared to developing countries and low income groups, iii) FDI determines the trade in services of only the developing countries and the impact is very less. In general, the FDI is not an important factor that determines the trade in services.

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