Research Article

Estimation of Income and Price Elasticities of India's Trade in Services: Evidence from Post-WTO Period

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Abstract

India's international trade in services benefited immensely from the change in policy stance from import substitution to export promotion in the post-1991 period. Services trade received a further boost when India became signatory to the World Trade Organization (WTO) in 1995. This article aims to estimate the income and price elasticities of India's services trade during the post-WTO period, using the autoregressive distributed lag (ARDL) approach to cointegration, for the time period starting from 1996–97 Q1 (Quarter 1) to 2011–12 Q4 (Quarter 4). This study finds that the long-run income elasticity of services export is quite high and statistically significant, when the gross domestic product (GDP) of the Organisation for Economic Co-operation and Development countries is taken as proxy for GDP of importing countries. However, the price elasticity of services export is found to be statistically insignificant. In case of services import, both the income and price elasticities of demand are found to be statistically significant, and services import is found to be more responsive to income than relative prices. The implications of the empirical findings for India's current account deficit are also explored.

JEL: E64, F14, F40

Keywords

Services trade, economic growth, exchange rate, ARDL, cointegration

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Introduction

International trade in services witnessed significant acceleration in the last decade of the twentieth century, rising from US$ 1798.9 billion in 1991 to US$ 8699.8 billion by 2012 (UNCTAD, 2013). Developing countries now account for one-fourth of the global trade in services. In spite of a rising contribution to services trade by developing countries, developed countries accounted for 67 per cent of world services exports and 59 per cent of world services imports in 2012 (UNCTAD, 2013). India's international trade in services benefited immensely from the change in policy stance from import substitution to export promotion in the post-1991 period. For instance, the share of services trade in India's gross domestic product (GDP) increased from 3.38 per cent in 1990–91 to 14.8 per cent in 2011–12 (World Bank, 2013). Services trade received a further boost when India became signatory to the General Agreement on Trade in Services (GATS) of the World Trade Organization (WTO) in 1995. In 2012, India ranked 7th in world services exports but 19th in world merchandise exports. India's share in global services exports stood at 3.2 per cent in 2012, whereas its share in global merchandise exports was only 1.6 per cent for the same year. Similarly, India's share in global services imports stood at 3.1 per cent in 2012, whereas its share in global merchandise imports was 2.6 per cent for the same year (WTO, 2013). Given its growing relevance world-wide and in India, it becomes imperative to examine and estimate the key economic determinants of India's international trade in services.

India's international trade in non-factor services, as per Reserve Bank of India (RBI) definition, is classified into miscellaneous, travel, transportation, insurance and government not included elsewhere (GNIE) services in the country's balance of payments. Miscellaneous services have emerged as the major 'internationally traded service' in India's services trade basket during the post-liberalization period. Miscellaneous services mainly include business services, construction, banking, communication and management services. The share of miscellaneous services in India's services export basket rose from 39 per cent in 1991–92 to 72 per cent in 2011–12, and attained a peak of 77 per cent in 2008–09. The share of miscellaneous services in India's services import basket also increased from 47 per cent in 1991–92 to 59 per cent in 2011–12, and attained a peak of 66 per cent in 2010–11. Raychaudhuri and De (2012) found that India has gained revealed comparative advantage (RCA) in exports of miscellaneous services such as financial services and computer and information services, whereas the country has lost comparative advantage in transport and travel services exports between 1991 and 2007. The determinants of services trade are varied and multidimensional. There is an array of factors which promote or retard services trade, measured in terms of exports and imports.

The objective of this study is to estimate the income and price elasticities of demand for India's services trade during the post-WTO period—from 1996–97 Q1 (Quarter 1) to 2011–12 Q4 (Quarter 4). The implications of the empirical findings for India's current account deficit are also explored. The year 1996–97 is chosen as the starting point since quarterly data on India's GDP is available only from that particular year. Moreover, most of the services became liberalized in India post-1995, once GATS of WTO became operational.

The rest of the article is organized as follows: Firstly, the review of literature is provided. Secondly, the empirical analysis is presented. And finally, the conclusion and policy implications are presented.

Literature Review

The Marshall–Lerner condition in trade theory relates price elasticities of international trade to external imbalances.[1] It states that for a depreciation of the domestic currency to reduce the trade deficit of a country, the sum of price elasticity of export demand (ε_X) and price elasticity of import demand (ε_M), in absolute terms, must be greater than 1. Prebisch (1950, 1959) related the income elasticity of exports and imports of a country with its balance of payments. He argued that the losers in international trade are the less developed countries (LDCs) which tend to specialize in diminishing returns activities and export primary products which have a low income elasticity of demand in world markets, and the gainers in international trade are the developed countries which specialize in increasing returns activities and export manufactured goods which have a high income elasticity of demand in world markets. In a 2-country model, if both the developed country and the LDC grow at the same rate, this would result in perpetual balance of payment deficit for the LDC and perpetual balance of payments surplus for the developed country. This is because the income elasticity of export demand of the LDC is lesser than the income elasticity of import demand of the LDC.

The imperfect substitutes model forms the basis for the estimation of trade elasticities. The key assumption of this model is that imports and exports are not perfect substitutes for domestic goods. Goldstein and Khan (1985) derived the imperfect substitutes model of a country's imports from, and exports to, the rest of the world. Import demand function and export demand function were specified to be functions of income and relative prices in this model.[2] Houthakker and Magee (1969) undertook a cross-country study to estimate the demand elasticities for both merchandise exports and imports, with respect to income and prices. Import demand was specified to be a function of home country's GDP and relative prices. Similarly, export demand was specified to be a function of importing countries' gross national product (GNP) and relative prices. Relative prices were measured as the price index of exports of home country, deflated by an index of export prices of other exporting countries. Both the export and import demand functions had a double-log specification and were estimated using ordinary least squares (OLS) regression. They found that estimates of income elasticity was significant for all countries, whereas estimates of price elasticity were insignificant for many countries and had a few incorrect signs. However, for a number of countries the sum of import and export price elasticities was found to be greater than 1 in absolute terms, satisfying the Marshall–Lerner condition. Hooper, Johnson and Marquez (2000) estimated and tested the stability of income and price elasticities of international trade, for the G7 countries. They used quarterly data on goods and services trade for the period of 1994–97. The trade elasticities were estimated using Johansen's cointegration and error correction model (ECM). They found

that except for France and Germany, price elasticities of all other countries satisfied the Marshall–Lerner condition.

Marquez (2005) estimated the income and price elasticities for US trade in services in particular, and evaluated the importance of aggregation and simultaneity biases. He estimated the trade elasticities for four categories of services: travel, fares, transportation and other private services. Using quarterly data from 1987 to 2001 and a log-linear specification, he found that the income elasticity for US exports of services was significantly greater than the income elasticity for US imports of services. Hung and Viana (1995) also modelled services trade flows of US, using the cointegration–ECM approach. The period of their study was from 1974 to 1993. They found that the US services trade surplus since the mid-1980s was because of robust economic growth abroad and dollar depreciation. They also found that growth in foreign direct investment (FDI) assets only had a modest net impact on the services trade balance.

Mehta and Mathur (2004) developed an econometric panel data framework for estimating a short-term forecasting model for India's merchandise exports by countries and commodities. The primary factors determining India's exports at a disaggregated level were taken to be the total imports of the destination country and relative prices. Their panel contained 17 cross-sectional commodity codes with time series ranging from 1993 to 2001. The forecasted growth rate estimated using their sub-model for India's exports to US was found to be 8.85 per cent for 2003–04. Das, Banga and Kumar (2011) estimated the income and price elasticities of demand for India's services exports, in order to assess the impact of the global recession on India's services exports. The period of their study was from 1970 to 2008. India's services exports in real terms was specified to be the function of World Real GDP and the real effective exchange rate (REER). The export elasticities were estimated using a double-log model, with the help of Engle–Granger approach to cointegration. The income elasticity of demand for India's services exports was found to be much higher than the price elasticity of demand for services exports, although both the determinants were found to be significant.

Sahoo, Dash and Mishra (2013) estimated the determinants of India's services exports during the three decades from 1980 to 2011. India's services export demand function was expressed as a function of world demand, exchange rate, manufacturing exports, human capital, financial development, infrastructure development, institutions, FDI and services trade barriers. The estimation was carried out using the time series techniques of dynamic ordinary least squares and autoregressive distributed lag (ARDL) approach to cointegration. They found that real world income, manufacturing exports, infrastructure stock, human capital and financial development exerted a significant positive effect on services exports. REER was also found to be a major determinant and it exerted a significant negative impact on India's aggregate services exports. Gupta, Raychaudhuri and Haldar (2015) estimated the determinants of exports of Indian information technology (IT) companies from 2000 to 2012, using the company-level data. India's IT exports was specified to be a function of world demand, REER, R&D and inflow of foreign capital. They found that world demand and REER exerted a

significant impact on India's IT exports in static panel data regression estimation. Foreign capital was found to have a significant negative influence on exports of Indian IT companies. In dynamic panel data regression estimation, past exports emerged as a significant determinant of India's IT exports.

The literature review indicates that all of the existing studies in the Indian context have focused solely on estimation of the services export demand function. In such a scenario, this study adds to the empirical literature by estimating both services export demand function and services import demand function for the Indian economy. This study also provides estimates of income elasticity of demand for India's services exports with respect to the Organisation for Economic Co-operation and Development (OECD) countries, which is relevant in formulation of destination-specific trade policies.

Empirical Analysis

Overview

Figures 1 and 2 illustrate an overview of the growth trend in India's services exports and services imports since 1996–97, considered along with the movements in income (GDP) and exchange rate (REER). The figures show that India's services exports and services imports have grown tremendously since the late 1990s. India's services exports has increased from ₹265.65 billion in 1996–97 to ₹6,844 billion in 2011–12, with a compound annual growth rate (CAGR) of 24.2 per cent. Services exports was found to have slightly declined in 2009–10, compared to the previous year, due to the economic recession in developed countries, whereas services imports registered a year-on-year increase

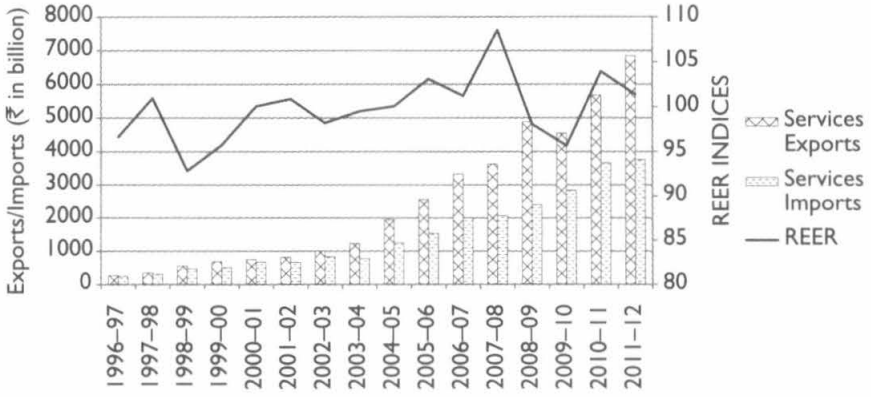

Figure 1. India's Services Trade and Exchange Rate Movements (1996–97 to 2011–12)

Source: Author's compilation based on data from Handbook of Statistics on Indian Economy 2012–13, RBI.

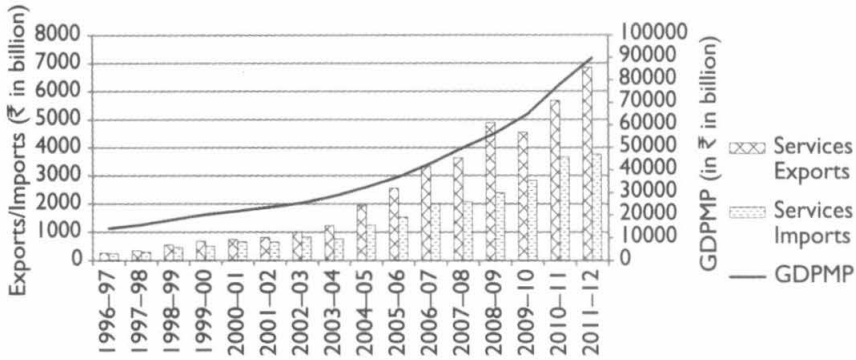

Figure 2. India's Services Trade and Income Movements (1996–97 to 2011–12)

Source: Author's compilation based on data from Handbook of Statistics on Indian Economy 2012–13, RBI.

even in 2009–10. This is regardless of the depreciation of REER from 98.08 in 2008–09 to 95.67 in 2009–10. India's services imports has increased steadily from ₹239.44 billion to ₹3,765 billion in 2011–12, with a CAGR of 20.2 per cent. Services exports is found to be higher than services imports throughout this time period, despite the fluctuations in REER. Figure 1 indicates that the REER appreciated to a peak of 108.54 in 2007–08, which was the year when the global financial crisis surfaced. However, services exports registered a year-on-year increase in 2007–08, in spite of appreciation of REER. Similarly, even when REER depreciated to a minimum of 92.84 in 1998–99, India's services imports witnessed a year-on-year increase in 1998–99. On the other hand, income and services trade are found to move in tandem and grow steadily during the post-WTO period, as is evident from Figure 2. India's GDP at market prices (base 2004–05) has increased steadily from ₹14,193 billion in 1996–97 to ₹89,749 billion in 2011–12, with a CAGR of 13.1 per cent. This descriptive analysis provides a background for the estimation of income and price elasticities of India's services trade in the rest of the article.

Empirical Model and Technique of Estimation

Adopting the empirical framework put forth by Houthakker and Magee (1969), this study specifies India's services export demand (*SerX*) to be a function of GDP of importing countries (*MGDP*) and REER, as given in Equation 1. Similarly, India's services import demand (*SerM*) is specified to be a function of India's GDP and REER, as given in Equation 2.

$$SerX_t = f\left(MGDP_t, REER_t\right) \tag{1}$$

$$SerM_t = g\left(GDP_t, REER_t\right) \tag{2}$$

The choice between the linear and log-linear functional form for these two model specifications is made based on Sargan's criteria *S* (1964).[3]

Income and price elasticities of India's services trade, as specified above, is estimated with the help of time series methodology. It is not possible to undertake a panel data analysis because country-wise data on India's services exports and services imports is not available. Each of the macroeconomic variables is initially tested for their stationarity properties and order of integration. The Augmented Dickey–Fuller (ADF) test and Kwiatkowski Phillips Schmidt and Shin (KPSS) test are used for this purpose. Subsequently, the bound testing approach to ARDL model developed by Pesaran, Shin and Smith (2001) is used to check if the variables are cointegrated. The ARDL approach to cointegration is preferred over Johansen's approach for this empirical analysis because the variables of interest are not purely I(1). The direction of causality is given *a priori* because the objective of this study is to estimate the income and price elasticities of India's services trade. Another significant advantage of this approach over other cointegration techniques is that different variables can be assigned different lag lengths in the ARDL model.

The following ARDL models are estimated to check for the presence of cointegration:

$$\Delta \ln SerX_t = \alpha_1 + \sum_{i=1}^{m} \beta_{1i} \Delta \ln SerX_{t-i} + \sum_{i=0}^{n} \beta_{2i} \Delta \ln MGDP_{t-i} + \sum_{i=0}^{p} \beta_{3i} \Delta \ln REER_{t-i} + \beta_4 \ln SerX_{t-1} + \beta_5 \ln MGDP_{t-1} + \beta_6 \ln REER_{t-1} + u_{1t} \quad (3)$$

$$\Delta \ln SerM_t = \alpha_2 + \sum_{j=1}^{q} \beta_{1j} \Delta \ln SerM_{t-j} + \sum_{j=0}^{r} \beta_{2j} \Delta \ln GDP_{t-j} + \sum_{j=0}^{s} \beta_{3j} \Delta \ln REER_{t-j} + \beta_7 \ln SerM_{t-1} + \beta_8 \ln GDP_{t-1} + \beta_9 \ln REER_{t-1} + u_{2t} \quad (4)$$

The existence of a cointegrated relationship between the variables in the above mentioned ARDL model specifications is examined with the help of *F* or Wald test statistics. Wald test examines the joint null hypothesis of zero cointegration between the variables (in case of Equation 3, H_0: $\beta_4 = \beta_5 = \beta_6 = 0$; and in case of Equation 4, H_0: $\beta_7 = \beta_8 = \beta_9 = 0$), against the alternate hypothesis of presence of cointegration. The calculated *F*-statistic is compared with two sets of critical values computed by Pesaran, Shin and Smith (2001) for a given level of significance, in their bound testing approach to the analysis of long-run relationships. If the computed *F*-statistic exceeds the upper critical bound value, it implies that all the variables are I(1), and the null hypothesis of zero cointegration can be rejected. If the computed *F*-statistic is below the lower critical bounds value, it implies that all variables are I(0), and the null hypothesis of zero cointegration cannot be rejected. However, if the calculated *F*-statistic falls within the bounds, the test becomes inconclusive. If the null hypothesis of zero cointegration is rejected, error correction representation of ARDL model is estimated to study the short-run dynamics. The error correction term (ECT) in the model measures the speed with

which the deviation from the long-run equilibrium is corrected in each period and is expected to have a negative sign.

Finally, regression diagnostic tests are performed for the ARDL models estimated as per Equations 3 and 4. Lagrange multiplier (LM) test is used to check whether these estimated ARDL models suffer from residual serial correlation. The null hypothesis of LM test is that there is no serial correlation, against the alternative hypothesis that the estimated model includes both AR and MA (Auto Regressive and Moving Average) error processes. LM test is applicable whether or not there are lagged dependent variables in the model. White test is used to test the null hypothesis that errors are homoskedastic and independent of the regressors, against the alternate hypothesis of presence of heteroskedasticity of unknown, general form. Jarque–Bera test is used to test the null hypothesis that the residuals are normally distributed. CUSUMSQ (cumulative sum of squares) test is also carried out to check for parameter instability in the estimated ARDL model. It is based on cumulative sum of squared recursive residuals. Movement outside the pair of 5 per cent critical lines indicates parameter instability. CUSUMSQ test is a variant of CUSUM (cumulative sum of recursive residuals) test.

Variables and Data Descriptions

This study pertains to international trade in services. The RBI's definition of 'service sector' is adopted, which includes 'construction activities'. REER is taken as the measure of relative prices. Quarterly data on India's GDP at market prices is used for estimating India's services import demand function. However, for estimating India's services export demand function, quarterly data on world GDP is not available. According to policy papers on India's service sector brought out by the Government of India (Prasad, 2007; Prasad & Sathish, 2010), the US, EU, UK, Japan and other OECD countries are the major export destinations of India's services exports. The OECD countries comprised three-fourth of the world services imports during the last one decade. Therefore, GDP of OECD countries is taken as a proxy for GDP of importing countries to estimate the income elasticity of services export demand of the Indian economy.

The period taken for this study is from 1996–97 Q1 to 2011–12 Q4, which equals to 64 quarterly time series observations. Quarterly data on India's GDP (base 2004–05) at constant prices is taken from National Account Statistics, published by CSO. Quarterly data on GDP of OECD countries at constant prices (seasonally adjusted, fixed Purchasing Power Parities, with reference year of 2005) is taken from OECD Stat, published by OECD. However, this data is reported in millions of US dollars. It is converted into billions of Indian rupees, by averaging the exchange rate over the study period, from 1996–97 to 2011–12, which amounts to ₹44.2 per US dollar. Quarterly data on India's services exports, services imports and the REER is taken from *Handbook of Statistics on Indian Economy 2011–13*, published by the RBI. The REER (base 2004–05) computed from 36 currency bilateral weights (trade-based weights), compiled by the RBI, is used for estimation of price elasticities of services trade.

Balance of payments data published by the RBI is at current prices. In most empirical studies, unit value of exports and imports are widely used to deflate international trade data. Time series data on unit value of services exports and services imports are not available for the Indian economy. Dash and Parida (2013) used the Wholesale Price Index (WPI) to deflate quarterly data on services exports and services imports into real terms, whereas Das, Banga and Kumar (2011) used GDP deflator to deflate annual data on services exports. In this study, services GDP deflator (base 2004–05) is used to convert quarterly data on services exports and services imports at current prices into constant prices. This is because the basket of commodities which constitute the WPI in India does not include services, which contributed a significant share of more than 50 per cent to India's GDP in 2011–12. The WPI has thus not been able to capture the structural transformation, which has occurred in the Indian economy over the past two decades.

Empirical Results

Table 1 presents the statistical outcomes from using Sargan's criteria *S* for estimating services export and import demand functions for Indian economy. In both cases, the *S* value is found to be greater than 1. Hence, the log-linear functional form is preferred to linear functional form for estimation of both the demand functions. The log-linear form of the macroeconomic variables, including *SerX* (services exports), *SerM* (services imports), *REER*, *MGDP* (GDP of importing countries) and *GDP* (India's GDP), are initially examined for their unit root properties. The ADF test and KPSS test are used for this purpose. Table 2 presents the results of ADF test for examining the stationarity properties of the macroeconomic variables required to estimate the income and price elasticities of India's services trade. The optimal lag length for carrying out the ADF test for each of the variables is chosen on the basis of Akaike information criterion (AIC). Based on the statistical significance of the test statistic, it is found that in the level form, the null hypothesis of presence of unit root can be rejected only in case of *lnREER*. This implies that the variable *lnREER* is stationary in the level form, that is, I(0). All other variables are found to be stationary in first difference, that is, they are integrated of Order 1 or I(1).

To reconfirm the unit root properties of the macroeconomic variables required for estimation, KPSS test is also carried out and results are reported in Table 3. From Table 3, it is found that only in the case of *lnREER*, the null hypothesis of

Table 1. Sargan's Criteria for Choosing Functional Form

Model	*S* Value	Choice of Functional Form
SerX=f(MGDP, REER)	2.46	log-linear form preferred
SerM=g(GDP, REER)	1.09	log-linear form preferred

Source: Author's Calculations.

Table 2. Results of ADF Test for Stationarity

	Test Statistic			
	(Level of Variables)		(First Difference)	
Variable	Intercept	Intercept+Trend	Intercept	Intercept+Trend
lnMGDP	−1.78	−1.65	−3.92***	−4.19***
lnREER	−3.62***	−3.85**	–	–
lnGDP	2.03	−0.502	12.54***	−17.17***
lnSerX	1.45	−1.56	−5.14***	−5.62***
lnSerM	0.16	−2.08	−10.34***	−10.31***

Source: Author's calculations.

Notes: 1. *ln* denotes natural log of the variable.
2. ***,**,* denotes 1 per cent, 5 per cent and 10 per cent level of statistical significance, respectively.

Table 3. Results of KPSS Test for Stationarity

	Test Statistic			
	(Level of Variables)		(First Difference)	
Variable	Intercept	Intercept+Trend	Intercept	Intercept+Trend
lnMGDP	0.98***	0.20**	0.302	0.05
lnREER	0.21	0.12	–	–
lnGDP	0.99***	0.28***	0.403	0.12
lnSerX	0.98***	0.22***	0.31	0.13
lnSerM	0.98***	0.24***	0.25	0.14

Source: Author's calculations.

Notes: 1. *ln* denotes natural log of the variable.
2. ***,**,* denotes 1 per cent, 5 per cent and 10 per cent level of statistical significance, respectively.

stationarity cannot be rejected in the level form. This implies that *lnREER* is I(0), which reinforces the earlier findings of ADF test. All the other variables become stationary only at first difference, that is, they are I(1). Since the macroeconomic variables are found to be a mix of I(1) and I(0), the bound testing approach to ARDL model is implemented to check for the presence of any cointegrating relationship among these variables and subsequently estimate the services export and import demand functions. This approach cannot be used if any of the variables is found to be I(2).

Estimation of India's Services Export Demand Function

Services export demand function is estimated in the log-linear form as per Equation 3, and ARDL (4, 2, 1) model is chosen based on Schwarz Bayesian criterion (SBC). In ARDL (4, 2, 1) model, Lag 4 corresponds to the variable *lnSerX*, Lag 2 corresponds to *lnMGDP* and Lag 1 corresponds to *lnREER*. The long-run coefficients estimated from ARDL (4, 2, 1) model are reported in Table 4. When

Table 4. Long-run Coefficients of Services Export Demand Function Estimated from ARDL (4, 2, 1) Model

Dependent Variable is *lnSerX*		
Regressor	Coefficient	*T*-Ratio[p value]
lnMGDP	8.26***	12.86 [0.000]
lnREER	−1.77	−1.41 [0.165]
C	−103.32***	−13.13 [0.000]
R Squared = 0.98		
F statistic F(9, 50) = 245.74[0.000]		
Akaike Information Criterion = 37.71		
Schwarz Bayesian Criterion = 27.23		
DW statistic = 2.03		

Source: Author's calculations.

Notes: 1. Lag-length is chosen on the basis of SBC.
2. ***, **,* denotes 1 per cent, 5 per cent and 10 per cent level of statistical significance, respectively.

Wald test is performed for ARDL (4, 2, 1) model, the *F*-statistic is found to be 4.91 (with probability (*p*) value of 0.02). Assuming a model with unrestricted intercept and no trend and with two regressors (k = 2), the asymptotic lower and upper bound values of *F*-statistic from Pesaran, Shin and Smith (2001) are (3.79, 4.85) at the 5 per cent level of significance. Since the computed *F*-statistic exceeds the critical upper bound at 5 per cent significance level, the null hypothesis of zero cointegration can be rejected in this case. This implies that there exists a long-run equilibrium relationship between services exports, importing countries' GDP and REER for the Indian economy during the post-WTO period. The income elasticity of services export demand is estimated to be 8.26. It has predicted sign and is statistically significant. This implies that given the exchange rate, a 1 per cent increase in GDP growth of importing countries will lead to a growth in India's services exports by 8.26 per cent. The price elasticity of services exports is estimated to be −1.77. It also has predicted sign but is found to be statistically insignificant. This implies that in the long-run, India's services exports is responsive only to changes in income, and not relative prices.

These findings do not fully conform to earlier studies on determinants of India's services exports, which found income elasticity of demand of services exports to be higher than the price elasticity of demand, and also found both the income and price elasticity of services exports to be statistically significant. The findings of this study differ from earlier studies due to differences in methodology, choice of variables and time span of the study. Many studies in international trade have failed to find statistically significant export–exchange rate elasticities, similar to the findings of this study. Rangarajan and Mishra (2013) examined this phenomenon and found two factors contributing to this. First of all, exports and exchange rates are highly endogenous. Secondly, macro equations do not allow the export–exchange rate elasticity to vary depending on the position of the aggregate supply curve.

Moreover, time series data on price indices of services exports and services imports are not available for Indian economy. This is because in almost all countries, customs records pertain only to goods, not services. Customs records are the main source of information for constructing export and import price indices. As per IMF (2009), export and import price indices currently produced generally exclude services. These indices traditionally have been compiled for goods as indices of the unit values of detailed custom classes. Serious conceptual problems are also involved in measuring the prices of services such as insurance, finance and entertainment services. Hence, in this study, the REER is used as the common measure of relative prices of services exports as well as services imports.

The error correction representation of ARDL (4, 2, 1) model gives the short-run dynamics. The estimation results are reported in Table 5. The short-run income elasticities of demand for services exports are also found to be statistically significant, whereas the price elasticity is statistically insignificant. However, the short-run elasticities are not found to have the expected signs. The ECT is found to be negative and statistically significant, providing further empirical evidence in support of presence of cointegration between services exports, GDP of importing countries and REER. ECT value of –0.37 implies that about 37 per cent of the short-run disequilibrium between these variables is corrected every quarter.

Regression diagnostic tests performed for the estimated ARDL (4, 2, 1) model are reported in Table 6. It is found that none of null hypotheses of LM test, Jarque–Bera test and White test can be rejected in the case of ARDL (4,2,1) model, whether we consider the LM version or *F* version of test statistic. LM statistic follows an asymptotic chi-square distribution. Hence, it can be concluded that the services export demand function estimated as ARDL (4, 2, 1) model does not suffer from serial correlation, heteroskedasticity or non-normality. Figure 3 plots the results of CUSUMSQ test for ARDL (4, 2, 1) model. Cumulative sum of squares of recursive residuals is found to lie well within the 5 per cent critical lines, indicating parameter stability.

Table 5. Estimation Results of Error Correction Representation of ARDL (4, 2, 1) Model

Dependent Variable is *dlnSerX*		
Regressor	Coefficient	*T*-Ratio [*p* Value]
dlnSerX1	–0.23*	–1.69 [0.097]
dlnSerX2	–0.45***	–3.45 [0.001]
dlnSerX3	–0.265**	–2.16 [0.035]
dlnMGDP	9.64**	2.43 [0.019]
dlnMGDP1	–10.67***	–2.77 [0.008]
dlnREER	0.36	0.49 [0.628]
dC	–38.21***	–2.89 [0.005]
ECT(–1)	–0.37***	–3.19 [0.002]

Source: Author's calculations.

Note: ***,**,* denotes 1 per cent, 5 per cent and 10 per cent level of statistical significance, respectively.

Table 6. Diagnostic Tests for Services Export Demand Function: ARDL (4, 2, 1) Model

Diagnostic Tests	Null H_0	LM Version	F Version
Lagrange Multiplier test	zero serial correlation	CHSQ (4) = 4.002 [0.406]	F (4,46) = 0.82 [0.518]
Jarque–Bera test	Normality (normally distributed residuals)	CHSQ (2) = 0.57 [0.752]	Not applicable
White test	Homoskedasticity	CHSQ (1) = 3.46 [0.103]	F (1,58) = 3.55 [0.104]

Source: Author's calculations.

Notes: 1. ***,**,* 1 per cent, 5 per cent and 10 per cent level of statistical significance, respectively.
2. Figures in parenthesis [ ] are probability values.

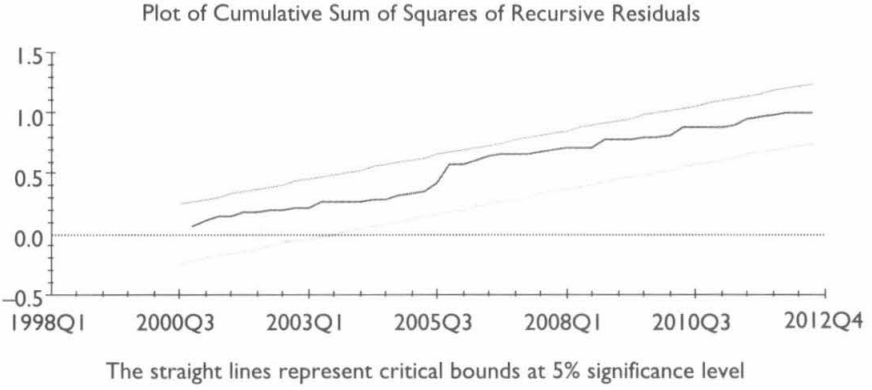

Figure 3. CUSUMSQ Test Results for ARDL (4, 2, 1) Model

Source: Author's calculations.

Estimation of India's Services Import Demand Function

Services import demand function is estimated in the log-linear functional form as per Equation 4, and ARDL (2, 1, 0) model is chosen based on SBC. In ARDL (2, 1, 0) model, Lag 2 corresponds to the variable *lnSerM*, Lag 1 corresponds to *lnGDP* and Lag 0 corresponds to *lnREER*. The long-run coefficients estimated from ARDL (2, 1, 0) model are reported in Table 7. When Wald test is performed for this model, the *F*-statistic is found to be 4.17. This *F*-statistic is found to be statistically significant, with probability (*p*) value of 0.01. Assuming a model with unrestricted intercept and no trend, and with two regressors (k =2), the lower and upper bound critical values of *F*-statistic from Pesaran, Shin and Smith (2001) are (3.17, 4.14) at the 10 per cent level of significance. Since the computed *F*-statistic exceeded the critical upper bound at the 10 per cent significance level, the null hypothesis of zero cointegration can be rejected. This establishes the presence a long-run equilibrium relationship between services imports, GDP and REER for the Indian economy, during the post-WTO period. The income elasticity of demand for services imports is estimated to be 1.98. It is found

Table 7. Long-run Coefficients of Services Import Demand Function Estimated from ARDL (2, 1, 0) Model

Dependent Variable is *lnSerM*		
Regressor	Coefficient	*T*-Ratio[p Value]
lnGDP	1.98***	14.76 [0.000]
lnREER	1.84**	2.05 [0.045]
C	−20.67*	−5.04 [0.000]
R Squared = 0.93		
F-statistic F(5, 56) = 146.26 [0.000]		
Akaike Information Criterion = 18.21		
Schwarz Bayesian Criterion = 11.83		
DW-statistic = 2.07		

Source: Author's calculations.

Notes: 1. Lag-length is chosen on the basis of SBC.
2. ***, **,* denotes 1 per cent, 5 per cent and 10 per cent level of statistical significance, respectively.

to have predicted sign and is statistically significant. The economic implication is that given the exchange rate, a 1 per cent increase in India's GDP will lead to a rise in India's services imports by 1.98 per cent. The price elasticity of services imports is estimated to be 1.84 and is also found to be statistically significant. This implies that given India's income, a 1 per cent increase in the REER will lead to a rise in India's services imports by 1.84 per cent. In the long run, India's services imports are found to be more responsive to income, compared to relative prices.

The error correction representation of the ARDL (2, 1, 0) model gives the short-run dynamics. The estimation results are reported in Table 8. The ECT is found to be negative and statistically significant, reaffirming the presence of

Table 8. Estimation Results of Error Correction Representation of ARDL (2,1,0) Model

Dependent Variable is *dlnSerM*		
Regressor	Coefficient	*T*-Ratio[Prob.]
dlnSerM1	−0.18	−1.52 [0.135]
dlnGDP	0.54**	1.96 [0.054]
dlnREER	1.07*	1.89 [0.063]
dC	−11.99***	−3.39 [0.001]
ECT(-1)	−0.58***	−4.49 [0.000]

Source: Author's calculations.

Note: ***,**,* denotes 1 per cent, 5 per cent and 10 per cent level of statistical significance, respectively.

Table 9. Diagnostic Tests for Services Import Demand Function: ARDL (2, 1, 0) Model

Diagnostic Tests	Null H_0	LM Version	F Version
Lagrange Multiplier test	zero serial correlation	CHSQ (4) = 6.66 [0.155]	F (4,52) = 1.56 [0.198]
Jarque–Bera test	Normality (normally distributed residuals)	CHSQ (2) = 1.19 [0.552]	Not applicable
White test	Homoskedasticity	CHSQ (1) = 0.21 [0.645]	F (1,60) = 0.21 [0.651]

Source: Author's calculations.

Notes: 1. ***,**,* denotes 1 per cent, 5 per cent and 10 per cent level of statistical significance, respectively.

2. Figures in parenthesis [ ] are probability values.

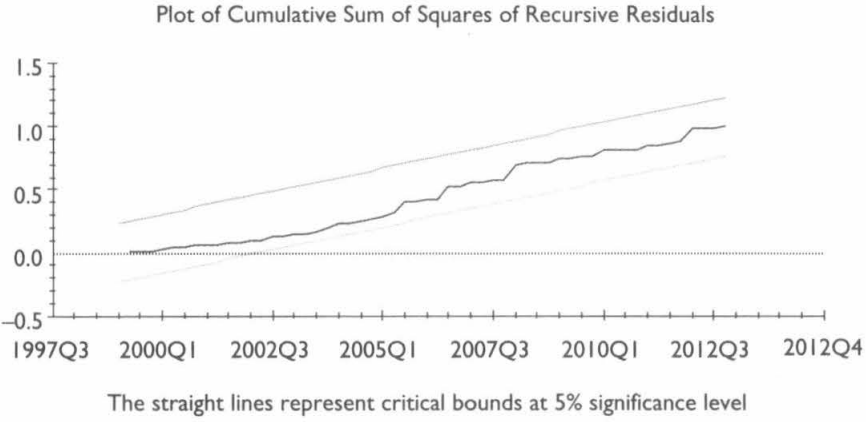

Figure 4. CUSUMSQ Test Results for ARDL (2, 1, 0) Model

Source: Author's calculations.

cointegration between the variables. The ECT is found to be –0.58, implying that about 58 per cent of the short-run disequilibrium between services imports, India's GDP and REER is corrected every quarter. The short-run income and price elasticities of demand for India's services imports are found to have positive sign and also statistically significant.

Regression diagnostic tests performed for ARDL (2, 1, 0) model are reported in Table 9. From Table 9, it is found that none of null hypotheses of LM test, Jarque–Bera test and White test can be rejected in the case of ARDL (2, 1, 0) model as well. This implies that services import demand function estimated as ARDL (2, 1, 0) model does not suffer from serial correlation, heteroskedasticity or non-normality. Figure 4 plots the results of CUSUMSQ test for ARDL (2, 1, 0) model. Here again, cumulative sum of squares of recursive residuals is found to lie within the 5 per cent critical lines, indicating parameter stability.

Conclusions and Policy Implications

Many international studies have found income elasticity of demand for services exports to be above unity, which is in consonance with the findings of this article. Using the ARDL approach to cointegration, this study finds price elasticity of India's services export demand to be low and statistically insignificant, whereas income elasticity of services export demand is found to be quite high, positive and statistically significant. On the other hand, income elasticity of demand and price elasticity of demand for India's services imports are found to be positive and statistically significant. In the long run, the income elasticity of demand for services exports is found to be remarkably higher than income elasticity of services imports for the Indian economy. As a result, India's services trade balance will continue to be in surplus in the long run, which is good for India's external stabilization. Prebisch's (1950, 1959) argument is thus found to be valid for India's international trade in services. India's services trade exhibits characteristics of a developed country as expounded by Prebisch, because of which India is a net gainer when it engages in international trade in services. Favourable income elasticities of services trade contribute in a big way towards reducing India's current account deficit, given the fact that merchandise trade is in persistent deficit. The sum of price elasticities of services exports and services imports (in absolute terms) are found to be greater than 1 in the long run, satisfying Marshall–Lerner condition. However, rupee depreciation as a policy instrument would not be very successful in bringing down India's current account deficit in the long run, due to the insignificant price elasticity of demand for services exports. There are three different perspectives on current account balance: (a) a domestic perspective based on national income and product accounts, (b) an international perspective based on trade flows in goods and services and (c) another international perspective based on flows and holdings of financial assets (Mann, 2002). This study, by focusing on the current account perspective based on international trade flows, helped to examine how global and national GDP growth, as well the exchange rate, affects India's current account balance.

The findings of this study have important implications for exports from developing countries like India. First, it indicates that growth of India's services exports is highly dependent on the economic performance of developed countries, such as OECD countries. The drawback is that an economic recession in the developed countries will severely impact upon India's services exports. Another implication is that higher the income elasticity of demand for services exports, the more capable is services exports to act as a powerful engine of economic growth for the Indian economy. Low and statistically insignificant price elasticity of services exports implies that it would be difficult to propel services export growth through improvements in price competitiveness. Another possible explanation for insignificant price elasticity of services exports is that India's services exports are already quite price-competitive and have a comparative advantage in the world market, due to cheap but highly skilled English-speaking workforce employed in many of the sub-sectors such as IT and business process outsourcing (BPO).

Hence, fluctuations in exchange rate do not have a significant impact upon services export demand. REER is used as the common measure of relative prices of services exports as well as services imports in this study. The robustness of price elasticities of India's services trade estimated in this study can be increased, conditional upon the availability of separate services export price indices and services import price indices in future. The estimation of country-specific income and price elasticities of India's services trade can be undertaken in future, provided that the destination-wise data on India's services exports and services imports becomes available.

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Notes

1. The mathematical proof of the Marshall–Lerner condition is as follows:

   Trade balance $TB = (1/E)\,X(E) - M(E)$

   where E is the exchange rate. X is exports and M is imports.

   On differentiating, we get: $\frac{dTB}{dE} = -\left(\frac{1}{E^2}\right)X + \left(\frac{1}{E}\right)\left(\frac{dX}{dE}\right) - \left(\frac{dM}{dE}\right)$

   Multiply by E^2/X.

   This quantity > 0 iff $-1 + \left(\frac{E}{X}\right)\left(\frac{dX}{dE}\right) - \left(\frac{E^2}{X}\right)\left(\frac{dM}{dE}\right) > 0$

   Price elasticity of export demand and price elasiticity of import demand is defined as $\varepsilon_X \equiv \left(\frac{dX}{dE}\right)\left(\frac{E}{X}\right)$ and $\varepsilon_M \equiv -\left(\frac{dM}{dE}\right)\left(\frac{E}{M}\right)$ respectively.

   The condition becomes: $-1 + \varepsilon_X + \left(\frac{EM}{X}\right)(\varepsilon_M) > 0$

   Assume for simplicity that we start from an initial position of balanced trade: $EM = X$
   Then the inequality reduces to: $-1 + \varepsilon_X + \varepsilon_M > 0$. This is the Marshall–Lerner condition.
2. Under the assumption of homogeneity, import demand function of country i (I_i^d) is specified as $I_i^d = g\,(Y_i, PM_i/P_i)$ where Y_i is real income of country i, PM_i is the import price index in domestic currency and P_i is the price index for domestically produced goods. Export demand function of country i (X_i^d) is specified as $X_i^d = f(Y^*, PX_i/P^*)$ where Y^* is real income of rest of the world, PX_i is export price index in domestic currency, and P^* is the price index of foreign goods in world market.
3. Sargan's Criteria S is given by $(\hat{\sigma}_u / g\,\hat{\sigma}_v)^T$, where g is the geometric mean of the dependent variable in the linear form; $\hat{\sigma}_u$ is the OLS estimate of standard deviation of the underlying errors in the linear regression; $\hat{\sigma}_v$ is the OLS estimate of standard deviation of the underlying errors in the log-linear regression; and T is the number of observations. If S is less than 1, the data can be said to favour the linear functional form. If S is greater than 1, the data can be said to favour the log-linear functional form.

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