

Do Exchange Rate Movements Affect India's Services Exports? Evidence from ARDL Bounds Testing Approach

Manoranjan Sahoo, M. Suresh Babu, and Umakant Dash

Abstract—This study examines the impact of exchange rate movements on the services exports in India during 1975 to 2014. We use the Autoregressive and Distributed Lag (ARDL) bounds testing cointegration approach to examine the long run equilibrium relationship among the variables. The cointegration result shows that there exist long run equilibrium relationship among the variables. Further, our results show that in the long run exchange rate has a negative and significant impact on the total services exports (TSE) whereas the impact is negative but not significant in the short run. The study also reveals that the supply augmenting factors (such as FDI inflows, financial development and globalisation) and the demand side factors (such as world demand for services exports) are more dominant than the price effects to affect the services exports in India. Therefore, to maintain price competition, exchange rate policies need to be complemented by suitable supply side policies such as encouraging FDI inflows in the service sectors to sustain the rising services exports in the long run.

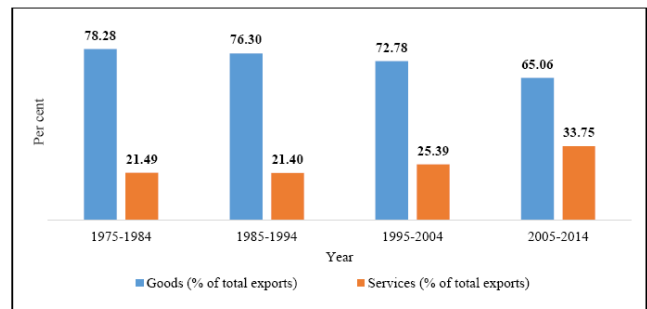
Index Terms—Exchange rate, globalisation, India, service exports.

I. INTRODUCTION

Recently, majority of the emerging and developing economies follow the export-led growth (ELG) hypothesis because of the increasing importance of international trade flows in the economic systems. Further, it is also argued that economic growth of an economy can be generated not only by the increasing participation of labour and capital as proposed by the classical economists, but also by expanding the exports to the wider international markets [1]. Following the success of East Asian countries, India followed the export-led growth strategy in 1990s as a part of its structural adjustment programme comprising of liberalisation, privatization and open economy policies [2]. India has also gained significant improvement in the services exports in the last two decades (See Fig. 1). While the growth of goods export of India shows a decreasing trend, there is a significant rise in the services exports after the globalisation period of 1990s. The services exports has increased from 15.27 per cent of total exports in 1975 to 32.16 per cent of total exports in 2014, almost a double increase in the total services exports as compared to the former year (Source: World Development Indicators, 2016). It is evident that India has been facing continuous deficits in its goods trade (and this is considered as the main cause of deficit in India's

current account) which is being adjusted by the rising surpluses in its services trade [3].

Given the rising importance of exports on the economic growth, many of the theoretical and empirical literatures have found the adverse impact of exchange rate movements on the exports growth. One of the major theoretical evidence is the famous Mundell-Fleming (M-F) model. The basic argument of M-F model is that in a small open economy, given the nominal wages to be constant, an exchange rate appreciation adversely affects the exports and positively affects the imports of goods and services [4]. Therefore, the main purpose of this paper is to investigate the impact of exchange rate movements on the services exports in India due to the growing importance of services exports in the correction of India's balance of payments. Further, the past literatures also found that along with the price effect, the demand and the supply side factors also play important role to influence the goods and services exports of an economy [2], [5]. For this reason, we are also investigating the importance of the demand side factors (like world demand for services exports) and the supply side factors (like foreign direct investment inflows, financial development and globalisation) to influence the services exports in India.



Source: World Development Indicators (WDI) of World Bank

Fig. 1. Trend in goods exports and services exports, 1975-2014 (Decadal Average).

Our study differs from the existing literature on several grounds. *First*, we use a longer time series data for the period 1975 to 2014. *Second*, we investigate the impact of the demand side as well as supply side factors to influence the services export in India. To the best of our knowledge there is no study, except [2], to examine the impact of exchange rate movements on the services exports in the context of India. Further, their study has only analysed the determinants of the modern services exports (MSEs) while it overlooked the factors affecting the total services exports.

The remainder of the paper is structured as follows. Section II reviews the past literature related to the effects of exchange rates on the trade flows. Section III describes the

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data and variables. Section IV explains the econometric methodology. Section V presents the results and discussions. Section VI concludes with policy prescriptions.

II. REVIEW OF LITERATURE

Although majority of studies are focusing on the impact of the exchange rate movements on the total trade flows, the literatures on the relationship between the service exports and exchange rate, particularly in the Indian context, are limited. Recently, some studies argued that rising military expenditure on defence imports is one of the major cause of India's trade deficit [3], [6].

Reference [7], by investigating the determinants of the services exports for the 15 European countries for the period of 1976-2000, found that the variables like foreign income, price and exchange rate are the major determinants to influence the services exports in these economies. [8], on the other hand, assessed the factors influencing the services trade relative to the goods trade for 10 OECD member countries during 1999-2000. By using the standard Gravity model the authors found that geographical distance, cost of transport and economic liberalization are the important factors for the services trade.

Further, recently [2] investigated the determinants of modern services exports in India for the period of 1980-2011. The results of the study showed that the endowment factors human capital, and physical infrastructure stocks and financial development along with world demand, exchange rate and goods exports are the major determinants of the MSEs in India. They also found that the software and communication exports depend more on the human capital, telecommunication, FDI and quality of institutions than the world demand, infrastructure and real exchange rate.

From the above literature review we saw that majority of the studies are cross-sectional and basically focusing on examining the determinants of goods and services exports and not giving much emphasis on the exchange rate which is, theoretically, expected to be a major determinant of the exports. Further, to the best of our knowledge there is only few studies examining the importance of exchange rate movements in explaining the services exports particularly in India. This study tries to fill this gap by emphasizing the impact of exchange rate movements on the services export in the Indian context.

III. DATA SOURCES AND VARIABLES

This study uses annual time series data for the period of

$$\begin{aligned} \Delta TSE_t = & \alpha_0 + \sum_{i=1}^m \alpha_{1i} \Delta TSE_{t-i} + \sum_{i=0}^m \alpha_{2i} \Delta REER_{t-i} + \sum_{i=0}^m \alpha_{3i} \Delta GEXP_{t-i} + \sum_{i=0}^m \alpha_{4i} \Delta FINDEV_{t-i} \\ & + \sum_{i=0}^m \alpha_{5i} \Delta FDI_{t-i} + \sum_{i=0}^m \alpha_{6i} \Delta SIMP_{t-i} + \sum_{i=0}^m \alpha_{7i} \Delta GLOBAL_{t-i} + \alpha_8 TSE_{t-1} + \alpha_9 REER_{t-1} \\ & + \alpha_{10} GEXP_{t-1} + \alpha_{11} FINDEV_{t-1} + \alpha_{12} FDI_{t-1} + \alpha_{13} SIMP_{t-1} + \alpha_{14} GLOBAL_{t-1} + \mu_t \end{aligned} \quad (1)$$

where m is optimal lag length and Δ is first difference estimator in Model 1. α_s represent the parameters and μ_t

1975 to 2014. The period of study is chosen mainly on the basis of the availability of data. The data is sourced from the World Development Indicators (WDI) of World Bank and the Handbook of Statistics on Indian Economy (RBI), Reserve Bank of India. The variable description is given in Table I.

TABLE I: SUMMARY STATISTICS FOR KEY VARIABLES, 1975-2014.

Variable	Definition	Mean	Std. Dev.	Min.	Max.	Source
TSE	Total services exports as % of GDP	3.336	2.573	0.839	8.664	WDI
REER	Real effective exchange rate (36-currency trade based index)	122.785	28.332	92.750	172.673	RBI
GEXP	Total goods exports as % of GDP	8.485	4.157	4.001	17.127	WDI
FINDEV	Financial development (measured by domestic credit to private sectors as % of GDP)	29.870	11.404	14.676	52.203	WDI
FDI	Net inflows of FDI as % of GDP	0.690	0.859	-0.029	3.546	WDI
SIMP	World services import net of India as % of world GDP	4.670	0.758	3.688	6.295	WDI
GLOBAL	Overall globalisation index	37.853	10.148	25.746	51.642	Dreher (2006)

IV. ECONOMETRIC METHODOLOGY

We use the autoregressive and distributed lag (ARDL) bounds testing approach developed by [9] for examining the cointegrating relationship among the variables and also to test the long run and short run impact of exchange rate and the other explanatory variables on the services exports. The ARDL model can give efficient results in the presence of a single structural break in the dependent variable [10] and also it can be used even the variables are integrated of the mixed order but no variable is integrated of order two i.e. I(2) [9].

To find the long-run relationship among the variables, the following ARDL model is estimated:

is the error term. First and second parts of the above equation represent error correction dynamics and the long-run relationship among the series, respectively. To test the

existence of long-run relationship, F-test is employed. Finally, the computed *F-statistics* are compared with the critical values of [11] because alternative lower and upper bounds critical values are more appropriate than that of [9] for small sample sizes. A decision about the existence or non-existence of the cointegration among the variables can be inferred if the computed F-statistic falls outside the upper or lower bounds critical values, respectively. Further, if the computed F-statistic value falls within the upper and lower bounds critical values, then the result will be inconclusive. The optimal lag order is selected on the basis of Akaike Information Criterion (AIC). The minimum AIC of the model implies optimal lag length.

V. RESULTS AND DISCUSSIONS

Checking of the stationarity property of the variables is considered as the important precondition for investigating the cointegration among them. For this reason, we use the [12] which accommodates information about a single unknown structural break present in the series. The results of ZA test is presented in Table II. It shows that all the variables are non-stationary at their levels and stationary at first difference in the presence of a single structural break. As no variable is integrated of order two, this allows us to apply the cointegration test [9].

TABLE II: ZIVOT-ANDREWS UNIT ROOT TEST

Variables	Level		1 st Difference			
	T-Stat.	Break	Decision	T-Stat.	Break	Decision
TSE	-3.147	1994	Unit root	-7.897*	2007	Stationary
REER	-2.757	1993	Unit root	-5.872*	1988	Stationary
GEXP	-2.690	2000	Unit root	-7.278*	1992	Stationary
FINDEV	-3.134	1996	Unit root	-8.054*	2005	Stationary
FDI	-3.210	1990	Unit root	-7.589*	2008	Stationary
SIMP	-4.603	1989	Unit root	-6.138*	1985	Stationary
GLOBAL	-2.440	2008	Unit root	-7.586*	1997	Stationary

Note: * Represent significance at 1% level. The values -4.93, -4.42 and -4.11 are the tabulated t-statistic values at 1%, 5% and 10% for ZA test with trend.

The ARDL cointegration test results are given in the Table III. Here we have estimated two models. Model 1 includes goods exports as an explanatory variable whereas Model 2 does not include goods exports in the model. This is because goods export is assumed to be correlated to the exchange rate that may cause multicollinearity problem in the model. So in order to check the consistency of our results we estimated two different models. As it is well known that the ARDL approach is sensitive to the lag length selection in the model, we use the Akaike Information Criteria (AIC) to select the appropriate lag length. As reported by [13] the dynamic link between the series can be well captured with the appropriate selection of the lag length. The optimum lags are given in the column 2 of

Table III. For testing the existence of cointegration in different models, we used [11] critical values. The bounds testing results show that the calculated F-statistic is found to be greater than the upper bounds critical values when total services exports (TSE_t) is used as dependent variables. This shows that ARDL bounds test confirms the long run relationship between the variables in India for the period 1975 to 2014.

TABLE III: THE BOUNDS TEST FOR COINTEGRATING RELATIONSHIP

Estimated models	Optimal lag	Break	F-stat.
TSE=f(REER, GEXP, FINDEV, FDI, SIMP, GLOBAL)	(3,1,2,2,3,3,3)	1994	14.861*
TSE=f(REER, FINDEV, FDI, SIMP, GLOBAL)	(3,2,3,1,3,3)	1994	20.791*

Note: We use the ARDL empirical model with unrestricted intercept and unrestricted trend. The upper and lower critical bounds developed by [11] are 6.263, 4.527 (4.700, 3.327) and 4.040, 2.831 at 1% (5%) and 10% levels, respectively. The asterisk ***, ** and * show significance at 1%, 5% and 10% levels, respectively.

The existence of cointegration relationship between the variables leads us to examine the long run and short run impact of real exchange rate, goods exports, financial development, FDI inflows, world services imports net of India and globalisation on the total services exports of India. Both the long run and short run results are reported in Table IV.

TABLE IV: LONG RUN AND SHORT RUN RESULTS

Variables (TSE as dependent variable)	Model 1 (With GDPXP)	Model 4 (Without GDPXP)
Long run		
Constant	-6.042*	-6.087*
REER _t	-0.009*	-0.007*
GEXP _t	-0.031	--
FINDEV _t	0.166*	0.160*
FDI _t	0.239*	0.210*
SIMP _t	1.034*	0.854*
GLOBAL _t	0.065*	0.083*
D _t	0.220**	0.041
Short run		
Constant	-17.755*	-17.185*
ΔREER _t	-0.005	-0.010
ΔGEXP _t	-0.115	--
ΔFINDEV _t	0.149*	0.193*
ΔFDI _t	0.805*	0.832*
ΔSIMP _t	0.675**	0.572
ΔGLOBAL _t	0.013	0.137*
D _t	0.646**	0.116

Note: The asterisk ***, ** and * indicate significance at 1%, 5% and 10% levels, respectively.

The results show that the exchange rate movements negatively and significantly affect the total services exports, while in the short it affects negatively but not significantly. In other words, TSE is elastic to the exchange rate movements in the long run whereas in the short run it is inelastic in nature. Our study provides similar findings like [2] who found that India's modern services exports are negatively related to the movements in the exchange rate. Our results also show that FDI inflows, financial development, world demand for services exports and globalisations are positively and significantly affect the services exports in India. However, the impact of goods

exports found to be negative but insignificant in both long run and short run.

Moreover, the results from the Table IV show that though the impact of the exchange rate on the total services exports is significant, but the coefficient value of the exchange rate is very small as compared to the coefficient values of the FDI inflows, financial development, world demand for exports and globalisation. This implies that as compared to the price effect, the supply and the demand side factors are more dominant. In other words, the supply and demand side factors play important role to influence the services exports in India than the exchange rate movements. In addition, the stability of our ARDL models are investigated by employing the cumulative sum of recursive residuals (CUSUM) and the CUSUM of squares (CUSUMsq) suggested by [14] (Stability test results will be available upon request).

VI. CONCLUDING REMARKS AND POLICY IMPLICATIONS

This study empirically examines the relationship between services exports and exchange rate movements by incorporating goods exports, financial development, net FDI inflows, world demand for services exports and globalisation as the other potential control variables for the Indian economy during 1975-2014. The results of our study reveals that all the variables share a common trend in the long run. Further, we also find that though the exchange rate negatively and significantly affects the total services exports in India, the supply augmenting factors (such as FDI inflows, financial development and globalisation) and demand side factors (such as world demand for services exports) have stronger impact on the services exports. Therefore, more FDI inflows can be encouraged in the services sectors for the production of better and quality services which can encourage more demand from the rest of the world. Further, financial development and globalisation can be given priority for the better channelization of resources and free flow of goods and services among the economies, respectively.

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REFERENCES

- [1] N. C. Pradhan, "Exports and economic growth: An examination of ELG hypothesis for India," *Reserve Bank of India Occasional Papers*, vol. 31, no. 3, pp. 35-66, 2010.
- [2] P. Sahoo and R. K. Dash, "India's surge in modern services exports: Empirics for policy," *Journal of Policy Modeling*, vol. 36, no. 6, pp. 1082-1100, 2014.
- [3] M. Sahoo, M. S. Babu, and U. Dash, "Current account sustainability in SAARC economies: Evidence from combined cointegration approach," *Theoretical and Applied Economics*, vol. 609, no. 4, pp. 281-298, 2016.
- [4] T. Abeyasinghe and T. L. Yeok, "Exchange rate appreciation and export competitiveness. The case of Singapore," *Applied economics*, vol. 30, no. 1, pp. 51-55, 1998.
- [5] B. Eichengreen and P. Gupta, "Exports of services: Indian experience in perspective," *Indian Growth and Development Review*, vol. 6, no. 1, pp. 35-60, 2013.
- [6] D. P. Dash, D. P. Bal, and M. Sahoo, "Nexus between defense expenditure and economic growth in BRIC economies: An empirical investigation," *Theoretical and Applied Economics*, vol. 606, no. 1, pp. 89-102, 2016.
- [7] S. Barcenilla and J. Molero, "Service export flows: Empirical evidence for European project," 2003.
- [8] F. Kimura and H. H. Lee, "The gravity equation in international trade in services," *Review of world economics*, vol. 142, no. 1, pp. 92-121, 2006.
- [9] M. H. Pesaran, Y. Shin, and R. J. Smith, "Bounds testing approaches to the analysis of level relationships," *Journal of applied econometrics*, vol. 16, no. 3, pp. 289-326, 2001.
- [10] M. Shahbaz, H. Mallick, M. K. Mahalik, and P. Sadorsky, "The role of globalization on the recent evolution of energy demand in India: Implications for sustainable development," *Energy Economics*, vol. 55, pp. 52-68, 2016.
- [11] P. K. Narayan, "The saving and investment nexus for China: Evidence from cointegration tests," *Applied Economics*, vol. 37, no. 17, pp. 1979-1990, 2005.
- [12] E. Zivot and D. W. K. Andrews, "Further evidence on the great crash, the oil-price shock and the unit-root hypothesis," *Journal of Business and Economic Statistics*, vol. 10, no. 3, pp. 251-270.
- [13] H. Lütkepohl, "Structural vector autoregressive analysis for cointegrated variables," *Modern Econometric Analysis*, pp. 73-86, 2006.
- [14] R. L. Brown, J. Durbin, and J. M. Evans, "Techniques for testing the constancy of regression relationships over time," *Journal of the Royal Statistical Society, Series B (Methodological)*, pp. 149-192, 1975.



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