Do Exchange Rates Affect Exports in India?

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Abstract

It is shown that the 36 country real effective exchange rate (REER) of India, which is *I*(1), becomes stationary once a single exogenous shock (corresponding to the implementation of the liberalization policy by the government of India) is separated from its stochastic component and modelled as a break in the deterministic trend. The implication of this for the export supply function is enormous. While without the break real export has a long-run relationship with REER and gross domestic product, with the break the relationship no more exists.

Keywords

Real exports, real effective exchange rate, structural breaks, unit root, cointegration

JEL Classification: F31, C32, F41

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Introduction

The past two decades have been decades of extensive policy reforms in India. These reforms were gradually implemented since 1991 at the behest of the International Monetary Fund (IMF) and touched upon almost every aspect of India's economy. One of the primary areas targeted by the reforms was the foreign exchange market. Another prime target was India's international trade.[1] With such momentous changes happening in both these sectors, it is to be expected that the reforms will cast their spell on the variables associated with these sectors and on any interrelationship that may exist between them.

One aspect of this interrelationship is the relationship between export and its relative price in terms of the foreign currency represented by the real exchange rate.[2] Empirical studies across the globe have yielded mixed results for the exchange rate variable both in export demand and export supply equations. The results are sensitive to the choices of sample period, model specification and countries considered.[3] The primary reason for this is that relative price is one of a long list of factors that potentially affects export. In the Indian context, studies conducted over different periods of time and over several categories of models (with different sets of co-independent variables) have reported both presence and absence of possible links between exchange rates and exports. For instance, using the data for the period 1962–1987, Joshi and Little (1994) have found the price elasticity of demand for exports to be about 1.1 in the short run and about 3 in the long run. Their study has also shown higher export growth during 1970s and from the mid-1980s when the real devaluation of rupee was maintained, and slowdown in export

[1] India was traditionally one of the least open economies of the world (e.g., if we consider the beginning of the decade data for PENN's (PWT 6.2) 'openness in constant prices' variable, the best rank India ever had in terms of openness during this period was in 1970 when it was ranked 9th among the least open economies). In the trade sector, reforms mostly consisted of dismantling restrictions to import. However, several export incentives were also conceived and implemented in this period.

[2] The Reserve Bank of India defines the nominal and real effective exchange rates (NEER and REER) in terms of rupees (see Section *The Exchange Rate Series*).

[3] See, for example, Wilson and Tat (2001) and Bahmani-Oskooee and Kara (2003) for two recent studies.

growth during the real appreciation of rupee in the early 1960s and the first half of 1980s. Using a non-structural eclectic model for the period 1963–1994, Srinivasan (1998) has also reported relative prices as a significant export determinant in India. Veeramani (2008), using a longer time period from 1960 to 2007, has found that the appreciation of the real effective exchange rate (REER) leads to a fall in the dollar value of India's merchandise exports. However, the degree of such negative association between exports and the REER has declined since 2002; while the role of the rate of growth of India's real gross domestic product (GDP) and that of the world exports have assumed greater importance. His analysis also suggested that the strong growth of India's merchandise exports during 2002–2007 is likely to continue for at least 5 years after the period considered by him (2008–2012). However, Nayyar (1988), Ghosh (1990), Sarkar (1994) and Sinha Roy (2001) and Bhattacharyya and Mukherjee (2014) have taken the opposite stand on whether relative prices are significant as a determinant in explaining export performance and argue, for instance, that Indian exports are not necessarily price responsive, as turning points in India's export performance were not often led by the movements in exchange rate.

None of these papers, however, consider the regime shift due to the implementation of the liberalization policies explicitly in their data analysis. As we will see below, a mere visual examination of a plot of (at least some of) the relevant series clearly reveals breaks in the trend curve around the time the liberalization policies were implemented. Our main focus in this article is to determine the influence of these breaks on the outcome of the unit root as well as cointegration tests involving the series.

Even disregarding the issue of structural breaks due to liberalization, it is hard to form an a priori hypothesis about the export-exchange rate link. As several authors have argued, India's imports are expected to be less responsive than India's exports to changes in relative price. This is because a large part of India's imports (especially oil) are necessities with low elasticity of demand. On the other hand, India's major exports have traditionally been less sophisticated unskilled labour or resource intensive goods which many other countries produce. Thus, the exporters have an option of turning to other markets if the international prices

of Indian goods rise. Pitted against this is the fact that most Indian exporters quote the price of their products in terms of local currencies (mostly dollars or euros). This raises the possibility of zero pass-through of exchange rates to export prices. In fact, it has been found that the pass-through of exchange rates to goods imported by the US priced in terms of dollars is only about 25 per cent as against 95 per cent for goods priced in non-dollars (see Gopinath et al., 2010). If this is true for Indian exporters, then the effect of exchange rate is expected to be low for them. What this means is that since the possibility of losing international markets to competitors looms large for Indian exporters, they may be more willing to absorb price fluctuations to keep their markets intact. In these situations, the relationship between exports and exchange rates is likely to break down. Finally, the post-reform period for India coincided with the period of globalization the world over with trade flows reaching unprecedented heights. This 'world trade effect' reached India's shores as well raising the possibility of washing away any negative effects that exchange rates might have created.[4] Also the Indian currency devalues against dollar, while other countries stay put. This can happen if there is a country-specific measure, like that of the Indian liberalization as pointed out by the authors. Then, the Indian exports would be cheaper in the global market and should sell more if quality/quota/non-tariff barrier in the importing countries are not serious issues. Alternatively, there is a secular price decline for the export good. All countries gain and that with a lower exchange rate gain more by exporting more. So, if India is not the one with the lowest exchange rate, it may now consider devaluing its currency to retain market share. It should be noted that although the adjustments might lead to the same outcome and show a relation between exchange rates and exports, they are driven by two different shocks. The question of causality between export prices and exchange rates cannot be fully ruled out in that case. After all, the political economy of export policies accommodates long-standing debates on how lobbyists influence exchange rates for a country, in particular when the fluctuations in import prices can be passed on to the consumers with lesser frictions. Logically, therefore, the conclusion is far from being foregone—an ideal situation for the issue to be settled empirically.

[4] A decomposition of India's growth rate of exports shows that 'world trade effect' usually dominates other effects (see Veeramani, 2007).

Data and Methodology

The Exchange Rate Series

Figure 1 plots the nominal and real effective exchange rate (NEER and REER) for India between 1970 and 2007[5] where the two exchange rates are defined as:

$$NEER = \prod_{i=1}^{n} \left(\frac{e}{e_i} \right)^{w_i} \text{ and}$$

$$REER = \prod_{i=1}^{n} \left[\left(\frac{e}{e_i} \right) \left(\frac{P}{P_i} \right) \right]^{w_i}$$

where e is exchange rate of Indian rupee against Special Drawing Rights (SDRs) (SDR per rupee); e_i is exchange rate of the ith country's currency against SDRs (SDR per ith currency); w_i is $\frac{X_i + M_i}{\sum (X_i + M_i)}$ (trade-based weights) such that $\prod_{i=1}^{n} w_i = 1$, where X_i is export and M_i is import from the ith country; P is India's wholesale price index; P_i is CPI of the ith country; and n is 36 (number of countries involved in constructing the index). The indices are expressed per unit of rupee so that a rise implies appreciation of the rupee (see RBI, 2005, p. 1063).

NEER shows a sharp fall over the period with an almost horizontal portion from 1999 to 2000. REER (dotted line), on the other hand, shows a sharp fall until 1993–1994 and rising trend thereafter.[6] Taking REER

[5] All the data used in this article have been compiled from Handbook of Statistics on Indian Economy (2008–2009), published by Reserve Bank of India. All the variables are expressed in natural logarithms and are calculated at constant prices.

[6] Interestingly, NEER depreciated at a higher rate than REER for the whole period under consideration. After 1993–1994, REER started rising (appreciated). However, NEER continued to fall (depreciate) till 2000–2001. There is thus a degree of asymmetry in their behaviour during the period after 1993–1994 implying a higher inflation rate for India compared to its major trading partners.

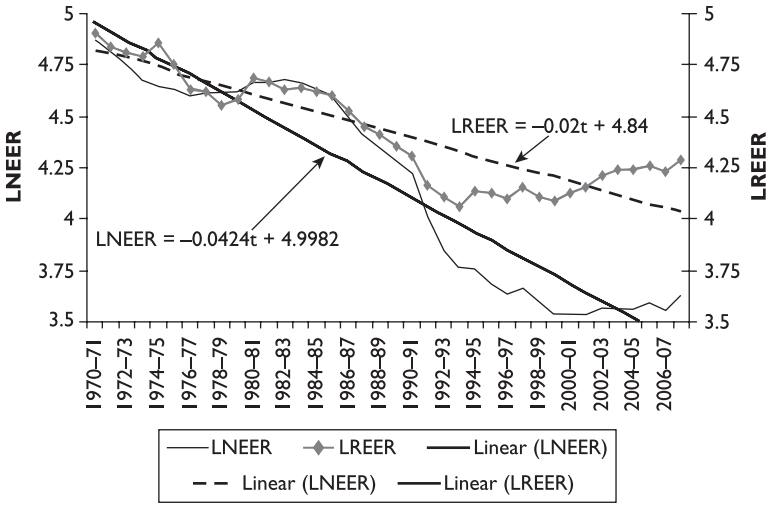

Figure 1. Annual Trend in LREER & LNEER

alone there are two opposing phases in its evolution over time (this cannot be said of the NEER):

- A depreciating part (up to 1993–1994)
- An appreciating part (after 1993–1994)

These segments of the REER curve are drawn separately in Figures 2 and 3. It can be seen from the diagrams that for the downward sloping phase the coefficient of the time trend is −0.03, whereas that of for the upward rising phase it is 0.01. Comparing the movement of the nominal rupee dollar exchange rate (not reported here) with those of NEER and REER, we find that it behaves almost exactly as NEER and unlike REER with a clear depreciation up to 2000–2001 and a slight appreciation thereafter.[7] To the extent that India's economic reforms were initiated in 1991 and trade and current account convertibility of the rupee was initiated in 1993 and 1994, visual observations are strongly suggestive of an

[7] In fact, the correlation of the dollar–rupee exchange rate with NEER is 0.94 and that with REER is 0.82.

indelible effect of policy reforms on all the three exchange rates. A visual examination of the (log values) of real export and real GDP series (to be plotted below in the third section; Figures 5 and 6), reveals an upward trend for the period 1970–1971 to 2006–2007.[8]

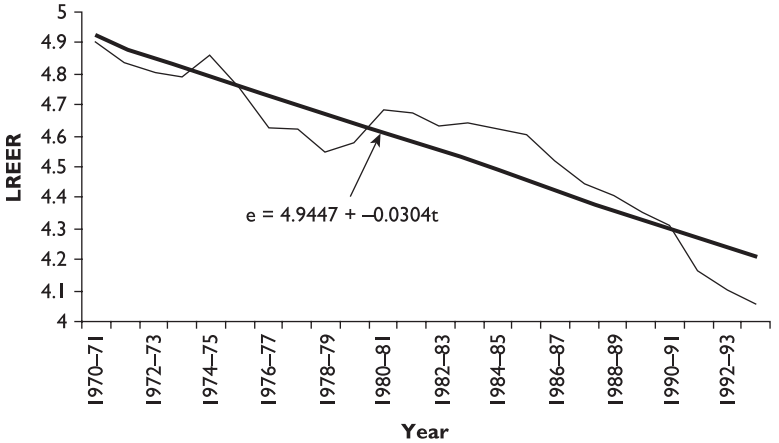

Figure 2. Phase I; LREER (1970–1971 to 1993–1994)

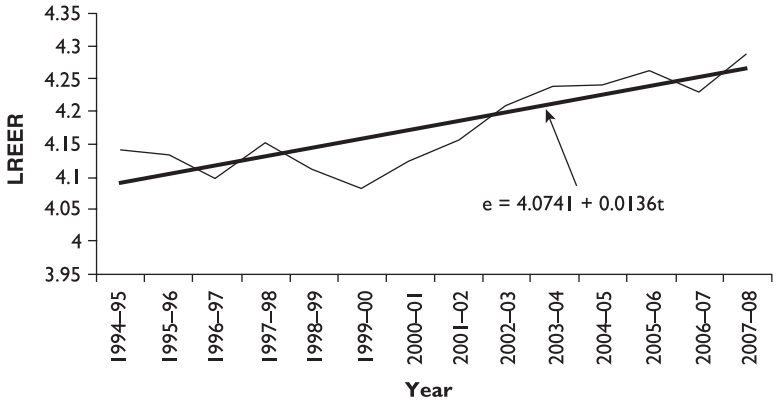

Figure 3. Phase II (1994–95 to 2006–07)

[8] The presence of structural breaks, though not so momentous, is noticeable around the period of India's policy reforms for these two variables as well (see Table 2).

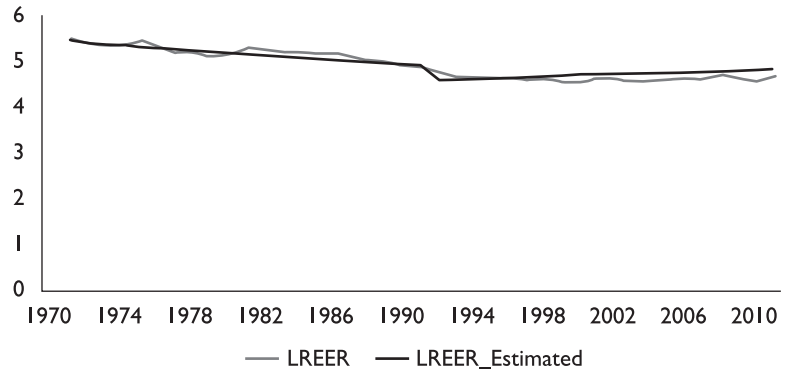

Figure 4. Regime Shift in the (Log) Value of 'REER'

Note: The broken trend line is a fitted trend by (OLS) of the form $\hat{y}_t = \hat{\mu} + \hat{\gamma}_1 DU_t + \hat{\beta}t + \hat{\gamma}_2 DT_t$, where $DU_t = DT_t = 0$ if $t \leq 1990$ and $DU_t = 1$, $DT_t = t$ if $t > 1990$.

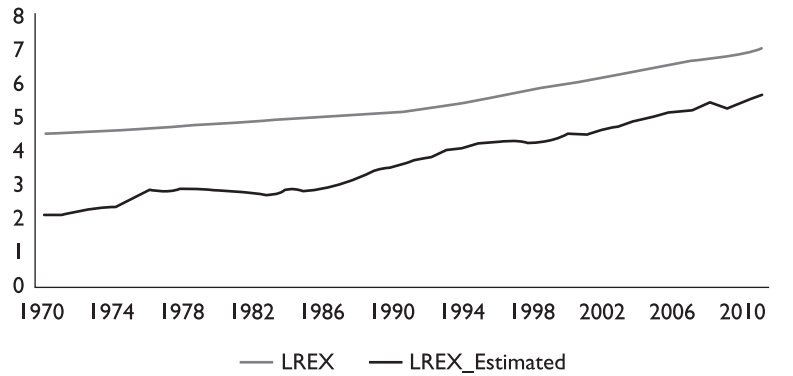

Figure 5. Regime Shift in the (Log) Value of 'REX'

Note: The broken trend line is a fitted trend by (OLS) of the form $\hat{y}_t = \hat{\mu} + \hat{\gamma}_1 DU_t + \hat{\beta}t + \hat{\gamma}_2 DT_t$, where $DU_t = DT_t = 0$ if $t \leq 1990$ and $DU_t = 1$, $DT_t = t$ if $t > 1990$.

Exchange Rates and Exports: The Casual Link

Before turning to the relationship between the exchange rate and exports formally, let us take a quick look at the kind of problem that we are likely to face while trying to explain India's export with the exchange

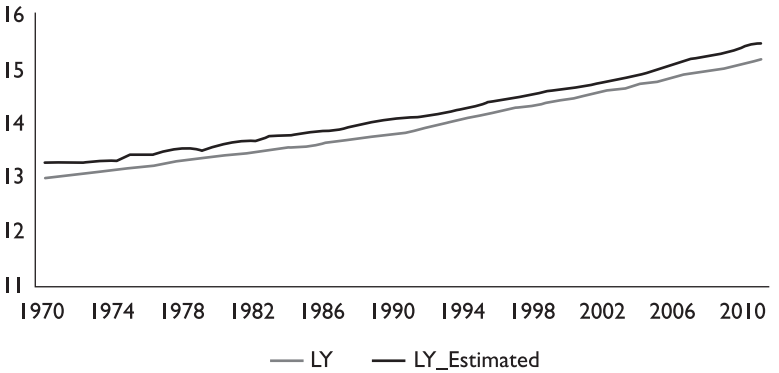

Figure 6. Regime Shift in the (Log) Value of 'Y'

Note: The broken trend line is a fitted trend by (OLS) of the form $\hat{y}_t = \hat{\mu} + \hat{\gamma}_1 DU_t + \hat{\beta}t + \hat{\gamma}_2 DT_t$, where $DU_t = DT_t = 0$ if $t \leq 1991$ and $DU_t = 1, DT_t = t$ if $t > 1991$.

rate disregarding the role of economic reforms. The plot of the two series reveals that the significant change in trend of the REER series has not been observed for exports (trend is positive throughout). We can thus immediately identify two eras in the relationship between the variables. In the first era lasting up to 1993–1994, the relationship between the two is exactly what the textbook argues: exchange rate depreciation having a positive effect on exports. In the second era starting from 1993 to 1994, the expected relationship between REER and exports has however reversed. The dichotomy is revealed in terms of correlations in Table 1. Even though magnitudes of correlations for two variables over time are meaningless as they are always expected to be high, the signs are still meaningful. It can be seen in the last row of the Table 1, the sign of the correlation coefficient between export and exchange rate has reversed in the 1994–1995 to 2007–2008 periods. This is true both for levels and growth rates (first difference of logs of the variables) as far as REER is concerned and only for growth rates for NEER. A cursory look at the data is thus strongly suggestive of a break in the *relationship* (in contrast to the variables themselves) between the variables. Does the overall relationship in the entire period survive this break? This is the question that we turn to now.

Table 1. Correlation Coefficients between Export and Exchange Rate

	Export and REER	Export and NEER
Year	Level (1st Diff.)	Level (1st Diff.)
1970–1971 to 2007–2008	−0.86 (−0.36)	−0.95 (−0.21)
1970–1971 to 1993–1994	−0.97 (−0.62)	−0.92 (−0.40)
1994–1995 to 2007–2008	+0.89 (+0.07)	−0.42 (+0.15)

Source: DGCI&S and Reserve Bank of India.

Methodology

There are a plethora of unit root tests with varied properties to choose from. Unit root test against a single-break stationary alternative was proposed by Perron (1989) and Zivot and Andrews (1992). It was extended to a two-break stationary alternative by Lumsdaine and Papell (1997) and up to five-break alternative, with an a priori unknown number of breaks, by Kapetianos (2005). However, as pointed out by Bec and Bassil (2009), these tests maintain the linearity assumption under the unit root null hypothesis. If a break exists under the null of unit root, they will exhibit size distortions (over rejection of the null) as well as the wrong estimation of the break point (see also Altinay, 2005; Kim and Perron, 2009; Nunes et al., 1997). To overcome this problem, Lee and Strazicich (2003, 2004) have developed an alternative (at most two) endogenous break unit root test that uses the Lagrange Multiplier (LM) test statistics and allows for breaks both under the null and the alternative hypothesis. Thus, any conclusion on the rejection of unit root null based on this LM test provides quite strong evidence of stationarity. We thus choose Lee and Strazicich (2003, 2004) over other tests, though we consider a single break in the series.

The strategy of cointegration will be specified after the results for the unit root tests are presented.

Results

A fundamental decision that has to be taken before we proceed with determining the order of integration of the variables is the number

of breaks/kinks we intend to internalize. Most data series experience multiple changes in slope and intercept over a period of time, like for instance the log of the real effective exchange rate (LREER) series plotted in the previous section, all of which can be reported as breaks (either in intercept or slope or both) on the basis of statistical tests. On the other hand, during a regime shift, we should expect multiple changes in polices as markets are gradually deregulated. All of these policy changes do not amount to breaks in the series. Thus, choosing the number of breaks for the data analysis is ultimately subjective. Domain knowledge dictates that there was *one* regime shift for India (implementation of liberalization), that it started informally from the mid-1980s and formally from 1991 and that the regime shift was ushered in by a series of policy changes all of which can be interpreted as small steps in a single direction. Take the example of the nominal exchange rate. Policy changes began with the rupee being devalued by 8 per cent in 1 July 1991 and by 11 per cent in 3 July 1991. It was made partially convertible on March 1992 in the trade account with the introduction of the (dual) liberalized Exchange Rate Management System (LERMS). The dual exchange rate system of March 1992 was unified and the rupee was made fully convertible on the trade account on February 1993. And finally, the rupee was made fully convertible in the current account in August 1994, thus achieving the Article VIII status of IMF. In spite of multiple policy changes as we have shown in the previous section, the data for nominal and real exchange rates show just one regime shift in the period after 1991. Further, though there are multiple kink points, the kink points do not necessarily coincide with the dates of the policy changes. We therefore conclude that in spite of the multiple policy changes as well as multiple kinks, it is appropriate to interpret domain knowledge to be supportive of a single break for the real exchange rate corresponding to the implementation of the liberalization policies. For analogous reasons, we allow for single breaks for the GDP and the real export series as well.

Tables 2–5 estimates the following export supply function for the Indian economy between 1970 and 2011:

$$LREX_t = \alpha + \beta_0 LREER_t + \beta_1 LY_t + u_t$$

Table 2. Unit Root Tests with One Structural Break (at Level)[a]

Series	Model	Break Point	Optimal Lags	*T*-statistic	Critical Values at 1%	Critical Values at 5%	Result
LREX	Break (intercept & trend)	1990	8	−4.02	(−5.05 to −5.11)	(−4.45 to −4.51)	Unit root
LREER	Break (intercept & trend)	1990	3	−4.53	(−5.05 to −5.11)	(−4.45 to −4.51)	*I*(0)
LY	Break (intercept & trend)	1992	8	−3.45	(−5.05 to −5.11)	(−4.45 to −4.51)	Unit root

Note: [a]Method applied is Lee and Strazicich (2004).

Table 3. Unit Root Tests with One Structural Break (at First Difference)[a]

Series	Model	Break Point	Optimal Lags	*T*-statistic	Critical Values at 1%	Critical Values at 5%	Result
LREX	Break (intercept & trend)	2003	9	−5.2	(−5.05 to −5.11)	(−4.45 to −4.51)	*I*(1)
LY	Break (intercept & trend)	1990	9	−5.83	(−5.05 to −5.11)	(−4.45 to −4.51)	*I*(1)

Note: [a]Method applied is Lee and Strazicich (2004).

Table 4. OLS Regression with *I*(0) Variables[1, 2]

	t_{1985}[c]	t_{1986}	t_{1987}	t_{1988}	t_{1989}	t_{1990}	t_{1991}	t_{1992}	t_{1993}	t_{1994}	t_{1995}
Constant	−0.38	−0.71	−0.63	−0.05	1.10	0.82	1.34	1.44	1.49	1.40	1.58
LREER	0.53	0.83	0.72	0.11	−1.06	−0.78	−1.31	−1.33	−1.46	−1.36	−1.54
DLY	−0.37	−0.51	−0.66	−0.27	−0.39	−0.35	−0.14	−0.17	−0.14	−0.19	−0.26
Trend	−1.11	−0.59	−0.08	−0.01	−0.42	−0.40	−0.75	−0.83	−0.76	−0.76	−0.87
D	0.56	1.05	1.11	0.58	−0.62	−0.42	−0.97	−0.99	−1.31	−1.26	−1.67
DT	1.11	0.59	0.01	−0.19	0.33	0.31	0.76	0.87	1.04	1.06	1.42

Notes: [a]Dependent variable DLREX. [b]The figures in the table indicate the estimated *t*-statistic. [c]*t*-Statistic.

Table 5. ARDL Cointegration with Level Variables

Year	Type of Break	*F*-statistic	*W*-statistic	Year	Type of Break	*F*-statistic	*W*-statistic
1985	Intercept	2.65	10.61	1991	Intercept	1.93	7.71
	Trend	2.97	11.88		Trend	1.93	7.71
1986	Intercept	3.13	12.53	1992	Intercept	1.93	7.72
	Trend	3.44	13.77		Trend	1.93	7.73
1987	Intercept	3.17	12.69	1993	Intercept	2.15	8.62
	Trend	3.39	13.58		Trend	2.13	8.53
1988	Intercept	2.62	10.48	1994	Intercept	2.12	8.49
	Trend	2.71	10.86		Trend	2.10	8.40
1989	Intercept	1.96	7.82	1995	Intercept	2.62	10.47
	Trend	1.95	7.80		Trend	2.52	10.08
1990	Intercept	2.10	8.40				
	Trend	2.05	8.21				

Notes: [a]Dependent variable LREX. [b]Critical value bounds for the *F*-statistic at 5 per cent are (4.45, 5.64) and for the *W*-statistics at 5 per cent are (17.78, 22.54) (see Pesaran and Shin, 1999).

where LREX is India's real value of export, LREER is India's real effective exchange rate and LY is India's GDP all in their natural logs. Tables 2 and 3 confirm the existence of one structural break for all the three series. As expected, the break date for LREER coincides with the policy of devaluation. Interestingly, the breaks in LREX and LY are *before* the formal implementation of the liberalization polices.

After accounting for one break in the deterministic trend the outcome of the unit root test shows that while LREER is $I(0)$, LREX and LY are both $I(1)$. Clearly therefore, standard methods of cointegration of $I(1)$ variables are not applicable in this case. The strategy that we use is (a) to reduce all the variables to $I(0)$ by a single differencing of LREX and LY and run ordinary least square (OLS) and (b) to use the Auto Regressive Distributed Lag (ARDL) method on the level variables. The corresponding equations for the two cases are:

$$\text{(a)}\ \Delta LREX_t = \alpha_0 + \phi_0 t + (\alpha_{1+i} - \alpha_0) D_{1985+i} + (\phi_{1+i} - \phi_0) D_{1985+i} t + \beta_0 LREER_t + \beta_1 \Delta LY_t + u_t$$

$$\text{(b)}\ \Delta LREX_t = \alpha_0 + \phi_0 t + (\alpha_{1+i} - \alpha_0) D_{1985+i} + (\phi_{1+i} - \phi_0) D_{1985+i} t + \sum_{k=1}^{p} \beta_k \Delta LREX_{t-k} + \sum_{l=1}^{p} \chi_l \Delta LREER_{t-l} + \sum_{m=1}^{p} \delta_m \Delta LY_{t-m} + \lambda_1 LREX_{t-1} + \lambda_2 LREER_{t-1} + \lambda_3 LY_{t-1} + u_t$$

for each $i = 0, \ldots, 10$,

where Δ is the first difference operator[9] and the optimal lag length for the ARDL method turns out to be (1, 0, 0, 0).[10] We assume that the break in the relationship between the variables could have occurred at a maximum of 10 lags from the date of informal implementation of the liberalization policies in 1985. Thus, D_{1985+i} ($i = 0, \ldots, 10$) is defined as follows:

$$D_{1985+i} = 0 \text{ for } t < 1985 + i$$
$$= 1 \text{ for } t \geq 1985 + i$$

The crash (break only in intercept) and growth (break only in slope) models in the second equations were estimated separately so that there are (10 + 20 =) 30 equations to estimate in (a) and (b). The equations in (b) show the relationship between LREER and LREX at the level while those in equations in (a) show the relationship between LREER and the one period relative growth rate of LREX.[11]

The results for the equations in (a) and (b) are reported in Tables 4 and 5. It is clear from the tables that LREER does not have any statistically significant relationship either with LREX or its one period relative growth rate. However, there is a statistically significant cointegrating relationship with LREER without structural break (see Appendix).[12]

[9] The rest of the Greek letters in the equations being the coefficients to be estimated.

[10] The Schwarz Bayesian Criterion (SBC) was used for determining the lag lengths.

[11] Thus, say, $\hat{x}_{it} = \frac{dx}{x}$ in this discrete case has been written as $\Delta \ln x_t$ ($\ln x_t - \ln x_{t-1}$).

[12] Veeramani (2008) conducts a similar exercise (as in the Appendix) for the period 1960–2007 and arrive at the similar conclusions. Working with several forms of quarterly REER

Statistically, the difference in the result is due to the incorrect determination of the order of integration of the LREER series. As it turns out, LREER falls within a class of variables first analyzed by Perron (1989).[13] Using the argument in that paper, we can argue that with an obvious regime shift for LREER resulting in a significant shift of intercept as well as the slope of the trend function (see Figure 4), the Augmented Dickey–Fuller (ADF) test is no more consistent and the unit root hypothesis has been accepted by the test for the level variable even though it is not true. The magnitude of the shift (at the break point) is strong enough for the ADF test to give erroneous results.

On the other hand, Figures 5 and 6 clearly show that nothing so momentous happened with LREX and LY. Their trends are smooth compared to LREER. Logically, the low variability of the LREX series is due to the fact that the main impact of reform in the trade sector in India was in imports rather than exports. Imports were considerably more regulated than exports so that there was much more for the government to do with imports compared to exports. Also, the relatively minor changes that were undertaken for exports were introduced over a long period of time resulting in a relatively smoother transition. Thus, although there were continuous changes in export mix and also the destination, the acceleration in growth was broad-based, with a double-digit growth rate registered across all the commodity groups and service sectors. Export performance improved after reforms at a comparatively greater pace. For the period 1970–1990, total merchandise exports grew at 37.49 per cent while for the period 1990–2008 the growth rate increased to 48.33 per cent.[14] The case of GDP is different with export accounting; for a small part of GDP, it had its own story to tell independently of exchange rates. The decade of 1980s was marked by the emergence of the Indian economy out of the low growth syndrome of the previous three decades; the pick-up benefitted from the initiation of some reform measures since mid-1980s aimed at increasing domestic competitiveness. The political

(including the 5-country trade weighted version and the ones where the wholesale price index for India is replaced by the consumer price index) between 1993 and 2001, Kohli (2002) finds that REER is mostly stationary. None of these papers consider structural breaks.

[13] Perron (1989) showed that a large number of variables found to be $I(1)$ by Nelson and Plosser (1982) without break become $I(0)$ after internalizing the break. Many subsequent papers, in fact, almost all papers on structural break have raised and discussed these issues.

[14] Source: WITS.

instability and the Gulf war coupled with rising current account deficits, and dwindling foreign exchange reserves, resulted in a dip in the average of the annual growth rate of GDP dipped during the three-year period of fiscal contraction from 1990–1991 to 1992–1993.[15] Thereafter, the growth impulses gathered the necessary momentum and exhibit a near upward trend.

Concluding Observations

The government of India's New Economic Policy of 1991 had two parts. The main aim was to change the structure of the economy from a government-oriented one to a market-oriented one. This was the long-term objective which was expected to be implemented in phases over a period of 10 or 20 years. The other objective was to stabilize the economy while the policies are being implemented. These policies mostly consisted of monetary and fiscal policies and were clearly short-term in nature implemented from time to time and adjusted or withdrawn according to the prevailing situation at any point of time.

The journey from a mixed economy with socialistic objectives towards a free-market economy with competitive objectives has to be an extremely tedious one anywhere in the world. For a country as massive and as complex and chaotic as India, it is natural to expect the journey to be next to impossible. However, they did not have a choice as they were made to follow a liberalization package of the IMF.

The IMF's liberalization package touched upon every aspect of the economy. Since simultaneous implementation of all of them was not feasible, a question of sequentiality in the policies came to the fore and was much discussed by economists in the early 1990s. One of the first policies to be implemented was the exchange rate policy. It should be understood that before the decade of the 1990s India's exchange rate was more or less fixed. Between 1947 and 1975, the rupee was pegged to the pound sterling after which it was pegged to a basket of currencies.[16] The Reserve

[15] It is not surprising therefore that Lee and Strazicich's (2004) break-point for LY has been estimated at 1989–1990.

[16] There was a period in 1971 when the rupee was pegged to the dollar rather than the sterling at ₹7.5 to the dollar. The sterling peg returned from January 1972 and continued till

Bank of India (RBI) announced the exchange rates on the basis of the daily exchange rate movements of a select number of currencies (of India's major trading partners). The fluctuations were intended mainly to keep the real exchange rate constant.

From this system of fixed (or 'implicitly adjustable peg') exchange rate, the Indian government shifted to a flexible exchange rate system (in the current account) by 1992–1993. The shift was achieved by devaluations as well as removal of regulations. The devaluation of the currency created a break in the exchange rate series and the removal of regulations affected its over-time movements. However, exports, which did not face such drastic policy changes and were riding the crest of booming world trade due to liberalization, performed relatively steadily over time. Thus, the two variables became delineated after the post-reform period, exports continuously rising at a time when the rupee was actually appreciating in terms of the REER. This weakened the impact of the REER on exports to insignificant levels. Exports in India are mostly caused by other factors, not by the REER.

Appendix

Analysis without Structural Breaks

Note since all the variables are $I(1)$ without structural break, we have used the two-step Granger procedure for cointegration.

Table A1. Unit Root Tests

	ADF[a]		PP[b]		
Variables	Level	First Difference	Level	First Difference	Conclusion
LREX	−1.59	−3.32***	−1.86	−6.09*	*I*(1)
LREER	−0.92	−5.92*	−0.97	−5.91*	*I*(1)
LY	−1.28	−8.04*	−1.28	−10.38*	*I*(1)

Notes: [a]Augmented Dickey-Fuller test. [b]Philips-Perron test. Asterisks (*) and (***) denote statistically significant at 1 per cent and 10 per cent levels, respectively. Results reported are those with drift and trend.

September 1975. In June 1972, the sterling started to float so that the peg implied that the value of the rupee had to be kept stable with respect to the (floating) sterling.

Table A2. Cointegration

	Estimated Coefficients
LREER	0.65* (4.29)
LY	1.30* (18.46)
Constant	−11.64* (−6.87)

Notes: Asterisk (*) denotes statistically significant at 1 per cent level; *t*-tatistic in parentheses; Dependent variable log of India's real exports; and Error is white noise (ADF statistic: −2.51).

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