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ABSTRACT

Earlier studies that investigated the J-Curve phenomenon for Pakistan employed aggregate trade data. These studies suffered from the "aggregation bias" problem. In order to overcome this constraint, this paper tests the effects of real exchange rate depreciation in the Pakistani Rupee on the bilateral trade balance between Pakistan and her 12 respective trade partners. These countries, together, account for almost half of Pakistan's total trade. In order to differentiate between the long-run equilibrium and short-run disequilibrium dynamics, and also to deal with non-stationary data, the ARDL approach is used. The results do not provide any support for the standard J-curve phenomenon.

JEL classification: F12, F14, F31

Keywords: J-Curve, Trade Balance, Marshall-Lerner Condition

1. INTRODUCTION

Exchange rate policy has always been a contentious issue for developing countries. Most developing countries, including Pakistan, have devalued their currencies, time and again, when faced with the balance of payments deficit problem. In the economics literature, there are two views that form the basis for devaluation of the domestic currency. The absorption approach argues that devaluation results into switching in spending from foreign to domestic goods, and thus improves the trade balance; while the Monetarist argument is that devaluation improves the trade balance by reducing the real value of cash balances and changing the relative price of traded and non-traded goods—The Marshall-Lerner condition states that "if sum of import and export demand elasticities is greater than one, devaluation will improve the trade balance" and is considered both necessary as well as sufficient for the envisaged improvement in the trade balance to occur. However, in some cases, even when the Marshal-Lerner condition is satisfied, the trade balance has continued to deteriorate [Bahmani-Oskooee (1985)]. This shifts the focus from the Marshall-Lerner condition to the j-curve phenomenon explained below.

Due to its lag structure, currency devaluation is said to worsen the trade balance first, and then improve it later resulting in a pattern resembling the letter J, hence the J-Curve nomenclature [Magee (1973)].

The standard theoretical explanation for the j-curve phenomenon: A change in the exchange rate has two effects on trade flows—the price effect and the volume effect. The price effect implies that currency depreciation will cause imports to be more expensive and domestic exports to be cheaper for foreign buyers at least in the short run. Since the volume of goods imported and exported might not change drastically in the short run, the trade balance may initially deteriorate. However, the volume of trade changes eventually in response to the depreciation in the currency. In other words, the price effect is generally believed to dominate the volume effect in the short run. In the long run, however, if the Marshall-Lerner condition holds, the volume effect takes over and reverses the price effect, and the trade balance improves.

However, the empirical evidence for the existence of the j-curve can at best be described as mixed. Earlier studies like Krugman and Baldwin (1987), find evidence of a J-curve in US data. However, in a series of papers, Rose and Yellen (1989), and Rose (1990, 1991), not only is the J-curve hypothesis rejected, but it is also argued that there is no significant effect of the real exchange rate on the trade balance for both the developing and the developed countries, including the US. In a more recent study, Bahmani-Oskoee and Brooks (1999) used the Auto-regressive Distributed Lags (ARDL) approach to analyse the US data support the Rose and Yellen findings that there is no effect of the real exchange rate on the trade balance in the short run, but, in the long-run, the real depreciation of the US Dollar is found to have a favourable effect on the trade balance.

There are a few studies [Rehman and Afzal (2003), Aftab and Aurangzeb (2002) and Bahmani-Oskooee (1985)] which have tested the J-curve phenomenon for Pakistan. However, the major limitation of these studies is that they employed aggregate trade data, and therefore suffer from 'aggregation bias'. Marquez (1990) suggests that using disaggregated data is more appropriate when investigating bilateral trade. To overcome these problems, in this paper we investigate the short-run and the long-run effects of real depreciation of the Pakistani Rupee on the bilateral trade balance between Pakistan and each of her 12 trading partners using quarterly data over the time period 1980–2005. These countries, together, account for more than 50 percent of Pakistan's total trade (see Table 1). The remaining trade partners could not be included due to nonavailability of data. We used the bilateral exchange rate with individual trade partners as it provides a clearer picture of the country-specific trade performance [Akhter and Malik (2000)]. Depreciation against a single country's currency improves the trade balance only with that particular country provided the Marshall Lerner condition holds. Therefore, pursuing a policy of bilateral currency adjustment will be a more appropriate strategy to improve the trade balance. The only other study [Akhtar and Malik (2000)] that employed disaggregated quarterly data applied the 3SLS technique to investigate the Marshall-Lerner condition for Pakistan with respect to its four trading partners, UK, USA, Germany, and Japan. They conclude that real devaluation does not improve our trade balance with USA and Germany, while it can arrest the trade balance deterioration with UK and Japan". However, the study does not control for non-stationary data.

Another important issue when analysing the impact of depreciation of the Pakistani rupee against the trade partners' currencies is the comparative assessment of competitors' behaviour. If competitor countries also devalue their currencies in response to local currency depreciation, then depreciation may even worsen the trade balance rather than ameliorating it. In this study we also consider this issue by looking at the response of Pakistan's major competitors.

Our paper is based on Bahmani-Oskooee's and Ratha (2004), methodology employed on disaggregated trade data for India. We use quarterly time series for the period of 1980:1 to 2005:4 for Pakistan. Moreover, as mentioned above, we use disaggregated country-wise trade data for Pakistan in order to avoid "aggregation bias". The countries included in the studies and their respective shares are given in the Table 1.

Table 1

Pakistan's Trade Share with Her Major Trading Partners

Trade Shares	Share
United States	14.4%
Canada	1.3%
Japan	4.4%
France	2.5%
Germany	4.9%
Italy	2.6%
Netherlands	1.8%
Spain	1.3%
United Kingdom	5.2%
Hong Kong	3.1%
Korea	2.5%
Singapore	3.6%
Total	47.6%

The trade deficit/surplus with the respective trade partners are given in Table 2. Japan, Singapore, and South Korea are countries with which Pakistan posted a trade deficit throughout the time period 1997-98–2005-06. The share of trade with these countries is 10.5 percent of the total trade. Our trade was also in deficit with Canada during the period 2003-04–2005-06.

Table 2

Trade Deficit/Surplus with the Trade Partners 1997-98, 2005-06

Countries	1997-98	1998-99	1999-00	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06
Canada	1745.81	4685.52	5469.14	5936.37	6075.63	4966.36	***–1364.5***	***–160.74***	***–6731.7***
USA	27646.2	49239.7	76460.7	98361.1	96633.1	110076	92998.7	111612	151770
France	2615.33	3559.86	2996.86	7004.08	7021.30	7552.64	10256.7	9484.96	***–225.01***
Germany	833.9	6516.42	4628.57	6598.35	778.486	983.565	***–299.96***	***–12404***	***–29282***
Italy	***–116.15***	***–2524***	1969.73	3061.17	2386.36	4849.63	8144.74	13322.7	3691.97
Netherlands	5897.87	4779.99	3844.67	3166.57	5074.96	5434.14	6609.96	11759.6	8949.90
Spain	4535.37	5021.10	5291.17	6774.99	7099.53	10082.9	12813.8	15107.9	19097.8
UK	7878.31	5650.70	11591.8	13199.2	18604.4	25253.3	28945.2	21391.0	5335.7
Hong Kong	24463.2	24860.8	24598.5	25599.8	22971.4	21032.0	25094.9	27501.6	30860.1
Japan	***–186634***	***–25201***	***–19830***	***–22501***	***–21575***	***–3870***	***–46151***	***–76288***	***–102507***
Singapore	***–7488.73***	***–13960.9***	***–11298.5***	***–16255.7***	***–17056.5***	***–19877***	***–21553***	***–18794***	***–25459***
South Korea	***–8339.1***	***–7186.1***	***–5637.4***	***–4464.3***	***–2215.6***	***–6872.7***	***–10284***	***–21942***	***–25467***
Total	***–63178***	***–75621***	***–90113***	***–87929***	***–73683.6***	***–62078***	***–188789***	***–368991***	***–726318***

Textile and Clothing constitute round about 70 percent of our total exports, and the major competitors in exporting these items include; Bulgaria, Bangladesh, China, India, Indonesia, Morocco, Sri Lanka, Thailand, and Turkey, etc.

The rest of the paper is structured as follows. Section 2 introduces the methodology. The empirical results are discussed in Section 3. The last section provides the conclusion and policy recommendations.

2. THE MODEL AND METHODOLOGY

Following Arora, Bahmani-Oskooee, and Goswami (2003), and Bahmani-Oskooee and Brooks (1999) our model expresses the trade balance as a function of domestic income, foreign income and the real exchange rate (see equation 1 below).

$$\ln\left(x_{it} / m_{it} \right) = \beta_0 + \beta_1 \ln r_{ti} + \beta_2 \ln y_{pt} + \beta_3 \ln y_{it} + \varepsilon_{it} \qquad \ldots \qquad \ldots \qquad (1)$$

Where the measure of trade balance is the ratio of Pakistani exports to the *i*th trade partner (x_{it}) over her imports from the *i*th trade partner (m_{it}); y_{pt} is Pakistan's income, and y_{it} is the income of the respective trading partner *i*., r_{it} is the real bilateral exchange rate between Pakistan and trading partner *i* (an increase implies depreciation). The depreciation of the Pakistani rupee against the trading partner's currency could have a positive or a negative impact on the trade balance, depending upon the nature of exports to, and imports from the trading partner i.e. $\beta_1 > 0$ or $\beta_1 < 0$. If an increase in domestic income raises imports, the estimate of β_2 would be expected to be negative; on the other hand, if an increase in y_{pt} is due to an increase in the production of import-substitute goods, then it is possible that the relationship between domestic income and the measure of the trade balance is positive. Similarly, the estimated value of β_3 could be either negative or positive.

We incorporate the short-run dynamics into Equation (1) in order to test the J-curve hypothesis. As the econometrics literature suggests, Equation (1) can be specified in an error-correction modeling format. To avoid the difficulty of choosing among different tests for unit root, based on Pesaran and Shin (1995) and Pesaran, *et al.* (2001), we use a relatively new methodology—the Autoregressive Distributed Lag (ARDL) approach. Equation (1) may be rewritten:

$$\begin{aligned}\Delta\ln\left(x_{it} / m_{it} \right) = {} & \beta_0 + \sum\beta_{1j}\Delta\ln r_{t-j} + \sum\beta_{2j}\Delta\ln y_{pt-j} + \sum\beta_{3j}\Delta\ln y_{it-j} \\ & + \sum\beta_{4j}\Delta\ln\left(x_{it-j} / m_{it-j} \right) + \gamma_1 \ln(x_{it-1}/m_{it-1}) + \gamma_2 \ln r_{it-1} \\ & + \gamma_3 \ln y_{pt-1} + \gamma_4 \ln y_{it-1} + \varepsilon_{it} \qquad \ldots \qquad \ldots \qquad (2)\end{aligned}$$

Equation (2) can be estimated in two steps. In the first step, the null hypothesis of 'non-existence of the long-run relationship' among the variables i.e. H0: $\gamma_1 = \gamma_2 = \gamma_3 = \gamma_4 = 0_3$, is tested against the alternative of H1: $\gamma_1 \neq 0,\ \gamma_2 \neq 0,\ \gamma_3 \neq 0,\ \gamma_4 \neq 0_3$.The relevant statistic to test the null is the familiar F-statistic.

Once the long run relationship i.e. the co integration among the variables is confirmed in the first step, the following Error Correction Model (ECM) can be estimated in the second step:

$$\Delta\ln\left(x_{it}/m_{it}\right) = \beta_0 + \sum\beta_{1i}\Delta\ln r_{it-j} + \sum\beta_{2i}\Delta\ln y_{pt-j} + \sum\beta_{3i}\Delta\ln y_{it-j} + \sum\beta_{4i}\Delta\ln\left(x_{it-j}/m_{it-j}\right) + \lambda EC_{it-1} + \upsilon_t \qquad \ldots \quad (3)$$

where λ is the speed of the adjustment parameter and EC is the residual obtained in the first step.

3. EMPIRICAL RESULTS

Quarterly data from 1980:1 to 2005:4 is used to test the j-curve hypothesis for Pakistan with her 12 largest trading partners. Applying the methodology outlined in the section above, we first estimate Equation (2). For the null of no Cointegration, the lags are selected on the basis of the Akaike Information Criterion (AIC). Results of the F-test in the first step are sensitive to the number of lags imposed on the first differenced variables [Bahmani-Oskooee and Brooks (1999)]. As illustrated in Table 3, we fail to reject the null of no cointegration for four out of the twelve trade partners considered; these are Canada, Japan, Korea and Singapore. Further, for the 8 remaining trade partners for which the null of no cointegration is rejected, we estimate the cointegrating equations including only significant lags in Equation (2).[1] The long-run relationships are reported in Table 4. We then move onto the second step, and estimate the error correction model for each respective trade partner: these results are provided in Table 5.

Table 3

The Results of the F-test and the Number of Lags Selected

Trade Partner	Lags Selected	F-statistic (Calculated)
Canada	2	2.458506
France	8	8.406200
Germany	2	12.63870
Hong Kong	6	20.54643
Italy	2	5.567571
Japan	2	1.209614
Korea	6	2.442403
Netherlands	8	8.932439
Singapore	2	2.576226
Spain	2	9.550253
UK	2	8.085907
USA	6	4.704340

Note: Critical value of F-statistic is 3.57.

[1]LM residual test is used to make sure that the error term is white noise. We also use the CUSUM and CUSUM of SQUARES test to check the stability of the model.

The results in Table 4 show that the lagged error-correction term carries its expected negative sign and is highly significant in all cases. This further supports the co-integration results obtained by using the F-test in the first step. As for the J-curve hypothesis, the standard J-Curve pattern is not observed in any of the cases considered (see Table 5).

Table 4

Long-run Estimated Equations for the Trade Balance

Country	Co-integrating Equations
France	$\ln(x_t/m_t) = \underset{(-1.3)}{-0.2} \ln r_t + \underset{(2.9}{0.9} \ln y_{pt} - \underset{(-2.8)}{0.5} \ln y_{it}$
Germany	$\ln(x_t/m_t) = \underset{(5.8)}{0.9} \ln r_t - \underset{(-2.6)}{0.07} \ln y_{pt} - \underset{(-0.4)}{0.06} \ln y_{it}$
Hong Kong	$\ln(x_t/m_t) = -5.2 + \underset{(2.2)}{0.5} \ln r_t - \underset{(-0.2)}{0.07} \ln y_{pt} + \underset{(6.4)}{2.9} \ln y_{it}$
Italy	$\ln(x_t/m_t) = \underset{(1.9)}{0.6} \ln r_t - \underset{-1.3)}{0.7} \ln y_{pt} + \underset{(1.5)}{1.1} \ln y_{it}$
Netherlands	$\ln(x_t/m_t) = 10.0 + \underset{(4.1)}{1.6} \ln r_t - \underset{(-1.0)}{0.4} \ln y_{pt} + \underset{(2.2)}{5.7} \ln y_{it}$
Spain	$\ln(x_t/m_t) = \underset{(4.1)}{1.1} \ln r_t + \underset{(0.6)}{0.2} \ln y_{pt} + \underset{(0.7)}{0.3} \ln y_{it}$
UK	$\ln(x_t/m_t) = -7.5 + \underset{(1.3)}{0.3} \ln r_t - \underset{(-1.6)}{0.3} \ln y_{pt} + \underset{(3.0)}{3.8} \ln y_{it}$
USA	$\ln(x_t/m_t) = -\underset{(-0.9)}{0.4} \ln r_t + \underset{(3.7)}{3.8} \ln y_{pt} - \underset{(-3.7)}{3.8} \ln y_{it}$

Note: Numbers in parenthesis are *t*-statistics.

Although no evidence is found to confirm the standard j-curve phenomenon at the disaggregated country level, in the long run, we find a positive and significant impact of exchange rate depreciation on Pakistan's respective bilateral trade balance with Germany, Hong Kong, Italy, Netherlands, and Spain. While in the case of UK, USA and France, exchange rate depreciation does not have a significant impact on the respective bilateral trade balance with each of these three countries.

Table 5

Coefficient Estimates of the Exchange Rate and the Error Correction Term

	Trading Partners				
	France	Germany	Hong Kong	Italy	Netherlands
$\Delta \ln r$	–0.1	0.5	1.8	0.8	0.4
	(–0.6)	(1.5)	(0.9)	(0.2)	(0.5)
$\Delta \ln r_{t-1}$	0.1	0.02	1.2	0.3	0.4
	(0.3)	(0.05)	(0.6)	(0.5)	(0.5)
$\Delta \ln r_{t-2}$	–0.04	0.2	–0.7	–0.5	–0.97
	(–0.2)	(0.4)	(–0.3)	(–0.3)	(–1.2)
$\Delta \ln r_{t-3}$	–0.3		4.4		–1.0
	(–1.2)		(2.4)		(–1.2)
$\Delta \ln r_{t-4}$	0.2		3.1		–1.1
	(0.8)		(1.7)		(–1.3)
$\Delta \ln r_{t-5}$	–0.1		1.4		0.5
	(–0.3)		(0.7)		(0.7)
$\Delta \ln r_{t-6}$	–0.4		–0.2		0.02
	(–1.9)		(–0.12)		(0.03)
$\Delta \ln r_{t-7}$	–0.1				–0.03
	(–0.7)				(–0.04)
$\Delta \ln r_{t-8}$	0.3				0.4
	(1.4)				(0.5)
EC_{t-1}	–0.6	–0.6	–0.9	–0.3	–0.4
	(–2.8)	(–4.5)	(–5.0)	(–3.3)	(–2.5)

	Spain	UK	USA
$\Delta \ln r$	0.5	0.5	–0.3
	(0.6)	(0.9)	(–1.6)
$\Delta \ln r_{t-1}$	0.6	0.2	–0.2
	(0.8)	(0.4)	(–1.4)
$\Delta \ln r_{t-2}$	0.4	0.5	–0.3
	(0.6)	(0.7)	(–1.7)
$\Delta \ln r_{t-3}$	0.6	–0.4	–0.1
	(0.8)	(–0.6)	(–0.9)
$\Delta \ln r_{t-4}$	0.7	0.3	–0.1
	(0.9)	(0.5)	(–0.7)
EC_{t-1}	–0.4	–0.2	–0.1
	(–2.7)	(–2.3)	(–3.2)

Note that, at an aggregate level, the majority of previous studies concluded that a real devaluation in the long run is estimated to positively impact the trade balance. (See the grid below for a comparison with previous studies).

	Marshall-Lerner Condition	Methodology	Estimation Period	Data Frequency
Aftab and Aurangzeb (2002)	Satisfied	Cointegration	1980–2000	Quarterly
Akhtar and Malik (2000)	Not satisfied for US and Germany but satisfied for UK and Japan	3SLS	1982–96	Quarterly
Bahmani-Oskooee (1998)	Strongly satisfied (3.11)	Cointegration	1973–90	Quarterly
Khan and Aftab (1995)	“Barely satisfied”	IV	1983–93	Quarterly
Hasan and Khan (1994)	Strongly satisfied (1.64)	3SLS	1972–91	Annual

However, at a more disaggregated country-wise analysis, exchange rate depreciation does not have a significant impact on the trade balance in three of the eight countries considered: these three countries together account for a little more than 22 percent of Pakistan’s total trades share; in fact, USA and UK are among Pakistan’s largest trading partners. The findings are comparable with what Arora, Bahmani-Oskooee, and Goswami (2003) conclude in the case of India. Using disaggregated trade data for India, against her 7 major trade partners, Arora, Bahmani-Oskooee, and Goswami (2003) conclude that in the long-run, real depreciation of the rupee against the currencies of Australia, Germany, Italy and Japan, has a positive impact on the trade balance, however, in the other three countries considered (USA, UK and France) Arora, *et al.* (2003) also did not find a significant impact of real rupee depreciation on India’s bilateral trade balance with USA, UK and France respectively.

Additionally, we aggregate the estimated coefficients associated with each respective bilateral exchange rate after multiplying each coefficient with its respective trade share. The aggregation is made on the assumption that the *relative* exchange rate between the partner currencies remains unchanged. Thus, the aggregate effect of domestic exchange rate depreciation may be expressed as follows:

$$\theta = \sum \delta_i \beta_i = (0.07)\,(-0.2) + (0.13)\,(0.9) + (0.09)\,(0.5) + (0.06)\,(0.07) + $$
$$+(0.05)(1.6)+(1.1)(0.04)+(1.3)(0.14)+(0.4)(-0.4) = 0.34$$

At the aggregate level the trade balance improves as a result of depreciation of the Pak rupee against the currencies of its respective trade partners.

Next we look at the extent to which the response of our competitors may dampen the effect of the deprecation in the Pak rupee *vis-à-vis* its trade partners. The correlations of our main competitors' real effective exchange rates with Pakistan's exchange rate are provided in Table 6.

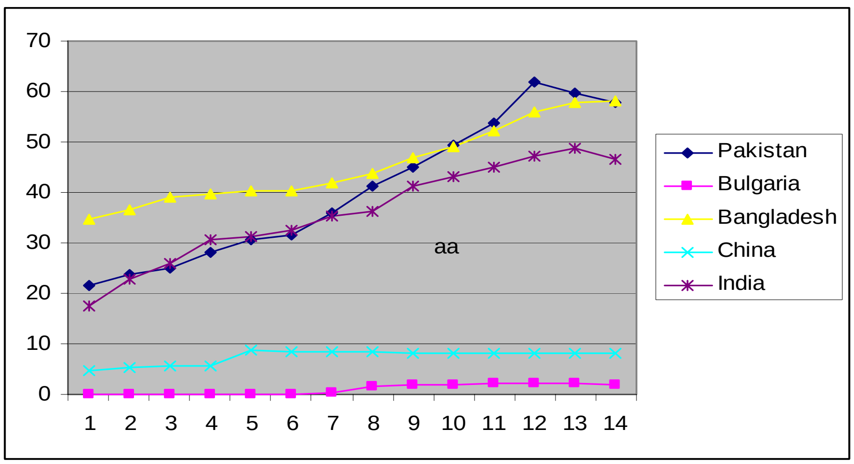
Table 6

Correlation between Real Effective Exchange Rate of Pakistan and Her Major Competitors

	Bulgaria	Bangladesh	China	India	Indonesia	Morocco	Sri Lanka	Turkey	Thailand
Pakistan	0..98	0..93	0.7	0..97	0..92	0.89	0..97	0..94	0.89

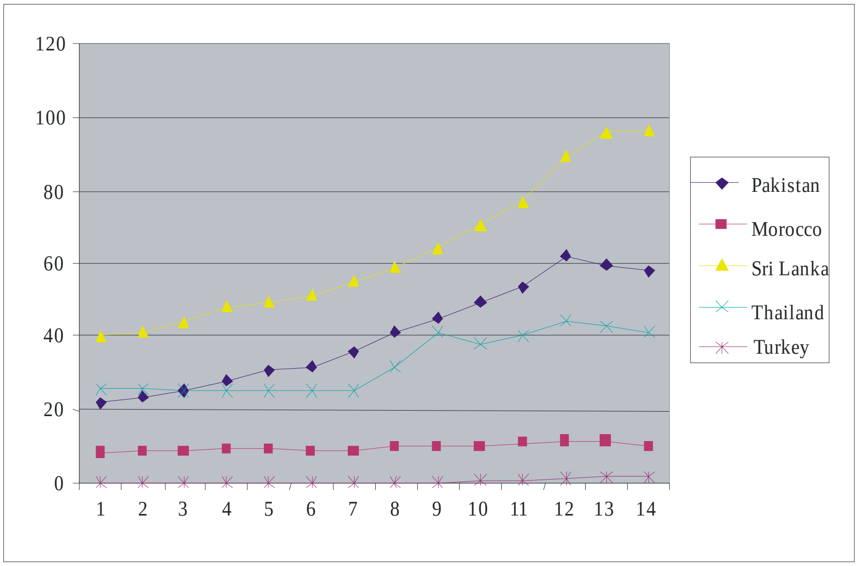
As illustrated in Figures 1 and 2 below, movement in the Pakistani rupee with respect to the US dollar is in the same direction as the movement in the exchange rate of its neighbours (Bangladesh, India, Sri Lanka and Thailand).[2] However, with respect to competitors who were geographically farther away from Pakistan (Bulgaria, Morocco and Turkey) the exchange rate movement is not such aligned. This correlation in the exchange rate movement of the Pakistani Rupee and its geographical neighbors is an important caveat to keep in mind when discussing the policy implications of exchange rate depreciation in Pakistan's context.

Fig. 1. Movement in Exchange Rates of Pakistan and Her Trade Partners



[2]It is preferable to use the real effective exchange rate (REER), but as REER was not available for all the countries considered we used the nominal exchange rates instead.

Fig. 2. Movement in Exchange Rates of Pakistan and Her Trade Partners



4. CONCLUSION AND POLICY IMPLICATIONS

Although the initial motivation of this paper was to investigate the j-curve for Pakistan with its major bilateral trade partners, but the long-run results are also relevant and warrant discussion. First, with respect to the short-run dynamics, we were unable to trace the standard j-curve for any of Pakistan's bilateral trade partners. Second, with respect to the long run analysis, while for five of the eight countries considered (Germany, Hong Kong, Italy, Netherlands, and Spain) a real devaluation of the Pakistani Rupee improves the Pakistani trade balance with each country, with the other three trade partners considered (i.e. UK, USA and France) a real devaluation of the Pakistani Rupee does not have a significant impact on the Pakistani trade balance with the respective country. To reiterate, USA and UK together account for almost 20 percent of Pakistan's total trade. Hence, a devaluation policy should be viewed with caution. The present concentration of trade with countries where real devaluation does not have a significant effect on the respective trade balance, suggests a need for Pakistan to diversify its export destinations.

Further research, closely analysing the commodities traded with each bilateral trade partner, is suggested before making clear policy recommendations *vis-à-vis* the viability of a real exchange devaluation policy. In the meantime, this paper suggests exploring new markets rather than the present concentration of trade with the US and UK.

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