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TESTING OF MARSHALL-LERNER CONDITION: EVIDENCE FROM PAKISTAN

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ABSTRACT

To empirically assess the Marshall Lerner condition, our study examined bilateral trade data of Pakistan's export and import with ten key trading partners in terms of the disaggregated model. Prior studies used the aggregated model to evaluate the Marshall Lerner condition, however the aggregated model frequently produces mixed results due to aggregation bias. The Marshall-Lerner condition only holds in a disaggregated method for seven countries: Japan, China, Kuwait, Germany, the United States, Saudi Arabia, and Italy. Except for the UK, France, and Turkey, the competitive real effective exchange rate or depreciated value of Pakistan currency (PKR) improved the bilateral trade balance on average with mentioned trading partners. Additionally, the PKR devaluation alone will not improve the bilateral trade deficit with three European nations, including France, the UK, and Turkey. To maintain a favourable bilateral trade balance with these European countries, the authorities should implement supply-side and preventative measures.

Keywords: Exports, Imports, Marshall Lerner condition, Dis-aggregated analysis
JEL Codes: F10

I. INTRODUCTION

Any economy's overall trade is determined by the country's decision on bilateral exchange rates with trading partners. To study the trade balance dynamics, it's crucial to understand exchange rate movements. The real effective exchange rate is used in this study to examine the responses of various key trading partners. Pakistan is a developing economy with extremely elastic export demand as well as inelastic import demand in international markets. Due to the effects of a real effective exchange rate, it is critical to understand the varied responses of Pakistan's bilateral trade with significant trading partners. In the world economy, the bilateral exchange rate system, i.e. the actual effective exchange rate, is regarded a more market-oriented exchange rate system (Dhasmana, 2013). To improve the trade balance, Pakistan had experienced devaluation a subsequent series of times since 1955. Pakistani currency (PKR) first time devalued after the North and South Korean war. In 1972 when East Pakistan has separated this brought a structural shift in Pakistan and decreased the international and interregional trade of Pakistan. To combat this problem, the multiple exchange rates were introduced on May 11, 1972, which remained in function until 1982. In 1972, the Pakistani currency has been devalued for the second time. During 1982 the currency (PKR) had been devalued and Pakistan started managing a floating exchange rate system and the Pakistan currency have been delinked from the United States dollar to get rid of the problem of overvaluation of REER because at that time the United States currency or US dollar became appreciated in the global market. Since the 1990s, it was largely debated that the competitive exchange rate (CER) matters for Pakistan's economic growth and trade balance.

In long run, the balance of payment may be improved if the price elasticity of demand for import and export is greater than one (Marshall, 1923; and Lerner, 1944). Despite the proof of the Marshall-Lerner condition, it was also detected that the balance of payment has tended to worsen this phenomenon diverted the concentration of the researchers from the Marshall-Lerner condition to J-curve (Bahmani-Oskooee & Niroomand, 1998; Bahmani-Oskooee & Hajilee, 2009). Various factors are contributing to the J-curve effect, initially at the time of devaluation, in short-run, the trade

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balance deteriorated because the price level in the economy prevailed on the old exchange rate, the devaluation also increase the economic activities in the countries, increased the economic growth, in the start, the devaluation increased the trade deficit of some countries, but after some time lower value of exchange rate increased the production activities within the economy and the balance of trade tend to improve (Yuen-Ling & Geoi-Mei, 2008; Yazici & Islam, 2011; Weerasinghe & and Perera, 2019). This study is an attempt to examine the cost of exchange rate changes faced by the Pakistan economy. This study shows how the import increased due to overvalued real effective exchange rate, and the causes of low response of the export due to overvalued real effective exchange rate. This research study tested the Marshall Lerner condition in terms of a disaggregated model with respect to major trading partners individually. Large empirical studies have been conducted on the exchange rate dynamics and trade balance of Pakistan (Muhammad, 2010; Waliullah et al., 2010; Ali, 2011; Ali & Chani, 2013; Iqbal et al., 2015; Ali & Naeem, 2017; Ali & Audi, 2018; Ahmad et al., 2022) but limited work has been carried out on misalignment of the real effective exchange rate. So, the main objective of this study is to empirically test empirically the Marshall Lerner theorem at a dis-aggregate level.

II. LITERATURE REVIEW

Matesanz & Fugarolas (2006) investigated the existence Marshall-Lerner condition from the association among real exchange rate besides trade balance for the Argentinian economy as well as the analysis confirmed existence of the Marshall-Lerner condition. Yuen-Ling & Geoi-Mei (2008) investigated the Marshall-Lerner condition from quantitative association between real exchange rate as well as trade balance during 1955-2006 for the Malaysian economy using Engle granger, co-integration techniques, and VEC model. The study exhibits that the devaluation may improve the trade balance, in the long run, confirming the Marshall-Lerner condition.

Maria et al., (2012) conducted a research study to test the Marshall-Lerner condition for the economy of Kenya for the period of 1996-2011. The study found strong co-integration among the balance of payment, real exchange rate, and relative income, thus confirming the existence of the Marshall-Lerner condition. The study also concluded that the devaluation of the Kenyan shilling is helpful to solve the balance of payment problem. Sek & Har (2014) examined the Marshall-Lerner condition for Malaysia with her trading partners i.e. United States of America, China, European Union (EU), Japan, and Singapore. The outcome of the study concluded that the Marshall-Lerner condition didn't hold for the Malaysian economy in the bilateral relationship with her aforesaid major trading partners countries.

Murshed et al., (2014) investigated the existence of Marshall-Lerner condition for Bangladesh's economy during the period of 1973-2011. The study confirmed the existence of the Marshall-Lerner condition and concluded that exchange rate devaluation can improve the trade balance of Bangladesh. Shahzad, Nafees & Farid (2017) investigated the existence of Marshall-Lerner condition for South Asian countries i.e. Sri Lanka, Maldives, Nepal, Bangladesh, India, Pakistan, and Bhutan for the period of 1993-2010. From the analysis, it could be concluded that the Marshall-Lerner condition doesn't exist for south Asian countries. The study suggested that the government should use import substitution and export promotion measures to improve balance. Genemo (2017) investigated the Marshall-Lerner condition for East African countries for the period of 1990-2014. The empirical analysis found the existence of the Marshall-Lerner condition i.e. "the demand for import and export is inelastic then devaluation would further increase the trade deficit". Mahmood, Tawfik &Alkhateeb (2017) investigated the effect of devaluation and appreciation on the trade balance of Saudi Arabia. The study confirmed that the depreciation of the exchange rate improved all the service sectors and hence trade balance except tourism, traveling, and construction sector. Moreover, the exchange rate with trade balance showed the pattern of the Marshall-Lerner condition in long run.

Michael & Emeka (2017) conducted a research study to investigate the relationship between exchange rate and trade balance in the context of devaluation of exchange rate for Nigerian economy over the period of 1980-2015. According to the results of study, export has not significant effect on trade in Nigeria after devaluation. The study recommended that the country should stop further devaluation because the Marshall-Lerner condition didn't hold for the Nigerian economy. The study suggested that the government should concentrate on export promotion measures in long-run, and should make policies measures to stop further importation to the Nigerian economy. Ogbonna (2018) conducted a research study for the Nigerian economy to test the Marshall-Lerner condition and J-curve. Empirical analysis of the econometric techniques revealed that the Marshall-Lerner condition doesn't hold for the Nigerian economy, and added that there is no short-run and long-run relationship between trade balance and exchange rate. The study recommends that the government should not rely on devaluation of exchange rate for minimization of the trade deficit in the balance of payment, and should use direct control measures, such diversification of export base, import substitution policies, and imposing of import quota for improving the trade balance.

III. THEORETICAL FRAMEWORK FOR MARSHALL-LERNER CONDITION

The elasticity approach is based on the effect of exchange rate dynamics on the trade balance. According to this approach, the depreciation of the domestic exchange rate may improve a country's trade balance, if the sum of elasticity of domestic demand for import and the demand for foreign goods is more than unity. This theory underlies the assumption that domestic income (Y_{pak}), foreign income (Y_w) and prices remain constant that the change in the relative price among the countries is brought about only by the variations in the exchange rate (ER). The Marshall-Lerner condition elasticity approach measured the effect of exchange rate on the trade balance in terms of volume effect and price effect. In case of exchange rate ER depreciation, the imports price after ER price transmits to domestic price then in terms of domestic currency increases and export price measured in term of the foreign currency tends to decrease. Therefore, the currency pass-through will improve the trade balance, and the volume effect may be positive for the trade balance.

The correction of the trade balance of a country through the elasticity approach can be traced back to the work of (Bickerdike, 1920), as the elasticity approach, for the correction of trade balance presented by Bikerdike. Metzler and Robinson also worked on the ideas of Bickerdike and made some useful contributions in the elasticity approach. This approach studies the effect of changes in relative prices of domestic and foreign goods, due to change in the exchange rate which affect the trade balance, Alfred Marshall (1842-1924) and Lerner presented the Marshall-Lerner condition which states that,

$$PED_X + PED_M \qquad (1)$$

Here $P.E.D_X$: Price elasticity of demand for exports (X) &
$P.E.D_M$: Price elasticity of demand for imports (M).

This Marshall Lerner condition assumes that the country's balance of trade may improve if the sum of price elasticity of foreign demand for export and the price of elasticity of domestic demand for import is exceeded one. If the above condition is satisfied the devaluation will improve the balance of trade.

The theory of J-curve was established after thirty years of Marshall Lerner's condition. Stephen (1973) was the first who detected the pattern of J-curve, when the trade balance of the United States (US) worsened in 1972 in spite, the devaluation of the US dollar in 1971. The behavior of the TB and exchange rate (ER) depreciation in the short term and long term resembles the English letter "J". In the short period of time when the exchange rate depreciates the trade balance deteriorates due to the inelastic demand of import.

i.e. $P.E.D_X + P.E.D_M < 1 \qquad (2)$

Afterward, due to depreciation the export increases than imports, which improves the trade balance. Economists have termed (J-curve), the behavior of the country trade balance first worsened before improving due to the devaluation of national currency.

The variations in country exchange rate bring about changes after when the exchange rate transmitted in the prices of the domestic goods and foreign goods, which brings the changes in the response of the consumer and producer after some time of span. As stated by (Lal and Lowinger, 2002), "while the exchange rate changes quickly, the prices of traded goods and services and subsequently the volume of such goods will respond with a variable and often a lengthy lag" This time lag has given the name of J-curve).

IV. EMPIRICAL MODEL FOR MARSHALL LERNER (ML) CONDITION

IV.I. BILATERAL EXPORT MODEL

The following model of export is given in log-form to determine the elasticity of export in disaggregated view with each of the major trading partner with misalignment of REER. As

$$L(X_i)= \alpha_0 + \alpha_1 \{L(Y_{pak})\}+ \alpha_2 (REER)+\mu_t \qquad (3)$$

The exports of Pakistan towards its major trading partner's countries is indicated by ($L(X_i)$), GDP of Pakistan (GDP_{pak}), and REER. The Log (L) is applied on all variables to estimate the elasticity's of the variables.

IV.II. BILATERAL IMPORT MODEL

The following import model is regressed in log-form in order to determine the long-run elasticity of import in disaggregated view with each of the major trading partner.

$$L(M_i)= \beta_0 + \beta_1 \{L(GDP_{pak})\}+ \beta_2 (REER)+\mu_t \qquad (4)$$

The imports of Pakistan from its major trading partner's countries is shown by L(Mi), GDP of Pakistan by (GDP_{pak}), and REER.

IV.III. EMPIRICAL TESTING OF MARSHALL LERNER

In terms of trade balance and exchange rate as well as for decision of currency devaluation that may lead to an increase in exports of the country and to minimize imports that leads to control trade deficit, the Marshall Lerner condition is an important element that not only determines the relationship between trade balance and exchange rate but also gives direction to policy analyst for controlling and decision-making regarding their domestic and international currency. Further, Marshall Lerner condition is also considered a good tool to respond to the international market's condition to increase their exports by controlling and changing their exchange rate. However, the mixed outcome of the Marshal-Linear condition exists for various countries. There are some countries where the Marshall Lerner condition exists while in some countries it doesn't (J-curve phenomena exits). This study is empirical testing the Marshall Lerner condition for Pakistan for its ten major trading partner countries that include the USA, UK, China, Germany, France, Italy, Japan, Kuwait, Saudi Arabia, and Turkey. Firstly, the Johansen Co-integration technique is applied to examine the co-integration and relation of these countries with exports and imports of Pakistan. The result of Johansen Co-integration is depicted in table (1).

Table 1: Results of Johansen Co-integration Analysis

Countries	H_0	Exports of Pakistan towards Major Trading Partners $\{L(X_{pak})\}$			Imports of Pakistan from Major Trading Partners $\{L(M_{pak})\}$		
		Max. Eigen Values	Trace Stat. Values	Prob. values	Max. Eigen Values	Trace Stat. Values	Prob. Values
USA	$H_0 = 0$	0.408145	31.52743	0.0313*	0.355809	30.09173	0.0462*
	$H_0 \leq 1$	0.208101	12.12114	0.1512	0.307869	13.82061	0.0280*
	$H_0 \leq 2$	0.089970	3.488269	0.0618	0.005535	0.205349	0.6504
UK	$H_0 = 0$	0.343415	32.79965	0.0219*	0.524593	34.27572	0.0143*
	$H_0 \leq 1$	0.293981	17.23365	0.0271*	0.121076	6.019528	0.6932
	$H_0 \leq 2$	0.111003	4.353458	0.0369*	0.028925	1.115374	0.2909
China	$H_0 = 0$	0.392483	32.09252	0.0267*	0.485183	38.23329	0.0042*
	$H_0 \leq 1$	0.280841	13.65261	0.0930	0.306672	13.66737	0.0925
	$H_0 \leq 2$	0.038554	1.454707	0.2278	0.003131	0.116040	0.7334
France	$H_0 = 0$	0.367036	33.63787	0.0172*	0.455046	39.44637	0.0029*
	$H_0 \leq 1$	0.276484	16.71624	0.0326*	0.345200	16.98536	0.0296*
	$H_0 \leq 2$	0.120286	4.741845	0.0294*	0.035010	1.318599	0.2508
Germany	$H_0 = 0$	0.321551	30.74335	0.0388*	0.359910	30.91036	0.0371*
	$H_0 \leq 1$	0.295639	16.38936	0.0366*	0.291865	14.40292	0.0725
	$H_0 \leq 2$	0.088343	3.422184	0.0643	0.043187	1.633439	0.2012
Italy	$H_0 = 0$	0.344249	29.18662	0.0487*	0.554828	42.02729	0.0012*
	$H_0 \leq 1$	0.210771	13.57358	0.0954	0.300350	12.89268	0.1188
	$H_0 \leq 2$	0.122040	4.815712	0.0282*	0.000955	0.034395	0.8528
Japan	$H_0 = 0$	0.430685	33.22798	0.0194*	0.400990	31.47120	0.0318*
	$H_0 \leq 1$	0.249933	12.94843	0.1167	0.280820	13.02206	0.1140
	$H_0 \leq 2$	0.069549	2.595107	0.1072	0.031571	1.154893	0.2825
Kuwait	$H_0 = 0$	0.454666	33.52265	0.0178*	0.482393	42.76756	0.0010*
	$H_0 \leq 1$	0.188880	11.08743	0.2062	0.385681	18.40163	0.0177*
	$H_0 \leq 2$	0.086363	3.341893	0.0675	0.010049	0.373696	0.5410
S. Arabia	$H_0 = 0$	0.561819	47.88112	0.0002*	0.537588	45.71875	0.0004*
	$H_0 \leq 1$	0.309883	17.35159	0.0260*	0.332212	17.18069	0.0276*
	$H_0 \leq 2$	0.093413	3.628528	0.0568	0.058761	2.240648	0.1344
Turkey	$H_0 = 0$	0.342950	31.15370	0.0347*	0.411523	30.97437	0.0364*
	$H_0 \leq 1$	0.267397	15.61388	0.0480*	0.230907	11.35630	0.1905
	$H_0 \leq 2$	0.104923	4.101298	0.0428*	0.043413	1.642206	0.2000

(*) indicates co-integrating factor at 5% significance level

Many of the researchers analyzed that the suitable methodology for empirical testing of Marshall Lerner condition is the co-integration analysis and has been applied in the majority of the studies (i.e. Halicioglu, 2011; Bahmani-Oskooee and Hajilee, 2009; Rustam, 2013; Eita, 2013; Iqbal et al., 2015; and Siklar and Kecili, 2018) while examining Marshall Lerner condition or J-curve phenomenon. Moreover, some of the researchers viewed that as Marshal-Lerner condition is the long-run phenomenon between the trade balance and exchange rate, therefore the best methodology

for the examination of such condition is co-integration analysis (Bahmani-Oskooee and Alse, 1994; Bahmani-Oskooee and Niroomand, 1998; Hacker and Hatemi, 2003; Bahmani-Oskooee et al., 2006; Yazici and Islam, 2011; Soleymani and Saboori, 2012; Bahmani-Oskooee and Gelan, 2012; Akonji et al., 2013; Iqbal et al., 2015; Siklar and Kecili, 2018). The Johansson Co-integration analysis is applied in this study too to empirically examine the co-integrating factor of Pakistan exports and imports with its major trading partners countries. The outcomes of the co-integration test depicted in the table (4.19) show that there are at least one co-integrating factor exits for each country that indicates the long run association of Pakistan exports, imports with its major trading partner's countries.

Further, to empirically examine and test the existence of Marshal-Lerner condition for Pakistan, the Vector Error Correction methodology is applied against the ten major trading countries as in the majority of the past studies (i.e. Akbostanci, 2004; Ardalani and Bahmani-Oskooee, 2007; Hsing, 2009; Jamilov, 2013; Eita, 2013; and Dong, 2017) the same methodology was applied to investigate the Marshal-Linear or J-curve phenomena and as well as based on results of a co-integration test given in table (1). For that purpose, the following models are be regressed to investigate whether either Marshal-Linear condition or J-curve phenomena exit for Pakistan with its trading partner's countries. The model for export demand of Pakistan is

$$L(X_i)= \alpha_0 + \alpha_1 \{L(Y_{pak})\}+ \alpha_2 (REER)+\mu_t \qquad (5)$$

The exports of Pakistan towards its major trading partners countries is indicated by "$L(X_i)$", "Y_{pak}" GDP of Pakistan and real effective exchange rate by "REER". The Log (L) is applied to all variables to estimate the elasticity's of the variables. For the imports demand function, the following model is regressed

$$L(M_i)= \beta_0 + \beta_1 \{L(Y_{pak})\}+ \beta_2 (REER)+\mu_t \qquad (6)$$

The imports of Pakistan from its major trading partners countries is shown by "L(Mi)", GDP of Pakistan by "Y_{pak}" and "REER" shows the real effective exchange rate.

The above models used for estimation of Marshal-Lerner condition were also applied by (Loto, 2011; Jamilov, 2012; and Bahman, Harvey and Hegerty, 2013) in their studies and thus the idea of the current studies is consistent with these past studies. Both the models (5 & 6) are regressed by applying Vector Error Correction Model and the result of ECM technique given in table (2) found the evidence of Marshal-Lerner condition with seven (USA, China, Germany, Italy, Japan, Kuwait, and Saudi Arabia) major trading partners countries, as the elasticity's of exports of Pakistan towards these countries and imports of Pakistan from these countries is greater than one ($\alpha_1+ \beta_1 >1$). From the findings, it can be concluded that as per the framework of the Marshal-Linear theorem that devaluation in the currency procures the exports of Pakistan that can bring stability and sustainability to the trade balance of Pakistan. Further, the study didn't find any evidence of the Marshal-Linear theorem and found the J-curve phenomenon of Pakistan with its three major trading partners' countries that are United Kingdom (UK), France, and Turkey as the elasticity's of exports plus imports is less than one ($\alpha_1+ \beta_1 < 1$). This implies that while trading with these three countries the devaluation in Pakistani currency didn't accomplish any fruitful and satisfactory increase in exports that helps in stabilizing and minimizing the trade balance of Pakistan.

Table 2: Testing of Marshall-Lerner Condition

Countries	Exports of Pakistan towards Major Trading Partners $\{L(X_{pak})\}$				Imports of Pakistan from Major Trading Partners$\{L(M_{pak})\}$				$\alpha_2+ \beta_2$	$\alpha_1+ \beta_1$
	$Log(Y_{pak})$		Log(REER)		$Log(Y_{pak})$		Log(REER)			
	α_1	t-stat.	α_2	t-stat.	β_1	t-stat.	β_2	t-stat.		
USA	0.422	3.762	-0.463	-3.135	0.632	3.263	-0.626	-3.509	-1.089	1.054
UK	0.105	2.527	-0.276	-2.206	0.359	2.594	-0.191	-2.283	-0.467	0.464
China	0.524	3.907	-0.389	-3.884	0.629	4.191	-0.724	-3.076	-1.113	1.153
France	0.348	3.895	-0.147	-2.102	0.217	3.826	-0.489	-2.731	-0.636	0.565
Germany	0.767	3.917	-0.534	-2.821	0.297	2.561	-0.496	-2.843	-1.03	1.064
Italy	0.673	2.964	-0.316	-2.243	0.524	3.472	-0.765	-4.718	-1.081	1.197
Japan	0.352	3.304	-0.397	-3.745	0.691	3.516	-0.687	-3.682	-1.084	1.043
Kuwait	0.373	3.212	-0.595	-2.234	0.715	3.763	-0.735	-3.792	-1.33	1.088
S. Arabia	0.594	3.346	-0.385	-2.962	0.578	3.443	-0.679	-3.718	-1.064	1.172
Turkey	0.398	3.395	-0.167	-2.445	0.283	2.363	-0.181	-3.418	-0.348	0.681

V. CONCLUSION

This study used the bilateral trade data of export and import of Pakistan with its major trading partner's countries in terms of the disaggregated model to test the Marshall-Lerner condition. Previous studies tested the Marshall-Lerner condition in terms of the aggregated model, but the aggregated model often gives mixed results due to aggregation bias. The empirical findings of the study revealed that the Marshall Lerner condition holds only for seven countries, i.e. Japan, China, United States, Saudi Arabia, Italy, Germany, and Kuwait. Further, the data didn't support the Marshall-Lerner phenomenon for three European countries i.e. United Kingdom, Turkey, and France. The empirical outcome suggests that the competitive real effective exchange rate may improve the bilateral trade balance with seven countries i.e. Japan, China, United Kingdom, United States, Turkey, Saudi Arabia, and Italy. Furthermore, solely the PKR depreciation with three European countries i.e. France, United Kingdom, and Turkey will not improve the bilateral trade balance with these countries. The government of Pakistan should take supply-side and precautionary measures to ensure a favorable bilateral trade balance with these European countries.

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