Accounting for City Real Exchange Rates: The Case of Pakistan

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In this study we scrutinize the role of traded and non-traded goods in the fluctuations of city real exchange rates in Pakistan. We decompose the city real exchange rates into traded and non-traded goods by Mean Square Error (MSE). We consider 17 cities and compute 272 bilateral real exchange rates, to find the proportion of traded and non-traded goods in variation real exchange rates at different horizons of data. Our findings suggest that non-traded goods averagely explain 25% to 30% of the fluctuations of city real exchange rates in Pakistan. This would be the first study which constructed the traded and non-traded price indices and analyses their contribution in city exchange rates.

1. Introduction

Financial institutions, financial markets and international trade for small open economies relies upon the stabilization of exchange rate (Hassan et al., 2023). Financial risk depends on the stabilization of exchange rate, prices, wages, interest rate, output growth and more macroeconomic building blocks affected by the fluctuating exchange rate, and consequences follows by the depreciation of the real exchange rate for the improvement of external balance. The purchasing power parity theory verifies long run equilibrium of real exchange rate (RER) and to analyses credibility of any shock either permanent or transitory to real exchange rate (Pasara & Mugwira, 2023). Perfect markets and free trade assumptions state that the ratio of general price levels of two countries equalized the nominal exchange rate of both countries (Weber & Shaikh, 2022). According to this assumption any shock to real exchange rate is transitory and mean reverting and this leads to the Law of One Price. However, existence of non-traded goods and services leads the theory more divisive.

A flexible dynamic general equilibrium model of exchange rate formation is proposed by Itskhoki and Mukhin (2021), who further clarify all of the main mysteries surrounding conventional and real exchange rates. These include the PPP puzzle, the Backus-Smith puzzle, the terms-of-trade puzzle, the Meese-Rogoff disconnection puzzle, and the UIP puzzle. They go on to demonstrate that a model that just includes this financial shock is quantitatively in line with instances that describe the dynamic relationship between macro factors and exchange rates. Although nominal rigidities marginally enhance the model's quantitative performance, they are not required for exchange rate decoupling because the underlying cause is independent of monetary shocks. To solve the additional Mussa dilemma and Engel's risk premium puzzle, we expand our investigation to multiple shocks and an explicit financial sector model.A collection of variance breakdowns utilizing a panel data set containing global prices for products is presented by Crucini et al. (2020). The panel covers 301 products and services from 1990 to 2015, spread over 123 cities in 78 different nations. They examine departures from the Law of One Price (LOP) that are good-by-good for every pair of bilateral cities and periods.
Their key discovery is that, in comparison to the distribution's overall temporal evolution, variance within the LOP distribution is substantial.

To be more precise, they discover that: (i) time-series variability about the long term LOP deviations accounts for the same amount of the total price distribution as do long-term deviations from LOP; (ii) the cross-good variance of the price distribution surpasses circulation in its mean, the equally-weighted real exchange rate; (iii) common variation in LOP deviations, such as that provided by variance in nominal exchange rates, is smaller relative to good-specific variation; (iv) time series variance is larger for traded products than for non-traded products, while the opposite is true for cross-sectional variation; and (v) city and good-specific "fixed effects" play a significant role in explaining how the instances of the price distribution differ in The cross-section (Ahajjam et al., 2023). They argue that these findings should inform research at the intersection of international macroeconomics and international trade.

Devereux et al. (2018). The relationship amongst real exchange rates and industry total factor productivity measurements for Eurozone member states is examined in "Real exchange rates and sectoral productivity in the Eurozone." They demonstrate how changes in real exchange rates, both in the cross-country and time series, strongly align with a modified Balassa-Samuelson explanation that takes into account adjustments to labor market wedges and sectoral productivity. To produce a cross-section and time series of actual exchange rates that can be directly contrasted to the data, they build a sticking price dynamic general equilibrium model. results from simulated regressions closely resemble the empirical findings for the Eurozone, assuming a common currency. Their results are in contrary to earlier research, involving country pairs with fluctuating nominal exchange rates and showed no correlation between high-income nations' level of productivity and the real exchange rate.

Couharde et al. (2020) decompose the Consumer price index data of United States and its trading partners into traded and non-traded price index, and compute traded and non-traded indices' contribution in variation of bilateral aggregate real exchange rate. He concludes that non-tradable component's contribution is in very small amount in variability of real exchange rate. Engel's conclusion shifted the economists view of classical dichotomy to that all final goods market are equally segmented. This result suggests that purchasing power parity (PPP) hypothesis of traded goods does not hold, this is critical finding because most of the modelling in real exchange rate are based on the assumption of PPP in traded goods. The objective of this study is to verify the finds of Couharde et al. (2020) on the monthly data of CPI of cities of a developing country like Pakistan in Pakistan.

1.2 Decomposition of Consumer Price Index

Ayres et al. (2020) measured the real exchange rates using five different methods; and consumer price index (CPI) is one of them. The consumer price index is geometric weighted average of tradable and non-tradable goods. They constructed tradable goods price index for each country from food and goods less food. Non-tradable goods price index is constructed from housing and services. Real Exchange Rate of Pakistani Cities

In our study we considered the consumer price index of 17 Pakistani cities as a measure of real exchange rate. Pakistani cities which I have considered in this study including Rawalpindi, Islamabad, Faisalabad, Sialkot, Gujranwala, Lahore, Sargodha, Multan, Karachi, Bahawalpur, Quetta, Hyderabad, Larkana, Sukkur, Bannu, Peshawar and Khuzdar. Consumer price index of these cities consist of 12 sub-indices as Food and Non-alcoholic beverage index, Clothing and Footwear index, Alcoholic beverage tobacco index, Housing equipment rent and maintenance index, Housing water electricity gas fuel index, Health index, Hotel and restaurant index, communication index, Transport index, education index, recreation and culture index, Miscellaneous goods and services index.

We follow the Engel (1999) methodology to classify the consumer price index in tradable and non-tradable goods and services indices. So we construct the tradable price index using the food and Non-alcoholic beverage, clothing and footwear price index; non-tradable price index is constructed using the remaining sub-indices of consumer price index of all cities of Pakistan.

This is a bilateral study so we compute the 272 pair wise tradable and non-tradable price indices using Cobb-Douglas production function to compute the share of tradable and non-tradable price indices of all cities. These shares and tradable and non-tradable price indices will be utilized to calculate the real exchange rate of all cities.

2. Literature Review

Gilbert and Morshed (2010) decomposed the real exchange rate by using the yearly data of consumer price index of Indian cities. They analysed the role and importance of nontraded goods by using methodology the mean square error (MSE) decomposition (Engel, 1999) and concluded that about 30% variation in real exchange rate in Indian cities is due to non-traded goods. They also analyzed the role of consumption elasticity of substitution between traded and non-traded goods and concluded that the greater the elasticity of substitution have negative impact on share of non-traded goods.

It means elasticity of substitution is inversely related to the share of non-traded goods sector. So, one cannot ignore the importance of consumption elasticity of substitution in the accounting of RER. Chen et al. (2006) analyzed relationship between the relative prices of non-tradables and fluctuations of real exchange rates using the US regional data for fixed exchange rate regimes (US city level data and international level data on consumer price index). They computed the regional tradable and non-tradable price indices, US city level tradable non tradable price indices and compare them with Engel's computed tradable and non-tradable price indices of US with its largest trading partners.

They concluded that the purchasing power parity holds strongly across US region, therefore non tradable plays key role in regional real exchange rate fluctuations. Non tradable price indices explain variations about 80% in real exchange rate changes over medium and long run horizons. They also concluded that the non-tradable price indices also explain large part of real exchange rates changes internationally with high expenditure share. For city level data they concluded that the averagely tradable and non-tradable both account for city real exchange rate variation at all horizons. The difference between city and regional real exchange rates changes is that in regional data only non-tradable account for variation at medium and long run time horizons. It is because the deviations of tradable from purchasing power parity are larger and more persistent and speed of adjustment is much slower (3 to 5 years) but in regional data speed of adjustment is less than one year. It means cities are more specialized in production than regions and therefore subject to larger shocks.

Parsley (2006) decomposed the real exchange rate into tradable and non-tradable component by using the 25 years data of East Asian countries on consumer price index. He decomposes real exchange rates changes by Mean Square Error Methodology (Engel1999). He calculated 21 bilateral real exchange rates. He concluded that non traded goods prices index ratio is trivially small for all time horizons. The relative prices of non-traded goods reports for less than 60% deviations. It may be due to degree of openness cross sectional variation in either income level among these Pacific-Rim economies.

Cecchetti (1999) examined the dynamics of price indices of 19 US cities by using the panel econometric technique. He used the data price indices from 1918 to 1995 and concludes that the relative price of the US cities is mean reverting at slow rate. In his conclusion half-life of convergence is about 9 years. It means slow rate of convergence account for a combination of the presence of transportation cost, differential speed of adjustment to the small and large shocks and inclusion of non-traded goods prices in overall price indices.

Burstien (2005) using the quarterly data of 11 large economies from 1971 q1 to 2002q4. He used the Engel (1999) methodology to analyse the role of non-tradable price indices in real exchange rate movements. He found that non traded price index caused more than fifty percent fluctuations in real exchange rate. He suggested that role of tradable and non-tradable should equal in modelling real exchange rate movements.

Morshed et al. (2002) analyzed the price dynamics of Indian cities by cointegration approach. They computed common trend for prices in 25 cities. The rate of convergence of prices found by applying impulse response function and concludes that shock’s half-life is very small. They evaluated shock transmission procedure between cities and found no any systematic behavior of prices.

Balassa and Sameulson (1964) criticized and reject PPP theory for real exchange rate by committing that PPP theory is not valid for determination of real exchange rate because the productivity differences of nontraded goods diverges the real exchange rate from long run equilibrium; as general price levels includes nontraded goods prices so it resist to equalize the general price levels of two countries. Productivity in Tradable sector is more than the non-tradable sector which causes increase in prices in nontraded goods which leads to increase in real exchange rate.

In the light of above precious literature, we decompose the real exchange rate of 17 large cities of Pakistan to dig the truth underneath about Pakistan. Real exchange rate of Pakistan is very volatile due to this the economy of Pakistan facing huge shocks. It is important to analyse the dynamics of these shocks in Pakistani cities whether they are same or different. The study intends to find the cities where the effects of shock are persistent and more volatile than others which has welfare consequences for the inhabitants of these cities. There is a need to make such policies which reduce these shocks and give a way to enhance economy.

3. Data and Methodology

Consumer price index data of 17 cities (Lahore, Faisalabad, Rawalpindi, Multan, Gujranwala, Islamabad, Sargodha, Sialkot, Bahawalpur, Karachi, Hyderabad, Sukkur, Larkana, Peshawar, Banu, Quetta, Khuzdar) is collected from division level Pakistan Bureau of statistics offices. CPI data is on monthly basis from July 2001 to December 2013.

3.1 Decomposition of Real Exchange Rate Movements

In decomposition of real exchange rate movement, the main step is construction of the traded and non-traded price indexes of 17 cities. Engel (1999) computed five different measures of real exchange rates – using consumer price indexes; the first measure it classifies housing and services as non-tradable and commodities as tradable. He argued that the consumer prices consist of non-traded component marketing services by investigating the US Japanese exchange rate data. Engel concluded that findings were almost identical across all measures. In case of Pakistani cities we use consumer price index exclusively.

We use the monthly data from July 2001 to December 2013 on consumer price index of each city. The data is taken from the Pakistan bureau of Statistics. According to Engel (1999) we classify the consumer price index into two categories traded component (food and Nonalcoholic beverages and footwear and clothing) and remaining sub-indices include in the non-traded component. The geometric weights for the all items or series were estimated from the logarithmic regressions of the form

$$\Delta(cpi - rent) = \sum_i \emptyset_i \Delta(traded_i - rent) + \sum_j \emptyset_j \Delta(services_j - rent) + \varepsilon$$

The geometric weight for rent is computed residually $1 - \sum_i \emptyset_i + \sum_j \emptyset_j$

Now the traded and non-traded component will be computed as

$$P^T = \frac{1}{\sum_i \emptyset_i} \sum_i \emptyset_i \, traded_i, \quad P^N = \frac{1}{\sum_j \emptyset_j} \sum_j \emptyset_j \, services_j$$

The decomposition of RER movements under Cobb Douglas function is explain in following section.

3.2 Cobb-Douglas Utility Function

The derivations of this section taken from (Engle 1999) and Scott Gilbert and Morshed (2010). If the utility function underlying a consumption basket for city i is a Cobb-Douglas aggregator then

$$C_i = C_{iT}^{1-\beta} C_{iN}^{\beta} \qquad (1)$$

where C_i is the consumption basket of city i, CiT and CiN is the consumption of traded and non-traded goods. β denotes weight of non-traded goods in C_i. Equation (1) can be written as

$$P_i = P_{iT}^{1-\beta} P_{iN}^{\beta} \qquad (2)$$

where P_i represents price level of city i, $PiT\ and\ PiN$ are prices of traded goods and nontraded goods, respectively.
Equation (1) and (2) can be written for other city j as

$$C_j = C_{jT}^{1-\delta} C_{iN}^{\delta} \qquad (3)$$

And

$$P_j = P_{jT}^{1-\delta} P_{jN}^{\delta} \qquad (4)$$

In equation (3) C_j represents the consumption basket of city j, CjT and CjN are consumption of traded and non-traded goods, respectively and δ is the weight of nontraded goods inC_j. P_j is the aggregate price index of city j and PjT and PjN are prices of traded and nontraded goods, respectively.

The formula for city real exchange rate is given by

$$Q = \frac{P_j}{P_i} \qquad (5)$$

where Q is city real exchange rate. By putting equation (2) & (4) into (5) and taking logs on both sides, after some algebraic manipulations we obtain the following

$$q = x + y \qquad (6)$$

And

$$x = p_{jT} - p_{iT} \qquad (7)$$

is a price differential of traded goods, and

$$y = (p_{jN} - p_{jT}) - \beta(p_{iN} - p_{iT}) \qquad (8)$$

Equation (8) is the price differential of nontrade goods, and q is the real exchange rate in logarithmic form.

3.3 Decomposition of City Real Exchange Rate

The decomposition of city RER by Cobb-Douglas technique is carried as discussed in section 3. We compute x and y from equation (7) and (8), respectively, to explain the contribution of x and y in variation of q. We analyze role of these $xs\ and\ ys$ to the fluctuations of qs. We employed (Engel 1999) methodology to compute$\beta_1 and\ \beta_2$. β_1 measures the share of traded goods in variation of real exchange rates changes except the comovements between price differentials of traded and nontraded goods at different horizons where β_2 includes the comovements. These measures are

$$\beta_1 = \frac{MSE(x_t - x_{t-n})}{MSE(x_t - x_{t-n}) + MSE(y_t - y_{t-n})}$$

$$\beta_2 = \frac{MSE(x_t - x_{t-n}) + mean(x_t - x_{t-n})mean(y_t - y_{t-n}) + cov((x_t - x_{t-n}, y_t - y_{t-n}))}{MSE(q_t - q_{t-n})}$$

Where MSE is defined as

$$MSE(x_t - x_{t-n}) = var(x_t - x_{t-n}) + [mean(x_t - x_{t-n})]^2$$

We compute β_1 and β_2 measures for Cobb-Douglas aggregation.

4. Results

We compute B1 at maximum of 12 period lags as our dataset contains monthly data and we use city specific weights for traded and nontraded goods in consumption basket. The average weight for nontraded goods in the consumption basket for all the cities is 0.494. But it varies between 0.31 to 0.58 for individual cities. Table 01 shows the city wise weights of traded and nontraded goods in consumption basket. Islamabad as capital city has highest nontraded share and Larkana has lowest nontraded share. All the densely populated cities like as Karachi, Lahore Rawalpindi have almost same nontraded share in consumption basket.

Table 02 shows the results of B1 measure at lag 1 for all cities. First row or column shows the B1 value for the city Lahore as numeraire. Each row or column represents B1 value for respective city. We find that on average about 75 percent of real exchange rates changes in cities attributed to traded goods at lag 1.

Table 3-6 shows the results of B1at lag 2,3 6 and 12 respectively. Results depicted in these tables suggest that share of traded goods in fluctuations of real exchange rate slightly decrease throughout the year. Thus our results suggest that prices of nontraded goods explain 20% of the changes in the city real exchange rates explained significantly.

The nontraded goods contribute differently in fluctuations of real exchange rates across cities. We report the results of calculated B1 measure for 17 cities with different locations and different populations in table 2-6 for a horizon of 1 to 12 months. Figure 1 shows the variations in B1 measure of largest eight cities at different horizons. It can be visualized that the variation in share of traded goods is decreasing over time. It is clear from table 2-6 that cross city results of B1 varies. For example, in Table-2 row 1, nontraded goods explain only 19% for Sialkot and 36% for Islamabad. This may be due to different weights of nontraded goods in CPIs of these cities (weight of nontraded goods in Sialkot 51% and Islamabad 69%).

The results depicted in table 2-6 verifies the significant contribution of nontraded goods in variations of city real exchange rates of Pakistan. The results of B2 are not presented here and will be provided on demand.

5. Conclusion

The nontraded goods prices significantly explain the variations in the city real exchange rates of Pakistan, as in literature which shows that fluctuation in real exchange rates is mostly arising from the traded goods prices. In literature, Engle (1999), Mendoza (2000) obtained their results on developed countries data, Parsley 2007 obtain results on middle income countries Chen et Al. 2006, used regional data to confirm significant contribution of nontraded prices in fluctuations of real exchange rates. Only one study related to developing countries found, Scott Gilbert and Morshed (2009) classify the role of nontraded goods in Indian city real exchange rates and confirms the role of nontraded goods in explaining the city real exchange rates changes. This study is also complementing to Scott Gilbert and Morshed (2010) in case of city RER of Pakistan. We scrutinize the city real exchange rates variations of 17 large cities of Pakistan. By applying the mean square error decomposition we also reached at same conclusion that city real exchanged rate of Pakistan is also significantly influenced by the nontraded goods prices.

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Table No 1: Weights of Traded and Non-Traded Goods in City Wise CPI of Pakistan

City	Average Traded share	Average Non Traded Share
LAHORE	0.431	0.569
FAISALABAD	0.483	0.517
RAWALPINDI	0.421	0.579
MULTAN	0.499	0.501
GUJRANWALA	0.542	0.458
ISLAMABAD	0.313	0.687
SARGODHA	0.554	0.446
SIALKOT	0.494	0.506
BAHAWALPUR	0.501	0.499
KARACHI	0.439	0.561
hyderabad	0.520	0.480
SUKKUR	0.570	0.430
LARKANA	0.582	0.418
PESHAWAR	0.451	0.549
BANNU	0.532	0.468
QUETTA	0.501	0.499
KHUZDAR	0.562	0.438

Table No 2: Estimated Results of B1 Measure (Share of Traded Goods in Variation of City Real Exchange Rates) At N=1 By Cobb-Douglas Consumption Aggregation

	LHR	FSBD	RWP	MUL	GJRV	ISLBI	SGDA	SLKT	BHW	KCHI	HYDI	SUK	LAR	PESH	BAN	QUT	KHZ
LHR	0.00																
FSBD	0.80	0.00															
RWP	0.80	0.74	0.00														
MUL	0.79	0.80	0.75	0.00													
GJRW	0.79	0.75	0.75	0.77	0.00												
ISLBD	0.65	0.59	0.34	0.62	0.56	0.00											
SGDA	0.81	0.79	0.76	0.79	0.77	0.57	0.00										
SLKT	0.81	0.78	0.76	0.78	0.75	0.55	0.82	0.00									
BHWP	0.80	0.76	0.75	0.77	0.76	0.57	0.81	0.80	0.00								
KCHI	0.77	0.77	0.76	0.77	0.76	0.58	0.78	0.77	0.77	0.00							
HYDER	0.79	0.78	0.78	0.78	0.80	0.63	0.81	0.80	0.80	0.76	0.00						
SUK	0.79	0.77	0.74	0.77	0.80	0.57	0.80	0.80	0.79	0.76	0.79	0.00					
LAR	0.81	0.80	0.78	0.80	0.81	0.64	0.83	0.81	0.82	0.81	0.81	0.82	0.00				
PESH	0.78	0.73	0.71	0.77	0.72	0.54	0.73	0.76	0.75	0.75	0.75	0.72	0.77	0.00			
BAN	0.80	0.79	0.75	0.78	0.80	0.65	0.78	0.79	0.79	0.78	0.78	0.80	0.81	0.70	0.00		
QUT	0.79	0.78	0.75	0.78	0.79	0.64	0.79	0.79	0.78	0.76	0.78	0.79	0.81	0.73	0.77	0.00	
KHZ	0.80	0.81	0.77	0.80	0.83	0.65	0.82	0.80	0.81	0.78	0.81	0.82	0.83	0.74	0.83	0.78	0.00

Table No 3: Estimated Results of B1 Measure (Share of Traded Goods in Variation of City Real Exchange Rates) at N=2 by Cobb-Douglas Consumption Aggregation

	LHR	FSBD	RWP	MUL	GJRW	ISLBD	SGDA	SLKT	BHW	KCHI	HYDE	SUK	LAR	PESH	BAN	QUT	KHZ
LHR	0																
FSBD	0.75	0															
RWP	0.75	0.7	0														
MUL	0.77	0.8	0.7	0													
GJRW	0.76	0.8	0.8	0.8	0												
ISLBD	0.54	0.6	0.3	0.6	0.6	0											
SGDA	0.76	0.8	0.7	0.8	0.8	0.5	0										
SLKT	0.77	0.8	0.8	0.8	0.8	0.5	0.8	0									
BHWP	0.76	0.7	0.7	0.8	0.8	0.5	0.8	0.8	0								
KCHI	0.75	0.8	0.8	0.8	0.8	0.5	0.8	0.8	0.8	0							
HYDER	0.76	0.8	0.8	0.8	0.8	0.6	0.8	0.8	0.8	0.8	0						
SUK	0.75	0.8	0.7	0.8	0.8	0.6	0.8	0.8	0.8	0.8	0.8	0					
LAR	0.78	0.8	0.8	0.8	0.8	0.6	0.8	0.8	0.8	0.8	0.8	0.8	0				
PESH	0.76	0.7	0.7	0.7	0.8	0.5	0.7	0.8	0.8	0.8	0.7	0.7	0.8	0			
BAN	0.79	0.8	0.8	0.8	0.8	0.7	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.71	0		
QUT	0.76	0.8	0.7	0.8	0.8	0.6	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.74	0.8	0	
KHZ	0.81	0.8	0.8	0.8	0.8	0.7	0.8	0.8	0.8	0.8	0.8	0.8	0.9	0.77	0.8	0.8	0

Table 4 Estimated Results of B1 Measure (Share of Traded Goods in Variation of City Real Exchange Rates) at n=3 by Cobb-Douglas Consumption Aggregation

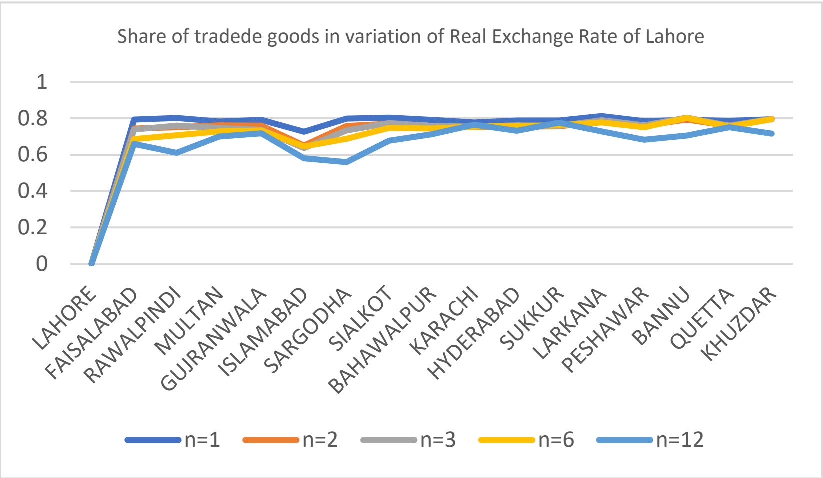
	LHR	FSBD	RWP	MUL	GJRV	ISLBI	SGDA	SLKT	BHW	KCHI	HYDE	SUK	LAR	PESH	BAN	QUT	KHZ
LHR	0																
FSBD	0.75	0															
RWP	0.76	0.7	0														
MUL	0.75	0.8	0.8	0													
GJRW	0.74	0.7	0.8	0.8	0												
ISLBD	0.52	0.6	0.3	0.6	0.5	0											
SGDA	0.74	0.8	0.7	0.8	0.8	0.5	0										
SLKT	0.78	0.8	0.8	0.8	0.8	0.5	0.8	0									
BHWP	0.76	0.7	0.7	0.8	0.8	0.5	0.8	0.8	0								
KCHI	0.75	0.8	0.7	0.8	0.8	0.5	0.7	0.8	0.8	0							
HYDER	0.76	0.8	0.8	0.8	0.8	0.6	0.8	0.8	0.8	0.7	0						
SUK	0.76	0.8	0.8	0.8	0.8	0.5	0.8	0.8	0.8	0.7	0.8	0					
LAR	0.79	0.8	0.8	0.8	0.8	0.6	0.8	0.8	0.8	0.8	0.8	0.8	0				
PESH	0.76	0.7	0.7	0.7	0.8	0.5	0.7	0.8	0.8	0.8	0.7	0.8	0.8	0			
BAN	0.8	0.8	0.8	0.8	0.8	0.7	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.7	0		
QUT	0.77	0.8	0.7	0.8	0.8	0.6	0.8	0.8	0.7	0.7	0.8	0.8	0.8	0.74	0.8	0	
KHZ	0.81	0.8	0.8	0.8	0.8	0.7	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.76	0.8	0.8	0

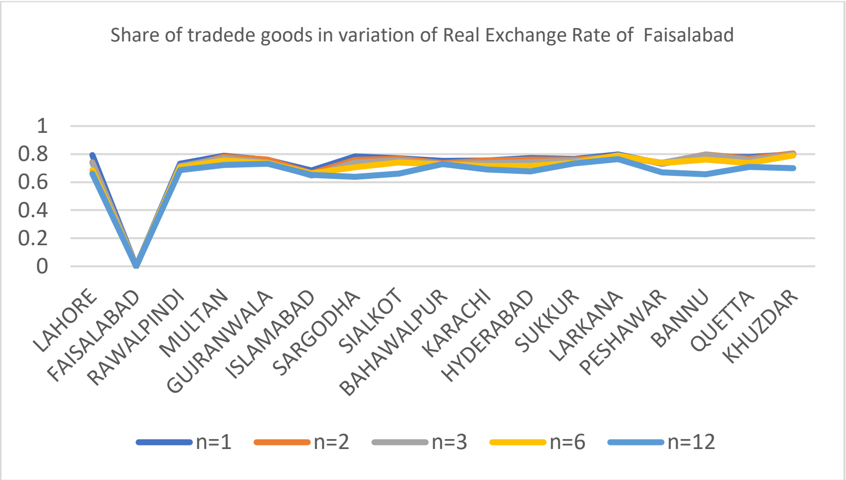
Table No 5: Estimated Results of B1 Measure (Share of Traded Goods in Variation of City Real Exchange Rates) at N=6 by Cobb-Douglas Consumption Aggregation

	LHR	FSBD	RWP	MUL	GJRV	ISLBI	SGDA	SLKT	BHW	KCHI	HYDI	SUK	LAR	PESH	BAN	QUT	KHZ
LHR	0.00																
FSBD	0.70	0.00															
RWP	0.71	0.72	0.00														
MUL	0.73	0.76	0.77	0.00													
GJRW	0.74	0.73	0.82	0.79	0.00												
ISLBD	0.48	0.61	0.25	0.59	0.59	0.00											
SGDA	0.69	0.72	0.75	0.75	0.77	0.45	0.00										
SLKT	0.74	0.74	0.76	0.78	0.77	0.56	0.77	0.00									
BHWP	0.75	0.73	0.74	0.78	0.77	0.58	0.76	0.78	0.00								
KCHI	0.75	0.74	0.75	0.74	0.77	0.51	0.71	0.72	0.74	0.00							
HYDER	0.76	0.73	0.79	0.75	0.82	0.53	0.76	0.79	0.76	0.73	0.00						
SUK	0.76	0.75	0.79	0.81	0.85	0.57	0.77	0.80	0.80	0.77	0.79	0.00					
LAR	0.78	0.80	0.80	0.82	0.83	0.64	0.83	0.81	0.83	0.78	0.78	0.83	0.00				
PESH	0.75	0.74	0.73	0.75	0.79	0.53	0.69	0.74	0.74	0.76	0.75	0.77	0.78	0.00			
BAN	0.80	0.77	0.80	0.79	0.84	0.65	0.77	0.79	0.80	0.77	0.79	0.84	0.82	0.68	0.00		
QUT	0.76	0.74	0.75	0.77	0.78	0.58	0.77	0.78	0.73	0.74	0.78	0.78	0.81	0.73	0.77	0.00	
KHZ	0.81	0.80	0.81	0.82	0.85	0.68	0.81	0.80	0.84	0.80	0.81	0.84	0.86	0.74	0.82	0.80	0.00

Table 6 Table 5 Estimated Results of B1 Measure (Share of Traded Goods in Variation of City Real Exchange Rates) at N=12 by Cobb-Douglas Consumption Aggregation

	LHR	FSBD	RWP	MUL	GJRV	ISLBI	SGDA	SLKT	BHW	KCHI	HYDI	SUK	LAR	PESH	BAN	QUT	KHZ
LHR	0.00																
FSBD	0.68	0.00															
RWP	0.62	0.71	0.00														
MUL	0.71	0.73	0.79	0.00													
GJRW	0.73	0.72	0.83	0.80	0.00												
ISLBD	0.38	0.62	0.18	0.58	0.61	0.00											
SGDA	0.58	0.66	0.73	0.73	0.71	0.42	0.00										
SLKT	0.68	0.66	0.75	0.79	0.77	0.49	0.68	0.00									
BHWP	0.74	0.74	0.74	0.80	0.76	0.57	0.77	0.77	0.00								
KCHI	0.76	0.72	0.76	0.75	0.78	0.52	0.70	0.71	0.74	0.00							
HYDER	0.73	0.69	0.81	0.77	0.81	0.52	0.74	0.79	0.76	0.74	0.00						
SUK	0.78	0.74	0.82	0.84	0.87	0.61	0.77	0.79	0.81	0.78	0.78	0.00					
LAR	0.74	0.77	0.80	0.84	0.82	0.59	0.84	0.78	0.86	0.74	0.72	0.80	0.00				
PESH	0.69	0.68	0.70	0.74	0.77	0.51	0.62	0.70	0.75	0.74	0.74	0.72	0.73	0.00			
BAN	0.71	0.66	0.77	0.76	0.78	0.58	0.73	0.68	0.76	0.70	0.75	0.79	0.77	0.63	0.00		
QUT	0.75	0.72	0.79	0.77	0.78	0.55	0.73	0.76	0.75	0.74	0.77	0.76	0.77	0.68	0.66	0.00	
KHZ	0.72	0.70	0.82	0.81	0.82	0.61	0.79	0.71	0.82	0.74	0.79	0.80	0.84	0.64	0.81	0.68	0.00


Share of tradede goods in variation of Real Exchange Rate of Lahore
1
0.8
0.6
0.4
0.2
0
LAHORE
FAISALABAD
RAWALPINDI
MULTAN
GUJRANWALA
ISLAMABAD
SARGODHA
SIALKOT
BAHAWALPUR
KARACHI
HYDERABAD
SUKKUR
LARKANA
PESHAWAR
BANNU
QUETTA
KHUZDAR
n=1
n=2
n=3
n=6
n=12


Share of tradede goods in variation of Real Exchange Rate of Faisalabad
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0.6
0.4
0.2
0
LAHORE
FAISALABAD
RAWALPINDI
MULTAN
GUJRANWALA
ISLAMABAD
SARGODHA
SIALKOT
BAHAWALPUR
KARACHI
HYDERABAD
SUKKUR
LARKANA
PESHAWAR
BANNU
QUETTA
KHUZDAR
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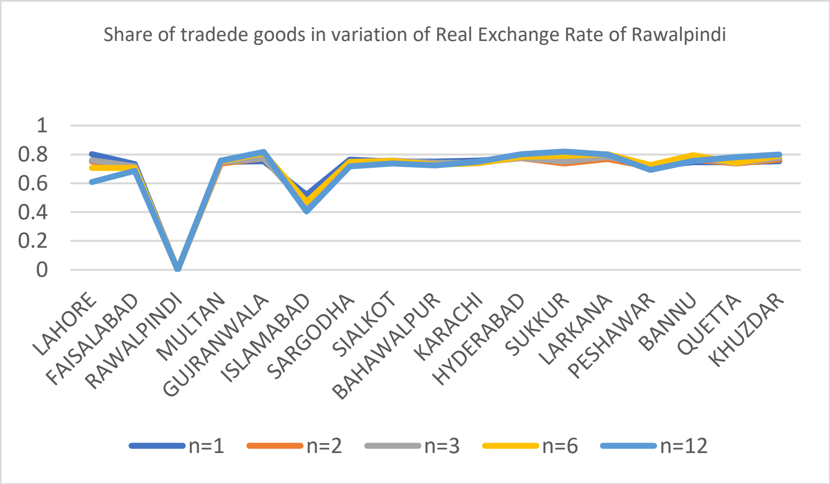
n=2
n=3
n=6
n=12


Share of tradede goods in variation of Real Exchange Rate of Rawalpindi
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0.6
0.4
0.2
0
LAHORE
FAISALABAD
RAWALPINDI
MULTAN
GUJRANWALA
ISLAMABAD
SARGODHA
SIALKOT
BAHAWALPUR
KARACHI
HYDERABAD
SUKKUR
LARKANA
PESHAWAR
BANNU
QUETTA
KHUZDAR
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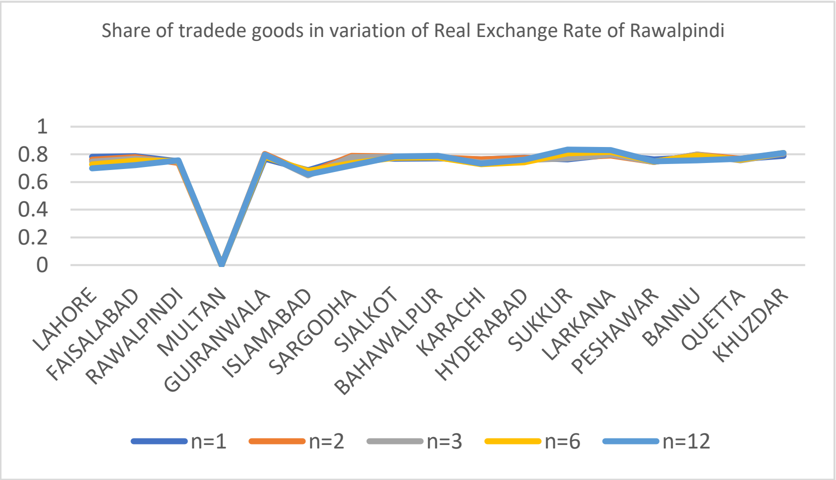
Share of tradede goods in variation of Real Exchange Rate of Rawalpindi
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0.8
0.6
0.4
0.2
0
LAHORE
FAISALABAD
RAWALPINDI
MULTAN
GUJRANWALA
ISLAMABAD
SARGODHA
SIALKOT
BAHAWALPUR
KARACHI
HYDERABAD
SUKKUR
LARKANA
PESHAWAR
BANNU
QUETTA
KHUZDAR
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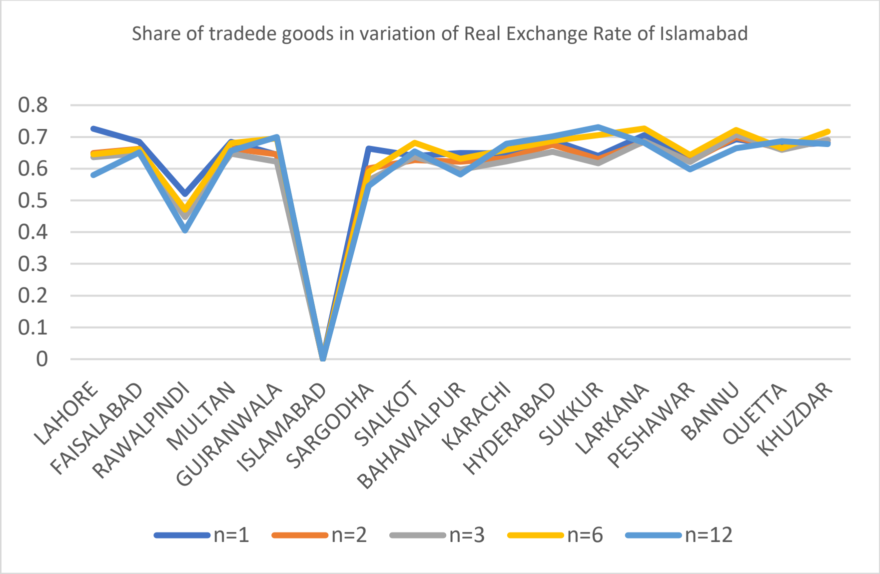
Share of tradede goods in variation of Real Exchange Rate of Islamabad
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0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
LAHORE
FAISALABAD
RAWALPINDI
MULTAN
GUJRANWALA
ISLAMABAD
SARGODHA
SIALKOT
BAHAWALPUR
KARACHI
HYDERABAD
SUKKUR
LARKANA
PESHAWAR
BANNU
QUETTA
KHUZDAR
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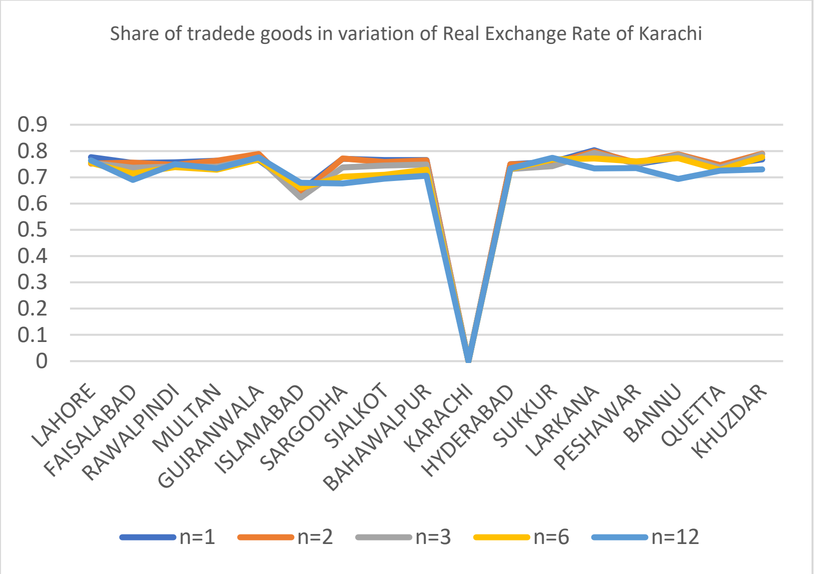
Share of tradede goods in variation of Real Exchange Rate of Karachi
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
LAHORE
FAISALABAD
RAWALPINDI
MULTAN
GUJRANWALA
ISLAMABAD
SARGODHA
SIALKOT
BAHAWALPUR
KARACHI
HYDERABAD
SUKKUR
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PESHAWAR
BANNU
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KHUZDAR
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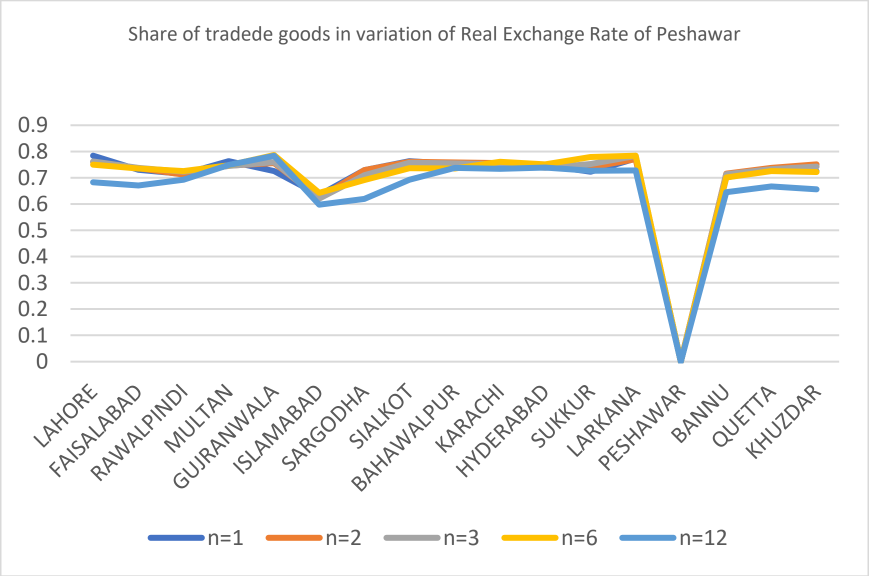
Share of tradede goods in variation of Real Exchange Rate of Peshawar
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0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
LAHORE
FAISALABAD
RAWALPINDI
MULTAN
GUJRANWALA
ISLAMABAD
SARGODHA
SIALKOT
BAHAWALPUR
KARACHI
HYDERABAD
SUKKUR
LARKANA
PESHAWAR
BANNU
QUETTA
KHUZDAR
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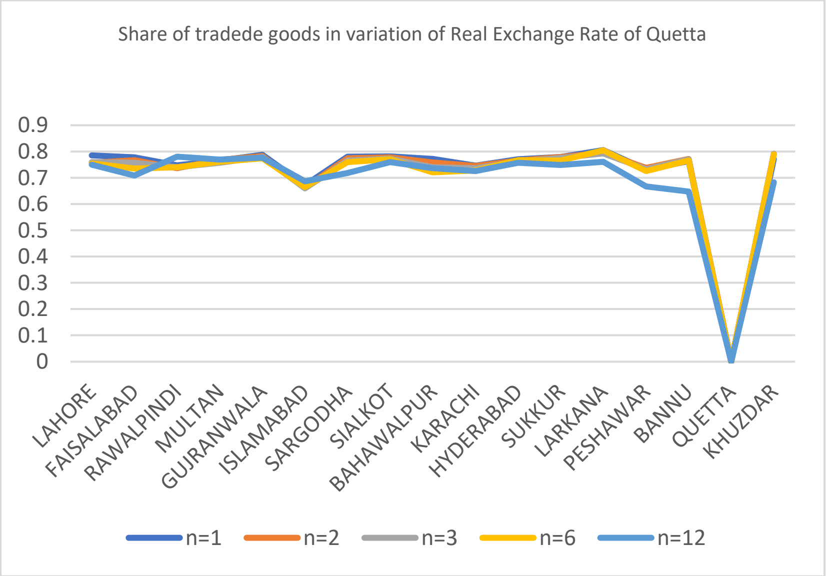
Share of tradede goods in variation of Real Exchange Rate of Quetta
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0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
LAHORE
FAISALABAD
RAWALPINDI
MULTAN
GUJRANWALA
ISLAMABAD
SARGODHA
SIALKOT
BAHAWALPUR
KARACHI
HYDERABAD
SUKKUR
LARKANA
PESHAWAR
BANNU
QUETTA
KHUZDAR
n=1
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