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Real Exchange Rate Fluctuations and Relative Prices in Turkey

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Abstract

Traditional theory puts forwards that real exchange rate fluctuations should result from the changes in the relative price of non-tradable goods since tradable goods' prices are to equalize among countries due to the law of one price. However, significant number of researches reported that in many cases, the contribution of tradable goods' prices is not negligible, or even surpass that of the non-tradable goods' prices. This paper studies the relation between the real exchange rate and relative prices for Turkey. The relation is found to be stronger with the relative price of tradable goods, unlike the traditional theory. But the proportion of the fluctuations in real exchange rates accounted for by relative non-tradable goods prices has increased in recent years. These findings imply the real exchange rates in Turkey to be driven by nominal factors, rather than real factors until recently.

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1. Introduction

As proposed by the traditional real exchange rate theory, the relative prices of tradable goods between countries must be stable as they are expected to comply with the law of one price. Deviations, if any, should be small and temporary due to arbitrage activities. Non-tradable goods' prices, however, are not subject to arbitrage opportunity. Thus, their prices are domestically determined and can show different patterns across countries (see Cassel, 1918 or Pigou, 1923, as examples).

Accordingly, if one sees fluctuations in the real exchange rate, these should result from fluctuations in the price levels of non-tradable goods relative to those of tradable goods within countries, rather than the fluctuations in the price level of tradable goods across countries. In fact, there is a large amount of studies in the literature supporting this idea. In a well known approach, Balassa (1964) and Samuelson (1964) emphasize cross-country differences in the internal price of non-tradable goods relative to tradable goods that are due to higher productivity in tradable sectors of countries in the early stage of their development. Stockman and Tesar (1990), Gregorio and Wolf (1994), Razin (1993), Fernandez de Cordoba and Kehoe (2000), Broeck and Sløk (2001), as well as Halpern and Wyplosz (2001), are only few of studies presenting models in which the real exchange rate fluctuations are productivity-based and reflect changes in the relative price of non-tradable to tradable goods.

On the other hand, there have recently been various attempts questioning the traditional assumption. Kravis and Lipsey (1977), Lapham (1990), and Knetter (1993) have shown that large deviations from the law of one price actually happen for many tradable goods. Engel (1999) measured the proportion of US real exchange rate movements that can be accounted for by movements in the relative prices of non-tradable goods and found that almost all of the fluctuation in real exchange rates can be accounted for by aggregate deviations from the law of one price in tradable goods. Parsley and Popper (2002) show that a deviation from the law of one price in even a single tradable good can account for virtually all of the real exchange rate movements. Betts and Devereux (2000), Chari, Kehoe and McGrattan (2002) and Morales-Zumaquero (2006) are also studies with many others as well finding evidence of tradable goods prices-driven real exchange rates fluctuations.

This paper looks for the validity of the traditional theory that fluctuations in the real exchange rate should reflect changes in the relative price of non-tradable goods to tradable goods, for Turkey. For this purpose, various methods like sample correlations, relative standard deviations, variance decomposition and *OLS* are used to make inferences. Considering all results together suggests that, unlike the traditional theory, the relation of the real exchange rate is found to be stronger with the relative price of tradable goods.

For the reminder of this paper, two of the most commonly used methodologies for the real exchange rate decomposition are given in detail in the next section. The data and methods used during the analysis are presented in the third section, while the results are summarized thereafter. Concluding remarks aims at interpreting the results with attention given to drawing policy implications for Turkey.

2. Decomposing the Real Exchange Rate

The real exchange rate (*RER*) is defined in this paper as the ratio of the price level in home country (*P*) to the price level in the foreign country (P^*) in terms of the same currency (*S* representing the nominal exchange rate);

$$RER = S\frac{P}{P^*} \tag{1}$$

Accordingly, the increase in the *RER* implies an appreciation of the home country's currency against the foreign country's currency.

As the price levels in each country consist of tradable goods' prices (P_T) and non-tradable goods prices (P_N), the real exchange rate can be decomposed into two components as associated with P_T and P_N. The decomposition can be formulated in various ways. The most commonly used one is that proposed by Engel (1999). To remind briefly, Engel (1999)'s formulation is as follows: By assuming that a price index for a country is a geometric average of P_T and P_N, and α being the share of non-tradable goods in the price index, the price index *P* in home country can be written as follows;

$$P = P_T^{(1-\alpha)} P_N^{\alpha} \tag{2}$$

Taking the log of both sides of (2) yields

$$p = (1-\alpha)p_T + \alpha p_N \tag{3}$$

where *p* refers to the log of *P*. Equation (3) can be rewritten as the following;

$$p = p_T + \alpha(p_N - p_T) \tag{4}$$

By using the same method, one can also write the price level in foreign country as;

$$p^* = p_T^* + \beta(p_N^* - p_T^*) \tag{5}$$

where β is the share of non-tradable goods in the price index for the foreign country.

On the other hand, the log of equation (1) bring about;

$$rer = s + p - p^* \tag{6}$$

where *rer* and *s* are the logs of *RER* and *S*, respectively. One can replace *p* and p^* in (6) by (4) and (5), and obtain (7). The anti-log of (7) is presented in equation (8).

$$rer = s + p_T - p_T^* + \alpha(p_N - p_T) - \beta(p_N^* - p_T^*) \tag{7}$$

$$RER = S \frac{P_T}{P_T^*} \frac{(P_N / P_T)^{\alpha}}{(P_N^* / P_T^*)^{\beta}} \tag{8}$$

Equation (8) indicates that the *RER* is composed of two main parts; the relative price of tradable goods between two countries, i.e. the *RER* in tradable goods, $S(P_T / P_T^*)$, and a component that is a weighted relative price of non-tradable to tradable goods in each country, $(P_N / P_T)^{\alpha} /(P_N^* / P_T^*)^{\beta}$. Hence, after determining the indices of P_T and P_N for each country, one can compute the contribution of tradable goods prices and relative non-tradable goods prices across countries to the fluctuations in the *RER*.

Regarding the difficulty in determining precise indices for P_T and P_N, Betts and Kehoe (2001a) developed a decomposition that does not require determining an index for P_N to compute the contribution of P_T and P_N to the fluctuations in the *RER*. According to the method proposed by Betts and Kehoe (2001a), we can rewrite equation (1) as [1]

$$RER = S \frac{P_T}{P_T^*} \frac{P}{P^*} \frac{P_T^*}{P_T} \tag{9}$$

Here, again, the *RER* is composed of two main parts; the *RER* in tradable goods, $S(P_T / P_T^*)$, and the rest that is attributable to the relative price of non-tradable to

[1] Betts-Kehoe decomposition is actually the reverse of the representation in (9), and implies depreciation in home currency when the RER increases. The formulation is reversed in this paper in order to be consistent with equation (1).

tradable goods prices in each country, $(P/P^*)/(P_T^*/P_T)$. With shortened notations, (9) and its log can be written as (10) and (11), respectively.

$$RER = RER_T RER_N \quad (10)$$

$$rer = rer_T + rer_N \quad (11)$$

where $RER_T = S(P_T/P_T^*)$, $RER_N = (P/P^*)/(P_T^*/P_T)$ and lower cases denote the logs.

The advantage of Betts-Kehoe decomposition against the traditional one as used by Engel (1999) is that, the non-tradable goods price index is not directly needed in computing its impact on *RER* determination, neither the weight components.

3. Data and Methodology

The Betts-Kehoe real exchange rate decomposition method will be adopted throughout this paper due to its ease of calculation.

The choice of price series reflects the desire to handle a large sample of countries and data at higher frequencies. For this purpose, the aggregate price index *P* is represented by consumer price index (*CPI*), which contains prices for a basket of all goods and services, tradable and non-tradable ones, consumed in the country of concern. Though they may not directly measure the price of a country's output, they do so indirectly by measuring the purchasing power of that output over the consumption basket (Betts and Kehoe, 2001a). *GDP* deflators could be better choices, but unfortunately, they are not as widely available as *CPI*'s and possess lower frequencies.

Regarding the tradable goods price index, although there may be better indicators like sectoral gross output deflators, producer price index (*PPI*) seems to be the most widely available data, and is chosen to represent P_T.[2] In fact, since *PPI* data is measured at the production phase, it certainly excludes (non-tradable) marketing and other services.[3]

The home country in the analysis is Turkey. Foreign countries are chosen as being the first 40 countries ranked by their shares in Turkey's foreign trade volume

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[2] Edwards (1988), Balassa (1990), Ghura and Grennes (1993), Engel (1999), as well as Corsetti, Dedola and Leduc (2007) used PPI (or WPI) as a proxy to tradable goods' prices. Morales-Zumaquero (2006) prefers food prices to approximate tradables and services prices for non-tradables.

[3] Asserting that PPI is anyway contaminated by non-tradable components such as distribution costs, Burstein et al. (2005) propose to measure the price of tradable goods using the price of pure-traded goods at the dock, i.e. an average of export and imports price indices.

in 2006. Among those, Iraq, Algeria, Libya, UAE, Azerbaijan, T.R. Northern Cyprus and Syria are eliminated due to serious lack of data and replaced by the following countries (i.e. 41st, …) until reaching 40 countries. The countries taken into consideration made up 84.9% of Turkey's trade volume in 2006.[4] Marginal contribution of new countries would be very low. In fact, adding even the 10 following countries would increase this share by only 2.7 percentage points. Hence, the 40 countries selected are assumed to be fair enough in representing Turkey's trade partners. The list of countries is presented in Appendix A.

Aggregate *rer* for Turkey is calculated as the trade-weighted geometric average of price ratios presented in equation (1) in the previous section.

Trade volume data used for country selection and to compute trade weights in *rer* calculation are obtained from Turkish Statistical Institute (TURKSTAT), while *CPI*, *PPI* and nominal exchange rates are taken from IMF-IFS database and from countries' own statistical websites in cases of unavailability from IFS.

The sample correlation coefficient (r) indicating the strength and direction of the linear relationship between *rer* (represebted by y) and rer_N (represented by x) is calculated by the following standard formula;

$$r = \frac{cov(x, y)}{stdev(x) stdev(y)} \tag{12}$$

The similarity of the magnitude of fluctuations in *rer* and rer_N is measured by the relative standard deviation (*RSD*) and formulated as

$$RSD = \frac{stdev(x)}{stdev(y)} \tag{13}$$

To measure the fraction of the variance in *rer* accounted for by the variance in rer_N, a variance decomposition (also called -centered- mean squared error) is calculated as

$$var\,dec(x, y) = \frac{var(x)}{var(x) + var(y)} \tag{14}$$

Simple *OLS* regressions were also run between *rer* and rer_N (and the same process has been repeated for rer_T) and their R^2 coefficients are noted in order to cross check the previous results.

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[4] 2006 trade data are preferred instead of 2007 data because the 2007 trade data for Turkey were still provisional and subject to possible significant updates at the time of the analysis.

The largest time period is chosen, monthly, as January 2000 – June 2007 (i.e. 90 data points for each country) after considering all data limitations, which seems adequate enough in the case of Turkey.

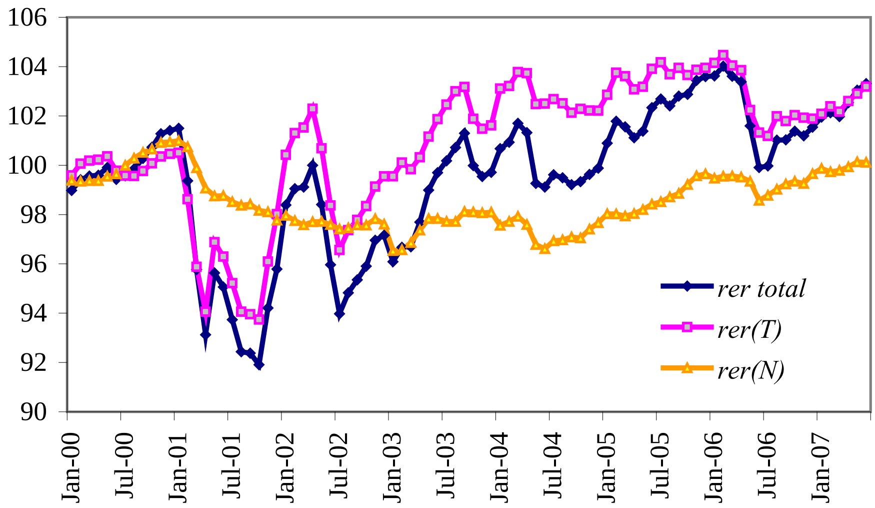
The data used in the paper are the de-trended logarithmic values,[5] but they are not de-seasonalized.[6]

4. Empirical Results

4.1. Visual Inspection

The aggregate real exchange rates calculated according to the methodology explained above and at equations (9) to (11) are presented in Figure 4.1.1. Instead of drawing figures for each bilateral *rer*, aggregate *rer* series for Turkey are calculated for graphing purpose. The calculation is made via geometric averaging bilateral *rer* series weighted with their share in Turkey's trade volume, where the shares are not held constant at a specific period but rather let to be variable in time.

Fig. 4.1.1. Real Exchange Rates for Turkey (2000=100)



[5] De-trended by using Hodrick-Prescott Filter.

[6] Tramo/Seats results did not suggest seasonality in any of the *rer* series considered.

Figure 4.1.1 shows that, though the long term trends moves together, the rer_N and *rer* behave quite differently, as compared with rer_T and *rer*. The similarity seems to improve during 2000 and in the period starting with 2004, while the differences are particularly pronounced during the 2001-2003 period. Thus, it would be wise to include at least three different horizons in the analysis, namely the full sample, and sub-samples 2000-2003 and 2004-2007. rer_T, on the other hand, looks as if it is the main determinant in *rer* movements in most of time under consideration.

4.2. Data Analysis

Results of the analyses are summarized in Table 4.2.1. The Augmented Dickey-Fuller unit root test revealed that only 8 out of 80 series (40 bilateral *rer* and 40 bilateral rer_N) were stationary with 95% confidence, and none with 99% confidence, but all were integrated of order 1 with 99% confidence. However, all has come out to be integrated of order zero after de-trending by Hodrick-Prescott (HP) Filter. The coefficients in the Table are generated through comparing the cyclical components of the (natural) logarithmic *rer* series aggregated by geometric averaging trade-weighted bilateral *rer* series.

Table 4.2.1
rer_N's Part in Determining Fluctuations in *rer* for Turkey

	Full Sample	Jan 2000 - Dec 2003	Jan 2004 - Jun 2007
r	0.562	0.504	0.780
RSD	0.319	0.298	0.397
vardec	0.121	0.102	0.226
R^2	0.316	0.254	0.609

The correlation coefficient of 56.2% in Table 4.2.1 for the full sample is not high, indicating a rather weak directional movement between *rer* and rer_N. The coefficient is still low in the first sub-sample, but increase by almost half in the second to 78%. The low correlations coefficient in the full sample and increasing correlation in the second sub-sample suggests the lack of “common” real shocks in the earlier period in the sample that drive both the relative internal price of non-tradables and the aggregate *rer*, but their presence in more recent years.

As measured by *RSD*, the magnitude of fluctuations in rer_N is less than half (only about one-third) of those in *rer* for the full sample, but again, improves to some extend when the sub-period 2004-2007 is considered alone. The coefficient is 29.8% in the first sub-period while 39.7% in the second.

rer_N accounts for 12.1% of all *rer* fluctuations in levels during 2000-2007. This rate reaches only 22.6% when the 2004-2007 period is considered as a sub-sample. Against the traditional theory putting forward that real exchange rate fluctuations should result from the changes in the relative price of non-tradable goods since tradable goods' prices are to equalize among countries due to the law of one price, the results for Turkey suggest a very small fraction of the variance in *rer* to be accounted for by the variance in rer_N. Yet, the considerable improvement (almost doubling) in this fraction -though still low- is noteworthy. We shall dwell upon it at the end of this section.

Table 4.2.1 also presents R^2 coefficients resulting from regressing *rer* on rer_N for Turkey in the three horizons considered, in order to cross check the robustness of the dimension and direction of the above-mentioned findings. Again, the R^2 in the full sample is quite low at 31.6%. R^2 increase significantly (to 60.9%) when the second period is considered alone. These results are generally in line with the findings of the previous measures. We can see that the relative prices of tradable goods seem to explain the movements in the real exchange rate as a greater percentage than the non-tradable goods, while the explanatory power of the latter increases considerably in recent years.

To ascertain the above inferences, the same measures have been recalculated for *rer* against rer_T this time, of which the results are summarized in Table 4.2.2. According to the Augmented Dickey-Fuller unit root test, only 4 out of 40 bilateral rer_N series were stationary with 95% confidence and one with 99% confidence, while all were integrated of order 1 with 99% confidence. All has become integrated of order zero after de-trending by HP Filter. Hence, the cyclical components of the HP filtered series are analyzed.

Table 4.2.2
rer_T's Part in Determining Fluctuations in *rer* for Turkey

	Full Sample	Jan 2000 - Dec 2003	Jan 2004 - Jun 2007
r	0.952	0.957	0.941
RSD	0.862	0.888	0.734
vardec	0.879	0.898	0.774
R^2	0.906	0.916	0.886

As expected regarding the impression got from the Figure 4.1.1, the values of the coefficients in Table 4.2.2 are generally much higher than those presented in Table 4.2.1. When the full sample is considered, a very strong directional movement between *rer* and rer_T exists for the whole sample (95.2%), while the magnitudes of fluctuations in rer_T are also very similar to those in *rer* (86.2%). rer_T accounts for 87.9% of *rer* fluctuations during 2000-2007 (more than seven times that for rer_N). R^2 is remarkably higher than that with rer_N.

Analyses made using sub-periods in Table 4.2.2 are in conformity with Table 4.2.1 in that all coefficients in the period 2004-2007 are lower than those in 2000-2003 indicating a weakening position of rer_T in determining the fluctuations in *rer* against the strengthening position of rer_N.

Betts and Kehoe (2001a) find that the stronger is the trade relationship between the two trade partners, the stronger is the relation between the bilateral *rer* and the bilateral relative price of non-tradable goods.[7] To do this, they group the US trade partners according to their trade intensities with the US, which are calculated by the following formulation:

$$trade\ \text{int}(x, US) = \frac{bilateral\ \ trade\ \ of\ \ x\ with\ US}{total\ \ trade\ \ of\ \ x} \tag{15}$$

and categorize the country as "high trade intensity" if $trade\text{int}(x,US) \geq 15\%$ and low intensity if the intensity is less than 15%. As an alternative, instead of looking if the trade intensity of "a given trade partner" of US influences the rer_N and *rer* relationship, they also propose a general formulation of trade intensity between any two countries as:

$$trade\ \text{int}(x, y) = \max\left(\frac{bilateral\ trade\ of\ x\ with\ y}{total\ trade\ of\ x}, \frac{bilateral\ trade\ of\ x\ with\ y}{total\ trade\ of\ y}\right) \tag{16}$$

by implicitly assuming that trade intensity need only be high for one of the two countries in any bilateral trade relationship for a strong relation between the rer_N and *rer*. As a consequence, they conclude in both approaches that high trade intensity is associated with a bigger role for rer_N in *rer* determination.

The trade intensities of Turkey's 40 trade partners considered in this study are calculated according to equation (15) and (16) separately. However, different than the case of US's trade partners, none of the 40 countries reached the 15% criteria of Betts and Kehoe (2001a) to be classified as "high trade intensity" with Turkey (see Appendix B for the trade intensities). In fact, the trade partner having the highest trade intensity with Turkey is Bulgaria with an intensity of only 8.4%, followed by

[7] Along with this, they discuss the concept of tradability and develop a theoretical framework in which some types of goods are more tradable than others; see Betts and Kehoe, 2001b for details.

Romania, 6%. None of Turkey's trade partners reaches 15% share in Turkey's trade volume as well (recall Appendix A).

The Figure B.1 (Appendix B) plots Turkey's trade partners assorted by their trade intensities with Turkey according to equation (15). As can be seen, although there is not a clear distinct group of countries to be separated from the others as being with high intensity, one can set a criterion at 6% (thus having two countries with high intensity), at 5% or 4% (4 and 5 countries, respectively, with high intensity). Setting 3% or 2% as the critical level would add up to this group 2 countries each. It is clear that, lowering the critical level that much by aiming the inclusion of more countries in the group, will not any more mean high share in trade. Thus, let's assume that in the case of Turkey, a country is said to have high trade intensity with Turkey if Turkey's share in its trade volume is at or exceeds 5%. As a result, 4 countries (Bulgaria, Romania, Iran and Ukraine) are categorized to have high trade intensity with Turkey.

The coefficients calculated according to this intensity criterion are presented in Table 4.2.3. Interestingly, the results are not as straightforward to make a clear inference as in Betts and Kehoe (2001a) findings. We have a similar result as their findings that the relation between *rer* and rer_N is slightly closer when trade intensity is high than when trade intensity is low if we only consider *RSD*. But the *r*, *vardec* and R^2 coefficients are not that high, and are even lower in high intensity case.

Table 4.2.3
Trade Intensity in Turkey's Trade Partners and rer_N's Part in Determining Fluctuations in *rer* for Turkey (*equation 15*)

	Full Sample	High Trade Intensity	Low Trade Intensity
r	0.562	0.481	0.560
RSD	0.319	0.326	0.323
vardec	0.121	0.115	0.124
R^2	0.316	0.235	0.317

The analysis is repeated using equation (16) instead of (15). This time 10 countries exceeds the 5%, namely Germany, Russia, Bulgaria, Italy, Romania, Iran, UK, France, USA and Ukraine. The results are presented in Table 4.2.4. The findings are very much in line with those of Table 4.2.3 except that the *vardec* decreases some in the low trade intensity case. Hence, we may assert that in the case of Turkey, though there are some symptoms of an association between low trade intensity and the role of rer_N in determining fluctuations in *rer*, results are not fully supportive for such a conclusion.

Table 4.2.4. Trade Intensity in Turkey's Trade Partners and rer_N's Part in Determining Fluctuations in *rer* for Turkey (*equation 16*)

	Full Sample	High Trade Intensity	Low Trade Intensity
r	0.562	0.543	0.595
RSD	0.319	0.326	0.311
vardec	0.121	0.124	0.117
R^2	0.316	0.294	0.354

In sum, using consumer price index as a proxy of the aggregate price level, producer price index as a proxy of the tradable goods prices, and the non-tradable goods prices calculated via the "Betts-Kehoe real exchange rate decomposition method", it can be said that the real exchange rate in Turkey is mainly driven by the "price of tradable goods relative to those in trading partners".

Considering the variability of the real exchange rate in tradable goods in Turkey (which is obvious in Figure 4.1.1) together with the abovementioned finding, the law of one price should not be taken as a fact in the case of Turkey unless further analyses are undertaken.

The contribution of the relative non-tradable goods prices to tradable goods prices to the fluctuations in the real exchange rate is found to be quite low as compared to the relative price of tradable goods across trading partners. Hence, the Balassa-Samuelson hypothesis that the productivity in tradable sectors increases faster than the productivity in non-tradable sectors, which results in price levels increasing faster in non-tradable sectors, is not supported by the real exchange rate decomposition made in this study in the case of Turkey.

When we separate our time period analyzed into two sub-periods, a somewhat different picture comes out. That is, the sources of fluctuations of real exchange rate for Turkey depends on the sample period we have considered. The story is still the same for the first sub-period 2000-2003. The real exchange rates fluctuations in Turkey are overwhelmingly determined by the international relative prices of tradable goods. In the period starting from 2004 through 2007, on the other hand, the role of non-traded goods improves significantly as compared to the first sub-period, yet well below that of tradable goods prices. This outcome may be interpreted as the structural reform policies in early 2000s right before and following the 2000/2001 financial crisis in Turkey[8] had their impact on the real

[8] A financial turmoil has happened in Turkey in November 2000 during an exchange rate based stabilization program. Subsequent developments (especially the interest rates staying at much higher levels compared to the pre-turmoil period) made the program unsustainable, resulting in the collapse of

sector through the second period, which may have led to productivity gains possessing further share in the determination of the currency appreciation in that period.

Separating countries as those having high trade intensity with Turkey and those having low trade intensity shows that trade intensity does matter in the context of rer_N's part in determining fluctuations in *rer* for Turkey, but not as much as in the case of US analyzed by Betts and Kehoe (2001a). This may be because US has considerably larger share in its main trade partners' trade volume as compared to Turkey's share in its trade partners (we can arrive this conclusion regarding their critical value of trade intensity set at 15%, to which none of Turkey's trade partners reaches). This puts US in a more "price maker" position and Turkey in a rather "price taker" position, which can be considered as a factor reducing the role of high trade intensive trade partners in determining the contribution of rer_N's to *rer* fluctuations.

the exchange rate system and the implementation of the floating exchange rate system. For detailed information about the crisis, see Ozatay and Sak (2003).

5. Concluding Remarks

This study tried to measure the proportion of Turkey's real exchange rate movements that can be accounted for by the movements in the relative prices of non-tradable goods. The decomposition is made for the period January 2000-June 2007 and the two sub-periods January 2000-December 2003 and January 2004-June 2007, as well as with a separation of countries into two groups regarding their trade intensities with Turkey. Four measures, namely the correlation coefficients, relative standard deviations, variance decomposition and R^2 coefficients are computed for this purpose.

If we obtained that the real exchange rate movements in Turkey are mainly driven by the relative prices of non-tradable goods in Turkey instead of the relative prices of tradable goods between Turkey and its trading partners, this would suggest that exchange rates could be modeled using models based on the properties of price levels, i.e., real shocks would be playing the central role in explaining the fluctuations in the real value of the currency as suggested by Balassa (1964) and Samuelson (1964). According to the Balassa-Samuelson hypothesis, the productivity in tradable sectors increases faster than the productivity in non-tradable sectors, which results in price levels increasing faster in non-tradable sectors. However, this has not been the case in this study. Relative price of non-tradable goods has not possessed strong evidence in supporting this approach. Thus, it seems that nominal shocks cause most of the volatility in real exchange rates for the case of Turkey.[9]

The real exchange rate is frequently used as an indicator of export competitiveness of Turkey in public debate and research arena. In this respect, an important inference one can draw from the analysis in this study is that, when the competitiveness is defined, following Dwyer (1991), as the ability of the domestic tradable goods sector to attract resources from the non-tradable goods sector, then the conventional real exchange rate can not be treated as a good measure in assessing the competitiveness of Turkey's tradable goods (or exports) sectors. In

[9] In order to check whether the growth in the productivity of non-tradable sector has actually surpassed that in tradable sector, we compared the performance of the productivity in services (services value added used as a proxy to non-tradable sector) with that in manufacturing sector (manufacturing value added approximating tradable sector) for the period under consideration of this study (See Appendix C). But no clear evidence has been found against Balassa-Samuelson hypothesis in this respect, which implies further research before one totally rejects this hypothesis for the case of Turkey.

fact, as found in this study, it is not primarily reflecting the relative price of tradable against non-tradable goods.

The findings of this study are, of course, highly dependent on the choice of price indices to represent aggregate price levels and tradable goods prices. As mentioned in the paper, the possibility of the existence of better indicators of aggregate price level and tradable goods prices is acknowledged. However, data limitations are unavoidable regarding the desire to handle a large sample of countries and data at higher frequencies for Turkey and its trade partners. Nevertheless, this study is assumed to have a considerable contribution to the literature on the Turkish economy that is in a fast catching-up process accompanied with significant currency appreciation.

We have got three main inferences at hand from this paper; that the real exchange rate of Turkey can be decomposed into its "tradable" and "non-tradable" components, that the main determinant of the real exchange rate fluctuations is the relative price of "tradable goods" against its trade partners, and that the contribution of "non-tradable goods prices relative to tradable goods prices" to these fluctuations has improved in recent years, though still much less than that of the relative price of tradable goods. Hence, a follow-up of this study may be, after certain amount of newer data is collected (probably after a couple of years), to check whether the improvement in the share of non-tradable goods prices in determining the real exchange rate fluctuations is a permanent issue and continuing. If this does not happen to be the case, then one shall still assume the real exchange rate fluctuations in Turkey to be mainly driven by the relative price of tradable goods.

Together with this or separately, the further research agenda can include considering alternative variables to represent the tradable or non-tradable prices in calculating the real exchange rate. For example, the export and import price indices are also generally available for many countries, and, as proposed by Burstein et al. (2005), a combination of these two indices can also be used as a measure of the price of pure-traded goods at the dock.

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Appendix A. Countries Categorized within the "Foreign Countries" Sample in the Paper

Table A.1. List of Countries and Their Share in Turkey's Trade Volume

Selection:	*Countries:*	*% share in Turkey's total trade in 2006:*
1	Germany	10.9
2	Russian Fed.	9.3
3	Italy	6.8
4	UK	5.3
5	France	5.3
6	USA	5.0
7	China	4.6
8	Spain	3.4
9	Iran	3.0
10	Romania	2.2
11	Switzerland	2.2
12	Netherlands	2.1
13	Ukraine	1.9
14	Belgium	1.7
15	S. Korea	1.6
16	Japan	1.5
17	S. Arabia	1.4
18	Bulgaria	1.4
(not selected)	Iraq	1.3
(not selected)	Algeria	1.3
(not selected)	Libya	1.2
19	Greece	1.2
20	Poland	1.1
21	S. Africa	1.1
(not selected)	U.A.E	1.0
22	Israel	1.0
23	Sweden	1.0
24	India	0.8
25	Austria	0.8
26	Hungary	0.8
27	Taiwan	0.8
28	Kazakhstan	0.8
29	Finland	0.7
30	Ireland	0.6
31	Denmark	0.6
32	Indonesia	0.5
33	Egypt	0.5
34	Czech Rep.	0.5
35	Brazil	0.5
36	Canada	0.5
(not selected)	Azerbaijan	0.5
37	Thailand	0.4
38	Malaysia	0.4
39	Portugal	0.4
(not selected)	T.R.N. Cyprus	0.4
(not selected)	Syria	0.4
40	Norway	0.3

Note: The trade volume consists of the sum of exports (f.o.b.) plus imports (c.i.f.) as published by Turkish Statistical Institute (TURKSTAT).
Source: TURKSTAT.

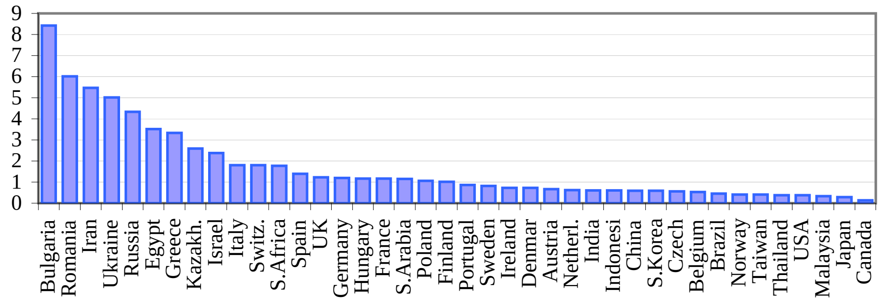
Appendix B. Trade Intensity of Turkey's Trade Partners with Turkey

Table B.1. List of Countries and Turkey's Share in Their Trade Volumes

Selection:	*Countries:*	*Trade Intensity (%):*
1	Germany	1.2
2	Russian Fed.	4.3
3	Italy	1.8
4	UK	1.2
5	France	1.2
6	USA	0.4
7	China	0.6
8	Spain	1.4
9	Iran	5.5
10	Romania	6.0
11	Switzerland	1.8
12	Netherlands	0.6
13	Ukraine	5.0
14	Belgium	0.5
15	S. Korea	0.6
16	Japan	0.3
17	S. Arabia	1.2
18	Bulgaria	8.4
19	Greece	3.3
20	Poland	1.1
21	S. Africa	1.8
22	Israel	2.4
23	Sweden	0.8
24	India	0.6
25	Austria	0.7
26	Hungary	1.2
27	Taiwan	0.4
28	Kazakhstan	2.6
29	Finland	1.0
30	Ireland	0.7
31	Denmark	0.7
32	Indonesia	0.6
33	Egypt	3.5
34	Czech Rep.	0.6
35	Brazil	0.5
36	Canada	0.1
37	Thailand	0.4
38	Malaysia	0.3
39	Portugal	0.9
40	Norway	0.4

Source: TURKSTAT, IMF-IFS database, World Trade Organization.

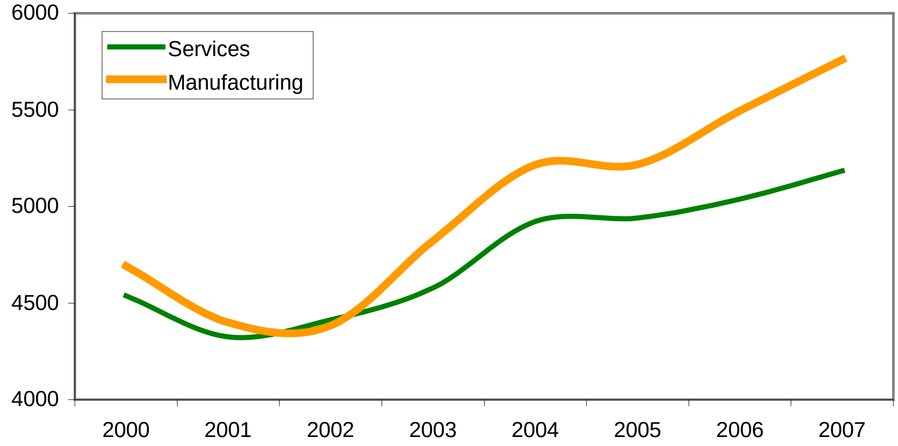
Fig. B.1. Trade Intensity of Turkey's Trade Partners with Turkey (%)



Source: TURKSTAT, IMF-IFS, World Trade Organization.

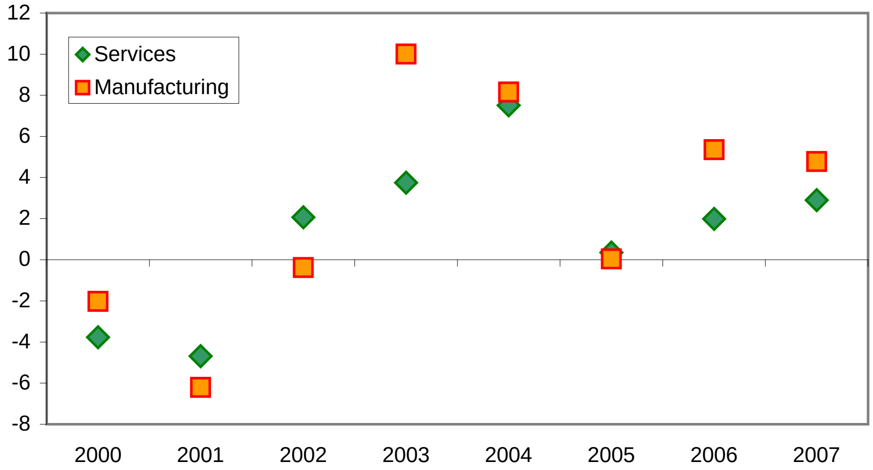
Appendix C. Comparison of Manufacturing and Services Sectors' Performances in Turkey

Fig. C.1. Manufacturing and Services Sectors' Productivity (New TL)



Source: TURKSTAT.

Fig. C.2. Growth in Manufacturing and Services Sectors' Productivity (%)



	Manufacturing	Services
Accumulated growth from 1999 to 2007:	19.7%	10.1%
Average growth between 2000-2007:	2.3%	1.2%

Source: TURKSTAT.