The role of home and foreign prices on tradables and nontradables in RER fluctuations in Russia

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THE ROLE OF HOME AND FOREIGN PRICES ON TRADABLES AND NONTRADABLES IN RER FLUCTUATIONS IN RUSSIA

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The aim of this work is to analyze the factors responsible for RER appreciation in 2000—2006 years in Russia. Particularly, this study empirically evaluates how closely real exchange rate movements are related to movements in the relative price of nontraded to traded goods and to changes in the relative prices of tradable goods across countries in the data. The paper investigates the quarterly sample on Russian data in the period of RER appreciation: 2000.Q1- 2006.Q4. The macro data on price indices, GDP, RER etc. are taken from the official Goskomstat statistics. The central tool of analysis is the variance decomposition. The main hypothesis that is tested is the violation of the law of one price. The analytical papers of Ariel Burstein, Martin Eichenbaum, Sergio Rebelo and also the papers of Caroline Betts and Timothy Kehoe are considered as a basis for research approach in this study.

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Трухачева Е., Сосунов К. Роль относительных цен на торгуемые и неторгуемые товары в определении реального обменного курса российского рубля: Препринт WP12/2007/13. – М.: Изд. дом ГУ ВШЭ, 2007. – 12 с. (на англ. яз.).

Цель данной работы – определить возможные факторы укрепления рубля в 2000–2006 гг. В частности, работа эмпирически оценивает насколько колебания реального курса рубля связаны с изменением относительной цены неторгуемых и торгуемых товаров в России и относительных цен отечественных и импортных товаров. Статья базируется на квартальной статистике по индексам цен, публикуемых Росстатом. Основным инструментом анализа является разложение дисперсии. Основная гипотеза, которую мы тестируем, – нарушение закона одной цены. Наш основной вывод состоит в том, что значительную часть колебаний реального курса объясняет именно изменение цен на отечественные и импортные торгуемые товары. Наш анализ базируется на схожих эмпирических исследованиях для ряда других стран (Burstein, Eichenbaum, Rebelo 2004; Betts and Kehoe 2001).

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Introduction

The traditional theory of purchasing power parity (absolute PPP) predicts that real exchange rates (RER) should equal 1, or at least have a tendency to return quickly to 1 when the LR ratio is disturbed for some reason. The absolute PPP theory suggests that the law of one price, which states that if there are no trade barriers, then a commodity should have the same price everywhere, is held. Krugman, Obstfeld (1990) offer four explanations for the failure of PPP:

1) Barriers to trade such as tariffs and transportation costs;
2) Different consumption preferences across countries;
3) The presence of nontraded goods in consumer price indices;
4) Prices which are sticky in terms of the currency in which the good is consumed.

Relative PPP states that changes in national price levels are always equal (i.e. PPP = const) or tend to equality in LR. The available data on national price indices are usually in changes (not in levels), thus the relative PPP should be measured.

The aim of this paper is to evaluate empirically how closely real exchange rate movements are related to movements in the relative price of nontraded to traded goods and to changes in the relative prices of tradable goods across countries in the data. We investigate the quarterly sample on Russian data: 2000. Q1 – 2006.Q4, the period of RER appreciation.

There are some research papers on this field mainly investigating the developed countries and fewer investigating developing countries, concerning Russia there is no any particular research.

The classical papers in this field are Engel (1993) and Engel (1999). Engel (1993) paper documents an empirical regularity that in the major industrialized countries, the volatility of the consumer price of a good relative to another good within the same country tends to be much lower than the volatility of the price of that good relative to the same good in another country. Engel (1999) uses as a measure of tradables CPI for goods only, consumption deflators for goods and the overall PPI. He concludes that relative prices of nontraded goods appear to account for almost none of the movements of U.S. real exchange rates.

Betts and Kehoe (2001) investigate the relationship between a measure of relative price of nontraded goods to traded goods across countries and the bi-

lateral real exchange rates in a sample of 52 countries and 1326 bilateral pairs over the period 1980–2000. They use CPI's as a measure of aggregate price indices and sectoral gross output deflators and PPI for goods as a traded goods price measure. Studying both deviations in levels and yearly changes, they find through variance decompositions that on average about one-third of deviations in levels of the real exchange rate, and about one-fifth of yearly changes, can be accounted for by fluctuations in the relative price of nontraded goods.

It is worth noting, that they also find that the inclusion of reach-poor country trade in the sample tends to reduce the nontraded goods component as does the inclusion of high-inflation country/low-inflation country trade pairs. They argue that high variability real exchange rates are much less strongly associated with the relative price of nontraded goods.

Betts and Kehoe (2005) argue that movements in nontraded goods prices are important in explaining real exchange rate fluctuations. Their analysis is based on real exchange rates constructed using gross output deflators and PPI's. They also find that when consumption based prices are used to measure prices on tradables, the significance of relative prices on nontraded goods is higher.

Burstein, Rebelo (2004) consider large RER appreciation episodes: Argentina 1991–2001 and Mexico 1988–1994. When the price of tradables is measured using retail prices, the percentages of movements in pure-traded goods are 89 and 58 percent in Argentina and Mexico, respectively. In contrast, movements in pure-traded goods, which are measured using an equally weighted geometric average of import and export price indices, account for a relatively small fraction of movements in the RER: 21 percent in Argentina and 4 percent in Mexico.

Burstein, Rebelo (2005) use the data for 11 OECD countries and conclude that using the retail prices of tradable goods leads one to overstate the fraction of cyclical RER^{cpi} fluctuations that are due to changes in the price of pure-traded goods across countries. To substantiate this statement they use U.S. data to decompose the variance of RER^{cpi} using two alternative measures of the price of tradable goods: the retail price of tradable goods and a weighted average of import and export prices. The first price measure implies that the relative price of nontradable to tradable goods accounts for virtually none of the variance of RER^{cpi}. In sharp contrast, the second price measure implies that the relative price of nontradable to tradable goods accounts for at least 55 percent of the variance of RER^{cpi}.

To summarize, each measure of prices has its own advantages and flaws. Retail (consumer) prices are heavily contaminated by the cost of nontradable distribution services such as retailing, wholesaling, and transportation. While there are inevitably some producer goods that are not traded, PPI and Gross

output deflators' data is measured at the production site and hence excludes nontraded marketing and other consumer services.

In addition, the prices of the items in the producer basket of goods are final output prices at the production site; in other words, they represent an improvement over value added data, therefore they are exclusive of the prices of any nontradable marketing and other final consumption services that are included in CPI component data, but they do not include the price of imported final goods.

Despite the advantages of import and export price indices (they are measured at the dock), there are some caveats: import and export indices include investment, intermediate goods, and raw materials as well as consumption goods.

This paper uses CPI for consumer goods, prices in building sector and prices for gross accumulation of fixed assets for investments. As a measure of foreign price indices only import prices are used because of specifics of Russian export, which will be discussed later.

Real Exchange rate decomposition

The usual definition of RER is CPI-based:

$$RER^{cpi} = \frac{P}{EP^*} \cdot$$

In this paper RER defined as:

$$RER = \frac{P}{EP_{IM}} \cdot \qquad (1)$$

P is expenditure deflator, P_{IM} is import price index and E is nominal exchange rate. P_{IM} deliberately does not include export prices because they mostly reflect world oil prices instead of foreign price levels for imported final goods.

The price index P consists of prices on consumption and investment goods with weights beta correspondingly. Also, We ignore government spending, considering them insignificant.

We use the Engel (1999) approach assuming that P is computed as a geometric average of the price of tradable goods (P_T) and the price of nontradable (P_N) goods:

$$P = (P_{CN}^{\alpha 1} P_{CT}^{1-\alpha 1})^{\beta} (P_{IN}^{\alpha 2} P_{IT}^{1-\alpha 2})^{1-\beta} \qquad (2)$$

The variables alpha 1 and alpha 2 represent the share of nontradable goods in the consumption and investment domestic price indices.

Putting (2) into (1) and taking the logarithm of (1) we get:

$$rer = \alpha 1\beta \ln(\frac{P_{CN}}{P_{CT}}) + \alpha 2(1-\beta)\ln(\frac{P_{IN}}{P_{IT}}) + \ln(\frac{P_{CT}^{\beta} P_{IT}^{1-\beta}}{EP_{IMP}}) \quad (3)$$

The logarithm of *RER* is *rer*.
Decomposition is: $rer = rer_T + rer_N$, where

$$rer_T = \alpha 1\beta \ln(\frac{P_{CN}}{P_{CT}}) + \alpha 2(1-\beta)\ln(\frac{P_{IN}}{P_{IT}}),$$

which reflects the relative price of nontradables to tradables,

and $$rer_N = \ln(\frac{P_{CT}^{\beta} P_{IT}^{1-\beta}}{EP_{IMP}}),$$

which reflects the ratio of tradables to import prices.
The variance of *rer* can be decomposed as:

$$var(rer) = var(rer_T) + var(rer_N) + 2\,\mathrm{cov}(rer_T, rer_N).$$

The variance statistics is computed as:

$$vardec = \frac{var(rer_N)}{var(rer_T) + var(rer_N)}.$$

Following Burstein, Rebelo (2005) We also compute a lower and upper bounds on the importance of movements in rer_N and in rer_T.
A lower bound, L^N, on the importance of movements in rer_N is computed by attributing the covariance term to fluctuations in the price of tradable goods because the estimated covariance $cov(rer_T, rer_N)$ is positive:

$$L^N = \frac{var(rer_N)}{var(rer)}.$$

An upper bound, U^N, on the importance of movements in rer_N is computed by attributing the estimated covariance term to fluctuations in the price of nontradable goods:

$$U^N = \frac{\mathrm{var}(rer_N) + 2\,\mathrm{cov}(rer_N, rer_T)}{\mathrm{var}(rer)}.$$

Similarly, for rer_T:

$$L^N = \frac{var(rer_T)}{var(rer)}$$

$$U^N = \frac{\mathrm{var}(rer_T) + 2\,\mathrm{cov}(rer_N, rer_T)}{\mathrm{var}(rer)}$$

We also calculate statistics $\frac{\Delta rer_T}{\Delta rer}$ and $\frac{\Delta rer_N}{\Delta rer}$, where delta means the difference between $rer / rer_T / rer_N$ in the final period and $rer / rer_T / rer_N$ in the zero estimation period. Thus, this statistics shows the share of rer_T and rer_N in the total *rer* increase during the estimation period.

Empirical estimation

Quarterly data on RER, ratio of expenditure deflator to nominal import price index, and on EP_{IM}, nominal import price index and other price indices for the period: 2000.Q1- 2006.Q4 are taken from Goskomstat.

We use the following measures for estimation:

$\alpha 1$ – The share of services in CPI index

$\alpha 2$ – The share of domestic and industrial building in investments in fixed assets

β – The share of final consumption in final consumption and gross accumulation of fixed assets (The GDP components statistics)

P - Expenditure deflator

EP_{IMP} – Import prices

P_{CN} – Prices for services (part of CPI)

P_{CT} – Prices for goods (part of CPI)

P_{IN} – Prices in building sector

$P_{IN}^{\alpha 2} P_{IT}^{1-\alpha 2}$ – Prices for gross accumulation of fixed assets

All the data samples are transferred to levels and normalized to log (1) =0 in the beginning of the first period (1 Jan 2000).

The Figure 1 demonstrates the dynamics of these price indices. The Figure 2 shows the aggregate dynamics for tradable and nontradable goods price indices.

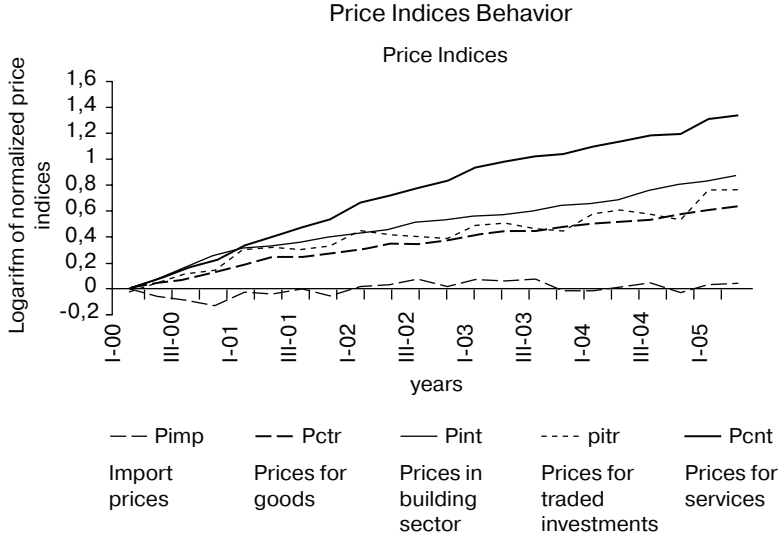

Figure 1.

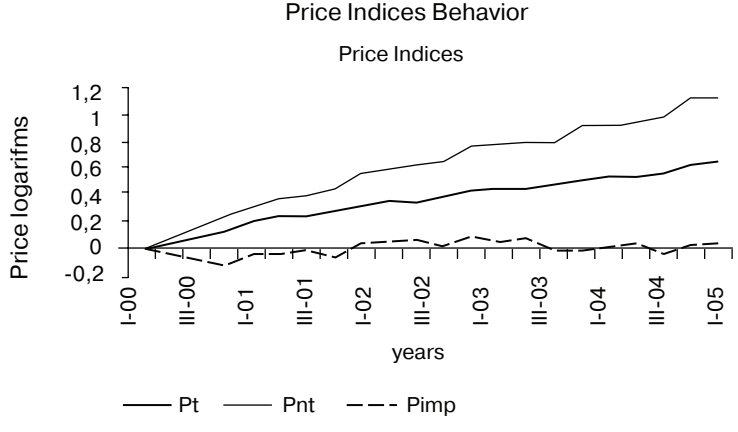

Figure 2.

As a measure of P_{CT} We use CPI index only for goods. As a measure of P_{NT} We use CPI index for services. These are approximate measures and have simple division "goods and services", but they still can be used as a proxy for domestic prices on traded goods and nontraded consumer services.

We also used different measures of prices in nontradable investment sector, including prices for building work, prices for housing and their combinations, but the results are quite robust to these modifications, so We kept the prices in building sector as the most adequate measure.

The Figure 3 illustrates the dynamics of *rer* and rer_N: while *rer* is rising rer_N stays nearly the same.

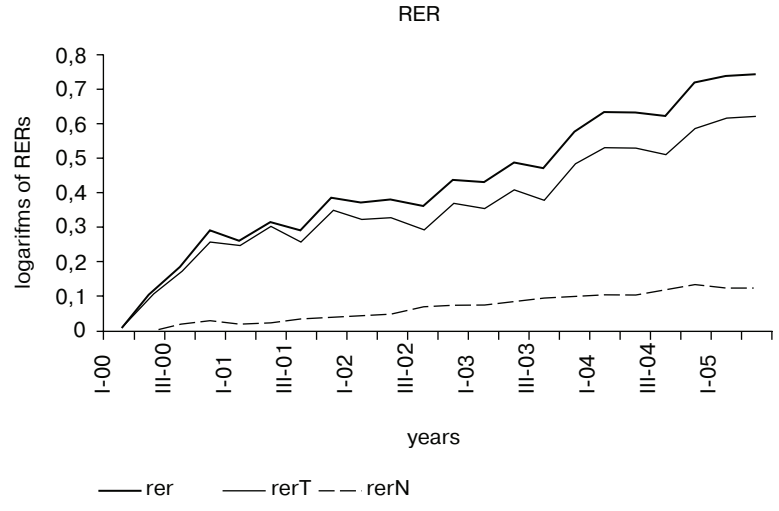

Figure 3.

The resulting estimates are the following:

Table 1. Estimated second moments of various measures of RER

Var(rer)	**Var(rer_T)**	**Var(rer_N)**	**cov(rer_T,rer_N)**	**Vardec**
0,0417	0,0263	0,0020	0,0064	0,0690

Table 2. Bounds of importance of different relative prices changes

Bounds	**On the importance of movements in:**	
	rer_N	rer_T
Lower	0,0468	0,6312
Upper	0,3541	0,9386

$$\frac{\Delta rer_T}{\Delta rer} = 83\%; \quad \frac{\Delta rer_N}{\Delta rer} = 17\%.$$

These results suggest that the RER fluctuations are mostly (about one third) due to fluctuations of relative prices of tradables across countries, that means the failure of the law of one price. Comparing to research of developing countries, that is consistent with the results of Burstein, Rebelo (2004) considering large RER appreciation episodes in Argentina 1991–2001 and Mexico 1988–1994, when they use the retail prices as a measure of traded goods. The results are also consistent with Engel (1999) research of developed countries, described in introduction.

The explanations of Burstein, Rebelo (2004) can be easily applied to Russian RER appreciation.

They find (using a weighted average of import and export prices as a P_T), that large RER depreciation and appreciation episodes gives much more significance to nontraded goods fluctuations comparing to small RER fluctuations episodes in developed countries, their results are likely to be explained by the possible developing countries specifics.

The slow response of nontradable goods prices could reflect the government-controlled prices that make relative prices (tradables to nontradables) less responsive to various shocks.

Conclusion

The paper results suggest that the RER appreciation in Russia is mostly due to fluctuations of relative prices of traded goods across countries, which is consistent with the main results of Engel (1999) and Burstein (2004 and 2005).

This result means that Russian commodities considered as a traded goods in fact are not completely such, i.e. there is a nontraded component in tradable goods.

These RER fluctuations could reflect a variety of factors: developing country specifics, such as government-controlled prices, that make relative prices less responsive to various shocks, sticky prices and endogenous changes in real markups. In addition, different countries import and export different baskets of goods. Therefore, changes in the relative price of these goods lead to changes in the relative price of traded baskets and in the measured RER.

The empirical evidence of Betts (2001) also can explain Russian RER fluctuations and the violation of the law of one price. She finds that the degree of violation of the law of one price is higher when the trade is between reach – poor countries, high inflation – low inflation countries and in countries with high variability of RER.

There are also several reasons to suppose that these results are potentially biased (giving too much role to tradables in RER fluctuations). One of these reasons is the consumer prices that are used to measure prices for consumer traded goods, which certainly include nontraded component. This suggestion is supported by the evidence of Burstein, Rebelo (2004 and 2005).

The important task for future research is ongoing exploration of better measures to estimate the RER fluctuations. Using an equally weighted geometric average of import and export price indices as a measure of tradable goods prices (as in Burstein 2005) is difficult because of the fact that in Russia export prices are mostly oil prices that basically reflect the world prices on oil.

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Научные доклады лаборатории макроэкономического анализа

Е. Трухачева, К. Сосунов

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