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on the Russian Economy**

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1. Introduction

According to the Russian GDP statistics in real terms the net exports have not contributed to the GDP growth. The recent real income growth in Russia, however, seems to have been much greater than the real GDP growth, owing to the marked increase in the terms-of-trade effects (TT) arising from high oil prices. This gap of perceptions can be solved by changing the accounting framework so that the system of national accounts (SNA) should provide scope for the recording of the terms-of-trade effects (Stuvel, 1959). As Kohli (2004) clarified, real GDP underestimates the increase in real domestic income under an improvement in the terms-trade as in the case of a technological progress. The improvement in the terms-of-trade enables the country to more imports (exports) for less exports (imports).

This paper develops further the measurement of the terms-of-trade effects in order to reach a better understanding of a turning point of the recent economic growth in Russia. Paying attention to the SNA 1993 recommendations, this paper presents alternative estimates of the terms-of-trade effects and the gross domestic income (GDI). In particular, this paper relies heavily on Stuvel's method developed in the 1950s. This paper further proceeds to the oil and gas sector's share of the terms-of-trade effects.

2. The Measurement of the Terms-of-trade Effects

The terms-of-trade effect expressed in base-year prices can be defined as follows:

¹ A draft of this paper was presented at the 39 National Congress of AAASS held at New Orleans on 18 November, 2007. I am grateful to Professors Itsuo Sakuma and Shinichiro Tabata for their valuable suggestions on the terms-of-trade effects in general and in Russia.. I also thank Professor Vladimir Popov for his valuable comments on the draft. This study is partially supported by the Kajima Foundation and the Strategic Research Promotion Fund of Institute of Economic Research, Hitotsubashi University.

$$\begin{aligned}
TT_r &= (E_n - M_n)/P - (E_r - M_r) \\
&= M_r(1 - P^m/P) + E_r(P^e/P - 1), \\
E_r &= E_n/P^e, M_r = M_n/P^m,
\end{aligned} \tag{1}$$

where subscripts r and n denote the real and nominal terms respectively, TT is the terms-of-trade effects, E and M are the exports and imports respectively, P^e and P^m are the export and import deflators respectively, and P is a common deflator of exports and imports.

Here let us define the gross domestic income in real terms, GDI_r as

$$GDI_r = GDP_r + TT_r. \tag{2}$$

It should be noted that we assume the net receipt from the rest of the world is zero. So Eq.(2) is different from the traditional identical relation ($GDI_r = GDP_r$). While real GDP is a concept relevant to the study of production and productivity, the real GDI would seem a more appropriate concept to use in the study of welfare (Stuvel, 1959, p.287).

Now the main problem is the selection of a common deflator, P . SNA 1993 allows for a variety of the selection.

If the export price index is chosen as a common deflator ($P=P^e$), it follows from Eq.(1) that

$$TT_r = TT_e = M_r(1 - P^m/P^e). \tag{3}$$

If $E_n > M_n$, this is Geary's case according to United Kingdom usage (P^m/P^e) in the 1950s.

If the import price index is chosen as a common deflator ($P=P^m$), we obtain from Eq.(1)

$$TT_r = TT_m = E_r(P^e/P^m - 1). \tag{4}$$

This corresponds to continental usage (P^e/P^m) in the 1950s.

In both Eqs. (3) and (4), if the terms-of-trade (P^e/P^m) > 1 , $TT_r > 0$ and if (P^e/P^m) < 1 , $TT_r < 0$. As the export prices and volumes are the main issues for recent Russia, obviously Eq.(4) with the import deflator as a common deflator would provide a better measurement of the impact of terms-of-trade on the real income. Indeed, in order to appreciate the impact of the terms-of-trade shifts on real incomes in Russia, OECD(2006, pp.22-24) employs Eq.(4) and names $GDI_r = GDP_r + TT_r$. as the "command GDP" which was referred as to "command-basis GDP" in Kohli (2004, p.97).² They claim that the command GDP provides a summary measure of the impact

² According to OECD(2006, p.23), Command GDP = TDDV + XGSV*(PXGS/PMGS) – MGSV. In our notations, TDDV = $C_r + I_r$ (see Eq.(5)) XGSV = E_r , MGSV = M_r , PXGS = P^e and PMGS = P^m . Hence, Command GDP = $C_r + I_r + E_r(P^e/P^m) - M_r = GDP_r - (E_r - M_r) + E_r(P^e/P^m) - M_r = GDP_r + E_r(P^e/P^m - 1) = GDP_r + TT_m$.

of terms-of-trade shifts on a country's purchasing power and ability to *command* goods and services. This is true if we consider their real domestic demand (TDDV) as consumption plus capital formation (investment) in real terms (C_r+I_r in Eq.(5) below).

Stuvel (1959) provided another common deflator P^{DA} which is defined as

$$P^{DA} = (C_n+I_n) / (C_r+I_r), \quad (5)$$

where C and I are consumption and capital formation (investment) respectively. This is the domestic demand deflator. Then

$$TT_r := TT^{DA} = (E_n - M_n) / P^{DA} - (E_r - M_r) \quad (6)$$

$$GDI_r = GDP_r + TT^{DA}.$$

From the view point of the national accounts this common deflator would yield the most satisfactory common deflator although Stuvel's common deflator would not necessarily reflect the terms-of-trade effects in a well defined manner. If $P^e > P^{DA} > P^m$, $TT^{DA} > 0$ and if $P^e < P^{DA} < P^m$, $TT^{DA} < 0$. However, if P^{DA} is not within the range between P^e and P^m , the sign of TT^{DA} is not clear. Nevertheless, we believe Eq.(6) provides a better summary measure of the impact of *net* terms-of-trade effects on an economy's ability to *dominate (command)* domestic demand.

3 Terms-of-trade Effects and Income Growth in Russia

Table 1 displays GDI growth rates based on Eq.(2), deflators, and terms-of-trade effects, for 2000-2006 in Russia. Figure 1 describes GDI growth rates in two cases of the common deflators (the import price index method and the domestic demand index/the Stuvel method). In 2000 and 2003 onward the terms-of-trade (P^e/P^m) was greater than unity and showed an increase, the growth of real income, GDI was much greater than that of GDP. Though P^{DA} was greater than P^e except for 2000 and 2005, and TT^{DA} was relatively small, TT^{DA} had shown a positive value after 2003 onward.³

For 2001 and 2002 since $(P^e/P^m) < 1$, GDI growth was smaller than GDP growth. Two cases of GDI growth show a rather similar trend. However, as for 2001 the GDI based on the Stuvel method showed much greater downward movement than that based on the import deflator method. During this period the domestic demand deflator was much greater than the export and import deflators due to domestic inflation.

Let us assume the above macro relations are applicable to sectoral relations using uniform macro deflators. Table 2 shows the oil and gas sector's terms-of-trade

³ In his comments on an earlier draft on my paper, Professor Vladimir Popov suggested a close relationship between PPP growth and GDI growth with TT. I am planning to develop his suggestion in another paper.

effects in rubles and its percent share in the total effects. In 2005 both shares of the oil and gas effects based on Nicholson and Stuvell showed marked high values, 1004% (over 100%) and 93%. However, for 2003 and 2004, the shares based on Stuvell showed rather small values. For these two years the oil and gas TT_m revealed much greater share than 50% while the share of the oil and gas TT^{DA} accounted for the level much less than 50%. It is noted that the share of crude oil TT^{DA} in 2003 and that of gas TT^{DA} in 2004 recorded a minus value. This suggests that the terms-of-trade effects in 2005 (and maybe in 2006) were completely due to the increases in oil prices but for 2003 and 2004 the impact of oil prices on the terms-of-trade effects was rather limited. Still domestic inflation pressure has remained strong.

Table 1 Impact of Terms-of-Trade Effects on GDI

Annual real growth rates of GDP and GDI				(%)			
	2000	2001	2002	2003	2004	2005	2006
	1995 base	2000 base	2000 base	previous year base			
GDP	10.0	5.1	4.7	7.3	7.2	6.4	6.7
GDI(P^e)	16.7	3.5	4.0	9.2	11.3	9.8	9.1
GDI(P^m)	22.0	2.6	3.8	10.1	13.5	12.0	10.5
GDI(P^{DA})	19.3	0.3	2.9	8.7	10.9	10.7	8.9
	previous year base						
GDI(P^e)	18.8	3.5	4.2				
GDI(P^m)	26.2	2.6	4.0				
GDI(P^{DA})	21.2	0.3	2.9				
Command GDP (P^m)		3.1	4.1	9.9	12.3	12.0	
Deflator (gross)				(%)			
	1995 base	2000 base	2000 base	previous year base			
P^e	600.4	98.4	103.1	108.5	112.6	121.8	111.0
P^m	514.4	103.9	110.8	101.3	97.0	105.5	100.7
P^{DA}	447.0	123.1	144.2	113.6	115.6	114.6	112.5
P^e/P^m	1.167	0.947	0.931	1.072	1.160	1.154	1.102
	previous year base						
P^e	141.0	98.4	104.8				
P^m	105.1	103.9	106.6				
P^{DA}	127.0	123.1	117.1				
P^e/P^m	1.342	0.947	0.983				
Terms of trade effects (gain)				(billion rubles)			
	1995 base	2000 base	2000 base	previous year base			
TT^e	49	-118	-178	208	537	588	520
TT^m	90	-179	-257	307	833	958	831
TT^{DA}	133	-349	-501	146	489	738	481
	previous year base						
TT^e	426	-118	-43				
TT^m	781	-179	-62				
TT^{DA}	540	-349	-160				

Notes:

Author's calculation based on NSR various years and www.gks.ru.

Command GDP is from Table 1.2 in OECD(2000, p.24).

Figure 1 Growth Rates of GDP and GDI

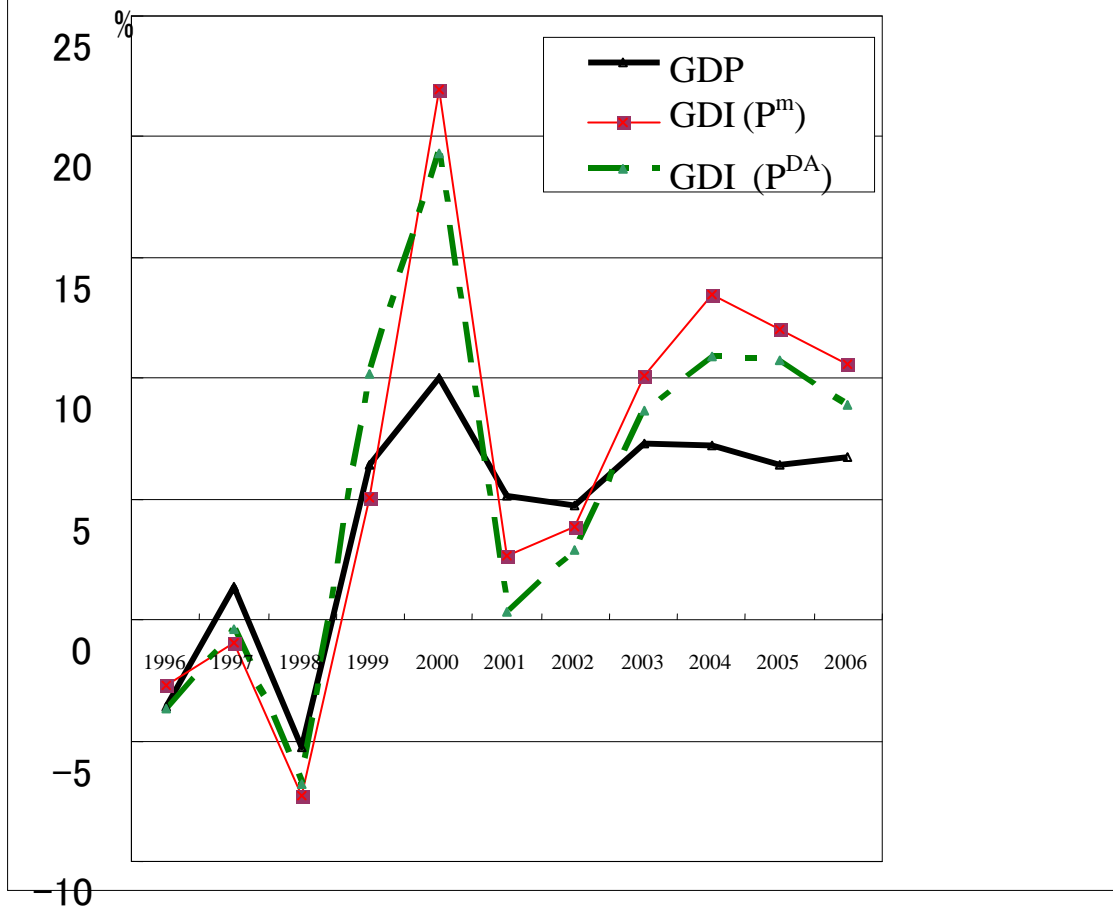


Table 2 Terms-of-Trade Effects by Oil and Gas Industries (previous year base)

		2003	2004	2005	2003	2004	2005
		TT (billion rubles)			Share(%)		
Oil and gas	TT_e	112.9	183.6	479.9	54.2	34.2	81.6
Crude oil		20.8	103.4	289.0	10.0	19.3	49.1
Refined oil		33.2	78.4	113.4	15.9	14.6	19.3
Gas		58.9	1.8	77.5	28.3	0.3	13.2
Oil and gas	TT_m	252.3	577.4	1002.1	82.1	69.3	104.6
Crude oil		99.0	340.2	585.2	32.2	40.8	61.1
Refined oil		59.9	146.2	227.9	19.5	17.5	23.8
Gas		93.5	91.0	189.0	30.4	10.9	19.7
Oil and gas	TT^{DA}	25.6	120.3	691.2	17.5	24.6	93.7
Crude oil		-28.1	65.3	408.8	-19.3	13.4	55.4
Refined oil		16.4	67.5	159.8	11.2	13.8	21.7
Gas		37.3	-12.6	122.6	25.5	-2.6	16.6

Notes:

1. Real rates of increases are from physical data in RSE 2006,
2. Nominal exports and imports: For 2003, the 2003 use and supply tables. For 2004 and 2005, data in USD are converted into data in rubles by IFS year average exchange rates.
3. Macro deflators in Table 1 are uniformly used for all sectoral ones.
4. Shares are computed based on TT values of Table 1 and this Table.

4. Concluding Remarks

We showed the alternative measurements of terms-of-trade effects and their impact on GDP and GDI. As was shown, the real gross domestic income reflects Russian welfare much better than real GDP. Kohli (2004) started with the Swedish experience which enjoyed a fall in import price deflator. Our interests relied upon a rise of export deflator. As in Russia the pricing of oil and gas has been separated from the domestic pricing of those. So as in the case of Sweden, we did not have to seriously consider inflation due to the increase in the export deflator. Needless to say, inflation pressure is still important in Russia. This aspect was fully taken into accounts in our analysis by employing Stuvél's method.

However, we did not mention any problem inherent to the impact of terms-of-trade effects on real income. If payoffs from the terms-of-trade effects for the current period are employed for the current consumption and/or investment, the additional consumption and/or investment should be reflected on the expenditure and

production sides of GDP. In this case $GDI_r = GDP_r + TT^{DA}$ should be modified to the extent of current uses of terms-of-trade gains. Indeed, in input-output literature (e.g., ten RAA, 2006) with assumptions on the relation $GDI_r = GDP_r$, TT (the terms-of-trade effects) and TFP (total factor productivity) are considered to be important factors determining the GDP(GDI) growth.

In the author's growth accounting analysis (Kuboniwa, 2007), the average annual growth rate 6.1% for 2000-2005 in Russia consists of capital contribution 1.8%, labor contribution 0.3% and TFP contribution 4.1%. Namely, 76% of the growth can be explained by the TFP contribution. To what extent was this TFP contribution derived from technological progress including increase in capital replacements and capacity utilization and the oil price movement? As can be shown by a simple econometric analysis, the Russian GDP growth has been much more stable and robust than the oil price changes for 1999-2006. In this context, TFP from supply side and TT (terms-of-trade effects) from income side are two essential factors for a better understanding of the recent growth in Russia. However, the relationships between terms-of-trade effects, total factor productivity and GDP/GDI growth need further study.

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