Basic income and increasing income inequality in Russia

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Abstract

It is shown that the average wages in Russia are undervalued approximately by 2 times. The level of income inequality is significant, and it is growing. Minimum wage is by 1.5 times less than the level of basic income in Alaska (by official exchange course), and the pensions are small. The developed by author method and models show that decreasing income inequality may lead to noticeable increasing the macroeconomic multiplier and economic growth, and at the same time societies with very low level of the income inequality can be unstable. They confirm also that the basic income equal to the present minimum wage could provide a key part of the answer to the inequality reduction. Obviously, considering the problems connected with introduction of basic income is the necessary step for development civil society in Russia and will positively influence on resolving the important for the Russian future problems.

Introduction

At present the problem of social protection is urgent in many countries. As the ILO reports, only 20% of population of the globe have adequate social insurance, but more than a half do not have it entirely. Less than 10% of employees in the least developed countries are involved into the system of social security, in the countries with the average income level this number is equal from 20 to 60%. Globalization is accompanied by greater income inequality. Problems of social justice are aggravated. As Ch. Clark writes, "we need to rethink both equity and efficiency, defining them in such a way that the dignity of all individuals is upheld and the common good is promoted" (Clark Ch., 2002). That is why the questions, connected with basic income proposal are widely discussed.

In some countries the basic income proposals are already realized. Thus, at present in the state of Alaska (USA) Basic income system exists in the form of the Permanent Fund payments: each inhabitant of the state receives $1654 (about 7% of average per-capita profit or 4.5% of the mean wages in the state). This value for Russia, using the official exchange rate, was equal in 2006 to the annual earnings of approximately 20% of population; it is higher by 1.5 times than the minimum annual wage established at the end of 2007.

The situation in Russia was very strictly characterized by Joseph Stiglitz, winner of the 2001 Nobel Prize for Economics. He wrote on the results of economic transitions in Russia as follows:

«For the majority of those living in the former Soviet Union, economic life under capitalism has been even worse than the old Communist leaders had said it would be… The middle class has been devastated, a system of crony and mafia capitalism has been created, and the one achievement, the creation of a democracy… appears fragile at best… While those in Russia must bear much of the blame for what has happened, the Western advisers, especially from the United States and the IMF, who marched in so quickly to preach the gospel of the market economy, must also take some blame. At the very least, they provided support to those who led Russia and many of the other economies down the paths they followed, arguing for a new religion — market fundamentalism — as a substitute for the old one — Marxism…»(Stiglitz, 2002, pp. 133—134). «Privatization, accompanied by the opening of the capital markets, led not to wealth creation but to asset stripping. »(Stiglitz, 2002, p. 144). «...It was expected that Russia would be spared the

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inequality arising from inherited wealth. Without this legacy of inherited inequality, there was the promise of a more egalitarian market economy. How differently matters have turned out! Russia today has a level of inequality comparable with the worst in the world, those Latin American societies which were based on a semi-feudal heritage. ...And the prognosis for the future is bleak: extremes of inequality impede growth, particularly when they lead to social and political instability» (Stiglitz, 2002, pp. 154—155).

Inequality is growing in Russia. That is why in May 2008 the present Prime Minister V.Putin declared about the preparation of the law that was accepted by Russian Parliament a month later at the beginning of June, 2008. According to it the minimum wage must be established at the level of 4330 rubles since January 1, 2009 (it is equal now to 2300 rubles or less than 17% of average wages). This level corresponds to the living minimum that had place in the fourth quarter of 2007. A special attention is paid to an increase in the real size of pensions. New Russian President Dmitriy Medvedev considers that in the future average pension have to be increased to 13 thousand rubles and more. In this regard, the examination of the basic income proposals for Russia is very important.

In this work the problems, connected with strengthening of income inequality in Russia are examined. In the first section of the work the indicators, which characterize inequality in Russia, are considered. In the second section the developed by author method and models are considered. The results obtained show that decreasing income inequality may lead to noticeable increasing the macroeconomic multiplier and economic growth. They confirm also that the basic income equal to the present minimum wage could provide a key part of the answer to the inequality reduction. At the same time, it is shown that very low level of inequality leads to the instable society that is some optimum level of the income inequality exists. Considering the problems connected with introduction of basic income is regarded as the necessary step for development civil society in Russia and will positively affect on resolving the important for the Russian future problems.

Growth of income inequality in Russia

Indicators of income inequality

Income differentiation of the population of Russia increases steadily after 1991. According to the data of Rosstat, in 2006 the 10% of the most rich received 30.2% of the total income (in 2005 - 29.9%), and the 10% with lowest income got only 2%. Income till 4500 rubles obtained 25.5%, less than 6000 rubles - 39%, from 6000 to 12000 rubles - 34.6%, and more than 12000 rubles - 26.4% of total population. One should consider that the data of Rosstat on income differentiation are understated, since according to the data of the special surveys and the World Bank data the actual level of inequality is considerably higher (table 1) (Rimashevskaya , 2005), (Shevyakov&Kiruta, 2002), (Shevyakov, 2005a), (Shevyakov, 2005b), (Aivazyan,1997), (Varshavsky, 2007a), (Varshavsky, 2007b).

Table 1.

Income distribution in Russia by 20 percent groups (100% = total income; the 1st group has the lowest income, the 5th group corresponds to the top 20 percent), %.

	Data of Rosstat [*]							ISI [**]	RLMS	RLMS	RLMS
No of the 20 percent group	1970	1980	1990	1995	2000	2004	2005	1998	1998	2000	2004
1	7.8	10.1	9.8	6.1	5.9	5.4	5.5	4.9	3.9	3.9	3.7
2	14.8	14.8	14.9	10.8	10.4	10.1	10.2	8.9	8.0	7.7	8.8
3	18	18.6	18.8	15.2	15.1	15.1	15.2	13.7	12.7	12.7	12.8
4	22.6	23.1	23.8	21.6	21.9	22.7	22.7	21.6	20.7	21.3	21.9
5	36.8	33.4	32.7	46.3	46.7	46.7	46.4	50.9	54.7	54.3	52.7

*1970-1990 - total income (including the cost of net output of the household activity of

population).

** Institute for Social Research (Moscow) and the Center of International public health of Boston University.

*** [RLMS] - Russian Longitudinal Monitoring Survey of the economy and health (RLMS) (Besstremyannaya, 2007).

The level of the income inequality of the population of Russia, estimated by the Gini coefficient, considerably exceeds the same index for the countries of East Europe, where the transformation of economic system was begun earlier, it is also higher than in the states of the CIS (table 2).

Table 2.

Inequality of earnings and income in transition economies (Gini index).

Country	Inequality of the earning distribution [*]	Year	Income inequality [**]	Year
Czech Republic	27.3	2002	23.5/25.4	2004
Slovenia	30.3	2004	24.3/28.4	2003
Latvia	32.1	2004	39.1/33.6	2004
Belarus'	33.8	2004	24.8/31.9	2004
Poland	35.1	2004	36.6/34.1	2004
Rumania	35.8	2003	35.9/30.3	2004
Kazakhstan	37.0	2004	…/29.1	
Hungary	38.6	2001	26.8/26.9	2003
Estonia	38.8	2001	40.2/37.2	2003
Lithuania	39.4	2004	30.9/31.9	2004
Ukraine	41.0	2004	32.7/32.0	2002
Russia	46.9	2004	42.2/40.7	2001
Russia	-		-/45.6	2005
Moscow	-		-/56.7	2005

* data of TransMONEE 2006 Database.

** Numerator - data of TransMONEE 2006 Database; denominator - data of the World Bank (for Russia, Belarus, Kazakhstan and Ukraine - data of Rosstat).

A special problem is the low level of pensions, gradually falling relatively to average wages. The relationship of average pensions and wages in the period of reformation of economic system was reduced from 33.7% in 1990 to 22.8% in 2007 (25.6% in 2006), and for skilled workers - till 15-20%. The flat rate of the income tax equal to 13%, practically do not create basis for redistributing and contributes to the conservation of high share of the poor population in Russia.

According to the results of survey made recently by All-Russian Center for studies of the public opinion (VCIOM) at present 83% of respondents do not attribute themselves to the middle class (VCIOM, 2008).

A special attention should be focused on the serious stratification of population in Moscow, where the Gini index was equal to 56.7 in 2005 (62.7 in 2002, (The social situation, 2004), which is higher than in Nigeria (50.6) and close to the Gini index for Brazil (58.5), Republic of South Africa (59.3), Botswana (63.0), Central African Republic (61.3), Swaziland (62.9), Sierra Leone (62.9) (World Development Indicators, 2004). These are the results of transition to the market system, carried out in accordance with the advices of the Western experts (see above words of J. Stiglitz).

The situation with income differentiation with the inverted scale of values, when the high-skilled workers are undervalued, that has place in Russia after 1991 presents a special danger. Thus, in Moscow the average wages in the R&D sector is only by 3.2 times and in education by 2.7 times higher than the living minimum. At the same time in some branches of the Moscow

economy the wages are by several times higher than in the R&D sector and education, - even in the trade they is higher, on the average, by 59% (table 3). This situation does not give stimuli for increasing level of qualification and knowledge. It leads to significant reduction in the inflow of young people into the R&D and other branches of the knowledge-based sector.

The concentration of income and wealth in the narrow stratum of the Russian society stimulates the outflow of savings abroad and excessive expenditures for the foreign objects of luxury. These processes are strengthened because of the orientation on the short term goals and uncertain future.

The low income of the major part of population leads to worsening the health of population, delays the development of civic society, decreases the social inclusion. It does not contribute to the solidarity of population and to growth of patriotic feelings and, simultaneously, it increases risks for those, who became rich after 1991.

There are also some indirect indicators of strong income differentiation of population. One of them is the serious growth of passengers on international airlines by 3.6 times and very strong decrease on domestic ones by 4 times (see fig. 1 where the dynamics of indicators of the passenger transport is shown).
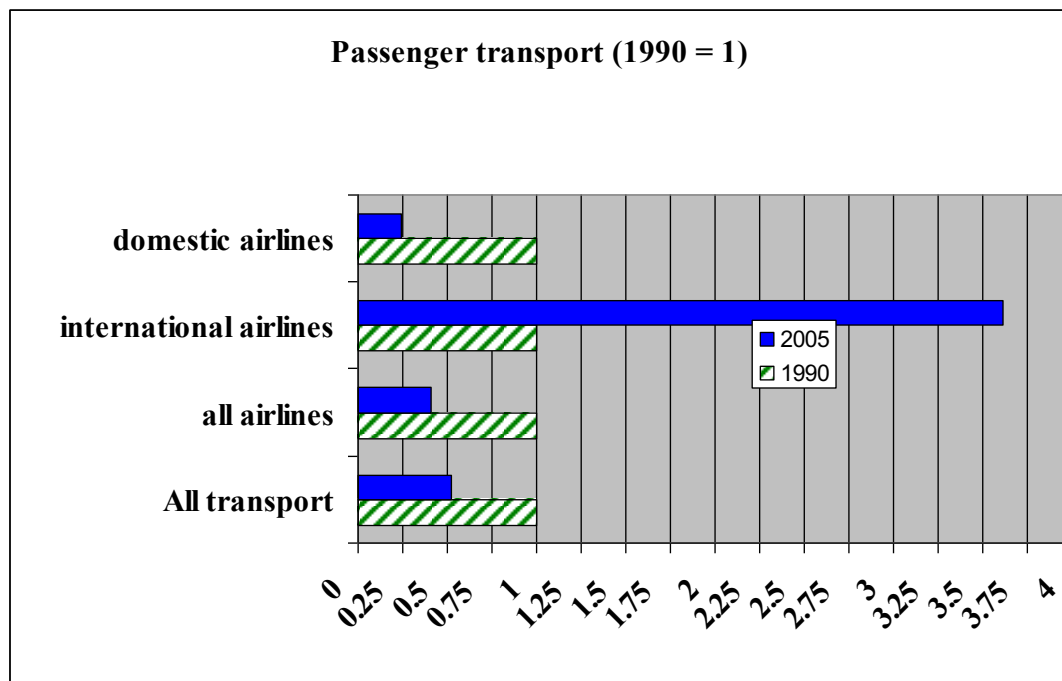

Fig. 1. The passenger transport in 1990-2005, change in number of passengers, times (1990 = 1)

The insufficient level of income for major part of population slows down Internet access and access to information for students, scientists, and engineers; it contributes to strengthening information gap and creates the risk of significant decreasing the quality of education.

As a whole it is possible to speak about negative impact of the income inequality on economic and social growth (Varshavsky, 2007a), (Varshavsky, 2007b).

Thus, development occurs in accordance with the Darwinian law ("It is not the strongest of the species that survive, nor the most intelligent, but the ones most responsive to change", Charles Darwin, 1856).

The increase in the income inequality is influenced now, after the end of primary privatization, by the low level of wages in the majority of industries and simultaneously very high payments in some branches. The degree of the underestimation of workers can be seen by comparing a the average value of annual wages to the GDP per capita ratio for Russia and other countries.

Table 3.
Average monthly wages in Moscow, 2005-2008 (estimated by the data of Mosgorstat)

Indicator	Average monthly wages, rubles *)				As a percentage of the financial organizations wages				growth 2008 / 2005
	2005	2006	2007	2008					
Average monthly wages of the workers	17 169	22 386	28222	33441	48	49	50	44	0.914
Financial organizations	35 890	45 666	56931	76496	100	100	100	100	1.000
Telecommunications	23 737	28 169	35970	40212	66	62	63	53	0.795
Wholesale and retail trade	21 686	25 743	32774	36161	60	56	58	47	0.782
Construction	17 331	20 851	26104	28886	48	46	46	38	0.782
Manufacturing	15 357	18 471	23648	27037	43	40	42	35	0.826
Health and social services	10 656	17 202	20832	26051	30	38	37	34	1.147
R&D	12144	16 211	20024	22678	34	35	35	30	0.876
Education	9484	13 689	17000	20450	26	30	30	27	1.012

*) 2006 – data for January-November; 2007 - for January –September; 2008 – for January – February.

In total this index for Russia is equal approximately to 60% of the USA level. It is the highest in Russia for financial services (almost the same, as in the USA -95.6%), accommodation and food services (92.2%), transport and telecommunications (77.6%). It is the lowest in education (39.2%), public health (48.9%), R&D sector (49.7%), agriculture (41.0%). For manufacturing this index is also low in average (51.9%) (table 4, see also table 3).

These data show, from one side, that the level of wages in Russia is approximately by 2 times understated and, from the other side, that the high inequality of payment by branches exists (it is low in the branches, which determine the development of the knowledge-based society (Makarov V.L., Varshavsky A.E., 2004)). The average level of pay is not high even in the branches of the fuel-energy complex, whose production predominates in the Russian export.

These data show also that wages in Russia could be increased on the average approximately by 1.5 times and in the manufacturing and knowledge sector by 2 times and even more. This conclusion coincides with the estimation of academician A. Aganbegyan, who proposes to double nominal wages (Aganbegyan, 2007).

The inequality of payments is also very serious problem for Russian regions. The very high differentiation of income by regions is constantly increasing because of the relatively fast growth of average income in capitals (Moscow, St. Petersburg) where it is by several times higher than in regions (see fig.2 where data for the several central regions are given).

The doubling of wages with the growth of the income tax will change the situation in the positive direction. At the same time, during the first stage it is possible to introduce some elements of the Basic Income like Basic Income payments, The Social Solidarity Fund, and new progressive tax system, see (Clark Ch., 2002). These measures will make it possible to raise total level of income, and in the following stage to begin an increase in the wages.

Table 4

Average annual wages to the GDP per capita ratio by industry, % (estimated using data of Rosstat, 2006, and BEA USA 2004)

	Russia	USA	Russia's level as a percentage to the USA level, %
Total	65.5	109.3	59.9
Finance and insurance	175.4	183.6	95.6
Accommodation and food services	46.2	50.1	92.2
Transportation	82.9	106.9	77.6
Real estate	78.0	103.4	75.4
Petroleum and coal products	138.7	191.3	72.5
Mining, except oil and gas	93.3	135.8	68.7
Primary metals	88.7	130.0	68.2
Construction	67.2	105.5	63.7
Oil and gas extraction	168.3	274.7	61.3
Retail trade	41.3	70.9	58.2
Manufacturing	63.6	122.5	51.9
Machinery	65.3	129.7	50.3
R&D	83.0	167.1	49.7
Telecommunications 1)	81.2	165.2	49.2
Health care and social assistance	49.6	101.4	48.9
Chemical products	73.0	174.5	41.8
Education	42.5	108.6	39.2
Agriculture, forestry, fishing	28.4	69.2	41.0

1) For the USA – telecommunications, information and data processing services.
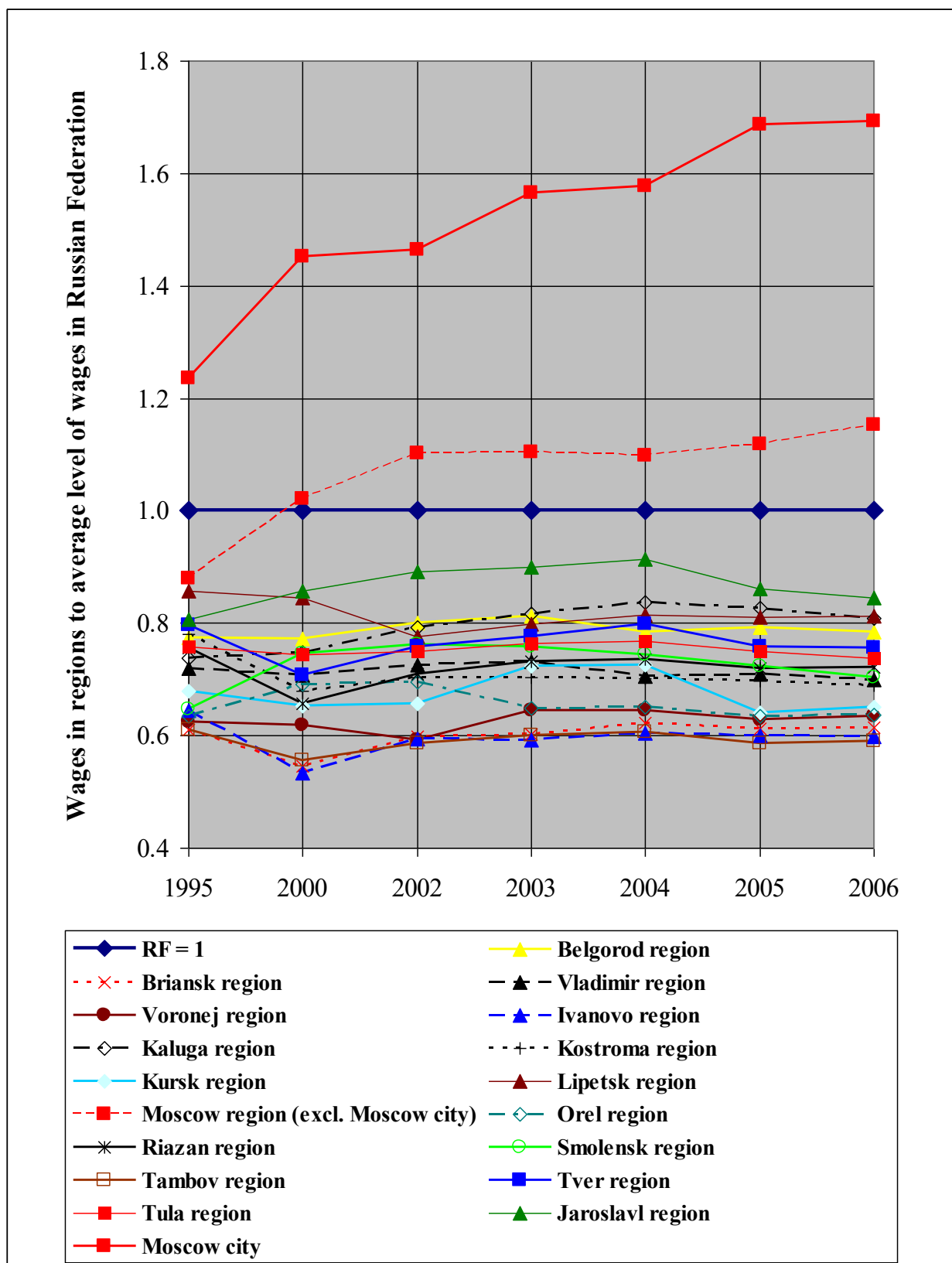
Fig.2. The growth of inequality of average wages in some Russian regions of the Central Federal Region compared with the average level of wages in Russian Federation (RF); 1 = average level of wages in Russian Federation.

Measuring the impact **of** *income inequality on growth*
Different views about inequality and economic growth

At present there are three different views on the impact of income inequality on economic growth, see also (Clark Ch., 2002).

According to the first, using the Kuznets-hypothesis (Kuznets, 1955), economic progress is initially accompanied by rising income inequality which is a contributory factor for economic growth. This point of view was supported in the middle of the second-half of the 20th century by Okun (Okun, 1975), Kaldor (Kaldor, 1956), Mirrlees (Mirrlees, 1971) and many others. In their opinion, capital of the richest part of the population is the basic source of savings and, correspondingly, the investments which ensure economic growth. On the contrary, the lower the level of inequality the less investments into the economy; small economic stratification and (or) high level of taxation for redistributing incomes stimulate the unwillingness for the hard work and reduction in the expenditures for increasing the qualification. For example, A. Okun wrote: "We can't have our cake of market efficiency and share it equally"(Okun, 1975).

However, at the end of the 20th and the beginning of the 21st century a whole series of the works of Alesina and Rodric (Alesina& Rodric, 1994), Benabou (Benabou, 1996), Osberg (Osberg, 2003), Persson and Tabellini (Persson&Tabellini, 1994), Brady (Brady, 2003, 2004), Heinrich (Heinrich, 2003), Clarke R. (Clarke R., 1995), Clark Ch. (Clark Ch., 2002) and other economists have shown that an increase in the share of savings of the rich part of population decreases the aggregated consumer demand, which is necessary for stimulating the investments and economic growth.

Similar views have the authors of the United Nations 2005 report (Human development report, 2005) who have noted that at present the human society understands the inadmissibility of different forms of inequality (gender, ethnic, called by inherited wealth, etc.). Each person must have equal with others rights for education, access to the knowledge, information, to the achievements of medicine and so forth. As Adam Smith wrote in the 'Wealth of Nations': "No society can surely be flourishing and happy of which the far greater part of the members is poor and miserable".

At the same time they did not deny that complete equality of the income distribution gives obviously significant negative effect on business and innovation activity and as a result leads toward the slow down of economic growth or even toward the negative rates of economic development. Thus, Ch. Clark writes: "Economic efficiency without equity is political and social, and in the long run economic, suicide. Economic equity without economic efficiency will fail to meet all needs, thus will not meet the reasonable equity criteria of a decent standard of living for all. New approaches and policies that promote both equity and efficiency, and not trade one off the other, are needed…"(Clark Ch., 2002).

There is also a third point of view, according to which available at present data are insufficient in order to determine unambiguously how the income inequality influences economic growth (Kenworthy, 2003), (Scruggs&Allen, 2005).They propose also that for studying income inequality impact on growth it is necessary to consider the different tendencies for the upper and lower parts of the income distribution (Voitchovsky, 2003). Nevertheless, these authors understand the necessity to reduce income economic inequality and the role of state as the basic mechanism of decreasing poverty (Brady, 2004), (Eicher&Turnovsky, 2003).

Below we show with the support of the models that significant income inequality slow down the economic growth and at the same time very low level of inequality can lead to instability in society.

The primary goal in this section is to illustrate the new opportunities that provides the approach proposed by the author in his papers (Varshavsky, 2003, 2007a, 2007b, 2007c). This approach offers first, a new especial parametric series of the income distribution by equal groups of population. The second, on the basis of the elaborated parametric series some models are worked out to analyze the impact of income inequality on growth as well as the impact of basic income on decreasing inequality.

New methodology.

At present there are several measures of income inequality developed by Gini (Gini coefficient), Atkinson (the Atkinson index, also known as the Atkinson measure), Theil (Theil's index), Hoover (Hoover index) (Atkinson &.Bourguignon, 2000). However their direct utilization for measuring the impact of inequality on economic growth and modeling is difficult. The proposed methodology is based on the assumption that one may construct an especial parametric series of the income distribution by n equal groups of population, such that the income of every group is taken in relation to income of the richest group, of the following form:

$$A(a,n)=\{A_1(a),\dots A_i(a),\dots A_n(a)\}, \tag{1}$$

where $A_1(a) = S_1(a)/S_n(a),\dots A_i(a) = S_i(a)/S_n(a),\dots A_n(a) = S_n(a)/S_n(a) \equiv 1$,

and $S_i(a)$ is the share of income of the group i in total income, i - is the number of group ($i=1$ corresponds to the poorest group), a - parameter, that can be determined as the "inequality indicator", n – number of equal groups of population.

The shares of the income groups in the total income are determined, obviously, as follows:

$$S_1(a) = A_1(a)/A(a),\dots S_i(a) = A_i(a)/A(a),\dots S_n(a) = A_n(a)/A(a), \tag{2}$$

where $A(a)=\sum_{i=1}^{n} A_i(a),$

$$\sum_{i=1}^{n} S_i(a)=1.$$

Then, for 20 percent income groups (quintiles), n=5, the following parametric series is obtained from (1):

$A_i(a) =a^{-(6-i)}$, $i=2, 3, 4$; $A_5(a)=1, A_1(a)=a^{-6}$
$$\text{or } \{A_1(a), A_2(a), A_3(a), A_4(a), A_5(a)\} = \{a^{-6}, a^{-4}, a^{-3}, a^{-2}, 1\}. \tag{3}$$

The shares of the groups in the total income are estimated as follows:

$$S_i(a)=a^{-(6-i)}/A(a), i=2, 3, 4; S_5(a)=1/A(a), S_1(a)=a^{-6}/A(a); A(a)=1+ a^{-2} +a^{-3} +a^{-4} +a^{-6}; \tag{4}$$
$$A_i(a) = S_i(a)/S_5(a).$$

(for n=10 and so forth the members of a series will take somewhat more complex form).

The inequality indicator a is, obviously, connected with the Gini coefficient. The relationship can be estimated by well known formula for a population uniform on the values y_i, $i = 1$ to n, indexed in non-decreasing order ($y_i \leq y_{i+1}$).

For most countries the inequality indicator a is in the range $1.25<a<1.6$ (or Gini coefficient $0.24<GINI<0.46$) and, as econometric analysis shows, we can use for this range the following linear regression that gives reasonably good approximation ($R^2=0.9943$):

$$GINI(a) = 0.618a – 0.520 \tag{5a}$$
or for increments
$$\Delta GINI(a) =0.618a. \tag{5b}$$

These relationships can be simplified for practical calculations without significant error as follows:

$$GINI(t) \approx 0.6a – 0.5 \tag{6a}$$
or for increments
$$\Delta GINI(t) \approx 0.6\Delta a. \tag{6b}$$

The series (3) gives very good precision of approximation with very high coefficients of determination R^2. One may see it on the fig. 3 where the real and estimated (with asterisk) relative income distributions for some countries are shown as a function of number of the 20 percent group ($i=5$ for the richest group). The values of estimated inequality indicator a , coefficients of

determination R^2, approximation of the Gini coefficient using formula (5a), real Gini coefficients from (World Income Inequality Database, 2006), and error of approximation of the Gini coefficient are given in table 5.

Table 5

Estimated values of inequality indicator a with coefficients of determination R^2 and approximation of the Gini coefficient using formula (5a), real Gini coefficients, and error of approximation of the Gini coefficient.

| Country	inequality indicator a	R^2	Approximation of the Gini coefficient, formula (5a)	Gini coefficient (World Income Inequality Database)	Error of approximation for Gini, %
Denmark	1.236	1.000	0.243	0.247	1.5
Slovenia	1.255	1.000	0.255	0.264	3.3
Finland	1.262	0.993	0.259	0.268	3.3
Sweden	1.265	0.998	0.261	0.272	3.9
Norway	1.267	0.988	0.263	0.274	4.1
Netherlands	1.308	0.999	0.288	0.307	6.2
Taiwan	1.322	0.991	0.296	0.319	7.1
Belgium	1.324	0.976	0.298	0.322	7.5
France	1.326	0.994	0.299	0.323	7.5
Ireland	1.348	0.994	0.313	0.341	8.3
Spain	1.354	0.999	0.316	0.345	8.3
Italy	1.372	0.999	0.328	0.358	8.5
United Kingdom	1.385	0.996	0.336	0.370	9.2
Republic of Korea	1.397	0.975	0.343	0.369	7.1
United States	1.434	1.000	0.366	0.401	8.8
Russian Federation	1.524	0.997	0.421	0.453	7.0
Argentina	1.641	0.997	0.494	0.523	5.6
Panama	1.757	0.998	0.565	0.578	2.2
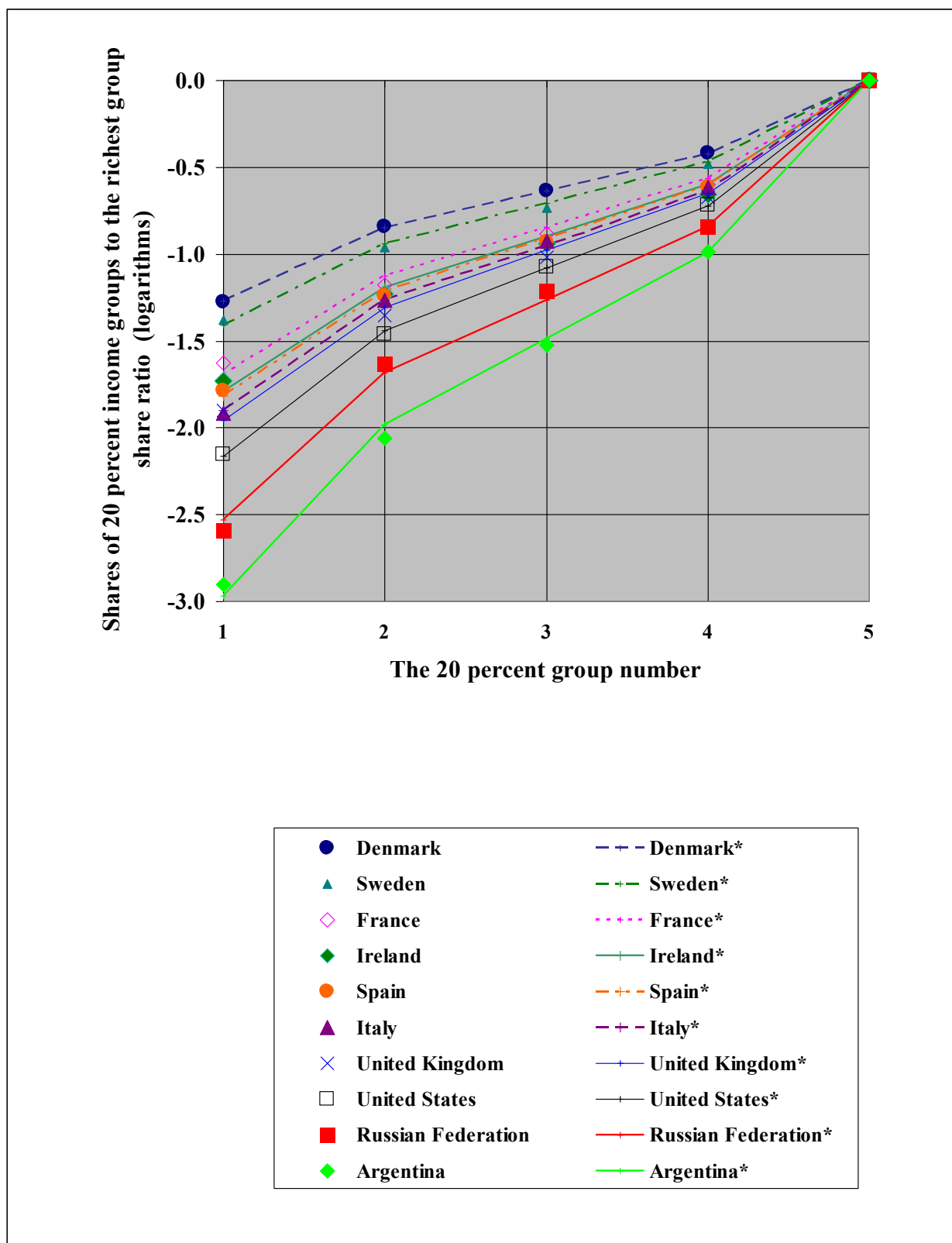
Fig.3. The real income distribution (disposable monetary income) and estimated (with asterisk) relative income distribution (3) for different countries as a function of the 20 percent group number ($i=1$ for the poorest group and $i=5$ for the richest group), logarithms. It is seen; for example, that the real distributions for Denmark and the USA practically coincide with the estimated distributions ($R^2=1.000$). The values of the inequality indicator a are given in table 5.

Modeling the influence of income inequality on economic growth (static model)

Using the series of the income distribution (1), let us examine hypothesis that the significant income differentiation slows down economic growth. It is possible to confirm it with the following modification of Keynes's model.

Assumption. The consumption of each population group is proportional to the disposable income Y_d: $C_i=C_{1i}Y_d$, $i=1,...n$, with different coefficients C_{1i}. These coefficients depend on the level of inequality and on the level of savings, which is minimal in the group with the lowest income and maximum in one with the highest income. The total volume of consumption C can be represented as the sum of the volumes of consumption C_i for all groups, i = 1,...n:

$$C=\sum_{i=1}^{n} C_i = Y_d \sum_{i=1}^{n} C_{1i}.$$

This hypothesis corresponds with the assumption of Kaldor (Kaldor, 1956) that the savings (propensity to save) is different for capitalists and workers; for capitalists the value of savings is proportional to total profit P: $S_p=s_p P$, and for workers – to total volume of wages: $S_w=s_w W$, $S_p+S_w= S$, see also (Pasinetti, 1962). In accordance with the hypothesis of Kaldor, marginal propensities to save in these groups are different, it is higher for capitalists: $s_p \neq s_w$, $s_p>s_w$.

Thus, similarly to the idea of Kaldor, it is assumed that propensity to save for the richer population group is considerably higher than for poorer groups and, correspondingly, propensity to consume is lower. That is propensity to consume f of each population group depends on the income inequality and the number i of the group:

$f = f_i(a)$, where $f_1(a)>f_2(a)>...>f_n(a)$, a – inequality indicator.

If the law of income distribution is determined by series (1), that is

$A(a,n)=\{A_1(a),... A_i(a),... A_n(a)\}$,

then $C_{1i} = C_{10}A_i(a)f_i(a)$, C_{10}=const

and the total function of consumption can be defined as

$C=C_{10}Y_d[A_1(a)f_1(a)+A_2(a)f_2(a)+...+A_n(a)f_n(a)]$.

For n=5 we obtain as follows:

$C= C_{10}Y_d[f_1(a)a^{-6}+f_2(a)a^{-4}+f_3(a)a^{-3}+f_4(a)a^{-2}+f_5(a)]/A(a)= Y_d K(a,f)$,

where $A(a)=a^{-6}+a^{-4}+a^{-3}+a^{-2}+1$,

and $K(a,f)= C_{10}[f_1(a)a^{-6}+f_2(a)a^{-4}+f_3(a)a^{-3}+f_4(a)a^{-2}+f_5(a)]/A(a)$.

One of possible alternatives for function f can be as follows:

$f_i(a)=e^{-q(a-1)i}$, i=2, 3, 4; $f_1(a)=1$, $f_5(a)= e^{-q(a-1)6}$, where $a>1$, $0<q<1$.

Obviously, the total consumption C reduces with increase in the inequality indicator a: $dC/da<0$, since $dK/da <0$, and respectively decreases the value of the investment or government spending multiplier $\mu=\Delta Y/\Delta I=\Delta Y/\Delta I$:
$\mu=1/(1-K(a,f))$.

The results of modeling, obtained in (Varshavsky&Kosmacheva, 2003), showed that for Russia $\mu =1.86$. Thus, the decreasing inequality from the level with the coefficient Gini =0.46 ($a=1.6$), to the level with Gini=0.28 ($a=1.3$) will lead, for example, for $q=0.05$ to an increase in

the multiplier by 8.2%. Correspondingly, the effect of additional investment or governmental expenditures on the economic growth will be greater.

Problem of instability in the society with the very low inequality: choosing the optimum level of income inequality

Social justice do not demand that the economic pie have to be equally divided, see, for example (Ch. Clark, 2002). One of the problems is that the absolutely egalitarian society can not be stable. It is possible to show with the aid of models that income inequality cannot be very low because of the growth of instability in the society. An increase in the instability in society with the very low level of inequality was shown by several methods (Varshavsky, 2007a), (Varshavsky, 2007b), (Varshavsky, 2007c), (Varshavsky, 2003). For example, the analysis of interrelation between different income groups can be carried out with the aid of the theory of cooperative games.

Let us limit our analysis by five groups of population with different shares of income in the total income: $S_1, S_2, S_3, S_4, S_5,$ $\sum_{i=1}^{5} S_i = 1$. We use the methodology given in the previous section. A share of each group i in the total income ($i = 1$ corresponds to the poorest group and $i = 5$ to the richest group) is equal to

$S_i(a) = A_i(a)/A(a)$, see (3) and (4).

<u>Assumption</u> Let us assume that the degree of participation in the political life and the political influence of each group are determined by the share of its income in the total income of the country owing to the possibility of creating coalitions for accepting the desirable political decisions. The coalition is winning if its share is equal to more than 50% of total income.

<u>Methodology</u>. We shall use the method based on the estimation of the Shapley value. Shapley showed that there is a unique payoff function that satisfies four axioms (group rationality, symmetry, null player condition, and additivity). The Shapley value for a player is a weighted sum of his marginal contributions to all coalitions he can join. In the game with this criterion the core consists of one distribution, in which the size of payments depends on "the force" of player, calculated as an expected marginal contribution, which can obtain coalition when this player enters it (Shapley, 1953), (Montet&Serra, 2003), (Owen, 1982). The method is based on searching the vector of the values of game $f(v)$, whose dimension is equal to n:

$f(v) = \{f_1(v),\ldots,f_n(v)\}$.

It is known that in the case of simple game v the formula for Shapley's vector has the following form:

$$f_i(v) = \sum_T (t-1)!(n-t)!/n!,$$

where n – number of players, t - number of elements in T, the summing up is accomplished over all such coalitions T, which are winning. This formula expresses the Shapley value for player i as a weighted sum of his marginal contributions to all coalitions he can join. The Shapley value provides evaluating the power structure in a coalition game and may be thought as index of power or index of social productivity, etc. (Montet&Serra, 2003).

The formula for $f_i(v)$ was used for analysis of the income distribution of five 20 percent income groups given by (3) and (4). For every level of inequality, characterized by inequality indicator a or, correspondingly, the Gini coefficient we have the coalition (3), (4):

$(S_1, S_2, S_3, S_4, S_5)$ or

$(a^{-6}/A,\ a^{-4}/A,\ a^{-3}/A,\ a^{-2}/A,\ 1/A)$,

where $A = 1 + a^{-2} + a^{-3} + a^{-4} + a^{-6}$.

Six variants of Shapley's vector were estimated, which correspond to six values of the of the inequality indicator a (a changed from 1.2 till 1.5). The shares for the chosen values of the inequality indicator (a=1.2 or coefficient Gini $\approx$ 0.22; a=1.25 and Gini $\approx$ 0.25; a=1.3 and Gini $\approx$ 0.28; a=1.35 and Gini $\approx$ 0.31, a=1.4 and Gini $\approx$ 0.34, a=1.5 and Gini $\approx$ 0.40) are given in table 6.

Table 6

Shares of income of the 20 percent group in the total income and Shapley values for different levels of the income inequality (Varshavsky, 2007b)

Inequality indicator a	Gini coefficient (approximate values)	Shapley value					Share in the total income				
		The 20 percent income group number					The 20 percent income group number				
		5	4	3	2	1	5	4	3	2	1
1.20	0.22	0.400	0.233	0.233	0.067	0.067	0.324	0.225	0.187	0.156	0.108
1.25	0.25	0.400	0.233	0.233	0.067	0.067	0.354	0.227	0.181	0.145	0.093
1.30	0.28	0.500	0.167	0.167	0.167	0.000	0.384	0.227	0.175	0.134	0.080
1.35	0.31	0.500	0.167	0.167	0.167	0.000	0.413	0.227	0.168	0.124	0.068
1.40	0.34	0.500	0.167	0.167	0.167	0.000	0.441	0.225	0.161	0.115	0.059
1.50	0.40	0.600	0.100	0.100	0.100	0.100	0.494	0.219	0.146	0.097	0.043

The obtained results can be interpreted as follows, see (Varshavsky, 2007b), (Varshavsky, 2007c),.

Empirical results

For all a in the range from 1.3 till 1.4 (or coefficient Gini $\approx$ 0.28-0.34) Shapley's vector takes the same form. In this case the component of vector, which corresponds to the fifth group (with greatest income), is equal to the sum of the Shapley's vector components that correspond to 2-nd, 3-rd and 4-th groups (they form the middle class), which are characterized by equal possibilities - their political weights (or their roles in society) are identical, though their shares in total income are different, but the poorest group has zero component, i.e. it has no any political weight in making political decisions. To the certain degree, it is possible to assume that with such weights of all groups the system is sufficiently stable as the influence of the richest group is balanced by the middle class characterized by the joint weights of the groups number 2, 3 and 4.

With the decrease of the inequality (a = 1.25 or Gini=0.25, and a = 1.20 or Gini=0.22) the role of groups number 2, 3, and 4 grows, the weight of the richest group decreases, and the weight of the poorest one becomes significant. In this case the influence of the richest group is less than total weight not only of all remaining groups, but also than combined influence of the 4th and 3rd, either of the 2nd, 3rd, and 4th, or of the 4th, 3rd, and 1st groups, but together with the 2nd and 1st groups the weight of the 5th group becomes sufficient, i.e. there are several variants of payoff that indicates on the insufficient stability of the society.

When the inequality increases (a = 1.5 or coefficient Gini = 0.4) the fifth group begins determine a situation as even together the weights of the rest groups, though they are equalized, already cannot impact on the decision making, see fig. 4 (Varshavsky, 2007b), (Varshavsky, 2007c).

These results coincide with optimal value of income inequality indicator a obtained in (Varshavsky, 2007a), (Varshavsky, 2007b) by other method based on using an especial utility function. This method gave optimal value of inequality indicator in the same range equal to a=1.29 and Gini coefficient equal approximately to 0.27.

Proposition. At present, the preferable level of inequality for developed countries corresponds to the value of the inequality indicator a in the range of 1.25<a<1.5, or to the coefficient

Gini between 0.25 and 0.40. That is the higher level of income inequality leads to decrease of the economic growth and the lower level of inequality can result in insufficiently stable society, aggravating political, social and economic problems. Apparently, the ranges of change found for the Gini coefficient and inequality indicator *a* corresponds to the best conditions for the development of the middle class.

These conclusion is proved also by the indicators for most developed European nations (Gini coefficient between 0.24 and 0.36). At the same time the inequality characterized by the coefficient Gini more than 0.40 (the USA, Russia, etc.) must negatively impact on the economic growth in the long-run.
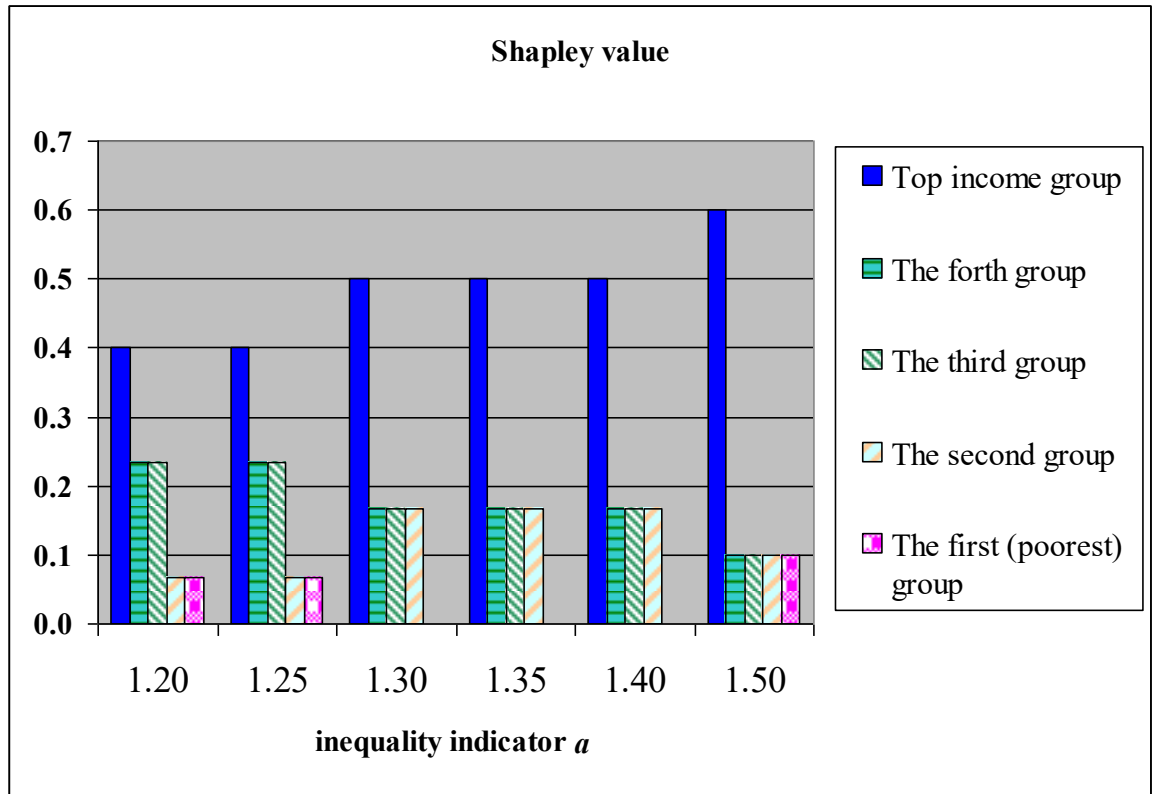

Fig. 4. Shapley vector for different levels of income inequality: 1) inequality indicator *a*=1.2, coefficient Gini≈0.22; 2) *a*=1.25, Gini≈0.25; 3) *a*=1.3, Gini≈0.28; 4) *a*=1.35, Gini≈0.31; 5) *a*=1.4, Gini≈0.34; 6) *a*=1.5, Gini≈0.4 (Varshavsky, 2007b), (Varshavsky, 2007c).

Measuring dynamics of the income differentiation

Let us examine the simple model of dynamics of the income differentiation, based on the analysis of dynamics of share of the poorest group relatively to dynamics of the total income.

We assume that the economy grows with the rate *β* that is the total income dynamics writes as

$Y = Y_0 e^{\beta t}$

and income of the poorest group $Y_1(t)$ increases with the rate $\theta \neq \beta$, i.e.

$Y_1(t) = Y(t)S_1(a(t)) = Y_{10}e^{\theta t}$,

where $S_1(a(t))$ is the income share of the poorest group and a(t) – time-variant inequality indicator.

The expression for the time-variant share of income of the poorest 20 percent group is equal, as follows from (1) and (2), to

$$S_1(a(t))=a(t)^{-6}/[1+ a(t)^{-2} +a(t)^{-3} +a(t)^{-4} +a(t)^{-6}].\qquad(7)$$

This formula can be approximated with the very high accuracy ($R^2 = 0.9991$) by the following exponential curve:

$$S_1(a(t)) = a(t)^{-6}/[1+ a(t)^{-2} +a(t)^{-3} +a(t)^{-4} +a(t)^{-6}] = S_{10}e^{-\lambda a(t)},$$
with parameters $S_{10} = 3.56$ and $\lambda = 2.92 \approx 3$.

This fact leads us to the very simple and useful formulas as now we have more simple expression for the income of the poorest group $Y_1(t)$:

$$Ln(Y_1(t)) = Ln(Y(t))+Ln(S_1(a(t)) = Ln(Y_0) +\beta t +Ln(S_{10})-\lambda a(t)=Ln(Y_{10})+ \theta t.$$

or $\Delta Ln(Y_1(t)) = \beta\Delta t - \lambda\Delta a(t) = \theta\Delta t,$

and then

$$\Delta a(t) = ((\beta-\theta)/\lambda)\Delta t$$

or $\theta = \beta-\lambda[\Delta a(t)/\Delta t].$

Substituting approximate value of $\lambda \approx 3$ and using expression (6b) for the Gini coefficient, one may obtain the following very simple approximate relationships:

$$\Delta a(t) \approx [(\beta-\theta)/3]\Delta t;\ or\ \theta \approx \beta-3[\Delta a(t)/\Delta t];\qquad(8a)$$

and $\Delta GINI(t) \approx [(\beta-\theta)/5]\Delta t,\ or\ \theta \approx \beta-5[\Delta GINI(t)/\Delta t].\qquad(8b)$

Thus, the growth rate of income of the poorest 20 percent group θ as well as change of the inequality indicator a and Gini coefficient can be estimated with the help of the formulas (8a) and (8b). One may use these expressions also for measuring the social tension.

The growth of social tension at some period T can be defined as a change of reverse share of the poorest group income
$N=[Y(t+T)/Y_1(t+T)]/[Y(t)/Y_1(t)].$
It is equal, as follows from the expressions (8a) and (8b), to

$$N=e^{(\beta-\theta)T} \approx e^{3T[\Delta a(t)/\Delta t]} \approx e^{5T[\Delta GINI(t)/\Delta t]}.$$

One may demand that $N<N_0$, where N_0 – some acceptable level. Then the change of income inequality in the long run measured by the Gini coefficient have to be limited as follows:
$Ln(N)/5T =[\Delta GINI(t)/\Delta t] < Ln(N_0)/5T.$
Empirical examples
If the absolute value of income of the poorest group does not change and total income grows with annual growth rate β equal to 1%, then for the period ten years ($\Delta t =10$) the increase of inequality indicator a will be equal to 0,033, and the coefficient Gini will grow approximately by 0,02.
The average annual rate of growth of disposable personal income in the USA in 1985-1997 was equal to $\beta= 2.5\%$. At the same time the growth of the coefficient Gini was equal to $\Delta GINI =$ 0.032 (for gross income, the data from (World Income Inequality Database), and growth of the inequality indicator a (estimated using the data from the same source) was equal to $\Delta a= 0.05$. Thus, the average annual rate of growth in the income of the poorest group (8a) in the USA was equal only to $\theta \approx 1.2\%$ that is approximately by 2 times lower than annual rate of growth of the dispos-

able personal income.

In 1992-1995 the average annual rates of decrease of the Russian disposable income was equal to β = (- 11.3%). Coefficient Gini within the same period grew approximately by 0.2. The average annual rate of reduction in the income of the poorest group, calculated by the formula (8a), was equal to θ = (-36.3%).

Measuring the impact of the Basic Income on decreasing income inequality

The problem of measuring the effect of basic income is of especial interest for economists. One may propose an approach based on the utilization of the series of income distribution (1) and (2) described in the previous section.

The main idea of the approach is to find the values of the inequality indicator or the Gini coefficient after introducing the Basic Income for different initial (before introduction of the Basic Income) shares of the poorest group income S_1 in the average income for all groups. That is our task is to find values of inequality indicator a from the equation $S_1 = A_1(a)/A(a)$, see (2).

For 20 percent income groups (n=5) we obtain from (4) the following equation:

$$a^6 + a^4 + a^3 + a^2 + 1 - 1/S_1 = 0.$$

One may resolve this equation by numerical methods, for example, using standard software packages. The equation have only one positive root for $S_1 < 0.2$. The results obtained are represented in the table 7 where for different values of the income of the first 20 percent group (the poorest group) measured as a share of the average income the inequality indicator and approximate Gini coefficients that were estimated using (6a) are given.

The data in the table 7 show that additional income given to the poorest group can lead to significant decreasing income inequality for the countries with large income inequality. It is seen also on fig. 5 where the Gini coefficient as a function of Basic Income for different initial values of income of the poorest group is shown. Fig. 5 indicate distinctly that the most effect from Basic Income one may expect in countries with high level of poverty.

Thus, it is possible to suggest that the Basic income equal even only to one tenth of the average income will give significant positive effect for decreasing poverty (we assume that after introducing Basic income the law of income distribution will be also described by the series (1)).

For example, if the poorest group had income equal to 0.1 of the average income, i.e. the level of inequality measured by Gini coefficient was equal to 0.60 (the inequality indicator a = 1.83), then there is some probability to expect that introducing the Basic income equal to 1/10 of the average income will provide decreasing the inequality level and, correspondingly, the Gini coefficient to 0.45 (the inequality indicator a=1.59).

For Russia with great differentiation of income by regions introducing the Basic income for some poorest regions could be very effective. On the first stage it could be expedient to introduce basic income in some poorest regions of Russia, as well as in some regions with sufficiently high industrial potential that were not developed in the transition period and suffer because of the outflow of labor resources into Moscow and Moscow region (like Bryanskaya, Ivanovskaya, Penzenskaya regions, etc.).

Table 7

The share of the first group (the poorest) of population in the average income measured as a share of average income and corresponding values of the inequality indicator *a*, Gini coefficient (approximate values) and negative increments of the Gini coefficient (-ΔGini).

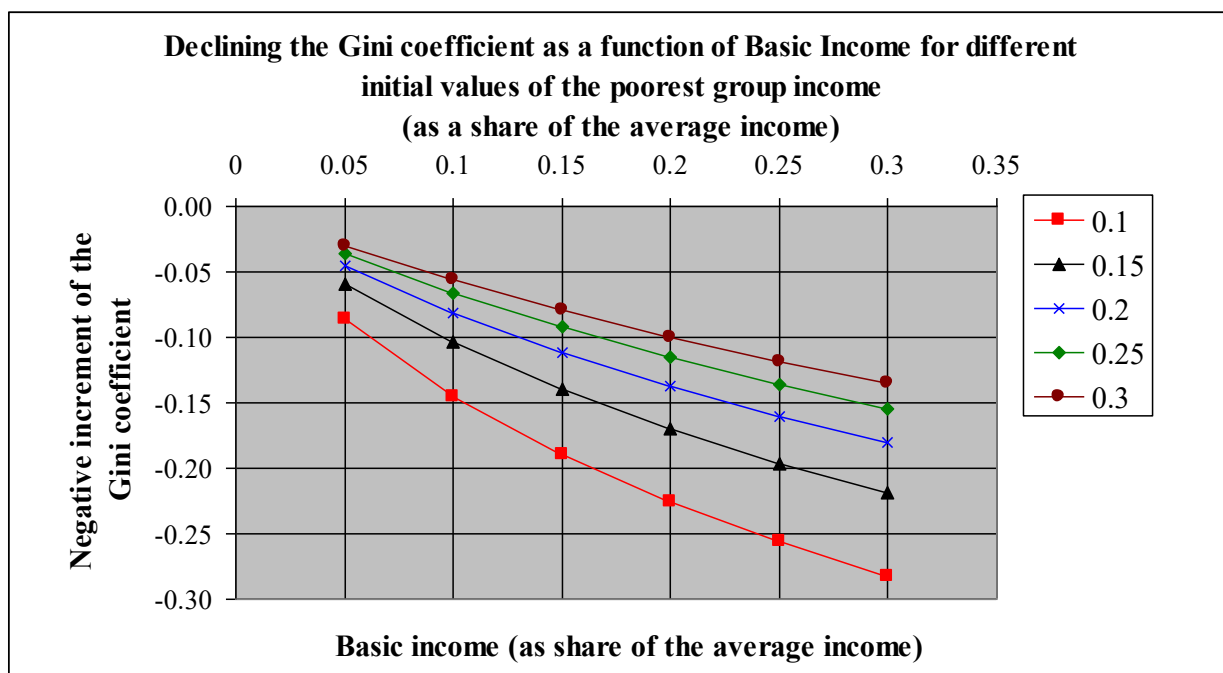| Average yearly income of the 1st (poorest) group measured as a share of average income	indicator of inequality *a*	Gini	-ΔGini
0.10	1,835	0,601	
0.15	1,689	0,513	0,087
0.20	1,589	0,453	0,060
0.25	1,513	0,408	0,045
0.30	1,452	0,371	0,037
0.35	1,401	0,341	0,031
0.40	1,358	0,315	0,026
0.45	1,319	0,292	0,023
0.50	1,285	0,271	0,021
0.55	1,254	0,252	0,019
0.60	1,226	0,236	0,017

Fig. 5. Declining the Gini coefficient as a function of Basic Income for different initial values of the poorest group income (as a share of the average income).

Conclusion

The study has shown that the significant income inequality leads to the lower rates of economic development, hampers transition to the civic society.

For guaranteeing of equal opportunities to all members of the Russian society the number of the economic measures is required as follows: progressive taxation, a substantial increase in wages, etc. It is necessary to use also the positive experience of developed countries in realiza-

tion of the corresponding social policy.

Obviously, the introduction of basic income equal to contemporary minimum wage would give essential means for the poorest strata of the Russian population, and thus reduce the level of inequality.

The use of resources of the Stabilization Fund (the total volume of the Fund was equal to $156.8 billion on January 1, 2008) could play a significant role in decreasing inequality. In this case the positive experience of the Government Pension Fund of Norway created in 1990 (its capitalization was equal to $310 billion in the first quarter 2007 and the share of each citizen of the country was equal about $44 thousand) should be considered (Value of Norwegian state oil fund, 2008).

For today's Russia the intention of President D. Medvedev and Prime Minister V. Putin to decrease inequality, to increase minimum wage and pensions is extremely important. The introducing the basic income is the necessary step in this direction and it will positively affect the solution of the most important for the future of Russia problem. Undoubtedly, the experience of the countries using the Basic Income system, even the small ones, such as Ireland will be very useful for developing the basic income scheme for Russia.

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