Pauhofová, Iveta; Bukharbaeva, Liliya; Ibragimova, Zulfiya et al.

Article

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Reference: Pauhofová, Iveta/Bukharbaeva, Liliya et. al. (2020). Measuring of inequality of opportunity : parametric approach. In: Ekonomický časopis 68 (5), S. 455 - 476.
https://www.sav.sk/journals/uploads/0603145005%2020%20Pauhofov%C3%A1%20a%20kol.%20+%20SR.pdf.

This Version is available at:
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Measuring of Inequality of Opportunity: Parametric Approach[1]

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Abstract

This paper measures the contribution of opportunity inequality to inequality of income and earnings in the Russian Federation, using a parametric approach. The paper uses the data from the 20-th round of the Russian Longitudinal Monitoring Survey – Higher School of Economics, which is a series of annual nation-wide representative surveys. The calculations were made for each of the three age cohorts in order to assess the contribution of opportunity inequality to inequality of income and earnings and their changes over time. According to the results obtained by our research team, the contribution of opportunity inequality to income inequality in Russia is 11.51%, and it quite significantly varies across different age cohorts. The contribution of opportunity inequality to inequality of earnings is somewhat greater – 16.32%, but is almost the same for all age cohorts. The results also reveal that throughout all age cohorts, the influence of inequality of opportunity upon inequality of income and earnings is mostly due to the direct impact of circumstance-factors upon an individual's income and earnings, and not due to their influence upon an individual's education level.

Keywords: *inequality of opportunity, inequality of individual achievements, effort-factors, circumstance-factors*

JEL Classification: D63, D31, E24

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[1] The reported study was funded by the Russian Foundation for Basic Research according to the research project No. 19-010-00453 and to the Slovak project VEGA No. 2/0002/19. The authors would like to thank the reviewers for useful and meaningful comments, which helped improve the paper's final version to a great extent.

Introduction

The term “equality of opportunity” was shaped on the back of the egalitarian social justice theories. Initially, equal opportunities were understood as absence of legal barriers for gaining access to specific education types or professions. Later on, the work Rawls (1971) devoted to the distribution of rights and resources among individuals based on the assumption that individuals are supposed to bear responsibility for their approach to life and personal goals, ambitions, and behavior it shapes, became the basis for the following social justice concept: if rights and resources are spread among society’s individuals equally, then the differences in their prosperity levels due to the differences in their approach to life and behaviors are a part of their personal responsibility and cannot be treated as unfair. Hence, the differences in prosperity due to inequality in rights and resources are unfair and need to be compensated for. The differences in prosperity levels based on different approaches to life and different behaviors of individuals are fair, hence they require no compensation.

These ideas were elaborated in an interesting way in the work Dworkin (1981a; 1981b) who suggests that inequalities in the distribution of individual talents and inferiorities also need to be compensated for. The author introduced the term “internal resources” to describe such personal characteristics and suggested that a fair society should also compensate for inequality in the distribution of such internal resources as well.

Later, the works Arneson (1989), Cohen (1989) and Roemer (1993; 1998) suggested replacing inequality of “resources” with inequality of “opportunities”. The researchers put forward the idea that an individual should bear responsibility only for what he has full control of. Hence, prosperity inequality due to the factors entirely dependent on an individual (called effort factors), is fair and doesn’t need to be compensated for (principle of natural reward). On the contrary, the differences in prosperity underpinned by the factors beyond an individuals’ control (called circumstance factors), are unfair and in a fair society they need to be compensated for (the compensation principle). Further on, works Fleurbaey (1995; 2008) formalized these ideas and on their back a theory was shaped. It builds criteria for the evaluation of social justice and efficacy of the state redistribution policy.

The early opportunity inequality studies never focused on the evaluation of inequality of opportunity in the society until Roemer (1998) made a strong contribution to the evaluation of inequality of opportunity by offering a mathematical definition for equal opportunities: by equality of opportunity conditional distribution of achievements by any fixed set of circumstances should coincide with their unconditional distribution.

Somewhat later, methods for the measuring of opportunity inequality were elaborated and applied to the microdata from a number of countries. Overall, two main approaches to the evaluation of opportunity inequality have been developed. A nonparametric approach suggested in the paper by Checchi and Peragine (2010) is based on the dividing of population into several homogenous groups. The strengths of a nonparametric approach are relative simplicity and the absence of need for an equation describing the connection between the factors and the individual achievement. The drawback of this approach is a quite limited range of the factors accountable.

The work Bourguignon, Ferreira and Menéndez (2007) suggests a parametric approach to the evaluation of inequality of opportunity which is also used in our research work. This approach is based on the comparison of the actual inequality of achievements with the inequality of the counterfactual achievements, i.e., the achievements that could have been made if the circumstances beyond an individual's control hadn't influenced his achievements. This approach is more complicated in terms of calculations, yet it gives an opportunity to take account of a much greater number of factors. In the abovementioned work the opportunity inequality was measured based on five circumstance-factors: education level of parents, father's professional status, race, and birth place. The effort-factors used were: an individual's education level, migration status, status on the labor market. The research is based on the Brazil household survey microdata, 1996 round. According to the calculations provided, these factors are accountable for 10 to 37% of inequality of earnings, depending on the age cohort.

The work Singh (2010) based on the microdata obtained from the human development survey held in India in 2004 – 2005 evaluates the contribution of inequality opportunity to inequality of earnings. A parametric approach was implemented to measure the contribution of such circumstance-factors as cast, religion, residency region, father's education level and his occupational status to inequality of earnings and consumption expenditure. The results showed that inequality of opportunity accounts for 18 – 26% of inequality of earnings in the urban population and it amounts to 16 – 21% in the rural population.

The work Hassine (2012) uses data from the Egyptian labor market survey, 1988, 1998, and 2006 rounds in order to measure the changes in the contribution of opportunity inequality to inequality of earnings that had taken place over time. Parents' length of studies, their employment type, father's occupational status and birth place were used as circumstance-factors. Earnings were used as the measure of individual achievement. According to the data obtained, in Egypt the contribution of opportunity inequality to inequality of earnings dropped from 22% in 1988 to 15% in 2006.

Marero and Rodrigez (2012) explore inequality of opportunity based on a parametric approach in 23 European countries for the year 2005 by using the EU Survey on Income, Social Inclusion and Living Conditions, or the EU-SILC database. A household income was used as an indicator of achievement, while parental education, father's professional status, individual's evaluation of the welfare of the family in which he grew up were used as circumstances. According to the results, the contribution of opportunity inequalty in Europe is on average approximately 9%, ranging from 2% in Denmark to 22% in Portugal.

The work Brzenzin'ski (2015) is largely similar to the previous work, but studies the inequality of opportunity in the European Union countries before and after the global economic crisis of 2008 – 2009. The work uses the data from the EU-SILC database 2004 and 2010. The individual achievement used here is the yearly equivalised disposable income of a household that the respondent is the head of. This paper used parents' level of education, father's profession, individual's birth place as circumstance-factors. The analysis revealed that after the global economic crisis, opportunity inequality increased in Belgium and Slovakia, but dropped in Portugal and Lithuania.

As for Russia, despite the fact that, the subject of socio-economic inequality in Russia is one of the most popular areas of research, the empirical work performed by Russian scientists in terms of the theory of equal opportunities is very small.

The work Mareeva (2018) is devoted to the studying of the opinions of residents of metropolitan cities (Moscow and St. Petersburg) and provincials regarding the possibilities to achieve their life goals.

The subject-related work Ovcharova, Popova and Rudberg (2016) estimates the contribution of certain factors to the explanation of the variance of per capita household spending in the dynamics of 1994 – 2014 using the data of the Russia Longitudinal Monitoring Survey (RLMS-HSE). However, the authors use a different classification of factors, which is incompatible with the division of factors into efforts and circumstances.

The study of the EBRD (2016) is the work done in keeping with the letter and spirit of the theory of equal opportunity and containing an assessment of inequality of opportunity in the Russian Federation. This work was performed using the microdata of the survey LiTS III (Life in Transition), round 2015 – 2016. This work explores inequality of opportunity in 33 countries, including the Russia. The analysis includes the following circumstances: parents' education, their membership in the Communist Party, gender, place of birth, nationality. According to the results obtained, the contribution of inequality of opportunity to earnings inequality in the Russian Federation amounts to 34.5%.

Goal, Methodology, Background of the Study

The paper's goal is to measure inequality of opportunity in the Russia using the microdata obtained by RLMS-HSE, based on a parametric approach.

As stated above, a parametric approach to the evaluation of inequality of opportunity was first suggested in the work Bourguignon, Ferreira and Menéndez (2007). This approach is based on the seminal work by Roemer (1998), which provides the following formal definition of equality of opportunity (1):

$$F(\{w\} \mid \boldsymbol{C}) = F\left(\{w\}\right) \tag{1}$$

where

$\{w\}$ – distribution of achievement;

$\boldsymbol{C}$ – vector of circumstance-factors;

F – distribution function.

Hence, according to Roemer, equality of opportunity is achieved when a conditional distribution of achievement by any fixed circumstance vector coincides with its unconditional distribution.

Following the idea of splitting the factors influencing individual achievement into circumstance-factors that are beyond an individual's control and effort factors that depend on an individual, the dependence of individual achievement on various factors can be presented as follows (2).

$$\omega_i = f\left(\boldsymbol{C}_i, \boldsymbol{E}_i, u_i\right) \tag{2}$$

where

ω_i – achievement of the i-th individual;

$\boldsymbol{C}_i$ – vector of values for circumstance-factors of the i-th individual;

$\boldsymbol{E}_i$ – vector of values for effort-factors of the i-th individual;

u_i – stands for other unobserved random factors influencing individual achievement.

While circumstance factors are inherently exogenous, effort-factors may depend on circumstance factors and other unobserved factors. With that in mind, formula (2) transforms into formula (3). In formula (3) $\mathbf{v}_i$ stands for other unobserved factors influencing effort-factors.

$$\omega_i = f\left(\boldsymbol{C}_i, \boldsymbol{E}_i\left(\boldsymbol{C}_i, \boldsymbol{v}_i\right), u_i\right) \tag{3}$$

The definition of equality of opportunity according to Roemer (1) implies the following three conclusions, which should be true provided opportunities are equal:

1. Individual achievement should not directly depend on circumstance factors (4).

$$\frac{\partial f\left(\boldsymbol{C}, \boldsymbol{E}, u\right)}{\partial c} = 0 \;\; \forall c \tag{4}$$

2. Effort-factors should not depend on circumstance factors (5).

$$F(\boldsymbol{E} \mid \boldsymbol{C}) = F(\boldsymbol{E}) \tag{5}$$

3. Random factors should not depend on circumstance-factors (6).

$$F(u \mid \boldsymbol{C}) = F(u) \tag{6}$$

Following the definition of equality of opportunity, in order to evaluate opportunity inequality we need to evaluate the extent to which $F(\{w\}|C) \neq F(\{w\})$. When a parametric approach is used this is achieved through the use of counterfactual distribution $\{\tilde{w}\}$, obtained by the replacement of actual values of individual achievement w_i with $\widetilde{w_i} = f\left(\overline{\boldsymbol{C}}, \boldsymbol{E}\left(\overline{\boldsymbol{C}}, \boldsymbol{v}_i\right), u_i\right)$, i.e. with the achievement that would have been made if the circumstance factors had been the same for all individuals. After that, using some inequality measure I we assess the actual inequality of achievement $I(\{w\})$ and the counterfactual inequality of achievement $I(\{\tilde{w}\})$ showing the inequality of achievement that could take place if no inequality of opportunity existed. In this case the contribution of opportunity inequality to inequality of achievement can be calculated using the following formula (7).

$$\Theta = \frac{\boldsymbol{I}(\{\boldsymbol{w}\}) - \boldsymbol{I}(\{\tilde{\boldsymbol{w}}\})}{\boldsymbol{I}(\{\boldsymbol{w}\})} \tag{7}$$

where Θ is the contribution of opportunity inequality to inequality of achievement.

As is clear from formula (3), the influence of circumstance-factors upon individual achievement can occur in two ways: through direct influence upon individual achievement and indirectly, through the influence of circumstance-factors on effort-factors and then through the influence of effort-factors upon individual achievement. A parametric approach makes it possible to separately measure the direct influence of circumstance factors on individual achievement. This can be made using counterfactual distribution $\{\tilde{w}^d\}$, obtained by replacing the actual values of individual achievement w_i with $\tilde{w}_i^d = f\left(\overline{\boldsymbol{C}}, \boldsymbol{E}_i\left(\boldsymbol{C}_i, \boldsymbol{v}_i\right), u_i\right)$, i.e. with the achievement that could take place if the circumstance factors were the same for all individuals and had no influence upon effort-factors. Then, using some inequality measure I, inequality of counterfactual achievement $I(\{\tilde{w}^d\})$ is assessed and the contribution of the direct influence of circumstance factors to inequality of achievement is accessed by formula (8).

$$\Theta^d = \frac{\boldsymbol{I}(\{\boldsymbol{w}\}) - \boldsymbol{I}(\{\tilde{\boldsymbol{w}}^d\})}{\boldsymbol{I}(\{\boldsymbol{w}\})} \tag{8}$$

where Θ^d is the contribution of the direct influence of circumstance factors to inequality of achievement.

Correspondingly, the contribution of the indirect influence of circumstance factors to inequality of achievement may be calculated by the formula (9).

$$\Theta^i = \Theta - \Theta^d \qquad (9)$$

where Θ^i is the contribution of the indirect influence of circumstantial factors to inequality of achievement.

Practical implementation of a parametric method implies, first of all, choosing a specific inequality measure, and secondly, evaluation of the function defined by the formula (3).

In the literature on inequality of opportunity, the Theil's L-index is almost always used as the inequality measure.

A specific type of the functional relationship (3) may vary depending on the specific variable used as a measure of an individual's achievement and on the circumstance-factors and effort-factors used.

In most cases, when income and earnings are used as the achievement variable, function (3) is evaluated as a model described by equations (10 – 11). Equation (10) originates from a well-known Mincer model which is widely used for explaining variation in income and earnings.

$$\ln(w_i) = \boldsymbol{C_i} \,.\, \boldsymbol{\alpha} + \boldsymbol{E_i} \,.\, \boldsymbol{\beta} + u_i \qquad (10)$$

$$\boldsymbol{E_i} = \boldsymbol{C_i} \,.\, \boldsymbol{B} + \boldsymbol{v_i} \qquad (11)$$

where

$\boldsymbol{\alpha}, \boldsymbol{\beta}$ – vectors of coefficients;

$\boldsymbol{B}$ – the matrix of coefficients, describing the influence of circumstances upon efforts, and u_i,

$\boldsymbol{v_i}$ – white noise errors.

Inserting equation (11) into equation (10) and performing rather simple conversions give us the equation (12), which can be represented as (13)

$$\ln(w_i) = \boldsymbol{C_i} \,.\, (\boldsymbol{\alpha} + \boldsymbol{B} \,.\, \boldsymbol{\beta}) + (\boldsymbol{v_i} \,.\, \boldsymbol{\beta} + u_i) \qquad (12)$$

$$\ln(w_i) = \boldsymbol{C_i} \cdot \boldsymbol{\varphi} + \varepsilon_i \qquad (13)$$

Equation (10) is called a long regression equation; equation (13) is called a short regression equation. Equation (13) is used to obtain counterfactual distribution $\{\tilde{w}\}$; $\tilde{w}_i$ calculated by formula (14). Equation (10) is used to obtain counterfactual distribution $\{\tilde{w}^d\}$; $\tilde{w}_i^d$ calculated by formula (15).

$$\tilde{w}_i = e^{\bar{\boldsymbol{C}} \cdot \hat{\boldsymbol{\varphi}} + \widehat{\varepsilon_i}} \tag{14}$$

$$\tilde{w}_i^{\,d} = e^{\bar{\boldsymbol{C}} \cdot \boldsymbol{\alpha} + \boldsymbol{E}_i \cdot \hat{\boldsymbol{\beta}} + \widehat{u_i}} \tag{15}$$

Formulas (14 – 15) can be represented as (16 – 17).

$$\tilde{w}_i = e^{\bar{\boldsymbol{C}} \cdot \hat{\boldsymbol{\varphi}}} \cdot e^{\widehat{\varepsilon_i}} \tag{16}$$

$$\tilde{w}_i^{\,d} = e^{\bar{\boldsymbol{C}} \cdot \boldsymbol{\alpha}} \cdot e^{\boldsymbol{E}_i \cdot \hat{\boldsymbol{\beta}} + \widehat{u_i}} \tag{17}$$

As we can see from (16 – 17), the first multiplying factor is a constant term. As the Theil's index is insensitive to the multiplication of a variable by a number, the calculations can be significantly simplified by calculating it for $\left\{e^{\widehat{\varepsilon_i}}\right\}$ and $\left\{e^{\boldsymbol{E}_i \cdot \hat{\boldsymbol{\beta}} + \widehat{u_i}}\right\}$ instead of $\{\tilde{w}\}$ and $\{\tilde{w}^d\}$, correspondingly.

The potentials of the empirical estimation of opportunity inequality are significantly limited by the data available. RLMS-HSE is a series of annual nation-wide representative surveys based on the probabilistic multiple-level strata-bound area sample. As of today, it is in fact the only available source of qualitative microdata on the Russia. The fullest information on individual circumstances and efforts is represented in the 20-th round that was held in 2011. This is why the data obtained from this particular round was used in our research.

This paper focuses on the evaluation of the contribution of opportunity inequality to inequality of an individual's achievement in terms of prosperity; hence, income and earnings were judged as the individual achievement measures.

The question about the respondent's income is formulated in the survey questionnaire as follows: "How much money including wages, pension payments, bonuses, revenues, allowances, welfare assistance, casual earnings and other cash proceeds have you received over the last 30 days?" Accordingly, we are dealing with real monthly disposable income. The questions regarding earnings are the following: "How much money net of tax and deductions have you received over the last 30 days at your principle place of employment?" "How much money net of tax and deductions have you received over the last 30 days from your secondary employment?" If the respondent provided the level of both types of earnings, their amounts were summed up. If only the amount of the primary type was provided, only that number was used. It means that we are dealing with the real monthly earnings. Both variables – income and earnings – have their own strengths and drawbacks when it comes to using them as individual achievement measures.

On the one hand, income includes all sources of monetary funds, and for this reason it is a better measure of an individual's material well-being than earnings.

On the other hand, earnings provide a better measure of an individual's worth on the labor market than income, and fit the term "individual achievement" better as they represent the dimension of what the individual «is worth» himself at the current moment of time. Besides, as related to opportunity inequality, it is of importance in terms of the fact that earnings are predominantly the primary income, least susceptible to state regulation, while income is a result of redistribution processes. According to egalitarian theory, the state redistribution policy should help reduce inequality of opportunity, in view of this it is expected that the contribution of opportunity inequality to inequality of income should be lower than its contribution to inequality of earnings. In order to test this hypothesis our research work has performed both calculations: using earnings as the measure of individual achievement and using individual income as the measure of individual achievement.

The circumstance-factors taken into account include: gender, type of the township where the respondent was born, educational and occupational status of the respondent's parents when the respondent was at the age of 15. An individual's education is used as effort-factor.

The sample used was limited to individuals aged 26 – 60, living in urban settlements. Limiting the sample by the age range of 26 – 60 years was due to the fact that the respondents of this age are the most active players on the labor market.

The analysis covered both the entire sample and three age cohorts separately (26 – 35 years of age, 36 – 50 years of age, and 51 – 60 years of age) in order to evaluate the contribution of inequality of opportunity to inequality of achievement over time. Overall, this approach is characteristic of the works devoted to inequality of opportunity and apparently is concerned with the hypothesis that the contribution of opportunity inequality to inequality of achievement may significantly vary depending on the individual's age. However, there is no clear hypothesis on the character of such connection in the works we have analyzed. It seems to us that the effect of such circumstances, as birthplace, educational level and occupational status of the parents should decrease as the individual grows older. Making calculations separately for each age cohort makes the testing of this hypothesis possible.

In 2011 the sample contained a total of 17 024 respondents; 5 576 of which were urban dwellers aged 26 – 60.

After deleting data with missing values, the sample for the evaluation of the contribution of opportunity inequality to inequality of earnings resulted in a sample size of 1 472 respondents, the sample for the evaluation of the contribution of opportunity inequality to inequality of income resulted in a sample size of 1 865 respondents.

Descriptive statistics for all the variables is provided in Table 1.

T a b l e 1

Discriptive Statistics

Variable	Age group						All					
	26 – 35			36 – 50			51 – 60			26 – 60		
	B1	B2	B3	B1	B2	B3	B1	B2	B3	B1	B2	B3
Individual's birthplace												
In a city	52.36	53.41	52.38	45.33	45.61	44.89	32.30	33.05	32.76	41.88	43.34	42.18
In an urban type settlement	14.39	15.73	15.24	14.00	13.64	15.53	14.04	15.16	14.71	14.10	14.61	15.16
In a village, rural settlement…	33.25	30.86	32.38	40.67	40.76	39.58	53.65	51.79	52.54	44.02	42.05	42.66
Gender												
Male	48.64	54.60	47.66	45.33	45.00	44.40	36.24	38.53	38.44	42.57	45.11	43.69
Female	51.36	45.40	52.34	54.67	55.00	55.60	63.76	61.47	61.56	57.43	54.89	56.31
Individual's education												
High school partially completed	8.44	8.01	9.91	6.13	5.45	7.78	8.01	6.11	7.86	7.35	6.25	8.46
High school completed	19.85	21.96	26.59	36.93	35.30	35.73	33.01	31.16	36.45	31.74	30.91	33.10
Vocational school or college completed	17.87	16.32	19.81	26.27	26.36	27.50	32.58	33.89	30.20	26.86	26.49	25.90
University degree and higher	53.85	53.71	43.68	30.67	32.88	28.99	26.40	28.84	25.50	34.05	36.35	32.54
Father's education												
High school partially completed	19.11	18.69	18.45	47.07	46.36	41.88	67.13	64.21	64.01	48.69	45.79	40.95
High school completed	28.29	28.78	31.89	19.73	20.30	23.17	12.50	13.47	14.20	18.82	20.04	23.31
Vocational school or college completed	22.83	24.93	23.73	14.13	13.79	15.67	9.83	10.74	10.48	14.37	15.35	16.68
University degree and higher	29.78	27.60	25.93	19.07	19.55	19.29	10.53	11.58	11.30	18.12	18.82	19.06
Mother's education												
High school partially completed	12.41	12.17	11.38	37.33	36.36	32.97	64.33	60.84	62.85	42.25	38.72	34.57
High school completed	25.81	26.11	28.50	24.13	24.85	25.77	14.89	15.58	15.56	20.97	22.15	23.76
Vocational school or college completed	34.00	35.61	34.92	24.53	24.09	25.30	13.06	14.95	13.37	22.20	23.78	24.98
University degree and higher	27.79	26.11	25.20	14.00	14.70	15.96	7.72	8.63	8.22	14.58	15.35	16.70

Variable	Age group						All					
	26 – 35			36 – 50			51 – 60			26 – 60		
	B1	**B2**	**B3**	**B1**	**B2**	**B3**	**B1**	**B2**	**B3**	**B1**	**B2**	**B3**
Father's occupational status												
Member of the military	6.20	6.82	3.83	4.53	4.85	4.15	3.37	4.00	3.11	4.45	5.03	3.75
Died or never lived with the respondent	7.44	7.72	9.74	5.33	5.00	8.97	6.04	6.11	9.53	6.06	5.98	9.37
Tier 1 qualification worker	7.20	6.53	6.18	11.73	11.82	8.66	15.31	15.37	14.48	12.12	11.75	9.59
Tier 2 qualification worker	51.86	53.71	54.23	53.33	52.73	54.26	51.97	49.68	51.27	52.49	51.97	53.38
Tier 3 qualification worker	7.20	7.72	8.47	8.00	8.03	7.95	8.15	8.00	8.76	7.88	7.95	8.34
Tier 4 qualification worker	13.40	12.46	11.22	11.07	11.36	11.65	8.99	10.32	8.19	10.78	11.28	10.52
Legislator, top manager	6.70	5.04	6.32	6.00	6.21	4.36	6.18	6.53	4.66	6.22	6.05	5.04
Mother's occupational status												
Member of the military	0.99	1.19	0.56	0.13	0.15	0.33	0.00	0.00	0.07	0.27	0.34	0.33
Died or never lived with the respondent	9.68	10.09	7.65	7.07	6.67	6.24	11.10	9.89	11.75	9.17	8.49	8.26
Tier 1 qualification worker	9.43	8.61	9.32	24.67	24.09	17.45	35.67	36.00	28.88	25.58	24.39	18.19
Tier 2 qualification worker	30.77	32.64	36.30	30.13	29.70	36.30	25.14	24.00	36.03	28.36	28.53	34.70
Tier 3 qualification worker	16.13	14.84	19.44	15.47	15.91	19.44	12.08	13.05	17.68	14.32	14.74	16.86
Tier 4 qualification worker	28.54	28.49	22.72	18.40	19.39	22.72	12.92	14.74	18.64	18.50	19.97	18.17
Legislator, top manager	4.47	4.15	4.01	4.13	4.09	4.01	3.09	2.32	3.62	3.81	3.53	3.50
Individual's income												
Mean	22 193	–	19 618	21 840	–	20 336	18 138	–	16 865	20 503	–	19 061
Standard deviation	16 800	–	15 946	19 148	–	17 906	16 757	–	14 258	17 854	–	16 343
Minimum	138	–	50	196	–	100	1 500	–	200	138	–	50
Maximum	120 000	–	186 000	179 000	–	255 000	209 500	–	209 500	209 500	–	255 000
Earnings												
Mean	–	23 447	20 832	–	21 779	20 244	–	17 233	16 139	–	20 694	19 394
Standard deviation	–	16 812	15 582	–	18 481	16 929	–	16 683	13 933	–	17 702	15 917
Minimum	–	2 000	1 000	–	2 000	100	–	400	400	–	400	100
Maximum	–	120 000	186 000	–	179 000	255 000	–	208 000	208 000	–	208 000	255 000

Notes: B3 – sample including 5 576 respondents, B1 – sample including 1 865 respondents, B2 – sample including 1 472 respondents. The table contains relative frequencies for categorial variables. Mean, standard deviation, minimum и maximum are provided for continuous variables.

Source: Author's computations.

As is shown in Table 1, the distribution of variables is different for each of the age cohorts. The following consistent patterns can be outlined:

- share of respondents born in a city is lower in the older age groups;
- educational level of the mother and father is lower in the older age groups;
- share of respondents with a university degree in the age group of 26 – 35 years is significantly higher than in any other age group.

Results and Discussion

Table 2 provides the results of evaluating short regressions with a dependent variable – logarithm of income.

After assessing the regression with the inclusion of all the six circumstance factors (columns 2, 4, 6, 8), it became obvious that most of the coefficients of the family background factors (education and occupational status of parents) are insignificant. Therefore, in order to study the stability of the results, we made a calculation of more economical models, sequentially excluding the two most insignificant factors of the family background. The results of evaluating these four-factor models are shown in columns 3, 5, 7, 9 of Table 2.

The results of evaluating short and long regressions with a dependent variable – logarithm of earnings as well as the results of evaluating long regressions with a dependent variable – logarithm of income are omitted due to the length restrictions for the article and can be provided on request. Residual and specification test results are provided in the Technical Appendix.

T a b l e 2

Short-form OLS Regressions of Income on Circumstances, by Age Cohorts

	26 – 35 year-olds		**36 – 50 year-olds**		**51 – 60 year-olds**		**26 – 60 year-olds**	
1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*
Number of factors	6	4	6	4	6	4	6	4
Father's education								
High school partially completed	–	–	–	–	–	–	–	–
High school completed	–0.225 **	–0.285 ***	0.088	–	0.073	0.098	0.022	–
Vocational school or college completed.	0.053	0.041	–0.063	–	0.111	0.044	0.076	–
University and higher degree	–0.189	–0.128	–0.068	–	0.202	0.108	0.041	–
Mother's education								
High school partially completed	–	–	–	–	–	–	–	–
High school completed	–0.122	–	0.209 **	0.244 ***	0.063	–	0.082	0.108 **

Vocational school or college completed.	–0.098	–	0.098	0.101	–0.049	–	0.022	0.105 **
University and higher degree	–0.021	–	0.296 **	0.292 ***	–0.064	–	0.125	0.229 ***
Father's occupational status								
Member of the military	0.177	0.101	0.244	0.173	–0.144	–	0.062	0.078
Died or never lived with the respondent	0.349 ***	0.343 ***	–0.219	–0.228	0.084	–	0.028	0.026
Tier 1 qualification worker	0.125	0.007	0.111	0.107	–0.016	–	0.049	0.037
Tier 2 qualification worker	–	–	–	–	–	–	–	–
Tier 3 qualification worker	–0.030	–0.014	0.230 *	0.194 *	0.071	–	0.087	0.113 *
Tier 4 qualification worker	–0.019	–0.027	0.265 **	0.196 *	–0.172	–	–0.008	0.025
Legislator, top manager	0.229	0.211	0.440 ***	0.378 ***	–0.149	–	0.127	0.157 **
Mother's occupationa status								
Member of the military	–0.253	–	0.291 *	–		–	0.014	–
Died or never lived with the respondent	–0.060	–	–0.010	–	0.043	0.039	–0.029	–
Tier 1 qualification worker	–0.268 *	–	–0.006	–	0.053	0.039	–0.026	–
Tier 2 qualification worker	–	–	–	–	–	–	–	–
Tier 3 qualification worker	0.093	–	–0.014	–	0.135	0.113	0.058	–
Tier 4 qualification worker	0.066	–	–0.003	–	0.325 **	0.236 **	0.103	–
Legislator, top manager	0.011	–	0.084	–	0.115	0.55	0.052	–
Gender								
Male	–	–	–	–	–	–	–	–
Female	–0.500 ***	–0.499 ***	–0.451 ***	–0.455 ***	–0.162 ***	–0.161 ***	–0.360 ***	–0.359 ***
Place of birth								
In a city	–	–	–	–	–	–	–	–
In an urban type settlement	–0.137	–0.135	–0.031	–0.033	0.084	0.083	–0.028	–0.028
In a village, rural settlement	–0.335 ***	–0.363 ***	–0.217 ***	–0.218 ***	–0.090	–0.090	–0.207 ***	–0.215 ***
Constant								
Constant term	10.241 ***	10.197 ***	9.818 ***	9.825 ***	9.589 ***	9.601 ***	9.836 ***	9.835 ***
N	403	403	750	750	712	712	1 865	1 865
R^2	0.190	0.173	0.154	0.151	0.058	0.048	0.103	0.101

Source: Author's computations.

The results of evaluating short and long regressions show that income and earnings of men are significantly higher than those of women across all age cohorts. Besides, a rural background has been shown to be a significant factor that has a substantial negative impact on income and earnings. A higher level of education has a substantial positive impact on income and earnings. Quite often regression coefficients for education and professional status of the parents are insignificant. A higher level of mother's education has a significant positive influence on income and earnings of people in the 36 – 50 and 26 – 60 age groups.

Table 3 presents the contribution of inequality of opportunity to inequality of income.

Table 3

Contribution of Inequality of Opportunity to Inequality of Income

	26 – 35 year-olds N = 403	**35 – 50 year-olds N = 750**	**51 – 60 year-olds N = 712**	**26 – 60 year-olds N = 1865**
Models with six circumstance-factors				
$I(\Phi(w))$	0.2750	0.3156	0.2523	0.2869
$I(\Phi(\tilde{w}))$	0.2242	0.2705	0.2282	0.2539
$I\left(\Phi\left(\tilde{w}^d\right)\right)$	0.2274	0.2758	0.2325	0.2586
Θ	18.49%	14.28%	9.57%	11.51%
Θ^d	17.30%	12.61%	7.84%	9.86%
Θ^i	1.19%	1.67%	1.73%	1.65%
Models with four circumstance-factors				
$I(\Phi(w))$	0.2750	0.3156	0.2523	0.2869
$I(\Phi(\tilde{w}))$	0.2306	0.2713	0.2313	0.2547
$I\left(\Phi\left(\tilde{w}^d\right)\right)$	0.2339	0.2768	0.2346	0.2595
Θ	16.17%	14.04%	8.33%	11.51%
Θ^d	14.95%	12.29%	7.00%	9.55%
Θ^i	1.22%	1.75%	1.33%	1.96%

Source: Author's computations.

As shown in Table 3, the largest inequality of income can be seen in the age group of 35 – 50 year-olds. The contribution of opportunity inequality to inequality of income is the highest in the youngest age cohort and drops as we move to the older age cohorts, which is in line with the hypothesis we made about the decline of the contribution of opportunity inequality to an individual's achievement over time. In all age cohorts the influence of opportunity inequality on inequality of income is great due to the direct effect, i.e. direct influence of circumstance-factors on an individual's income, and not due to their influence on his/her education level. The estimates obtained with more economical four-factor models are slightly lower than those obtained with the models of six circumstance-factors, but in general, all the patterns remain the same.

Table 4 shows the contribution of inequality of opportunity to inequality of earnings.

T a b l e 4

Contribution of Inequality of Opportunity to Inequality of Earnings

	26 – 35 year-olds N = 337	**35 – 50 year-olds N = 660**	**51 – 60 year-olds N = 475**	**26 – 60 year-olds N = 1472**
Models with six circumstance-factors				
$I(\Phi(w))$	0.2129	0.2623	0.2761	0.2630
$I(\Phi(\tilde{w}))$	0.1734	0.2132	0.2269	0.2199
$I\left(\Phi\left(\tilde{w}^d\right)\right)$	0.1765	0.2159	0.2309	0.2230
Θ	18.52%	18.73%	17.82%	16.34%
Θ^d	17.08%	17.66%	16.38%	15.21%
Θ^i	1.44%	1.07%	1.44%	1.13%
Models with four circumstance-factors				
$I(\Phi(w))$	0.2129	0.2623	0.2761	0.2630
$I(\Phi(\tilde{w}))$	0.1799	0.2161	0.2314	0.2207
$I\left(\Phi\left(\tilde{w}^d\right)\right)$	0.1823	0.2184	0.2352	0.2237
Θ	15.48%	17.61%	16.18%	16.08%
Θ^d	14.38%	16.74%	14.80%	14.94%
Θ^i	1.10%	0.87%	1.38%	1.14%

Source: Author's computations.

As shown in Table 4, inequality of earnings increases in the older age cohort. The contribution of inequality of opportunities to inequality of earnings insignificantly varies throughout different age cohorts, which goes against the hypothesis we made about the decline of the contribution of opportunity inequality to an individual's achievement over time. Across all the age cohorts the influence of inequality of opportunity on inequality of income is great due to the direct effect. As before, the estimates obtained with more economical models are slightly lower than those obtained with the models of six circumstance factors.

In general, comparing the results presented in Tables 3 and 4, we can see that the contribution of opportunity inequality to inequality of earnings is higher than its contribution to inequality of income. Thus, the hypothesis stating that redistribution processes to some extent contribute to the reduction of inequality of opportunities is confirmed. This is especially pronounced in the older age cohort.

It is of interest to compare our results with the results obtained by other researchers with the help of the same methodology. In terms of methodology, the works closest to ours are those by Bourguignon, Ferreira and Menéndez (2007), Singh (2010), Hassine (2012) briefly described in the introduction.

Table 5 shows the results obtained by Bourguignon, Ferreira and Menéndez (2007), Table 6 shows the results obtained by Singh (2010), Table 7 shows the results obtained by Hassine (2012).

Table 5

Contribution of Inequality of Opportunity to Inequality of Earnings, Bourguignon, Ferreira and Menéndez (2007)

	26 – 30 year-olds N = 1730	**31 – 35 year-olds N = 2457**	**36 – 40 year-olds N = 3726**	**41 – 45 year-olds N = 4877**	**46 – 50 year-olds N = 5488**	**51 – 55 year-olds N = 5643**	**56 – 60 year-olds N = 4553**
$I(\{w\})$	0.566	0.580	0.706	0.655	0.759	0.997	0.873
$I(\{\tilde{w}\})$	0.494	0.407	0.562	0.519	0.619	0.656	0.654
$I(\{\tilde{w}^d\})$	0.508	0.474	0.620	0.561	0.659	0.821	0.749
Θ	12.8%	29.8%	20.5%	20.8%	18.4%	34.3%	25.1%
Θ^d	10.2%	18.4%	12.2%	14.4%	13.2%	17.7%	14.2%

Source: Author's computations.

Table 6

Contribution of Inequality of Opportunity to Inequality of Earnings, Singh (2010)

	21 – 30 year-olds N = 5907	**31 – 40 year-olds N = 5129**	**41 – 50 year-olds N = 3970**	**51 – 65 year-olds N = 3296**
$I(\{w\})$	0.366	0.394	0.386	0.447
$I(\{\tilde{w}\})$	0.272	0.310	0.310	0.365
Θ	25.6%	21.3%	19.9%	18.3%

Source: Author's computations.

Table 7

Contribution of Inequality of Opportunity to Inequality of Earnings, Hassine (2012)

	15 – 29 year-olds	**30 – 44 year-olds**	**45 – 65 year-olds**	**15 – 65 year-olds**
In 1988				
$I(\{w\})$	0.270	0.190	0.258	0.267
Θ	7.5%	21.8%	23.2%	14.8%
In 1998				
$I(\{w\})$	0.176	0.182	0.223	0.219
Θ	11.6%	14.7%	16.1%	11.7%
In 2006				
$I(\{w\})$	0.345	0.453	0.381	0.423
Θ	9.9%	6.6%	7.0%	5.5%

Source: Author's computations.

Comparative analysis of tables 3 – 7 reveals similarities and differences between the results we obtained and the results obtained by other researchers. Firstly, our research, the research by Bourguignon, Ferreira and Menéndez (2007) and the research by Hassine (2012) on the statistics for the year 1998 reveal that inequality of earnings tends to increase as we move towards the older age groups. In the papers by Singh (2010) and Hassine (2012) based on the statistics for the year 2006 it's maximal in the medium age cohort and minimal in the youngest age cohort. Secondly, in our paper, the contribution of inequality of opportunity to inequality of earnings is almost the same for all age cohorts, while in the works of other authors it significantly varies. Thirdly, in the work by Bourguignon, Ferreira and Menéndez (2007) the direct effect prevails over the indirect one, just like in our research, but to a lesser extent.

Comparison of the contribution of opportunity inequality to income inequality in Russia in our calculation and in the calculation of the EBRD shows that our estimates of the contribution of opportunity inequality to earnings inequality (approximately 16.5%) is more than twice less than the estimates provided by the EBRD (35.4%). Such a huge gap forced us to compare the EBRD estimates for other countries with those made by other researchers for the same countries using the methods similar to ours (namely Brzenzin'ski (2015) and Marrero, Rodrigez (2012) that are briefly described in the introduction. The comparison results are shown in Table 8.

Table 8

Assessing the Contribution of Inequality of Opportunity (in %)

Country	EBRD	Brzenzin'ski		Marrero, Rodrigez
Slovenia	31.4	8	9.5	9.62
Germany	23.0	2.5	3	2.07
Slovakia	40.4	2.5	7	3.60
Czech Republic	41.9	6	8	5.85
Hungary	40.3	11	15	11.57
Italy	38.1	11	8	11.74
Greece	39.9	12	18	10.81
Estonia	47.1	12	11	10.94
Lithuania	28.8	17	8	14.42
Poland	36.8	11	10.5	10.27
Latvia	37.9	13	8.5	7.11

Source: Author's computations.

As can be seen from Table 8, the same wide gap between our estimates and the EBRD's estimates is observed when comparing the EBRD estimates for a number of countries with the estimates made by other researchers for the same countries. Unfortunately, in the EBRD Transition Report 2016 – 2017 (2016) there is no detailed description of the calculation methodology, we can only say with confidence that in this work the Gini index rather than the L – Theil index is used as a measure of inequality, and that a set of circumstance–factors is also different in the papers under consideration. It is also important to consider the fact that the data were collected at different times. All this allows us to state that these estimates are not directly comparable. The good news is that the LiTS III data are freely available, and therefore we can perform a more thorough analysis of the reasons for such a large discrepancy in estimates, which we are planing to realize in our future works.

Parametric Approach to Inequality of Opportunities: Problem of Endogeneity

It is worth mentioning that the evaluations obtained may be biased due to endogeneity problem. As is known, the key sources of endogeneity are the following:

- problem of reverse causality;
- problem of self-selection;
- problem of the omitted variable correlated with the independent variables included in the model.

The problem of reverse causality is unlikely to appear in this research. Independent variables are determined before the dependent variable, while the reverse influence of income or earnings on the factors is hardly possible at all.

The problem of self-selection is likely to appear. As indicated above, there are many gaps in the data; because of these gaps, the sample size for analyzing the contribution of opportunity inequality to income inequality fell from 5 576 to 1865, while the sample size for analyzing the contribution of opportunity inequality to earnings inequality fell from 5 576 to 1 472.

In order to determine whether the nature of the gaps in the data is random or nonrandom we compared the distributions of variables before and after the removal of gaps (Tables 9 and 10).

Table 9

Comparison of Distributions of Categorical Variables, X^2- test, p-values

Categorical variable	26 – 35 years	36 – 50 years	51 – 60 years	26 – 60 years
B3 vs B1				
Place Of Birth	0.916	0.658	0.883	0.516
Sex	0.725	0.658	0.312	0.401
Respondent's Education	0.002	0.372	0.434	0.223
Father's Education	0.355	0.070	0.547	0.000
Mother's Education	0.560	0.159	0.922	0.000
Father's Occupational Status	0.188	0.007	0.126	0.000
Mothers's Occupational Status	0.061	0.001	0.028	0.000
B3 vs B2				
Place Of Birth	0.888	0.557	0.958	0.749
Sex	0.020	0.787	0.974	0.328
Respondent's Education	0.010	0.085	0.055	0.003
Father's Education	0.727	0.155	0.981	0.005
Mother's Education	0.838	0.443	0.812	0.032
Father's Occupational Status	0.225	0.004	0.104	0.000
Mothers's Occupational Status	0.061	0.003	0.019	0.000

Source: Author's computations.

As it follows from Table 9, the situation in general looks good in relation to the most significant factors, namely, the place of birth and gender. In relation to less significant factors of the family background, the null hypothesis about the coincidence of distributions is often rejected.

T a b l e 10

Comparison of Distribution of Continuous Variables, p-values

Tests	26 – 35 years	36 – 50 years	51 – 60 years	26 – 60 years
Income				
Two sample Kolmogorov-Smirnov test	0.002	0.214	0.505	0.031
Wilcoxon rank sum test	0.001	0.171	0.182	0.012
Median test	0.006	0.309	0.496	0.059
Earnings				
Two sample Kolmogorov-Smirnov test	0.015	0.279	0.962	0.089
Wilcoxon rank sum test	0.004	0.144	0.401	0.088
Median test	0.004	0.344	0.730	0.381

Source: Author's computations.

Table 10 shows that differences in the distributions of continuous variables are statistically significant for the age cohort of 26 – 35 year-olds; in income distributions they are statistically significant in the age group of 26 – 60 year-olds, in all other cases the differences are statistically insignificant.

The problem of omitted variables is very likely to occur. We can list a number of circumstances that were not taken into account due to a complete lack of information on them (for example, material wealth, atmosphere of the family in which the respondent grew up).

Conclusion

This paper made an attempt to evaluate the contribution of inequality of opportunity relating to an individual's birthplace, gender, parents' education and occupational status to inequality of income and earnings using a parametric approach. We evaluated both the direct and the indirect effects. Besides, we studied how the contribution of opportunity inequality to inequality of income and earnings varies across different age cohorts.

We have discovered that the contribution of opportunity inequality to inequality of income amounts to approximately 11%, and varies quite significantly across different age cohorts. We can see that the minimal contribution of opportunity inequality to inequality of income is in the oldest age cohort, and the maximal one is in the youngest age cohort. The contribution of opportunity inequality to inequality of earnings is somewhat greater: approximately 16% and it's virtually the same for all age cohorts. Throughout all the age cohorts most influence of inequality of opportunity upon inequality of income and earnings is due to the direct effect, i.e. direct influence of circumstance-factors upon an individual's income, and not through their influence upon an individual's education level.

The results we have obtained show that the contribution of opportunity inequality to inequality of earnings is greater than its contribution to inequality of income. We interpret these results as follows: earnings are more like a primary income, least susceptible to state regulation, while an income is the result of redistribution processes. The fact that the contribution of opportunity inequality to inequality of income is lower than its contribution to inequality of earnings shows that the state redistribution policy contributes in some ways to a more equitable social structure from the perspective of egalitarian theory.

The hypothesis about the reduction of the contribution of opportunity inequality to inequality of achievement over time was verified when individual income and not the earnings was used as the achievement measure. Comparing our results to the results of other researchers, who used earnings as the achievement measure, and made calculations separately for each age cohort just the way we did, has revealed that other research papers failed to find any obvious regular connection between age and opportunity inequalty.

The results we obtained revealed vulnerability of the pre-retirement age group: according to our calculations, both income and earnings of the respondents aged 51 – 60 years are significantly lower than those of the people from other age groups. Besides, it is specifically in this age group where we can see the greatest inequality of earnings. This shows that earnings of lots of people aged 51 – 60 years are low or very low. This is especially disturbing given the ongoing pension reform of the Russian Federation, within the framework of which the retirement age is steadily increasing (for women – from the age of 55 to 60, for men – from the age of 60 to 65). Now it will take people longer to live to see their retirement pension, hence they will have to spend more time doing low-wage jobs. To be fair, it is worth mentioning that the authors of the retirement reform have some understanding of this problem: as part of the reform there are certain measures aimed at supporting people of the pre-retirement age. In particular, the law prescribes administrative or criminal liability for dismissal or refusal to hire a person because of the age; there are free professional development courses, travel benefits on public transport, benefits for housing and communal services and free annual medical examination. All these measures can be regarded as "empowerment" of this social group in the terms of egalitarian theory of social justice. Time will show the efficacy of these measures and their ability to compensate for the inequality conditioned by the circumstance beyond an individual's control, namely his age.

Overall, basing on the evaluation of the research works completed to study the problem of opportunity inequality, we would like to point out that there are both positive and negative aspects concerned with them. In our opinion, a wide geography of research and a well-developed methodology tried out on the microdata from a number of countries are on the plus side. The weakness is a very narrow range of factors taken account of.

All empirical works that we know of use the data from ready-made surveys, so the selection of circumstance-factors, effort-factors and measures of individual achievement is determined by the survey data available. We failed to find any works using the data specifically collected for the analysis of inequality of opportunities. Moreover, we didn't find any work that theorized and classified circumstance-factors and effort-factors, individual achievements and built a theoretical model of their interaction.

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Technical Appendix

Table

Resudual and Specification Test Results, p-values

Tests		26 – 35 year-olds	36 – 50 year-olds	51 – 60 year-olds	26 – 60 year-olds
Short regression, all factors are included, dependent variable is earnings					
IM-test	Heteroskedasticity	0.0855	0.9527	0.0000	0.2048
	Skewness	0.2326	0.4725	0.4662	0.2724
	Kurtosis	0.0756	0.0903	0.1155	0.0443
	Total	0.0551	0.9291	0.0000	0.1394
Ramsey RESET test		0.5794	0.8895	0.2960	0.1717
Long regression, all factors are included, dependent variable is earnings					
IM-test	Heteroskedasticity	0.0545	0.9565	0.0001	0.1550
	Skewness	0.1557	0.3861	0.3063	0.2930
	Kurtosis	0.0471	0.1352	0.0978	0.0453
	Total	0.0269	0.9319	0.0001	0.1107
Ramsey RESET test		0.5533	0.9160	0.1163	0.7915
Short regression, two family background factors are deleted, dependent variable is earnings					
IM-test	Heteroskedasticity	0.0946	0.9483	0.0000	0.1902
	Skewness	0.6198	0.2082	0.0872	0.0863
	Kurtosis	0.1482	0.1061	0.1162	0.0513
	Total	0.1300	0.8255	0.0000	0.0570
Ramsey RESET test		0.0114	0.6305	0.6030	0.1885
Long regression, two family background factors are deleted, dependent variable is earnings					
IM-test	Heteroskedasticity	0.0304	0.6135	0.0000	0.4638
	Skewness	0.3903	0.5970	0.0527	0.0976
	Kurtosis	0.0815	0.1654	0.0979	0.0496
	Total	0.0274	0.6315	0.0000	0.2121
Ramsey RESET test		0.0861	0.9521	0.1482	0.7352
Short regression, all factors are included, dependent variable is income					
IM-test	Heteroskedasticity	0.9972	0.9977	0.1459	0.9918
	Skewness	0.3862	0.2683	0.0941	0.1399
	Kurtosis	0.1895	0.0340	0.6943	0.0094
	Total	0.9929	0.9866	0.0855	0.9366
Ramsey RESET test		0.3334	0.5812	0.2508	0.4533
Long regression, all factors are included, dependent variable is income					
IM-test	Heteroskedasticity	0.9665	0.9953	0.0736	0.9977
	Skewness	0.4131	0.3520	0.3277	0.1344
	Kurtosis	0.1715	0.0340	0.3153	0.0071
	Total	0.9498	0.9851	0.0688	0.9765
Ramsey RESET test		0.4066	0.5938	0.1937	0.0563
Short regression, two family background factors are deleted, dependent variable is income					
IM-test	Heteroskedasticity	0.9580	0.6537	0.1754	0.5415
	Skewness	0.2122	0.0418	0.0279	0.0390
	Kurtosis	0.1952	0.0317	0.6291	0.0095
	Total	0.8644	0.2333	0.0540	0.1273
Ramsey RESET test		0.0317	0.4525	0.8652	0.2629
Long regression, two family background factors are deleted, dependent variable is income					
IM- test	Heteroskedasticity	0.6170	0.9243	0.3272	0.9523
	Skewness	0.1726	0.0763	0.2013	0.0547
	Kurtosis	0.1604	0.0339	0.2462	0.0075
	Total	0.4463	0.6771	0.2411	0.6478
Ramsey RESET test		0.3862	0.5551	0.1585	0.0517

Source: Author's computations.

As can be seen from the table, in most cases, but not all, the conditions of the Gauss-Markov theorem are observed. In some cases, there is a violation of the homoskedasticity condition. In these cases, there is no reason to worry much, since we used robust standard errors.