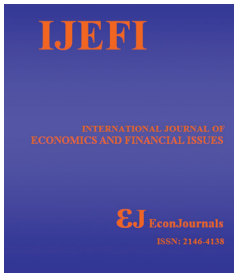

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Statistical Evaluation of the Equivalence Scale Based on Joint Accommodation for Households of the Russian Federation

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ABSTRACT

In this article an evaluation of equivalence scales for households of the Russian Federation is made using the data from "Russian monitoring of the economic situation and public health HSE" for the year 2013. Calculation of equivalence scales is done through a regression estimate of the Engel curve. Identified on the basis of the value of the resulting regression model scale are significantly different from the official scale of the Federal State Statistics Service of the Russian Federation. The authors have shown that it has significant implications for the evaluation of the relative poverty of certain vulnerable groups, in turn, has great significance for the implementation of targeted social policies.

Keywords: Equivalence Scale, Poverty, Household, Economies of Scale, Inequality, The Russian Federation
JEL Classifications: C83, C35, D63, D14, H31

1. INTRODUCTION

A comparison of the welfare level of households with different composition becomes necessary when considering many issues of the social policy, such as the identification and measurement of the poverty and level of socio-economic inequalities, the optimization of the existing system of social assistance, evaluation of the fairness of the tax burden. Their solution on the macroeconomic level depends on the availability of information on the social differentiation of society, especially on the proportion of poor and rich households in the total amount. To obtain such information, it is important to be able to distribute the entire population, or at least a representative sample of its degree of increase in the level of well-being, which raises the question of the objectivity of comparing these levels.

In economics, there are several concepts of welfare, but the possibility of quantitative measurements and comparisons give only those that are backed by sufficient and reliable statistical data. The most commonly used is the concept that explains the level of household wealth through its degree of security of consumer goods. The necessary statistical data in this case is collected in the course of regular official and private household income and consumption expenditure of households.

However, the available statistics is not always interpreted within the meaning of the concept. So, Mack and Lansley (Mack and Lansley, 1985) found that a direct comparison of income (consumption expenditure) families of different composition in order to compare their standard of living very meaningful, though, and finds application in statistical practice in several countries. One and the same amount of income, providing a comfortable standard of living for one person, leads over the poverty line a large family. Therefore, the income of households needs pre-adjustment before using them for the level of comparing life. To this end, equivalence scales are developed and calculated.

In the Russian Federation, the levels of living of households are measured by Federal State Statistics Service on the basis of their per capita income. This leads to an oversimplification of

differences in the composition of families, in fact they are only in the difference in their numbers. It turns equivalence scale, suggesting, for example, that the standards of living of the two households, respectively, of the two, and one person is equal, if the income of the first half will be greater than the second. Obviously, it is significant limitation for this method of calculating scales. First of all, all the members of the family differ in material and spiritual needs. For example, adults and children consume different amounts of food, pensioners and working people have different costs of transportation or clothing. The needs of households differentiated by age, gender and education of their members, geographical residence, the accumulated value of the property and other factors. In addition, households consisting of two or more people begin to act on the economy of scale. Household of two people can spend twice as much on food than one person, but with regard to public services such rule often does not apply.

Thus, used in Russia method of estimating equivalence scales doesn't take into account optimal allocation of resources and benefits within the household and is rarely used in the practice of foreign countries. World practice is based on the calculation of equivalence scales using the observed consumer behavior. It is, for example, a modified equivalence scale of the Organization for Economic Cooperation and Development (OECD). However, its use in Russia is difficult because of differences with the developed countries belonging to the OECD, in the relative prices of public goods (e.g., utilities) and private consumption. Thus, Lanjouw (Lanjouw et al., 2004) have shown that the equivalence scale in countries with transitive economies vary rapidly as a result of shifts in the relative prices. Moreover, studies from developed countries also demonstrate the importance of correct choice of equivalence scales. For example, de Vos, Zaidi (de Vos and Zaidi, 1997) found that the incidence of poverty among certain social groups in the European Union varies considerably by using different scales.

There is quite a large number of scientific papers on the problems of measuring the level of welfare and inequality, identifying poverty, corporate social responsibility and the calculation of equivalence scales and economies of scale as a result of living together in households. These include studies Pollak and Wales (Pollak and Wales, 1979), Deaton and Muellbauer (Deaton and Muellbauer, 1980), Blundell (Blundell, 1988), Nelson (Nelson, 1988), Lewbel (Lewbel, 1989), Blundell and Lewbel (Blundell and Lewbel, 1991), Browning (Browning, 1992), Blundell, Preston, and Walker (Blundell et al, 1994), Blackorby and Donaldson (Blackorby and Donaldson, 1994), Bourguignon and Chiappori (Bourguignon and Chiappori, 1994), Banks (Banks et al., 1997), Lewbel (Lewbel, 1997) Jorgenson (Jorgenson, 1997), Slesnick (Slesnick, 1998), Vermeulen (Vermeulen, 2000) and Glebova (Glebova et al., 2013).

Thus, used in Russia assessment of the level of welfare with the construction of equivalence scales on the basis of per capita income is incorrect. An important task in these conditions becomes more qualitative assessment of the scale to determine the exact sections of the population at risk of falling into poverty. The most optimal solution, in the opinion of the authors, is to calculate the scale of equivalence with rules formulated by Engel (Engel, 1895). It lies in the fact that families with the same proportion of food products in consumer spending have the same standard of living, regardless of their composition.

The authors seek to revise the official data on the level of poverty in Russia, taking into account the above factors. As a first hypothesis a lower ranking values of equivalence scale based on the use of economies of scale in the Russian Federation in comparison with the official equivalence scale of the Federal State Statistics Service of the Russian Federation is chosen. The second hypothesis - lack of statistically significant differences in the economies of scale for households with one or more persons of working age with the inclusion of an equal number of either children or the elderly.

2. METHODS

Used in the study methodology for calculating equivalence scales (Deaton and Muellbauer, 1986) based on the observed behavior of households in the optimal allocation of available resources. Base construction of equivalence scales is the assumption that the two different households have the same level of well-being if they spend on personal benefits equal share per capita expenditures. Calculation of equivalence scale begins with an assessment of the Engel curve - the relationship between the cost of consumption of a certain group of products and the general level of income/expenses.

As a basic article of personal expenses traditionally food costs are used. In some developed countries the cost of a wide range of personal benefits is taken as a basis, but for the Russian Federation as a country with transitive economy and a relatively low level of gross domestic product per capita seems appropriate to limit spending on food. Furthermore, firstly equivalence scale are important for accounting poverty, and in this case food costs are critical. It is believed that between the share of expenditure on food and the level of total expenditure negative correlation is observed (Deaton and Paxson, 1998) in accordance with the law of Engel.

To estimate the Engel curve the following regression equation is constructed (1):

$$w = a + b\ln\frac{X}{n} + \lambda n_t + \beta n_d + \delta n_p \quad (1)$$

where w - is the proportion of food expenditure in total household expenditure,

X - The overall cost/income households

n - Total number of persons in the household, n_t, n_d, n_p - The number of people in a household falling in the age group, respectively, of the working population, children and pensioners, a, b, λ, β, δ - the regression coefficients to be estimated.

The selected evaluation form Engel curve, in which the left is share of expenditure on food, and the right - the logarithm of the average per capita cost/income households, called the common shape or Woking-Leser form (Leser, 1963) and, as experience has

shown, it gives the greatest explanatory power and it is optimal for estimating the Engel curve.

Next equivalence scale is calculated based on the estimated regression coefficients found. To do this as a reference for comparison, it takes a simple household consisting of one person. Engel curve equation in this case is a special case of the equation (1) with $n = n_t = 1$:

$$w = a + b \ln \frac{X}{n} + \lambda$$

Obviously, the levels of household wealth arbitrary composition comprising in addition to those of working age of children and reference households are equal if

$$a + b \ln \frac{X}{n} + \lambda = a + b \ln \frac{X}{n} + \lambda n_t + \beta n_d$$

As a result, formula for the construction of the equivalence scale is following:

$$s = n \exp\left(\frac{1}{b}[\lambda(1 - n_t) - \beta n_d]\right) \quad (2)$$

Equivalence scales for households that include persons in addition to the working-age pensioners are similarly calculated. The economic interpretation of the formula (2) calculation of the scale is as follows: When comparing the welfare of the household reference and arbitrary composition of the last income should be divided into equivalence scale.

Analysis of the parameters of equivalence scale for the Russian Federation, as well as the subsequent evaluation of vulnerable groups were carried out on the basis of "the Russian monitoring of the economic situation and public health HSE" for the year 2012. It is carried out by the National Research University "Higher School of Economics" and ZAO "Demoscope" with the participation of the Population Center of the University of North Carolina at Chapel Hill and the Institute of Sociology since 1992 year. The sample of households is based on international methodology and is representative. A sample of 2013 year presents data on 6148 households, from which 5546 households are chosen for research, because they outlined in the questionnaire their income and food costs. By all indications, including gender, age, geographic location, family composition, a sample survey of the population is fully representative, allowing on the basis of its data to assess the equivalence scales and poverty in the Russian Federation.

3. RESULTS

In this study, regression estimation of the Engel curve is carried out by the share of expenditure on food. The dependent variable in the regression is the share of spending on food at home and away from home in the total household income, designated as "w." Expenditure on food households is defined as the amount of money spending on food at home and outside the home of all its members within 30 days, and the total income of the household cash income of the family for 30 days.

The independent variables in the regression are the following indicators:

$\ln \frac{X}{n}$ - the natural logarithm of per capita income. Presumably, the variable is with negative sign, since often households with higher incomes have a lower share of expenditure on food; n_t - the number of people of working age in the household, which are defined as all persons from 18 years and till the retirement age: In Russia, the retirement age for men is 60 years, for women - 55 years;

n_d - the number of children aged 0-17 years inclusively;
n_p - the number of people of retirement age;

As it can be seen on Table 1, all the signs near the variables in the regression match expectations. The coefficient of the natural logarithm of per capita income is negative, which once again confirms the validity of the law of Engel. From the coefficients of the variables that specify the age structure, it is possible to note the same coefficients of regressors, indicating the number of children and the elderly.

Thus, the regression equation in this research has the form

$$w = 2.04 - 0.17 \ln \frac{X}{n} - 0.04 n_t - 0.03 n_d - 0.03 n_p \quad (3)$$

The low coefficient of determination (0.19) resulting from the construction of the regression equation is typical for this kind of regression. Adding of additional fictive variables is likely to increase it.

The results of calculations for the numerical values of the parameters taken from the equation (3) are shown in Table 2.

Here is the equivalence scale for the Russian Federation, built using the regression coefficients in Table 1. As expected, the values of s increase with the number of household members. According to Table 2, the couple who lived separately before marriage, after it needs to increase their incomes for consumer spending at least 1.3 times, or decrease their level of well-being (according to the official methodology used by the Federal State Statistics Service of Russia, their costs should be increased twice). Or, for example, single woman after the birth of a child should raise consumption expenditure 1.42 times to maintain its level of prosperity. As can be seen from the last column, there is no pattern in the scale of increase in the size of saving increasing numbers of households. Only in a household consisting of two people of working age and a child or a pensioner, the appearance of a second child or

Table 1: The results of the Engel curve regression

Variable	Coefficient	Standard estimation	t-statistics	Significance
Const	2.04	0.04	48.05	0
$\ln \frac{X}{n}$	–0.17	0	–37.54	0
n_t	–0.04	0	–16.37	0
n_d	–0.03	0	–6.87	0
n_p	–0.03	0	–6.47	0

pensioner reduces the growth of the scale. As a result of the same factors in the variables and n_p in the regression equation (3) there is no statistically significant difference in the economies of scale for households with one or more persons of working age with the inclusion of an equal number of either children or the elderly, which is reflected in second column of Table 2.

Table 3 compares the resulting scale with other scales: The scale of the Federal State Statistics Service of the Russian Federation, the modified OECD scale and the scale of the Luxembourg Centre for the Study of income (by the LCD).

As shown in Table 3, in Russia between the official equivalence scale and the results obtained by the authors, there is a significant difference. Official scale used by the Federal State Statistics Service of Russia, underestimates the effect of economies of scale, which leads to deviations in the identification of vulnerable groups at risk of poverty. Also, the estimated range differs from the modified OECD scale, and the scale by the LCD, which are applied to the developed countries.

4. DISCUSSION

Real disposable income of the Russian population for 2013 year increased by 3.3%. In 2013, the average monthly nominal wage per employee was 29,960 rubles, having increased in comparison with 2012 year by 12.3%. Since the index of consumer prices for the year increased by 6.8%, the increase in real average monthly wage per employee for 2013 was 5.2%. Outstanding nominal average wage arrears for 2013 increased compared to the previous year by 24% - from 2046.7 up to 2.5369 billion rubles. The number of workers who had to wage arrears during the year ranged from 53 to 97 thousand people. Almost all wage arrears were formed as a debt due to lack of own funds of enterprises: Size of monthly salary arrears due to late receipt of funds from the budgets of all levels throughout the year, except February fluctuated at the level of 3-4% total volume of wage arrears.

Table 2: Equivalence scale for the Russian Federation in 2013 year

Household composition		Equivalence scale (s)	Δs
n_t	n_d or n_p		
1	0	1	-
2	0	1.27	0.27
3	0	1.6	0.34
4	0	2.03	0.42
1	1	1.19	0.19
1	2	1.42	0.23
1	3	1.7	0.27
2	1	1.51	0.51
2	2	1.8	0.29
2	3	2.15	0.35

Table 3: The estimated equivalence scale in comparison with the official scale, the modified OECD scale and the scale by the LCI

Household composition	Estimated scale	Official scale	OECD scale	LCI scale
1 adult	1	1	1	1
1 adult+1 child	1.19	2	1.5	1.5
1 adult+2 children	1.42	3	2	2
2 adults	1.27	2	1.7	1.5
2 adults+1 child	1.51	3	2.2	2
2 adults+2 children	1.8	4	2.7	2.5
2 adults+3 children	2.15	5	3.2	3

OECD: Organization for Economic Cooperation and Development, LCI: Luxembourg Centre for the Study of Income

Increase in salaries of public sector employees, which is funded by including the expense of subsidies to regional budgets from the federal budget, has led to the fact that the branch cut at the fastest pace in 2013 grew the average monthly salary (excluding social benefits) in the field of education (123.2%), health and social services (118.9%), which led in 2013 to increase the size of the average monthly wage (without social benefits) in the formation of up to 23421 rubles, health and social service - up to 24564 rubles. In 2013, the average monthly wage (without social benefits) amounted to 78% in education to the national level of the average wage and 82% to the level of wages in the manufacturing sector and in health; in the provision of social services - 81% of the national level of the average wage and 85% to the level of wages in the manufacturing sector.

In 2013, labor pensions were increased twice times:

- On 1 February they increased by 6.6%;
- On April, 1 pensions increased due to increased revenues of the Pension Fund of the Russian Federation in 2012, per pensioner. This measure increased the retirement pensions by another 3.3%.

In April 2013, the state pension were increased on 1.81%, and the size of monthly payments the federal benefit recipients had increased on 5.5%. In August, 2013 the next recalculation of pensions for working pensioners was held, taking into account the premiums for mandatory pension insurance from their employers, received in 2012. In 2013, growth in the average monthly pension for the year amounted to 9.7%, bringing the average size of the pension accrued for the year was formed at the level of 9918 rubles per month. The increase in the average real pensions was 2.8%.

Per capita income grew over 2013 by 10.7% and reached 25522 rubles per month. The nominal amount of increase per capita incomes (wages, pensions, cash income) for 2013 was slightly lower than the previous year, and inflation - higher (6.8% vs. 5.1% in 2012), which and resulted in a lower than in 2012, growth of real disposable income (3.3% vs. 4.6% in 2012).

In 2013, income inequality decreased slightly. The values of the income inequality decreased compared to 2012: Gini coefficient from 0.420 to 0.418, the ratio of funds from 16.4 to 16.2 times. Reducing inequality in the distribution of income of the population was associated with a decrease in the share of income of the 5th quintile (with the highest income) by 0.1 percentage points in the total income of the population and an increase in the share of income of the 2nd quintile by the same amount. This reduction in the share of monetary income of the 5th quintile of the population was concentrated among the wealthiest 10% of the population.

In 2013, the share of 10% of the richest population was 30.7% of the total income of the population against 30.8% in 2012. The proportion of 10% of the least well-off population remained at the level of 2012 and accounted for 1.9% of total money incomes.

The minimum subsistence level in 2013 was as follows: 7429 rubles per month on average for the entire population, including 8014 rubles per month for a working-age population, 6097 rubles per month - for pensioners, 7105 rubles per month - for children. The structure of the subsistence minimum account for the bulk of spending on food (45.8%). Expenditure on non-food goods was 23.4% and for services - by 23.6%. On the costs of compulsory payments and fees spent 7.2% of the subsistence minimum.

The ratio of the main indicators of income with the subsistence minimum in the III quarter 2013 has developed at the next level:

- The ratio of average per capita income to the subsistence minimum of the total population - 335.5%;
- The ratio of average monthly gross wages and salaries per employee to the subsistence minimum working age population - 380.9%;
- Ratio of the average size of the pension accrued to the subsistence minimum for pensioners - 177.2%.

The poverty rate for 2013 was 15.5 million persons or 10.8% of the total population, while in the same period of the previous year poverty rates were at 15.4 million people and 10.7%.

On this basis, the main directions of the poverty reduction in modern Russia can be the following:

- Improving health: Increased life expectancy, and especially active working life
- Improving the quality of people
- Formation of an effective labor market and productive employment, the creation of new, high-performance jobs
- Providing each family well-maintained housing and the creation of favorable conditions for this
- Ensuring a high level of insurance payments during the period of loss of earnings, targeted social support and social services for vulnerable groups
- Creation of prerequisites for gender equality in employment and income on equal work and equal, reducing domestic work
- Economic growth, increase the competitiveness of the domestic economy, reducing socio-economic differences between regions and between urban and rural areas.

5. CONCLUSION

Based on the analysis conducted in this paper, the following conclusions and recommendations are made:

1. Calculated in this study ranking values of equivalence scale based on the use of economies of scale in the Russian Federation are less in comparison with the scale of the equivalence of the official Federal State Statistics Service of the Russian Federation. This proves the first hypothesis and the need for equivalence scales based on the observed economies of scale for the analysis of relative poverty and identification of the most vulnerable to the risk of poverty groups of the population
2. Shifts in relative prices significantly affect the household economies of scale, and therefore it seems appropriate to regularly review the scale (for example, every 2 years) and in the event of abrupt changes in relative prices
3. Comparison of the estimated equivalence scales showed no statistically significant differences in the economies of scale for households with one or more persons of working age with the inclusion of an equal number of either children or the elderly. It proves the second hypothesis and allows us to talk about its adequacy for comparing households of different composition and appropriateness of further use for the analysis of different socio-economic characteristics of Russian households
4. The results of the assessment of the scale of equivalence among different population groups can be used by government, responsible for the development of social policy, to clarify the population at risk of poverty, and improve the targeting of social assistance.

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