Following the Tracks of Atkinson and Micklewright: the Changing Distribution of Income and Earnings in Poland from 1989 to 1995

by

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IN POLAND FROM 1989 TO 1995

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Introduction

The distribution of income in former planned economies has been widely studied by Lydall (68-78), Wiles (71), Pryor (73), Phelps Brown (88), Morrison (84), Redor (88) and lately by Atkinson and Mickelwright (92). All the authors, except Redor, broadly agree that the distribution of income was more egalitarian in communist economies than in the western ones. One of the main aims of the reform process is to establish a less egalitarian distribution of income very quickly; the magnitude of this economic necessity is daunting and as the last Economic Survey of Europe affirms: “It seems likely that never before in peacetime human history has such a profound redistribution of measured income and wealth taken place, within such a short period of time.”

After the beginning of the reform process very few studies have appeared on the expected change in the distribution of income in the eastern countries. There is an empirical reason for this lack of studies; the time span elapsed from the beginning of the reform process is short, the statistical data are not completely reliable, owing to changed ways of collecting data, making it difficult to compare the pre-89 situation with the post-89 one. The greatest difficulty lies in comparing data referring to different economic systems which are radically changing over time.

Studies are beginning to appear: Frick, Topinska, Wagner, Mueller (97) on Poland and East Germany, Rutkowsky (96), Kudrycka and Radziukiewicz (92) on Poland, Vecernik (95) on Czech Republic, Kornelius and Weder (96) on Baltic countries, Doyle (96) on Russia and Milanovic (96) on various countries.

The aim of our paper is twofold. The first aim is to study the distribution of income and earnings in Poland from 1988 to 1995, following the tracks of Atkinson and Micklewright’s book, applying the same methodology and the same data they use up to 1989; in a way this work seeks to be an extension of the work of Atkinson and Micklewright.

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1 A clear example comes from Poland, where the Polish Household Budget Survey underwent a radical change in 1993. The socio-economic groups passed from 4 to 6 categories, including the emerging private sector, but the publication has excluded income bands within each group, making it impossible to evaluate the quantitative distribution and, as a result, to continue the studies of Atkinson and Micklewright with the same framework of analysis after 1992.
All the works we have quoted above, except Milanovic, study the changing earnings or income distribution of the reforming countries taking the value of an inequality index (usually the Gini coefficient) for one year (Rutkowsky 1993, Topinska 1990, Kornelius 1994) and then comparing this value with a prereform one. On the contrary, we estimate the inequality indexes for every year after the beginning of the transformation in order to assess the dynamic pattern of the income or earnings distribution, trying to assess which are the winning or losing social categories in the reform proces.

The second aim is to assess, through the use of generalized Lorenz Curves, the gains or losses in terms of general economic welfare before and after the beginning of the reform period, giving a more vivid picture of the changing pattern of income and earnings distribution in Poland in this crucial time period.

**General results**

**The distribution of income 1985 - 1992**

In this paragraph we consider the behaviour of inequality indexes from 1985 to 1992. The indexes we take into account are the following: Gini coefficient, Robin Hood Index, coefficient of variation and the decile ratio.

<table>
<thead>
<tr>
<th>YEAR</th>
<th>P_5</th>
<th>P_10</th>
<th>P_25</th>
<th>P_35</th>
<th>P_50</th>
<th>P_90/ P_10</th>
<th>Gini</th>
<th>RHI</th>
<th>Var. Coeff.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1985</td>
<td>48.9</td>
<td>57.6</td>
<td>75</td>
<td>134.2</td>
<td>175.1</td>
<td>209.2</td>
<td>3.04</td>
<td>0.253</td>
<td>17.8</td>
</tr>
<tr>
<td>1988</td>
<td>49.7</td>
<td>59</td>
<td>75.8</td>
<td>133</td>
<td>174.8</td>
<td>207</td>
<td>2.96</td>
<td>0.246</td>
<td>17.4</td>
</tr>
<tr>
<td>1989</td>
<td>44.9</td>
<td>54.5</td>
<td>72.6</td>
<td>135.9</td>
<td>180.2</td>
<td>217</td>
<td>3.31</td>
<td>0.268</td>
<td>18.9</td>
</tr>
<tr>
<td>1990</td>
<td>46.02</td>
<td>55.17</td>
<td>73.71</td>
<td>133.49</td>
<td>176.05</td>
<td>209.11</td>
<td>3.19</td>
<td>0.258</td>
<td>18.17</td>
</tr>
<tr>
<td>1991</td>
<td>46.79</td>
<td>55.86</td>
<td>74.51</td>
<td>132.58</td>
<td>175.25</td>
<td>208.05</td>
<td>3.13</td>
<td>0.253</td>
<td>17.77</td>
</tr>
<tr>
<td>1992</td>
<td>45.86</td>
<td>55.07</td>
<td>73.36</td>
<td>135.02</td>
<td>176.91</td>
<td>211.69</td>
<td>3.21</td>
<td>0.26</td>
<td>18.28</td>
</tr>
</tbody>
</table>

Source: *Budgety gospodarstw domowych, various years, GUS, Warsaw, author's aggregations and calculations based on paretian interpolation*

From table 1 we see that the income distribution did not change very much, whichever index we consider; the Gini coefficient in 1985 was 25.3 and at the end of the period is 26.
There is a negligible increase which witnesses a substantial stability of the pattern of income distribution. The highest value of the index 26.8 in 1989 may be attributed to the price liberalization of agricultural goods, which increased peasants' incomes, changing the income distribution in their favour for that year. This temporary effect was cancelled by the subsequent effects of the measures of economic policies enacted by the first democratic government. The other indexes confirm the same pattern. The estimates made by Topinska and Wagner for the year 1989 show that the value of the Gini coefficient is very close to our estimate (26.07 against 26.8). The general indexes of income distribution do not show any beginning of an expected process of income dispersion. In our opinion this process could not be detected from data on income distribution, for the simple reason that the income originating in the non-agricultural private sector, which throve in that period, was not collected.

Furthermore, we estimated inequality indexes, Gini coefficient and RHI for the four socio-economic groups whose family budgets are given by the GUS and which account for the whole Polish population (table 2).

<table>
<thead>
<tr>
<th>TABLE 2</th>
<th>INCOME INEQUALITY INDICATORS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Workers</td>
<td></td>
</tr>
<tr>
<td>RHI</td>
<td>15.5</td>
</tr>
<tr>
<td>Gini</td>
<td>0.221</td>
</tr>
<tr>
<td>Mixed worker</td>
<td></td>
</tr>
<tr>
<td>RHI</td>
<td>17</td>
</tr>
<tr>
<td>Gini</td>
<td>0.2396</td>
</tr>
<tr>
<td>farmers</td>
<td></td>
</tr>
<tr>
<td>RHI</td>
<td>22.1</td>
</tr>
<tr>
<td>Gini</td>
<td>0.3067</td>
</tr>
<tr>
<td>Pensioners and retired persons</td>
<td></td>
</tr>
<tr>
<td>RHI</td>
<td>15.3</td>
</tr>
<tr>
<td>Gini</td>
<td>0.2169</td>
</tr>
</tbody>
</table>

Source: Budgety gospodarstw domowych and Warunki zycia ludnosci, various years, GUS, Warsaw, author's aggregations and calculations based on paretoian interpolation

The results are interesting because they show a quite substantial movement of the income distribution within every socio-economic group from 1989 onwards.
In fact, the Gini coefficient diminished for two socio-economic groups: mixed households, whose Gini coefficient diminished from 35.6 in 1989 to 28.6 in 1992, and farmers' households whose index passed from 24.9 in 1989 to 21.5 in 1992. On the contrary, for workers' households the index rose from 23.9 in 1989 to 25.95 in 1992 and for the last category, pensioners' households, the index changed from 22.9 in 1989 to 24.9 in 1992.

We want to emphasize the following points: during the first four years of the transformation process there was a negligible change in the distribution of income; what really changed was the income distribution within every socio-economic group. Our estimates show that for the first three years of the transformation process the structure of income distribution remained the typical distribution of a socialist country and did not approach the distribution of a middle range capitalist economy. The first four years of the transformation process did not basically alter the mechanism of income distribution in Poland.
The distribution of earnings 1988-1995

Quite a different picture emerges if we consider the earnings distribution instead of the income distribution. The earnings distribution has a different coverage and is available up to 1995\(^2\). Obviously we use the same indexes and our estimates can be directly linked to the ones of Atkinson and Micklewright.

\[ \text{GRAPH 1} \]

The Gini coefficient for earnings goes from 20.7 in 1989 to 28.2 in 1995 (graph 1). We can observe two substantial jumps in the value of the coefficient: the first one in 1990 at the very beginning of the transformation process, and the second one in 1994 when the economic recovery was under way and the reform process was proceeding under the new government elected in September 1992. This substantial change in the earnings distribution is confirmed by the other indexes (table 3).

<table>
<thead>
<tr>
<th>TABLE 3</th>
<th>EARNINGS INEQUALITY INDICATORS, 1988-1995</th>
</tr>
</thead>
<tbody>
<tr>
<td>Year</td>
<td>RHI</td>
</tr>
<tr>
<td>1988</td>
<td>14.8</td>
</tr>
<tr>
<td>1989</td>
<td>14.4</td>
</tr>
<tr>
<td>1990</td>
<td>16.7</td>
</tr>
<tr>
<td>1991</td>
<td>16.8</td>
</tr>
<tr>
<td>1992</td>
<td>17.4</td>
</tr>
<tr>
<td>1993</td>
<td>17.9</td>
</tr>
<tr>
<td>1994</td>
<td>19.7</td>
</tr>
<tr>
<td>1995</td>
<td>20.1</td>
</tr>
</tbody>
</table>

Source: Rocnik Statystycnyk, GUS, Warsaw; Author's calculations based on paretian interpolation

\(^2\) The pattern of the publications has not changed, enabling us to bring our analysis to the 1995. The main differences from the income coverage are the exclusion of the agricultural sector and the inclusion of the private sector firms from 1991.
If we take 1989 as the base year, we see that the Gini Coefficient goes from 20.7 to 28.2, with a jump of 7.5 percentage points, which is more than a third of the initial value. The same considerations apply to the RHI index, a jump of 39%, and to the coefficient of variation, a jump of 41%.

What clearly emerges is that the earnings distribution is becoming less egalitarian as time goes by, contradicting the previous findings on income distribution. If we take the same time period, 1989-1992, for both distributions, we see that the income Gini coefficient remains the same, while the second one goes from 20.7 to 24.6. The economic explanation for such a shift may be the one given by Rutkowsky (96) i.e. high skills with a high educational content mainly in the thriving private sector are better paid.

This pattern is clearly shown by graph 2, where the shift of the earnings distribution in favour of the highest three deciles and against the lowest two deciles is easily detected.

This pattern is confirmed by the decile ratio (table 4) which goes from 2.43 in 1989 to 3.4 in 1995.

<table>
<thead>
<tr>
<th>TABLE 4</th>
<th>DECILE RATIO, EARNINGS, 1989-1995</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.43</td>
<td>2.76</td>
</tr>
</tbody>
</table>

Source: Rocnik Statystycnyk, GUS, Warsaw; Author's calculations based on paretoian interpolation
The picture which emerges from these estimates is a process of an economic system that is quite quickly becoming less egalitarian, approaching the values in the earnings distribution typical of a capitalistic economy. Atkinson and Micklewright calculated a value of a Gini coefficient of 28.3 and a decile ratio of 3.39 for United Kingdom in 1989. According to these values Poland 1995 is very similar to United Kingdom 1989.
Some interesting features of the earnings distribution in Poland.

We consider the earnings distribution of white collar workers and blue collar workers and the changing relationship between the two distributions.

<table>
<thead>
<tr>
<th>TABLE 5</th>
<th>INEQUALITY STATISTICS FOR WHITE AND BLUE COLLAR WORKERS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Gini</td>
</tr>
<tr>
<td>1995</td>
<td></td>
</tr>
<tr>
<td>Blue collars</td>
<td>0.263</td>
</tr>
<tr>
<td>White collars</td>
<td>0.293</td>
</tr>
<tr>
<td>1989</td>
<td></td>
</tr>
<tr>
<td>Blue collars</td>
<td>0.210</td>
</tr>
<tr>
<td>White collars</td>
<td>0.191</td>
</tr>
</tbody>
</table>

Source: Rocnik Statystyczny, GUS, Warsaw; Author’s calculations based on paretin interpolation

From table 5 we see that the Gini coefficient for blue collar workers goes from 21 in 1989 to 26.4 in 1995, while the corresponding value for white collars workers goes from 19.1 in 1989 to 29.3 in 1995. This is consistent with our previous findings. The interesting feature is that the earnings distribution for white collars workers was more egalitarian in 1989 than the blue collars one, reflecting a socialist wage structure. In only six years this structure is completely reversed in favour of white collars workers.

<table>
<thead>
<tr>
<th>TABLE 6</th>
<th>RATIO OF THE CORRESPONDING DECILES OF THE TWO CATEGORIES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Decile</td>
<td>(Decile$_i$, white collars / Decile$_i$, blue collars)</td>
</tr>
<tr>
<td></td>
<td>first</td>
</tr>
<tr>
<td>1995</td>
<td>128.05</td>
</tr>
<tr>
<td>1994</td>
<td>126.69</td>
</tr>
<tr>
<td>1989</td>
<td>109.14</td>
</tr>
<tr>
<td>1988</td>
<td>107.06</td>
</tr>
</tbody>
</table>

Source: Rocnik Statystyczny, GUS, Warsaw; Author’s calculations based on paretin interpolation
From table 6 we can see that from 1991 onwards for every decile of the two distributions white collar workers earn more than the corresponding blue collar workers; the magnitude of this wage differential varies from 10.3% to 17.6% in 1991, rising to a value between 19% to 29% in 1995. In 1988 and 1989 the ratio for the highest deciles was still in favour of blue collar workers, as can be seen from the shaded area of the table. This change in the ratio testifies to a radical transformation of the wage structure of the Polish economy during the 90s.

A further interesting feature of the changing distribution in Poland is the changing gender distribution. The female Gini coefficient in 1985 was 17.72, which was the lowest for all eastern countries, while in 1995 it was 24.5, with an increase of 6.77 percentage points. The male Gini coefficient for earnings was 23.82 in 1985, rising to 29.39 in 1995, with an increase of 5.57 percentage points (see table 7).

<table>
<thead>
<tr>
<th>TABLE 7</th>
<th>SUMMARY STATISTICS ON GENDER DISTRIBUTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Female Gini coefficient</td>
<td>0.177267</td>
</tr>
<tr>
<td>Male Gini coefficient</td>
<td>0.238213</td>
</tr>
<tr>
<td>Ratio between the two coefficient</td>
<td>1.343809</td>
</tr>
</tbody>
</table>

*Source: Rocnik Statystycny, GUS, Warsaw; Author’s calculations based on paretoan interpolation*

What is clear is that the female distribution of earnings is widening, more than the male one. This phenomenon is witnessed by the ratio between the two Gini coefficients which was 1.34 in 1985 and 1.2 in 1995. An interesting feature is the relationship between male and female earnings: if we take the two earnings distributions and calculate the ratio of the same decile \( P_{i, \text{female}} / P_{i, \text{male}} \) of the two distributions, the result is a narrowing of the gap between male and female earnings (table 8).
TABLE 8

<table>
<thead>
<tr>
<th>Decile</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
</tr>
</thead>
<tbody>
<tr>
<td>1985</td>
<td>76,875</td>
<td>75,524</td>
<td>74,897</td>
<td>74,412</td>
<td>73,712</td>
<td>72,619</td>
<td>71,126</td>
<td>69,012</td>
<td>65,078</td>
</tr>
<tr>
<td>1991</td>
<td>83,135</td>
<td>81,516</td>
<td>81,293</td>
<td>80,896</td>
<td>78,898</td>
<td>78,885</td>
<td>77,109</td>
<td>74,586</td>
<td>71,655</td>
</tr>
<tr>
<td>1992</td>
<td>87,282</td>
<td>85,161</td>
<td>84,424</td>
<td>83,842</td>
<td>83,012</td>
<td>81,539</td>
<td>79,319</td>
<td>81,032</td>
<td>73,571</td>
</tr>
<tr>
<td>1993</td>
<td>86,741</td>
<td>83,09</td>
<td>81,642</td>
<td>80,914</td>
<td>80,222</td>
<td>79,149</td>
<td>77,488</td>
<td>75,167</td>
<td>72,99</td>
</tr>
<tr>
<td>1994</td>
<td>90,941</td>
<td>85,674</td>
<td>83,942</td>
<td>82,581</td>
<td>81,262</td>
<td>79,561</td>
<td>76,754</td>
<td>73,317</td>
<td>69,253</td>
</tr>
<tr>
<td>1995</td>
<td>91,7</td>
<td>86,1</td>
<td>83,4</td>
<td>81,8</td>
<td>80,1</td>
<td>77,8</td>
<td>75,2</td>
<td>72,2</td>
<td>69,3</td>
</tr>
</tbody>
</table>

Source: Rocnik Statystycny, GUS, Warsaw; Author’s calculations based on paretian interpolation

This phenomenon is stronger for the low deciles and relatively weaker for the highest deciles (graph 3). It seems that during the transformation the female earning capacity is closer to the male one, but if we take into consideration the female participation rate and the female unemployment rate (table 9), the picture is less clearcut.

GRAPH 3

<table>
<thead>
<tr>
<th>Participation Rate</th>
<th>Unemployment Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Year</td>
<td>total</td>
</tr>
<tr>
<td>1988</td>
<td>65.3</td>
</tr>
<tr>
<td>1990</td>
<td>/</td>
</tr>
<tr>
<td>1991</td>
<td>/</td>
</tr>
<tr>
<td>1992</td>
<td>61.7</td>
</tr>
<tr>
<td>1993</td>
<td>61.2</td>
</tr>
<tr>
<td>1994</td>
<td>59.2</td>
</tr>
<tr>
<td>1995</td>
<td>57.2</td>
</tr>
</tbody>
</table>

Generalized Lorenz curves for earnings and income distribution

In order to investigate if the distribution of income and earnings during the transformation process is welfare enhancing, we computed two generalized Lorenz curves (Shorrocks 83, Kakwani 84, Thistle 89) for the income and earnings distribution for the same time period considered above. The Lorenz curve is the graph of cumulative income or earnings shares, where individuals are ranked in ascending order. For a finite population $N$ indexed by their income rank so that $y_1 \leq y_2 \leq \ldots \leq y_n$ the Lorenz curve corresponds to the points \( \left( \frac{i}{N}, \frac{\sum_{n=1}^{i} y_n}{Y} \right) \), so that $L_y \left( \frac{i}{N} \right) = \frac{\sum_{n=1}^{i} y_n}{Y}$ with $1 \leq i \leq N$ and where $Y = \sum_{n=1}^{N} y_n$.

But the Lorenz curve provides only a partial ranking of the distribution, its distributional judgment is independent of the size of the income or earnings. For this reason, in order to make comparisons of distributions of various years and therefore with different income and earning mean, we use the generalized Lorenz curve. Shorrocks and Kakwani define the generalized Lorenz curve as the Lorenz curve scaled up by the mean of the distribution: $GL_y \left( \frac{i}{N} \right) = \mu L_y \left( \frac{i}{N} \right)$ with $1 \leq i \leq N$ so that $GL_y \left( \frac{i}{N} \right) = \frac{\sum_{n=1}^{i} y_n}{N}$. The generalized Lorenz curves are usually graphs which enable compare the income or earnings distribution of different populations at the same period to be compared; in our case the comparison is on the same population but at different time periods. For this reason, the income or earning mean by which a Lorenz curve is scaled has been deflated with two 1989 and 1992 deflators, that we use as benchmarks for the comparisons.
From graphs 4 and 5, where we have tabulated four Lorenz curves - two normal Lorenz curves for the years 1989-1992 and two generalized Lorenz curves for the same years - we immediately see that the two normal Lorenz curves for 1989-1992 almost overlap (graph 4), while the generalized one for 1992 lies below the 1989 one (graph 5). This means that the 1989 distribution of income was better in welfare terms than the 1992 one, or that the 1989 generalized Lorenz curve dominates the 1992 one.

If we plot two normal Lorenz curves for the earnings distribution 1989-1995 and two generalized Lorenz curves, we immediately see that the 1995 normal earnings distribution is lower than the 1989 one (graph 6), but if we consider the generalized Lorenz curve for 1995, the 1989 distribution of earnings dominates the 1995 one (graph 7).
In order to assess which deciles of the population have gained more or lost less during the transformation process, we also computed the ratio for every decile of the two generalized Lorenz curves in order to obtain the loss or gain of every decile in percentage terms. The ratio is \( \frac{\mu_\text{1992}^\text{def} S_i}{\mu_\text{1989}^\text{def} S_i} \) where \( S_i \) is the income share of the \( i \)-decile group and the 1992 mean is deflated to the year 1989\(^3\). Obviously, in the case of the earnings the ratio is \( \frac{\mu_\text{1995}^\text{def} S_i}{\mu_\text{1989}^\text{def} S_i} \).

\(^3\) In order to deflate the income and the earning mean we used the consumer prices index (annual average) from 1989 to 1995.
From graph 8 we see that the income loss for every decile varies from 0.23 to 0.27, showing that the loss range is narrow. On the contrary the graph of the earnings loss shows quite a different picture (graph 9). The loss range goes from 37% for the lowest deciles to 4% for the highest deciles. It is interesting to stress that the three highest deciles have the smallest losses, while from the third one onwards the loss becomes more than 25%.

At first sight, there is a contradiction between the two graphs which could be explained by the different survey coverage and by the longer time span of the second graph, which encompasses a period of strong growth of the Polish economy. In order to check our conclusions, we considered two subperiods 1989-1992 and 1992-1995 of the earnings distribution (graph 10).
The earnings distribution for the first period is quite similar to the income distribution for the loss range (24% to 31% versus 23% to 27%), even if this curve is downward sloping, while the other one is upward sloping in the last part. What is really important to emphasize is that the second graph witnesses a great differentiation in the earning losses among different deciles and a loss which decreases for each higher decile. The higher the decile, the lower the loss: in fact the highest decile has a gain of 1.5%.

**Conclusions**

Our general conclusion on the evolution of the pattern of income and earnings distribution is that a substantial change has occurred from 1989 to 1995. The general pattern of both the distributions has very rapidly approached the highest values of Gini coefficient typical of capitalist countries.

This change has occurred very rapidly; in the period 1989-1993 the change was negligible, albeit more pronounced if we take into consideration the earnings distribution. The period of great change is from 1992 onwards during which we observe a real widening of the earnings distribution. There are gainers and losers in this process. White collar workers are clear winners in comparison to blue collar workers, while the female distribution of earnings is widening more than the male one, and the gap between male and female earnings is narrowing.

Using the generalized Lorenz curve, we found a worsening of the economic welfare for the period under consideration compared to the previous one. The really interesting point to emerge from this analysis is that in such a situation the highest deciles have lost less than the lowest deciles and as time goes by they are even gaining: a process that will probably gain momentum as economic growth continues.
APPENDIX

Sources and methodology

In this section we briefly describe the data source and the methodology we used in estimating the distribution of income and earnings. The main sources are: the statistical yearbook of Poland (Rocznik Statystyczny) for earnings and the Polish household budget survey (Budgety Gospodarstw Domowych) for income.

As far as income data are concerned, we based our analysis on the data collected by the Polish household budget survey, which enabled us to study the changing income distribution up to 1992. We could not pursue our study further because in 1992 there was a radical change in the sampling frame and the Polish statistical authorities ceased publishing income bands.

From the Budget Survey we used the information on four types of households:

- Households of workers.
- Mixed households.
- Households of farms.
- Households of pensioners.

Even though the published data refer to monthly net household income, they represent an estimate of the annual incomes of the households divided by twelve. For a comprehensive description of all the sources of household income, we refer to the Polish publication.

The data on earnings collected up to 1995 by the September inquiry on the labour market are published every year by the Statistical Yearbook. The earnings are defined as gross monthly earnings of full time workers, and include base pay plus bonuses, overtime, premiums, compensation for hazardous work conditions, additional payments related to job tenure or holding of managerial position and profit shares. The data on earnings are comprehensive of the private sector firms with more than six employees.

We are well aware of the statistical differences caused by the change of economic systems, and for a detailed description of all the difficulties and shortcomings of the comparison between the two periods, we refer to Rutkowski (96) and Atkinson and Micklewright's book.

As we started our inquiry from the results obtained by Atkinson and Micklewright, we chose the same interpolation frame.
This approach starts from the top two intervals, that are assumed to be Paretian in form, and, working successively down from the top intervals, arrives at the lowest interval assuming that also the density in each interval is Paretian in form.

In order to compute the interpolated values we have used a personal software in MATLAB environment that solves the exponential equations through the Newton-Raphson method. Testing our program on data series already studied by Atkinson and Micklewright, we achieved the same results, thus checking the correctness of our method.

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4 For a more detailed description see Atkinson and Micklewright (1992) or Cowell (1996).
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