5.   THE INEQUALITY OF THE WAGE DISTRIBUTION IN 15 EUROPEAN COUNTRIES [1]

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5.1   Introduction

The distribution of incomes has always played an important part in economic theory as well as in economic policy. In the 18th and 19th centuries the distribution of the national product over the different classes was a major issue. This distribution is knows as the *categorical distribution*. Income shares are calculated as aggregates over all people belonging to each of the socio-economic classes. According to Ricardo, wages, profits and rents are attributed to labourers, entrepreneurs and landowners, respectively. According to Marx the struggle between the bourgeois (profits) and the proletariat (wages) determines the wage rate and the profit rate. So not only the income distribution matters, but also the remuneration or price ratio(s).

In the 20th century the distribution of incomes over persons − be it individuals, tax payers or households − became a major issue: the so-called *personal income distribution*. The income of a person is the aggregate of all the income components of that person. For many persons or households labour income is by far the most important income component. Accordingly it makes sense to analyse the personal distribution of wages only.

In this chapter the wage distribution of the 15 PURE countries is analysed. Strictly speaking we will analyse the distribution of hourly wages. For full-timers the distributions of hourly wages and annual earnings are the same. In our data this is the case for males (for females, also part-timers are included). One of the focuses of the

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[1] This chapter is partly based on PURE work in progress: Jeroen Smits and Joop Odink, *Differences among countries, trends, and decompositions of earnings inequality in 15 European countries*.

analysis is the contribution of education and work experience (or age) to total wage inequality.

5.2   Wage inequality and inequality of the wage distribution

Inequality has several aspects. It is necessary to make a clear distinction between wage inequality based on differences in hourly wages (or wage ratios) and inequality in the distribution of wages. Wage inequality focuses on *wages*, that is, wage differences (prices only). It can be measured using the *wage equation*. For inequality in the distribution of wages, both prices and quantities, resulting in income shares, matter. For the measurement of wage distributions *inequality indexes* could be used.

The following example further illustrates the difference between the two approaches. In a society with low-educated people earning 10 per hour, and high-educated people earning 20 per hour, the wage ratio is 2 irrespective of the population share of the highly educated. The inequality of the wage distribution, in contrast, will (in principle) be the higher the closer this population share is to 50%!

In the PURE project the wage equation has been the centre piece of the analysis. It is used to examine the rate of return on investments in education. An example of the wage equation for the Netherlands in 1996 is:

$$lnWage = 1.583 + 0.063 \, Schooling + 0.326 \, lnExperience - 0.132 D_{Female} \qquad (R^2 = 0.531)$$

The wage equation thus also produces information about wage inequality: wages and wage ratios according to education, experience (or age), gender, etc. According to the estimated wage equations for the 15 PURE countries, about 25% to over 50% (e.g. 53.1% for the Netherlands) of the observed differences in hourly wages can be attributed to years of schooling, age or years of work experience, and gender. All coefficients are highly significant with all standard errors being exceptionally low. According to the Dutch wage equation, the hourly wage increases by, on average, 6.3% with each additional year of schooling, while the wage rate at 10 years' experience rises with 3.3% for one additional year of experience. The hourly wage of females is, ceteris paribus, about 13.2% lower than for males.

5.3   Income inequality coefficients

There has been a great variety in *income inequality coefficients* throughout the economic literature. The choice of a measure has always been a tricky question. Also in several fields of economic analysis the choice of the right measure is a difficult question, for example the choice of a CPI. As the income distribution is an emotional subject, many papers have been written about the merits and shortcomings of the different inequality indexes. However, almost all authors agree about three basic axioms (postulates, criteria) that a decent index or coefficient should fulfil. Specifically, the index *(I)* should fulfil the criteria of *homogeneity, symmetry, and Pigou–Dalton*. Homogeneity implies that if all incomes are multiplied by the same constant, *I* does not change. An important consequence is that *I* can be expressed as a function of income shares only. Symmetry means that a change of income between two persons does not effect inequality. According to *Pigou–Dalton* (see Kakwani 1980) a transfer from a high income to a low income will reduce the inequality index.

Most of the existing indexes do not satisfy these criteria. However, a few well-known remain: the Gini index, the Theil index and Theil-related indexes, and the coefficient of variation. The Gini and Theil indexes typically have been developed for income inequality measurement, while the coefficient of variation is a general statistical measure.

If an additional criterion was added, only a few or even none of the indexes would remain. Kakwani (1980) adds measurement in a 0–1 scale as an additional criterion, which is met only by the Gini index. Foster (1983), in turn, proves that only Theil-related indexes combine the three aforementioned criteria plus the *additive decomposability criterion*. Additively decomposable means that the index is equal to the inequality between different groups plus the sum of the weighted within-group inequalities.

$$I = I_{\text{between groups}} + \Sigma w_i * I_{\text{within groups}}$$

As decomposability is an important aspect in our analysis, we choose to use the Theil indexes. Because in our data the criterion of Pigou–Dalton is not violated for the variance of the log income, which is also a decomposable index, this measure is adopted as well. Moreover, Theil (1967) proves that, if the distribution is log-normal, the Theil index is equal to half the variance of log incomes.

The results for three different inequality indexes of the wage distributions in the 15 PURE countries are shown in Figure 5.1.

Figure 5.1. Theil T, Theil N, and Variance of log income on the basis of hourly wages for the 15 PURE countries around 1995
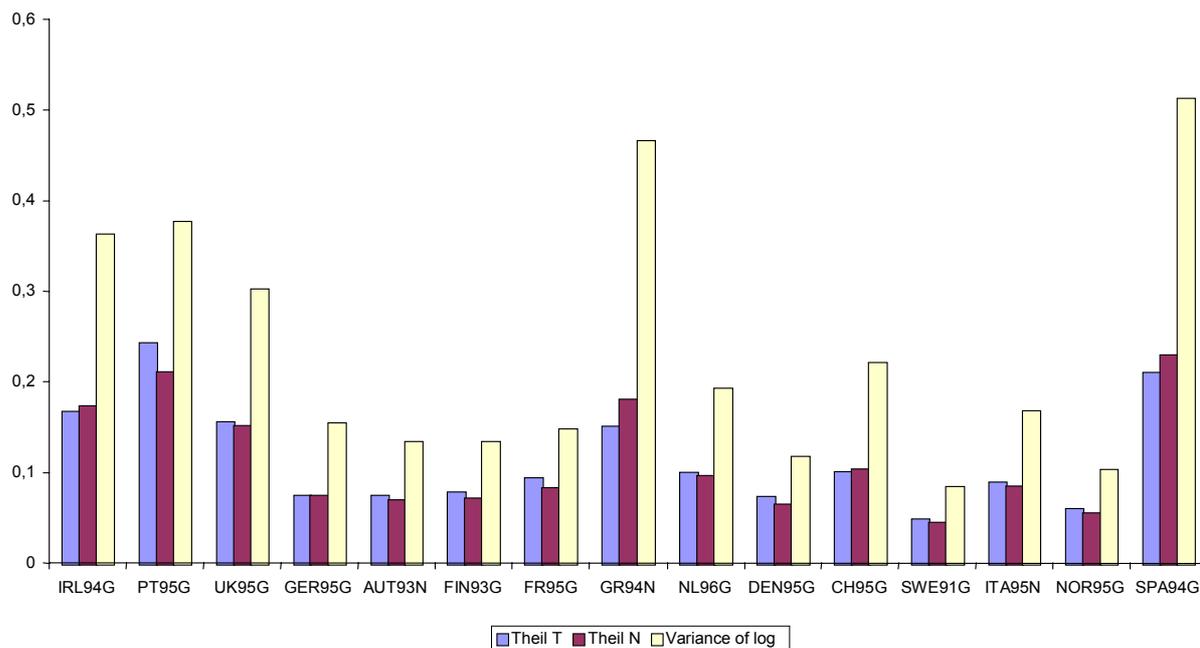
The main conclusions that can be drawn from the figure are:

❑ The differences between *Theil T* (using income shares as weights) and *Theil N* (using population shares as weights) are for all countries relatively small.

❑ The *variance of the log incomes* measure is about twice as large as Theil T.

❑ Spain, Greece, Portugal, Ireland and the UK are by far the most unequal countries with respect to hourly wages.

❑ Sweden is the most equal one.

As a consequence of the first and the second conclusion we shall concentrate on *Theil T* in the remainder of this chapter. When decomposing the index according to gender,

education, age, and a composition of these three variables, a total of four different between-group inequalities can be calculated. In Figure 5.2 those four between-group inequalities are expressed as a percentage of total inequality for each of the 15 PURE countries.

Figure 5.2. *Decomposition of Theil T according to gender, education, age and a combination of the three variables for the 15 PURE countries, percentage of total inequality*
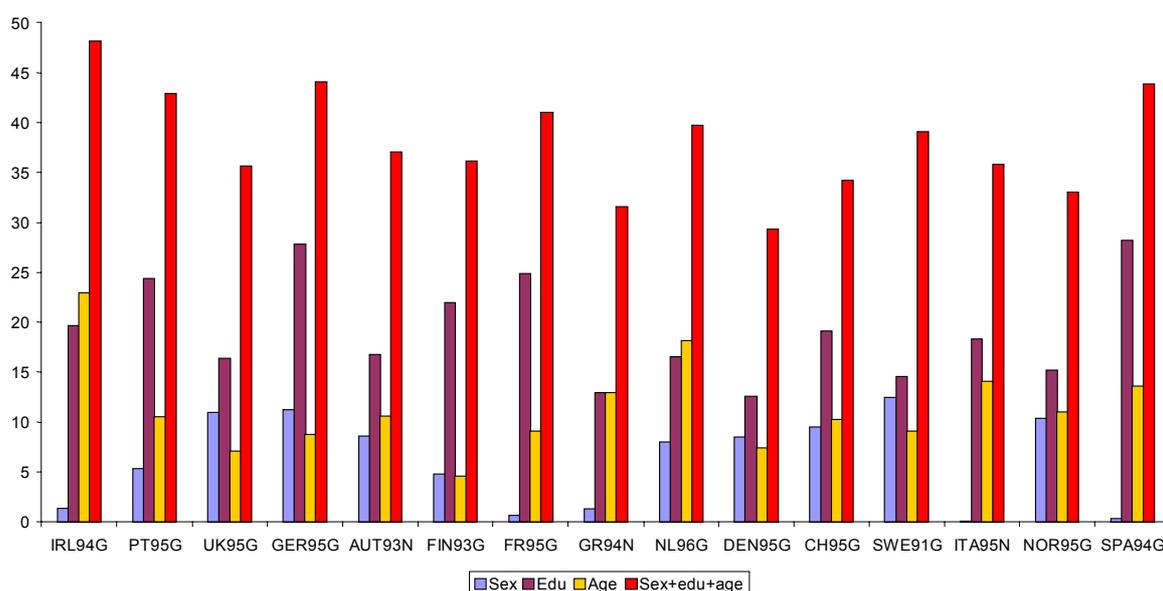

The following conclusions can be drawn from Figure 5.2:

❑ The combination of sex, education and age stands for about 30% to 50% of total inequality; Ireland with 48% being the highest and Denmark the lowest (28%).

❑ The sex effect varies heavily; from almost nothing (France) to over 12% (Sweden). However, this outcome might be influenced by the composition of age and gender.

❑ In Ireland and the Netherlands, age is more important than education; in almost all other countries the reverse is true.

In Figure 5.3, the wage distributions of males have been further analysed by adding various variables to education and age: regions, part-time vs. full-time, occupation, private vs. public sector, and manual vs. non-manual labour.

Figure 5.3. Decomposition of Theil T of males according to education, age, and combinations of education and age with region, private sector, manufacturing, and manual/non-manual occupation in the 15 PURE countries, percentage of total inequality
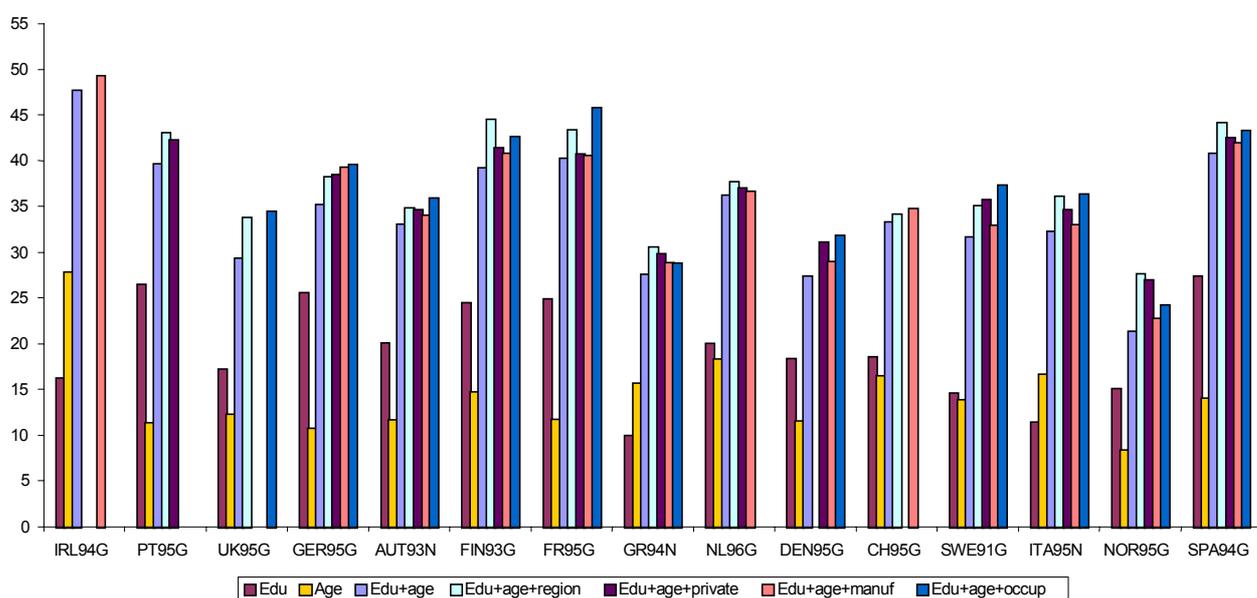
We can conclude that:

❑ Adding more variables (region, part-time, occupation, sector, etc.) does not substantially increase the share of between-group inequality in total inequality.

❑ Accordingly gender, education and age/experience are the top three components of income inequality between wage earners.

So far a static situation has been analysed. One of the main characteristics of the labour market in the second half of the 20th century is the increased schooling of the working population. According to the demand and supply models, one might think that wage

inequality has therefore been reduced substantially. There are, however, forces that work in the opposite direction.

Figure 5.4   Trend of Theil T for males in the 15 PURE countries

Not only has there been an increased supply of higher educated people, but also an increased demand in the labour market for such skills. Wage differences decrease only if this "race between technological development and education" (Tinbergen 1975, Ch. 6) is won by education. Since the eighties the rate of return on investment in education has been more or less constant in most PURE countries.

As long as wage ratios are constant, an increase in the population share of highly educated from a low level to a substantial level will increase between-group inequality (see above). Furthermore, within-group inequality is generally highest in the groups with the highest wages. As the shares of these groups are increasing, the weighted sum of the within-group inequalities will rise as well. Therefore we see in Figure 5.4, which shows the trend in wage inequality for 14 of the 15 PURE countries, that for most of them wage inequality has been increasing since 1980.

5.4   Some consequences for incomes policies

Three main groups of wage differences with respect to different political issues can be distinguished:

❑   compensating differences

❑   differences based on productivity differentials

❑   differences based on imperfect market conditions.

For *socialists* there is no problem if wage differences compensate for differences in effort or in the quality of the work (dirty, unpleasant). Wage differences based on productivity differences, in contrast, might be interpreted by them as being unfair. *Liberals* are in favour of good functioning markets. They will argue that productivity differences should be reflected in wages. If not, serious inefficiencies might be the result. *Both socialists and liberals* are in favour of elimination of differences based on imperfect market conditions. Therefore, in many countries the *equity efficiency trade-off* is a major political issue.

What about wage differences related to the big three: differences in education, experience or age, and gender? If the rate of return on investment in education reflects

the reference discount rate (e.g. a market interest rate corrected for (wage) inflation, uncertainty and the quality of the job), then we might argue that education-induced wage differences are compensating differences. Differences in experience reflect work done in the past, implying that those differences might be interpreted as a compensation for this past effort.

Lifetime wage incomes can be calculated by discounting wages over time. If the rate of return on investment in education happens to be the discount rate, then the differences arising from education and (calculated) experience will disappear out of the distribution of lifetime wages. The same is true for age-induced differences.

So far we have been working with age differences and not with differences in (estimated) experience. However, in groups with equal age and education the calculated experience will also be the same. We can therefore state that the education-related wage differences found in the PURE data sets largely reflect one-third to one-half of wage inequality whether measured by indexes or by wage equations. A substantial part of those differences might be interpreted as compensating wage differences.

This result, however, does not mean that there is no task for the policy makers. The race between technology and education has not ended yet. The demand for higher educated workers continues to grow. The important task of the government is to stimulate education. If the supply side lags behind demand, this may lead to increased inequality, and also to problems between supply and demand that might generate substantial unemployment.

Furthermore, the differences due to gender are substantially smaller than the differences in mean wages between genders. However, the resulting differences will probably still not be acceptable to politicians.

References:

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