

The Econometrics of *Dynamics of Inequalities and their Perception*

The aim of this document is to precise some aspects of the econometric techniques and data analysis that are part of the global project DynIPer.

1 Introduction

While income inequalities may seem constant over time (at least when we exclude crises), a dynamic analysis reveals that social mobility undergoes large and asymmetric movements. A transition probability matrix, estimated on UK panel data, shows that very poor and very rich households have a high probability of remaining in their initial position while social mobility concerns mainly intermediate categories. Traditionally, social mobility is seen either as a risk or as an opportunity. The question is then whether there is equality of opportunity in a society. The relation between objective mobility and perceived mobility has been discussed only very rarely because it involves two types of variables that are very different. Income mobility is measured using continuous variables with well defined models. Perceived inequalities and perceived mobility are measured using questions based on a Cantril scale, which means the creation of ordinal and ordered categorial variables. It is not an easy task to relate the two, especially in a dynamic setting.

The econometric part of the project can be divided into three main categories. First, it requires the use large data sets where individuals or households are surveyed regularly over time in order to be able to study dynamics. Second, the analysis of this type of data is based on particular econometric techniques which we intend to develop from a theoretical point of view. Third, well-being questions produce ordered categorical data which cannot be manipulated with the usual tools.

2 Global objectives

2.1 Context, social and economic issues

A dynamic investigation can unveil facts which remain hidden in a cross section analysis. Let us take the example of the British situation to illustrate this starting point of our project. In his presidential address to the European Society for Population Economics, Jenkins (2000) underlines that the income distribution in the UK has experienced great changes during the eighties, but that since 1991, this distribution seems to have remained relatively stable. If the poverty line were defined as half the mean income, the percentage of poor households would remain relatively stable, while if it were defined as half the mean of 1991 in real terms, this percentage would steadily decrease. Looking at the extent of inequality, the Gini coefficient is found to be extremely stable around 0.31-0.32 over the period. These figures suggest a certain degree of cross-section stability in the income distribution.

However, since 1991, the UK has collected the British Household Panel Survey (BHPS). This means that the same households are interviewed every year. It then becomes possible to study income dynamics. Jenkins provides an estimate of a transition matrix between income groups at a distance of one year. It represents the estimated probability for an individual belonging to one group in year t to move to another group the next year. These groups are defined by reference to a fraction of the mean income, a fraction taken between 0.5 and 1.5. In Table 1, we have re-estimated this matrix

Table 1: Transition probabilities in percentage

Income group	Period t					
	< 0.5	0.5-0.75	0.75-1.0	1.0-1.25	1.25-1.5	> 1.5
Period $t - 1$						
< 0.5	54	30	9	4	2	2
0.5-0.75	15	56	21	5	1	2
0.75-1.0	5	19	48	20	5	3
1.0-1.25	3	6	20	44	20	7
1.25-1.5	2	3	8	25	35	27
> 1.5	1	2	4	6	12	75

where the rows represent groups in wave $t - 1$, and the columns groups in wave t . This transition matrix is quite illuminating. First of all it clearly shows why the study of the dynamics of inequality is of interest. Society is not rigid; households are moving between groups. And this despite the fact that the Gini coefficient remained roughly the same over the period of estimation. Mobility becomes apparent when considering panel data sets. The second key point in this matrix is that the probability of moving between groups is not uniform. When you are in the two poorest groups, there is a larger probability of staying in the same group ($\simeq 55\%$) than moving upwards. Conversely, when you are in the richest group, the probability to stay in that group is even much larger (75%). The picture in between is more diverse. But however, there is a larger probability to drop in a lower group the next period than to climb up in a higher group.

Do individuals have a clear perception of inequalities and of their dynamics? Do they evaluate correctly their chances of moving up or moving down? Have they a correct perception of the income distribution and of their own position within that distribution? What is the influence of their perception on their well-being? Different world wide data bases are available concerning opinions and values. The BHPS already contains questions on well-being, but very few concerning the individual perception of inequality. We have to resort mainly to the *International Social Survey Program* (ISSP) and in particular to the *social inequality programme* that was undertaken in 1987, 1992 and 1999. The last wave was run in 2009 and is now available. Of course these surveys are not panel data, but there are questions on the family origin of the respondents, so some kind of long term dynamic analysis can be conducted with these data.

In the above transition matrix, we have defined groups with reference to the income level. When making comparisons, groups are defined by reference to other variables like education, age and region. This definition of a reference group allows one to study income inequality within groups and between groups. Inequality can be seen as a chance, an opportunity of getting a better job. Or it can be

regarded as a risk and finally as a lack of justice. Philosophers have discussed at length these two notions, with in particular Rawls (1971) who underlines that in order to be able to redistribute toward the poor, there must be something to redistribute. Efforts and qualifications have to be rewarded. Some existing econometric studies (see e.g. Clark (2006)) indicate that inequality has a positive influence on well-being when measured inside a reference group, thus promoting the idea of inequality as a chance. However, the influence of inequality between groups on well-being has not been appraised up to now. As well as the influence of the position of the individual within his reference group and the perception of his position. Maurin (2009) shows that in France there is a large discrepancy between actual declassification probabilities and the fear that individuals have of being downgraded. A dynamic analysis using panels data should distinguish these important different aspects which in fine determine collective well-being. And of course international comparisons are needed.

2.2 State of the art

The starting point of the modern literature on income inequality measurement is the paper by Atkinson (1970) where a measure of inequality is derived from a social welfare function. The social welfare function $W(\cdot)$ has the whole income distribution as an argument. Following this paper, a branch of the literature was devoted to the axiomatic construction of inequality indices and welfare functions. All these inequality measurements are based either on the observed income distribution or the observed distribution of consumption. This is a univariate characterisation of inequality. Recent econometric papers in this domain, devoted to the comparison of income distributions, involve for instance Davidson and Duclos (2000), Davidson (2009), Cowell and Flachaire (2007) or Davidson and Flachaire (2007), who are members of the team.

With van Praag (1971), we have the first consistent evaluation of an individual welfare function based on income perception and individual characteristics. The individual is able to evaluate his income level on an ordered subjective scale, or in other words his welfare position. The income evaluation question (IEQ) is central to this work. These evaluations follow a log normal distribution in individual income y_i with parameters μ_i and σ_i . σ_i is found to be fairly constant and mainly country specific while μ_i can be explained by family size and actual income. Using a Belgian consumer survey, van Praag (1971) has estimated individual utility functions $U(y_i)$ which have as an argument the individual income and not the whole income distribution. The fact that the subjective evaluation of the income distribution varies with individual income is called the preference drift (what is felt to be a low income will be different for a worker and for an executive). We note however that all subsequent work on subjective well-being evaluation is essentially of an empirical nature and that there is no axiomatic construction similar to that existing for observed income inequality measurement.

Individual preference drift has an immediate consequence at the macro level: this is the famous Easterlin (1974) paradox. In short, GDP per capita has increased over the years in all developed countries while mean satisfaction as reported in international surveys has remained fairly constant. Many explanations have been proposed for this paradox, the major one being that of the choice of reference groups, see e.g. Clark et al. (2008). Individuals compare themselves to their reference group. What is important is their relative position in their reference group and not their absolute income. In most empirical studies, the reference income appears with a negative sign which means that individuals are negatively affected by their position in the reference group. The reference group can be mainly defined in term of human capital (people with the same human capital stock). However, extensive research has been undertaken in order to determine more precisely the composition of the reference group and in particular the recent paper by Clark and Senik (2010).

The perception of inequality and its influence on the individual well-being has received far less

attention in the literature. In an unpublished paper, Clark (2006) found unexpectedly that individual welfare is positively affected by within group inequality. This result should be related to the wider debate that exists in the literature, starting with Rawls (1971), about the representation and the meaning of inequality. Are inequalities just or unjust? Can inequality be seen as an opportunity for social mobility? Or are people constrained by their initial conditions, roughly speaking their initial level of education? This first result of Clark (2006), confirmed by our own investigations using more recent British data, would favour this last interpretation. But for the while no empirical results are available concerning between group inequality. A partial answer can be found when inequality is measured within a region but not within a reference group based on human capital. For instance, using the GSOEP, Schwarze and Harpfer (2007) found that Germans are inequality averse, using different measures of inequality and a panel structure.

When considering other data sources such as surveys entirely devoted to opinions and values, we can have a direct information on the perception of inequalities. Several studies have been devoted to the analysis of these data such as the book by Forsé and Parodi (2007) and the more recent one by Forsé and Galland (2001). The paper by Piketty (2003) is particularly important as it is related to the theoretical model of social mobility analysed in Piketty (1995) or in Benabou and Ok (2001). These empirical results show that the perception of the income distribution is far from exact, that individuals are not in favour of large wage differentials, but that effort should be rewarded. However, no attempt is made to link this to the previous literature and in particular no relation is established between the reference group theory and the subjective perception of inequality, except perhaps in Clark and Senik (2010).

The capabilities approach of Sen (1993) suggests that poverty and inequality have non-monetary characterisations, for instance the access to the credit market or saving opportunities. More generally, evaluating capacities or capabilities consists in exploring a bunch of possible deprivations, of answering simple questions on a yes-no or more elaborate scale such as *do you manage to heat your house?* All those variables again cover the category of self-reported questions which find a non-monetary measure in official surveys. These deprivations might be more important when the household stays in a state of low income, see again the estimated transition matrix displayed above. Household surveys are particularly useful in capturing this multidimensional aspect of poverty, the association between low income and deprivation in the possibility of repairing the house, holidays once a year, housing facilities, neighbourhood problems, segregation, to quote a few examples. Having the capability to achieve basic functioning is the source of freedom to live well and has to be evaluated as so, independently of the level of income. The capability approach of Sen puts a considerable value on the freedom of choice. It might become a major ingredient in explaining the dynamics of poverty spells, the chances of climbing the social ladder versus the odds of getting down and the persistence that the rich have to stay in the upper class.

The followers of van Praag (1971) assume that all individuals use the same scale to evaluate the income distribution (what is a fair income). At the time of van Praag (1971), panel data were not available and so it was not possible to identify individual effects in simple well-being equations. Ferrer-i-Carbonell and Frijters (2004) demonstrate the fact that individual effects can have a tremendous influence on the estimation of well-being equations. These effects become identifiable as soon as we have panel data which started to become available in the nineties in Europe. The problem remains however of how to interpret these individual effects. Boyce (2010), using the German data of the GSOEP shows that 20% of the fixed effects can be explained by individual psychological features such as optimism, willingness to help others and so on. The GSOEP contains many variables which are directly related to individual psychology. The precise measurement of individual effects is also in question when choosing between fixed effects and random effects, the main difference being the

correlation assumed between residuals and individual effects. A Mundlak (1978) correction leads to a model with mixed properties.

Jenkins (2000) was one the first to stress the importance of studying income dynamics in order to measure income mobility. Of course the availability of panel data is essential for this purpose. We already mentioned the estimation of a transition matrix between income groups. Concentrating on earnings and wages, Lillard and Willis (1978) introduce a specific econometric model which allows one to decompose earnings between a permanent and a transitory components. They then compute the probability of falling into poverty using the American PSID. Stevens (1999) compares this model to various other specifications and in particular studies the length of poverty spells. These models are based on either observed wages or observed income. They should be compared to subjective perception of poverty risk and estimated together with a subjective financial ease equation.

Earnings, income, consumption are continuous variables which are treated with standard panel econometric models. The normality assumption for the error terms is questionable, but in general does not cause serious limitations. On the other hand, models explaining answers to subjective questions treat dichotomous variables which are converted into numerical variables on arbitrary ordinal discrete scales between 0 and 5, 0 and 7 (BHPS) or 0 and 10 (GSOEP). van Praag (1971) makes the heroic assumption that the distance between 1 and 2 is the same as the distance between 2 and 3 and so that a cardinalisation is possible. Ordered probit models usually do not rely on this simplification, but nevertheless are based on an implicit cardinalisation which relies exclusively on a normality assumption. This assumption is highly questionable. For instance Stewart (2004) has proposed an ordered probit model which generalises the usual Gaussian assumption by considering a semi-nonparametric estimator based on a Hermite form which approximates an unknown density as the product of Gaussian density times a squared polynomial. With this model, a job satisfaction equation can present a quite different life cycle and health status influence. And the estimated distribution is shown to be far from normal.

2.3 Three main themes

The project is centered on the dynamics of economic inequalities and their subjective perceptions.

1. *Adequate econometric models* The first objective is to contribute to the statistical treatment of ordinal data in the panel dimension. Many relationships relating covariates to the the ordinal endogenous variable are non-linear because for instance there are threshold values. Or simply because the relation between one variable and life satisfaction is highly non-linear. We have in mind the reference income. Usual ordered probit models with a panel dimension do not allow for non-linearities and in particular a non-parametric treatment of partial non-linearity. We intend to fill this gap when undertaking the empirical analysis. As already underlined, ordered probit models rely on a implicit assumption of cardinalisation. These models predict rather badly because they do not manage to correctly reproduce tail behaviour of the ordered responses. Moreover, individuals have a tendency to answer in the middle of the scale, creating a bias because an average answer might most of the time correspond to a “don’t know” answer. A proper treatment of these two effects is necessary and will be part of the project for instance on the lines of Gouret (2011).
2. *The treatment of ordinal variables.* When stating the Easterlin paradox, a mean value of happiness is computed for a country. However, computing such a mean has no real meaning because the variable considered is measured on a ordinal scale and not a cardinal one. Other measures have to be found for characterising well-being and inequality with such variables. We have to

propose a new way of evaluating individuals' status in such situations, based on their position in the distribution of the considered variable. We have to develop axiomatically a new class of inequality indices, conditional on a reference point. In this context, we can re-examine the merits of the mean, the median and the maximum status as reference points. This approach can be also applied to perceived health status and reported happiness.

3. *The individual perception of social mobility and subjective poverty.* Socio-economic surveys contain self-reported variables that help to understand the subjective perception of inequalities. In terms of the veil of ignorance, which category of individuals see inequalities as a risk and which category see inequality as an opportunity? The ISSP social inequality programme allows one to describe the subjective perception of the wage scale, eventually to evaluate the desired level of inequality and to determine what are the accepted determinants of wages. At least for Germany and the UK, it is possible to study the evolution of these perceptions and more recently for France as the 2009 wave is now available. The strong point of panel surveys relies on the presence of substantial self reported data that are related to the deprivation of capacities and thus allow a comparison between the contractual approach of Rawls (1971) and the capacity approach of Sen (1993). The measurement of social mobility can be examined firstly with the ISSP data as there are questions on social origins. However this measurement needs fundamentally the use of panel data, even if a large panel survey contains less information on subjective representations. What are the socioeconomic determinants of social mobility and how are these determinants and possibilities perceived by individuals? How is this mobility and immobility reproduced and maintained, in particular when considering the state of poverty? How can we characterise poverty persistence?

3 Scientific and technical programme

The project is organised around a common thread: *The individual perception of inequality and social mobility* using European comparisons.

Socio-economic surveys contain self-reported data that help to understand the subjective perception of inequalities. We allude here in particular to the *social inequality programme* of the ISSP. These data help to discuss several economic and philosophical questions and to obtain some answers. They are however not sufficient in order to investigate fully the question of social mobility which requires the use of panel data as explained in the introduction. Our project is thus divided into five parts: the gathering of large data sets, the building of adequate econometric models, the treatment of ordinal data, the perception of income inequality, the perception of income mobility.

3.1 Data availability

Our research programme will rely extensively on the availability of panel survey data in order to study and illustrate dynamics. Enormous progress has been made in the last decades in the availability of these panels. However, the situation is not uniform over European countries. There is a large asymmetry between the UK and Germany on one side, countries that have a long tradition of collecting panel data with the BHPS and GSOEP, and France on the other side for which we have only access to the now discontinued ECHP, recently replaced by the EU-SILC.

The BHPS (British Household Panel Survey) covers the period 1991-2009 and is freely available after registration. This data set contains more than 6,000 representative British households. Its

main objective is to identify and understand social changes. It thus contains the usual basic socio-demographic variables such as income, transfers and family composition, but also a wide variety of poly-chotomous variables that are indicators of either capability deprivation or subjective well-being. During the waves 7-11, the BHPS also provided data for the European Community Household Panel (ECHP).

The German Socio-Economic Panel (GSOEP) started in 1984. Its coverage is more important than that of the BHPS as it contains about 12,000 households. The objective is the same as the BHPS. It covers household composition, occupation, employment, earnings, health and life satisfaction questions. There is a strong cooperation with among others USA and Great Britain so that it is possible to obtain a common data set including the PSID, the BHPS and the GSOEP. The GSOEP is the important data set that contains the Income Evaluation Question (IEQ) of van Praag.

The European panel (ECHP) was an initiative launched by the European community which started in 1994, but ended in 2001. The UK and Germany were part of it as well as France. It is still available to researchers via the data archive at the university of Essex. It is the only means of undertaking European comparisons. The ECHP was replaced by the statistics on income and living conditions (EU-SILC) covering 25 European countries and launched in 2003. The full CD-ROM covering 2004-2008 cost 3750 euros and is available through Eurostat. French data are available only through the ECHP and the EU-SILC.

Panel surveys can be complemented by general surveys which also cover individuals, but the same individual is not followed over the years. These surveys data cover more specific aspects of well-being such as wealth data (LWS), collective representations and opinions (ISSP and WVS) or schooling performance (PISA).

The Luxembourg Wealth Study (LWS) follows the Luxembourg Income Study. It was made available in 2007 and covers only a limited number of European countries, including the UK and Germany, but excluding France. Besides wealth data, it contains additional self-reported variables such as risk-taking and risk attitude. Precisions can be obtained on their web site:

<http://www.lisproject.org/lwstechdoc.htm>.

While the large European panel data sets contain individual reported variables, they are not precise enough to conduct studies on collective representations of inequality and social mobility. The US General Society Survey (GSS), which began in 1972. It aims at monitoring societal changes and the growing complexity of the American society. Since 1985, the GSS took part in the International Social Survey Program (ISSP) which covers 47 countries. The ISSP contains standard demographic information and attitudinal or self representation questions. Different programs were conducted by the ISSP. Of direct interest to us is the *social inequality programme* that was activated in 1987, 1992 and 1999. The last wave was run in 2009 and is now available as announced on the ISSP web site: <http://www.issp.org/page.php?pageId=168>. France entered that programme only in 1999 and conducted interviews over 189 persons. The 1999 questionnaire covers inequality perception, the perceived existing wage scale contrasted with what a fair wage scale should be, fair taxation, education perspectives, fair income distribution, and traditional socio-economic variables such as income and family composition. This data set was used for instance by Forsé and Parodi (2007) to explore the sentiment of justice.

The ISSP is maintained at the Leibniz Institute for the Social Sciences

<http://www.gesis.org/en/services/data/survey-data>.

On the same site is available the The Mannheim Eurobarometer Trend File 1970-2002. This data set covers 32 annual cross sections where harmonised questions were asked concerning individual attitudes to the European Union and diverse other political or economic attitudes.

The World Values Survey is another statistical source for collecting opinions. The World Values Survey is a worldwide investigation of sociocultural and political change. It is conducted by a network of social scientists at leading universities all around the world. It aims at studying changing values and their impact on social and political life. It has produced evidence of gradual but pervasive changes in what people want out of life. It started in 1990 with the European Values Survey group and continued as the World Values Survey on a five year basis with questionnaires in 1995, 2000, 2005, 2010-2012, covering 56 states in 2005 which is the last available data set. It contain similar questions as the ISSP.

The Programme for International Student Assessment (PISA) is an OECD international survey which aims at quantifying the performance of 15-year old teenagers in schools. Four waves of data are available since 2000 and correspond to between 4,500 and 10,000 students in each of the participating countries. The survey is not a panel, because students of the same age are surveyed in each wave. It aims first at quantifying the performance of students in different fields and at allowing international comparisons and second at relating these performances to the socio-economic background of the students. This survey is thus useful for studying the equity in learning opportunities. It was used for instance in Micklewright and Schnepf (2007).

3.2 Adequate econometric models

The data set we can use to investigate *the dynamics of inequalities and their representations* have two main characteristics. They belong to panels in order to be able to study dynamics and they involve categorical data.

Self-reported data imply a rather specific type of econometric model. Income is measured on a continuous scale, even if the surveys might contain questions expressed in discrete ordered classes. In contrast, self-reported data (opinions) are reported on an ordinal scale usually called a Cantril scale which results in ordered items on a discrete scale like 1 to 5 or 1 to 7. We assume that they are related to an unobserved variable like well-being or financial satisfaction which is regarded as being continuous and can be estimated. The general class of models involved is *item response models* with polychotomous outcomes. Ferrer-i-Carbonell and Frijters (2004) provide a good survey of these models. They rely on a set of assumptions that it is useful to recall:

- A1 the discrete responses R_i are related in a positive way to an unobserved individual level of satisfaction W_i ,
- A2 the unobserved level W_i can be explained by a set of observed individual variables X_i ,
- A3 individual levels of satisfaction W_i and W_j between two individuals i and j can be compared in an ordinal way,
- A4 individual levels of satisfaction are cardinally comparable.

Depending on the assumptions we are prepared to make, various solutions are possible. Assumptions A1 and A2 are mandatory. Using a simple regression model based on OLS requires A4. Usually, A4 is considered as unrealistic, even if OLS is the preferred model for psychologists. A3 is the usual assumption and it implies the use of ordered logit or probit models, mainly used by economists. The

difference between $W_i = 5$ and $W_j = 4$ may well not be the same as the difference between $W_i = 3$ and $W_j = 2$. Thresholds have to be estimated (three thresholds in the case of a five items question). A3 assumes that the thresholds are identical between individuals and remain constant over time. When using panel data, A3 can be relaxed by introducing individual random effects.

This is the current state of the art. However, two kinds of problems arise very quickly. When studying for instance the question of the reference income, a problem which has been widely investigated in the literature, it is clear that the reference income enters a satisfaction equation in a non-linear way. Up to now, the literature has proposed only linear ordered probit models using panel data. New econometric tools are needed to open the way for modeling non-linearities, in particular in a non-parametric way.

More fundamentally, the unobserved levels of utility, the W_i are assumed to be normally distributed and more generally to have a symmetric distribution. When we check the fit of these models, we find that they predict well for mid-range answers, but that their prediction performance is poor for the tails. This seriously brings into question the normality assumption for underlying utility levels. This serious question can be tackled at different levels:

1. The normality assumption of the W_i can be relaxed, first by considering a Student distribution with the assumption that the number of degrees of freedom is identifiable. This could solve the question of the lack of good prediction in the tails. Asymmetry can also be introduced using the skewed Student distribution of Fernandez and Steel (1998).
2. Individuals have a tendency to give answers in the middle of the proposed scale, thus creating a bias of centrality. How to estimate this bias and how to take it into account in a ordered probit model is still an open question, even if a partial answer has been proposed by Gouret (2011).

3.3 The treatment of ordinal variables

The relationship between life satisfaction and income has been studied extensively in the literature. In a seminal paper, Easterlin (1974) shows that, for a given country, people with higher incomes are likely to report higher life satisfaction, whereas for cross-country comparisons and for higher income countries, the average level of life satisfaction does not vary much with higher income. This is known as the Easterlin or happiness-income paradox. The use of the average of an ordinal variable such as life satisfaction, implies that a linear cardinalisation is assumed. The main question is whether the results are sensitive to the choice of the linear scale. Preliminary investigations show that the choice of another scale, such as an exponential scale, produces very different results. Indeed, no link between life satisfaction and income appears and, thus, there is still no Easterlin paradox. Such sensitivity suggests that we need tools and measures that are robust to the choice of cardinalisation.

The standard theory of inequality measurement assumes that the equalisand is a cardinal quantity with known cardinalisation. However, one may need to make inequality comparisons where either the cardinalisation is unknown or the underlying data are categorical. Why is there a problem with ordinal data? Although we can use a small number of standard tools from distributional analysis, several key concepts are not well defined. For example the mean will depend on the particular cardinalisation that is used and so there is no meaning to points in a simplex. Therefore we cannot implement something like the Principle of Transfers. The literature on inequality in happiness, health and so on contains a number of work-rounds that address this problem but none of these work-rounds is entirely satisfactory. In some cases, first-order dominance criteria have been applied and quantiles have been used to characterise inequality comparisons. But difficulties can arise even with these methods, see Abul Naga and Yalcin (2010), Allison and Foster (2004).

We need to construct a fully-edged approach to inequality measurement with ordinal data. The key issue of the sensitivity to any cardinalisation can be handled by considering the individual's position in the distribution rather than the individual's income itself. In the case of categorical data, it leads us to consider the number of individuals in a category who are better off than those in the same category as individual i . In this project, we plan to develop an axiomatic discussion based on the individual's position to define appropriate inequality measures in the presence of ordinal data. We will have to treat two main issues:

1. The Principle of Transfers: In standard approaches to inequality measurement the transfer principle plays a central role; but in its pure form it is clearly not relevant here. The problem is that the transfer principle is simply inappropriate in the presence of ordinal data because there is no natural compensation to consider. However, we will examine whether it might apply in a modified form.
2. The reference point: In standard approaches to inequality measurement the mean is used as a reference point. Inequality indices measure the distance between the empirical distribution function and an egalitarian distribution, where each individual receives the mean income. With ordinal data, the role of the mean is not so clear and we will consider the median and alternative reference points.

Once some inequality measures are well-defined, we will have to study their statistical properties and to show their usefulness in practice, with access to amenities, reported happiness and perceived health status empirical studies.

3.4 Income inequality perceptions

Are inequalities perceived as a risk or as an opportunity? According to the answer, they have to be compensated or not by an adequate redistribution. Piketty (1995) relates subjective attitudes towards inequality to the level of income and the perception of social mobility. Individuals with a high income have a tendency to believe that efforts have to be rewarded and thus have a tendency to be less in favour of redistribution which is thought to have a disincentive effect. Piketty (2003) uses a French survey undertaken one year before the availability of the 1999 wave of the *social inequality programme* of the ISSP. He found a negative income bias in the attitudes toward redistribution. But this negative bias is smaller in France than in the US and moreover tends to be smaller when other variables are introduced. Political orientation plays a minor role just because left and right wing voters have similar incomes. The *right - left* opposition seems to be more concerned by the dimension *liberalism vs authoritarianism* than by the importance of redistribution.

The data contained in the *social inequality programme* of the ISSP allow one to answer many more questions. The attitude toward redistribution is related to the question about which type of inequality has to be compensated and in particular what are the perceived justifications for wage differences. Forsé and Parodi (2007) found, using these data and mostly with descriptive statistics, that existing inequalities are strongly underestimated, at least for high incomes and that in general the existing wage scale is widely accepted (when very high income professions are excluded). We have to measure exactly the relative importance of accepted wage determinants like physical difficulty, length of education, experience, responsibility and risk management or more crudely family needs, using more advanced econometric techniques. The sentiment of justice arises from the difference between the actual wage and the wage that the individual thinks he should get for his qualification or needs. Exploiting the questions asked in the newly released wave of the *social inequality programme*, we aim

to explain this sentiment of justice with reference to a series of socio-economic variables and relate it also to other questions about satisfaction. Since 1999, there has been a large increase in inequality, first noted in the UK and more recently after a major economic crisis. The new 2009 survey could produce ostensibly different results and thus a comparison between the two waves make sense.

However, many questions, including the comparison between perceived and effective inequalities require the use of panel data surveys. In particular, individuals refer either subjectively or objectively to reference groups (see e.g. Clark and Senik (2010) and Ferrer-i-Carbonell (2005)). The question of inequality perception inside the reference group and between reference groups is still unsolved, in particular when dynamics are involved. The reference income cannot presumably be measured by a simple mean as usually done in the literature, simply because the income distribution inside the reference group can be highly asymmetric. And the position inside the reference group or simply the complete income distribution can play a non trivial role which has to be investigated.

3.5 Mobility perception

The ISSP data set is not designed to explore social mobility questions as it is not a panel. However, it nevertheless includes a dynamic dimension because it contains questions about the family background and the social capital available at the time of education, such as *how many books had you at home when you were fifteen* or *what was the level of education of your parents?* It thus become possible to explain the perception of the individual's social position, his attitude toward redistribution as a function of his family background.

Of course, only panel data can provide an accurate objective measure of mobility. We can first estimate transition matrices between groups defined either by income classes or types of social groups. This type of mobility was analysed for instance by Maurin (2009) in France using the *Enquête Emploi*. But an econometric model can be used also to measure persistence and disentangle income between permanent and transitory components. This decomposition is particularly interesting for European comparisons. What becomes interesting then is to measure the existing distance between actual social mobility and the way social mobility is perceived or feared. And of course trying to explain the sources of these differences. We need a two equation econometric model combining an equation measuring income persistence and a life satisfaction equation. We have to identify which objective factors could explain the bias of perceived mobility. Maurin (2009) suggests among other things the rigidity of the labour market and insider-outsider phenomenon. There are certainly large European differences. For instance, if we analyse education groups in the UK, we find that there is an enormous income variance in the least educated group, showing that initial conditions do not prevent a minority of its members from escaping from a social status initially determined by education. This is certainly not true for other groups and for other countries.

In order to explain differences in mobility perceptions, we have to analyse the difference between objective earnings formation (the reward for human capital), and what is perceived as just for determining income, like for instance the needs of a large family. This type of explanation is in competition with the traditional debate about *effort versus luck* analysed in Piketty (2003). The chances of social mobility depend on the existence of a fair situation where everybody has the same opportunities. In particular, it depends on a fair access to education and how initial education is perceived in society and how that perception depends on income. The ISSP contains a question about the access to education: *should income play a role in the access to a better education?* Answers to this question could also be found in the PISA data relating school performance to family background. What should be the role of the state in providing equality of opportunities? Of course, international comparisons between France, the UK and Germany could reveal significant differences, since from Atkinson (2008) we know that

wages have evolved very differently in these countries over the last twenty five years.

4 References

- Abul Naga, R. H. and Yalcin, T. (2010). Median independent inequality orderings. Technical report, University of Aberdeen Business School.
- Allison, R. A. and Foster, J. E. (2004). Measuring health inequality using qualitative data. *Journal of Health Economics*, 23:505–552.
- Atkinson, A. (1970). On the measurement of inequality. *Journal of Economic Theory*, 2:244–263.
- Atkinson, A. (2008). *The Changing Distribution of Earnings in OECD Countries*. The Rodolfo Debenedetti lectures. Oxford University Press, Oxford.
- Benabou, R. and Ok, E. A. (2001). Social mobility and the demand for redistribution: The poun hypothesis. *The Quarterly Journal of Economics*, 116(2):447–487.
- Boyce, C. J. (2010). Understanding fixed effects in human well-being. *Journal of Economic Psychology*, 31:1–16.
- Clark, A. E. (2006). Inequality-aversion and income mobility: a direct test. Technical report, PSE.
- Clark, A. E., Frijters, P., and Shields, M. A. (2008). Relative income, happiness, and utility: An explanation for the Easterlin paradox and other puzzles. *Journal of Economic Literature*, 46(1):95–144.
- Clark, A. E. and Senik, C. (2010). Who compares to whom? the anatomy of income comparisons in europe. *The Economic Journal*, 120(544):573–594.
- Cowell, F. A. and Flachaire, E. (2007). Income distribution and inequality measurement: hte problem of extreme values. *Journal of Econometrics*, 141(2):1044–1072.
- Davidson, R. (2009). Reliable inference for the gini index. *Journal of Econometrics*, 150:30–40.
- Davidson, R. and Duclos, J.-Y. (2000). Statistical inference for stochastic dominance and for the measurement of poverty and inequality. *Econometrica*, 68:1435–1464.
- Davidson, R. and Flachaire, E. (2007). Asymptotic and bottstrap inference for inequality and poverty measures. *Journal of Econometrics*, 141(1):141–166.
- Easterlin, Richard, A. (1974). Does economic growth improve the human lot? In David, P. A. and Reder, Melvin, W., editors, *Nations and Households in Economic Growth: Essays in Honour of Moses Abramovitz*. Academic Press, Inc., New York.
- Fernandez, C. and Steel, M. F. J. (1998). On bayesian modeling of fat tails and skewness. *Journal of the American Statistical Association*, 93(441):359–371.
- Ferrer-i-Carbonell, A. (2005). Income and well-being: an empirical analysis of the comparison income effect. *Journal of Public Economics*, 89(5-6):997–1019.

- Ferrer-i-Carbonell, A. and Frijters, P. (2004). How important is methodology for the estimates of the determinants of happiness. *Economic Journal*, 114(497):641–659.
- Forsé, M. and Galland, O., editors (2001). *Les Français face aux Inégalités et à la Justice Sociale*. Armand Colin.
- Forsé, M. and Parodi, M. (2007). Perception des inégalités économiques et sentiment de justice sociale. *Revue de l'OFCE*, 102:483–540.
- Gouret, F. (2011). What can we learn from the fifties? Technical report, CAEPS, Universitat de Barcelona.
- Jenkins, S. P. (2000). Modelling household income dynamics. *Journal of Population Economics*, 13:529–567.
- Lillard, L. A. and Willis, R. J. (1978). Dynamic aspects of earning mobility. *Econometrica*, 46(5):985–1012.
- Maurin, E. (2009). *La peur du déclassement*. La République des Idées. Seuil, Paris.
- Micklewright, J. and Schnepf, S. (2007). Inequality of learning in industrialised countries. In Jenkins, S. and Micklewright, J., editors, *Inequality and Poverty re-Examined*, chapter 6, pages 129–145. Oxford University Press, Oxford.
- Mundlak, Y. (1978). On the pooling of time series and cross section data. *Econometrica*, 46(1):69–85.
- Piketty, T. (1995). Social mobility and redistributive politics. *The Quarterly Journal of Economics*, 110(3):551–584.
- Piketty, T. (2003). Attitudes vis-à-vis des inégalités de revenu en France: existerait-il un consensus? *Comprendre (PUF)*, 4:209–241.
- Rawls, J. (1971). *A Theory of Justice*. Oxford University Press, London.
- Schwarze, J. and Harpfer, M. (2007). Are people inequality averse, and do they prefer redistribution by the state?: Evidence from german longitudinal data on life satisfaction. *Journal of Socio-Economics*, 36(2):233–249.
- Sen, A. (1993). Capability and well-being. In Nussbaum, M. and Sen, A., editors, *The Quality of Life*. Clarendon Press, Oxford.
- Stevens, A. H. (1999). Climbing out of poverty, falling back in: Measuring the persistence of poverty over multiple spells. *The Journal of Human Resources*, 34(3):557–588.
- Stewart, M. B. (2004). Semi-nonparametric estimation of extended ordered probit models. *The STATA Journal*, 4:27–39.
- van Praag, B. M. (1971). The welfare function of income in belgium: An empirical investigation. *European Economic Review*, 2:337–369.