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Revisiting poverty and welfare dominance

by Gian Maria Tomat

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REVISITING POVERTY AND WELFARE DOMINANCE*

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Abstract

The paper reviews the theory of the measurement of poverty. The axiomatic theory is described and the axiomatic properties of poverty indexes are related to assumptions on the functional form of the poverty index function. The notion of poverty ordering is then introduced and followed by a review of the relations between the poverty orderings than can be defined from classes of poverty index functions with well-defined functional form properties and the notions of first order and second order stochastic dominance. The analysis applies the results used in the theory of economic inequality to study the relationship between welfare orderings and Lorenz dominance. The theory is used to analyze poverty patterns in Italy in 1997-2005.

JEL Classification: D63, I32.
Keywords: economic inequality, poverty, poverty ordering, stochastic dominance.

Contents

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** Bank of Italy, Economic Research, Via XX Settembre 97/E, 00187, Rome, Italy. Tel.: +39-06-47923179, Fax: +39-06-47925405. Email: gianmaria.tomat@bancaditalia.it.

1 Introduction

The purpose of the paper is to provide a review of the economic literature on poverty measurement, following the most important research contributions on this subject described in Atkinson (1998) and Sen (1997).

Traditionally, the economic literature on the measurement of poverty has been concerned with two questions: the identification of the poor and the aggregation of the information on income and other relevant variables in measures of poverty to be used for comparisons of poverty over time or across different populations. The problem of identification is usually defined along several dimensions, that include the choice of the variable measuring economic welfare and the specification of the conditions that qualify individuals as poor in a given population. The problem of aggregation is the problem of choice of the poverty index function and of the definition of the conditions that allow to make consistent ordinal comparisons of poverty across different populations. The paper is concerned in particular with the problem of aggregation.

The research in this field, has been initially concerned with the study of the properties of the poverty index function. More recently, Atkinson (1987) and Foster and Shorrocks (1988b, 1988c) have extended this type of analysis to the definition of the conditions that allow for consistent ordinal comparisons of poverty across income distributions and have introduced the notion of poverty ordering. The paper reviews the theory therefore considering first the problem of the definition of the properties of the poverty index function and then describing how these properties can be used to define poverty orderings that allow to make consistent ordinal poverty comparisons across different populations. The analysis is based on the application to the analysis of poverty, of the results that are used in the theory of economic inequality to study the relation between the income distribution, aggregate measures of economic inequality and economic welfare.

The theory is then applied to the study of recent developments in the poverty patterns in Italy. The analysis shows that the level of poverty in Italy has remained relatively stable during the 1997-2005 period, this is however the combined result of several factors. In particular, poverty rates seem to have increased for individuals belonging to the younger age classes of the population and decreased for the older ones and this population patterns display some territorial variation. In addition, socio-economic variables like the education level appear to have a sensible impact on the poverty rate.

The paper is organized as follows. Section 2, reviews the axiomatic theory of poverty measurement. Section 3, analyzes the properties of some of the most commonly used poverty index functions. Section 4, defines the notion of poverty ordering and reviews the most important results on the relation between the properties of the poverty index function and poverty orderings. Section 5, presents the data used in the empirical application. Section 6, applies the notions of poverty ordering to the analysis of poverty patterns in Italy in the 1997-2005 period. Section 7, presents additional results regarding the decomposition of poverty rates by population components Conclusions are drawn in section 8.

2 The axiomatic theory

In order to introduce the problem of poverty measurement we begin by assuming that the problem of identification has been solved and that there is available comparable information on the income levels of the individuals belonging to a given population, along with information on other socio-economic variables that allow to distribute individuals among different population sub-groups. We also assume that the poverty line is given so that we can identify the poor as those individuals with a level of income lower than or equal to the poverty line.[1]

Following the axiomatic approach to the measurement of poverty reviewed in Foster and Sen (1997), the problem of poverty aggregation can be defined as the study of the properties that should characterize a poverty measure defined on the basis of the available information on the distribution of income. These properties are usually derived from the theory of economic inequality or from welfare economics.[2]

In order to present this approach we introduce some preliminary notations and definitions. Let $x = (x_1, \ldots, x_n)$ denote the income distribution vector for a population of n individuals, where x_i is the income level of individual i, for $i = 1, \ldots, n$, and $X = \left\{x \in R^n_+ \ : n \in N\right\}$ denotes the set of all possible income distribution vectors. We are assuming that each individual income is nonnegative. Moreover, in the following we suppose that individual incomes are disposed by increasing

[1] The problem of identification is analyzed at more length in the sections devoted to the empirical application, where a description of the choices made to develop the empirical analysis is provided.

[2] An example of an axiomatic approach to welfare measurement is provided by Sen (1976a), where the analysis is developed in a multi-commodity framework and the aim is that of providing measures of economic inequality and aggregate income. The axiomatic approach to the measurement of poverty was introduced in the literature by Sen (1976b), an early review of this approach can be found in Kakwani (1980a).

order, such that $x_1 \leq x_2 \leq \cdots \leq x_n$, unless otherwise noted. Finally, given an income distribution $x \in X$ we denote with $n(x)$ its population size and with $\mu(x) = \sum_{i=1}^{n(x)} x_i / n(x)$ the mean income of the population.

For a given distribution $x \in X$ and a given poverty line $z \in R_+$, a poverty index is defined as a real valued function $P : X \times R_+ \to R$, with domain $X \times R_+$ and image $P(x; z) \in R$. We are assuming that the poverty line is a nonnegative real number. The poverty index aggregates all the relevant economic information regarding the poor. The set $Z = \{\omega \in R_+ : \omega \leq z\}$ defines the poverty domain.

The functional properties of poverty indexes are usually defined with reference to given changes of the income distribution of a given population of individuals. Most of the economic literature on poverty measurement has been concerned in particular with simple increments, rank preserving transfers or combinations of these two types of transformations. Given two income distribution vectors $x, x' \in X$, for a population of n individuals, the income distribution x' is obtained from the income distribution x by a simple increment, if $x' \geq x$. Similarly, given two income distribution vectors $x, x' \in X$, for a population of n individuals, the income distribution x' is obtained from the income distribution x by a rank preserving progressive transfer, if there exist individual indexes $i, j = 1, \ldots, n$ such that $1 \leq i < j \leq n$, $x'_i - x_i = x_j - x'_j \geq 0$ and $x'_k = x_k$ for all $k \neq i, j$.

The following properties are usually considered desirable for a poverty index:

(P.1) Monotonicity: given two income distribution vectors $x, x' \in X$ for a population of a given size $n \in N$ and a poverty line $z \in R_+$, if the distribution x' is obtained from the distribution x by a simple increment and $x'_i \geq x_i$ for at least one individual $i = 1, \ldots, n$ such that $x_i \in Z$ then $P(x'; z) \leq P(x; z)$.

(P.2) (Weak) Transfer: given two income distribution vectors $x, x' \in X$ for a population of a given size $n \in N$ and a poverty line $z \in R_+$, if the distribution x' is obtained from the distribution x by a rank preserving progressive transfer between two individuals $i, j = 1, \ldots . n$ such that $x_i, x_j \in Z$ then $P(x'; z) \leq P(x; z)$.

(P.3) Symmetry: given two income distribution vectors $x, x' \in X$ for a population of a given size $n \in N$ and a poverty line $z \in R_+$, if the distribution x' is obtained from the distribution x by a permutation, such that $x' = \Pi x$ where Π is an n-dimensional permutation matrix, then $P(x'; z) = P(x; z)$.[3]

(P.4) Focus: given two income distribution vectors $x, x' \in X$ for a population of a given size $n \in N$, if $x'_i = x_i$ for all i such that $x_i \in Z$ then $P(x'; z) = P(x; z)$.

[3] An n-dimensional permutation matrix is an n-dimensional square matrix $\Pi = [\pi_{ij}]$ with elements π_{ij} for $i, j = 1, ..., n$, such that for all $i = 1, ..., n$ and all $j = 1, ..., n$ either $\pi_{ij} = 0$ or $\pi_{ij} = 1$ and with only one element equal to 1 in each row and in each column of the matrix.

The property of monotonicity (P.1) states that the poverty index is a decreasing function of the income of the poor. According to the property of weak transfer (P.2) a rank preserving progressive transfer of income between the poor implies a decrease of the poverty measure. The property of symmetry (P.3) is essentially a condition of anonymity of the poverty index, this is an assumption that is borrowed from the theory of social choice and it states that the poverty measure should not depend on whose individuals in the population are the poor, other conditions being the same. Focus (P.4) requires the poverty measure to be invariant to changes in the income distribution of the non-poor.[4]
The following additional properties are often used in many applications:

(P.5) Replication invariance: given two income distribution vectors $x, x' \in X$ for a population of a given size $n \in N$ and a poverty line $z \in R_+$, if the distribution x' is obtained by replicating the distribution x for k times, such that $x' = (x, \ldots, x)$ and $n(x') = kn(x)$ where $k \in N$, then $P(x'; z) = P(x; z)$.
(P.6) Scale invariance: given two income distribution vectors $x, x' \in X$ for a population of a given size $n \in N$, poverty lines $z, z' \in R_+$ and a positive real scalar $\lambda \in R_+$, if $x' = \lambda x$ and $z' = \lambda z$ then $P(x'; z') = P(x; z)$.
(P.7) Continuity: the poverty index is a continuous function of the income distribution vector $x \in X$ and of the poverty line $z \in R_+$.
(P.8) Additive separability: the poverty index function is an additive separable function, such that $P(x; z) = F(\sum_{i=1}^{n(x)} p_i(x_i; z))$, where $p_i : R_+ \times R_+ \rightarrow R$, with domain $R_+ \times R_+$ and image $p_i(x_i; z) \in R$, is the poverty index function of the $i - th$ person in the ordered income distribution and $F : R \rightarrow R$ is an increasing real valued function.

The properties of replication and scale invariance (P.5) and (P.6) make the poverty measure analogous to physical measures of density. According to the former the poverty measure does not change if the population is replicated k times, the latter states that the poverty measure is homogeneous of degree 0 in the income distribution vector $x \in X$ and the poverty line $z \in Z$ and therefore does not change if both are scaled by a factor $\lambda > 0$. Replication invariance is a particular important property since it allows to extend the poverty comparisons to income distributions of populations with different sizes. Scale invariance is important, because it makes the poverty measure invariant to nominal variable changes. Finally, the property

[4] In the theory of social choice the condition of anonimity is usually imposed in order to make social preference orderings independent of the mapping between individuals and individual preferences. This is a condition that is usually considered essential for a democratic political system. For a more extensive discussion see, for instance, Arrow (1963) and Sen (1970).

of continuity (P.7) is important, because it makes the poverty index well behaved in the neighborhood of the poverty line.
In order to describe the property of additive separability (P.8), for a given income distribution vector $x \in X$ and a given poverty line $z \in Z$, let $q(x;z) = \max\{i : x_i \leq z \text{ for } i = 1, \ldots, n(x)\}$ denote the number of the poor in the population. The property of additive separability is often combined with other properties assuming that the individual poverty indexes are equal across poor individuals. In particular assuming that the individual poverty indexes are defined as $p_i(\omega; z) = p(\omega; z)$ for $i \leq q(x;z)$ and $p_i(\omega; z) = 0$ for $q(x;z) < i \leq n(x)$ and defining the index function as:

$$P(x;z) = \frac{1}{n(x)} \sum\nolimits_{i=1}^{q(x;z)} p(x_i; z) \tag{2.1}$$

the poverty index measures the average level of poverty in the population.
The poverty index defined in equation (2.1) satisfies symmetry, focus and replication invariance by construction. Moreover, the poverty index is decomposable. Assuming that the population is divided in M sub-groups with different socio-economic characteristics, an letting $x = (x^1, \ldots, x^M)$ where $x^m \in X$ is the income distribution vector of group m, and $s_m = n(x^m)/n(x)$ for all $m = 1, \ldots, M$, it follows that $P(x;z) = \sum_{m=1}^{M} s_m P(x^m; z)$, a weighted average of the poverty indexes for each population group, where each sub-group index is defined according to equation (2.1) and applied to the sub-group income distribution.
More generally, the property of additive separability implies that the poverty index is sub-group consistent. If the population is divided in different sub-groups, the index increases whenever the poverty index of any population sub-group increases.[5]
We note finally, that an additional interesting property for a poverty index is the property of transfer sensitivity. This property requires the effect of a rank preserving progressive transfer of income between two individuals that are a given income distance apart to be greater the lower are the individual income levels. Although we will later use this property, we do not provide here a formal analysis.[6]
The properties of a poverty index depend on the assumptions that are made on the functional form of the poverty index function $P : X \times R_+ \rightarrow R$. In order

[5] In an important paper Foster and Shorrocks (1991) have shown that, for a continuous poverty index and if the individual poverty index functions are equal across poor individuals, the condition of additive separability is both necessary and sufficient for sub-group consistency. Equation (2.1) shows that decomposability requires some further assumption on the functional form of the poverty index function.

[6] For an advanced treatment we refer instead to Shorrocks and Foster (1987), where the property is analyzed in the context of inequality measurement.

to characterize the relation between the axiomatic poverty index properties and the functional form of the poverty index function, we follow an approach that has previously been used within the theory of economic inequality. Formally, in the following we assume that the symmetry and focus axioms hold and we partition the income distribution vector $x \in X$ in two sub-vectors $x_P = (x_1, \ldots, x_q)$ and $x_{NP} = (x_{q+1}, \ldots, x_n)$, where $q = q(x; z)$ represents the number of the poor in the population, such that $x = (x_P, x_{NP})$. Moreover, for later use, we denote with B a bistochastic matrix of order n, that takes the block diagonal form $B = B_P \otimes I_{n-q}$, where B_P is a bistochastic matrix of order $q = q(x; z)$, I_{n-q} denotes the identity matrix of order $n - q$ and $B_P \otimes I_{n-q}$ denotes the complete product between B_P and I_{n-q}, such that $B = \begin{bmatrix} B_P & 0 \\ 0 & I_{n-q} \end{bmatrix}$. We recall here that a bistochastic matrix of order n is an n-dimensional square matrix $B = [b_{ij}]$ with nonnegative elements $b_{ij} \geq 0$, such that $\sum_{j=1}^{n} b_{ij} = 1$ for all $i = 1, \ldots, n$ and $\sum_{i=1}^{n} b_{ij} = 1$ for all $j = 1, \ldots, n$. A particular example of bistochastic matrix is a permutation matrix. We introduce the following definitions:

Monotonicity: The poverty index function $P : X \times R_+ \to R$ is monotonically decreasing in $x \in X$, if and only if given two income distribution vectors $x\,, x' \in X$ for a population of a given size $n \in N$, the condition $x' \geq x$, with $x'_i \geq x_i$ for at least one $i = 1, \ldots, n$ such that $x_i \in Z$, implies $P(x'; z) \leq P(x; z)$.
Schur-convexity: The poverty index function $P : X \times R_+ \to R$ is Schur-convex in $x \in X$, if and only if given two income distribution vectors $x, x' \in X$ for a population of a given size $n \in N$ and a block-diagonal bistochastic matrix B of order n that takes the form $B = B_P \otimes I_{n-q}$, where B_P is a bistochastic matrix of order $q = q(x; z)$, the condition $x' = Bx$ implies $P(x'; z) \leq P(x; z)$.

The assumption of monotonicity and the assumption of Schur-convexity are relatively conventional in the theory of economic inequality and can be used to prove an interesting result concerning the relation between the properties of the poverty index function P and the poverty axioms:

Lemma 2.1: Given a real valued poverty index function $P : X \times R_+ \to R$, with domain $X \times R_+$ and image $P(x; z) \in R$, and a poverty line $z \in R_+$ and assuming that the poverty index satisfies the properties of symmetry and focus, the following conditions hold:
(a) the poverty index $P(x; z)$ satisfies monotonicity if and only if the poverty index function P is monotonically decreasing;

(b) it satisfies weak transfer if and only if P is a Schur-convex function.

Proof: Appendix A.

The definitions of monotonicity and Schur-convexity and the results stated in Lemma 2.1 show that the assumption of monotonicity is equivalent to the assumption that the poverty index function is monotonically decreasing in the income of the poor and that the assumption of weak transfer is equivalent to the assumption of Schur-convexity. These two assumption are therefore analogous to the ones that are usually imposed on welfare functions in order to capture similar properties.
While the result of Lemma 2.1 is quite general, it can be specialized if more restrictive assumptions are made on the poverty index function P. In particular, if P is characterized by additive separability and takes the form defined in equation (2.1), the properties of the poverty index depend on the specific assumptions that are made on the individual poverty index function $p : R_+ \times R_+ \to R$:

Corollary 2.1: Given a poverty index function $P : X \times R_+ \to R$ with domain $X \times R_+$ and image $P(x; z) \in R$ and a poverty line $z \in R_+$, assuming that the poverty index satisfies the properties of symmetry, focus and additive separability and that it takes the form $P(x; z) = \sum_{i=1}^{q(x;z)} p(x_i; z)/n(x)$, where $p : R_+ \times R_+ \to R$, with domain $R_+ \times R_+$ and image $p(x_i; z) \in R$, is the individual poverty index function, the following conditions hold:
(a) the poverty index $P(x; z)$ satisfies monotonicity if and only if the individual poverty index function p is monotonically decreasing;
(b) it satisfies weak transfer if and only if p is convex.

Proof: Appendix A.

In addition to the results stated in Corollary 2.1, the assumption of additive separability implies that the property of scale invariance is satisfied if and only if the individual index function is homogeneous of degree 0 in the individual income and the poverty line, such that $p(\omega; z) = p(\lambda\omega; \lambda z)$ for all $\lambda > 0$. Moreover, Corollary 2.1 implies that in the case of a continuously differentiable individual index function monotonicity is equivalent to the assumption that $\partial p(\omega; z)/\partial\omega \leq 0$ and weak transfer is equivalent to the assumption that $\partial p(\omega; z)^2/\partial\omega^2 \geq 0$.[7]

[7] Also, for an additively decomposable index of the form defined in equation (2.1) and if the individual poverty index function is continuosly differentiable, transfer sensitivity is satisfied if and only if the individual poverty index function is characterized by a decreasing second derivative.

3 Poverty Indexes

In order to introduce some of the most commonly used poverty indexes, given an income distribution vector $x \in X$ and a poverty line $z \in R_+$, we consider the class of poverty indexes that are defined as a weighted sum of functions of the individual poverty gaps $(z - x_i)$, or of the individual normalized poverty gaps $(z - x_i)/z$, for $i = 1, ..., n(x)$. In the first case, the individual poverty index is defined as $p_i(x_i; z) = p(z - x_i)$ for $i \leq q(x; z)$ and $p_i(x; z) = 0$ for $q(x; z) < i \leq n(x)$ and in the second case as $p_i(x_i; z) = p((z - x_i)/z)$ for $i \leq q(x; z)$ and $p_i(x; z) = 0$ for $q(x; z) < i \leq n(x)$. These indexes may have the property of additive separability or take the decomposable form defined in equation (2.1), although this is not a requirement.

Within the class of poverty indexes that take the form defined in equation (2.1), the most commonly known is the headcount ratio. For the headcount ratio the individual poverty index function is defined as an indicator function over the domain of positive real numbers, with image $p(z - x_i) = 1$ if $z - x_i \geq 0$ and $p(z - x_i) = 0$ otherwise. The headcount ratio measures the fraction of the poor in the population:

$$H(x; z) = \frac{q(x; z)}{n(x)} \tag{3.1}$$

The headcount ratio satisfies the properties of symmetry, focus, replication invariance, scale invariance and decomposability, it does not however satisfy monotonicity, weak transfer and continuity. Increments of income to the poor that do not change the number of the poor leave the index unchanged and the same result holds for rank preserving progressive transfers between the poor. Moreover, the individual poverty index function is not continuous at the level of income given by the poverty line and this makes the index sensitive to measurement errors.

A second widely used poverty measure is the normalized poverty gap index. For this index the individual poverty index function is defined by the normalized poverty gap, such that $p((z - x_i)/z) = (z - x_i)/z$ for $i \leq q(x; z)$ and $p((z - x_i)/z)) = 0$ otherwise. The normalized poverty gap index is defined as:

$$P_G(x; z) = \frac{1}{n(x)} \sum_{i=1}^{q(x;z)} \frac{z - x_i}{z} \tag{3.2}$$

The normalized poverty gap index is equal to the product of the income gap ratio, $I(x; z) = (1 - \mu_p(x; z))/z$, where $\mu_p(x; z) = \sum_{i=1}^{q(x;z)} x_i/q(x; z)$ is the mean income of the poor, and of the headcount ratio, such that $P_G(x; z) = H(x; z)I(x; z)$. The

income gap ratio measures the average percentage shortfall from the poverty line of the incomes of the poor.
The poverty gap index satisfies the properties of monotonicity, symmetry, focus, replication invariance, scale invariance, decomposability and continuity, it does not however satisfy the property of weak transfer, because rank preserving transfers of income between the poor leave the mean income of the poor unchanged.[8]
A more general class of poverty indexes is the P_α class of Foster, Greer and Thorbecke (1984). The indexes belonging to this class are population averages of the normalized poverty gaps raised to a power $\alpha \geq 0$:

$$P_\alpha(x; z) = \frac{1}{n(x)} \sum_{i=1}^{q(x;z)} \left(\frac{z - x_i}{z} \right)^\alpha \quad \text{for } \alpha \geq 0 \tag{3.3}$$

For $\alpha = 0$ the poverty index defined in equation (3.3) reduces to the headcount ratio defined in equation (3.1) and for $\alpha = 1$ it reduces to the normalized poverty gap index defined in equation (3.2). In addition, for values of the coefficient $\alpha > 1$, in the P_α class of indexes the normalized poverty gaps are weighted by the normalized poverty gaps themselves raised to a power equal to $\alpha - 1$. This allows to give a greater weight to the poorer individuals in the income distribution.
The P_α indexes satisfy symmetry, focus, replication invariance, scale invariance, decomposability and continuity. Moreover, these indexes satisfy monotonicity for $\alpha > 0$, since in this case the individual poverty index function is monotonically decreasing and weak transfer for $\alpha > 1$, because in this range of values of α the individual poverty index function is convex.[9]
For later use, we note that the relation between the headcount ratio, the normalized poverty gap index and the P_α indexes compiled at different values of the parameter α, can also be interpreted in terms of different orders of stochastic dominance. The headcount ratio, as a function of the poverty line, is of course an indicator of first order stochastic dominance. Moreover, the following recursive struc-

[8]The income gap ratio is often used as an additional indicator to describe the character of the income distribution of the poor. However, as illustrated in Ravallion (1994), this indicator presents some drawbacks as a poverty index. Increases of income of the poor that move some individuals out of poverty may induce an increase of the income gap ratio, because the mean income of the poor may decrease as a consequence of this type of transformation. More generally, the income gap ratio is discontinuous in the neighborhood of the poverty line and is therefore subject to measurement error. The normalized poverty gap index removes both these distortions, because it makes the index continuous by averaging the normalized income gaps over the size of the whole population.

[9]In addition, for $\alpha > 2$ the P_α indexes sastify transfer sensitivity and for $\alpha \to +\infty$ the measurement rule defined by the P_α index converges to the maxmin criterion of welfare, due to Rawls (1971). In this limiting case the level of poverty is determined by the condition of the poorest individual in the given income distribution.

ture holds for the class of P_α functions: $z^{\alpha+1}P_{\alpha+1}(x;z) = (\alpha+1)\int_0^z \omega^\alpha P_\alpha(x;\omega)d\omega$. Letting $\alpha = 0$ in this expression leads to: $zP_G(x;z) = \int_0^z H(x;\omega)d\omega$ and shows, therefore, that the normalized poverty gap index can be interpreted as an indicator of second order stochastic dominance. Similarly, letting $\alpha = 1$ and substituting, it is possible to show that the P_2 index can be used as an indicator of third order stochastic dominance. The process can be repeated indefinitely for all integer values of α greater than or equal to 2.

A broader class of poverty indexes, is the class of Generalized Poverty Gap indexes (GPG), introduced by Jenkins and Lambert (1997). Poverty indexes belonging to the GPG class are defined as functions of the individual poverty gaps and by construction satisfy the properties of monotonicity, weak transfer, symmetry, focus and replication invariance. In addition, most indexes in this class are defined in terms of the normalized poverty gaps and therefore satisfy also the property of scale invariance.

In view of the results presented in the previous section, the indexes belonging to the GPG class are defined by monotonic decreasing, Schur-convex functions of the income distribution $x \in X$, for any given poverty line $z \in R_+$.

Poverty indexes belonging to the GPG class include the P_α indexes of Foster, Greer and Thorbecke (1984) defined in equation (3.3) for parameter $\alpha > 1$, since in this case the P_α function is monotonically decreasing and convex, as well as other indexes of a similar kind, such as the logarithmic index introduced by Watts (1968) and Clark, Hemming and Ulph (1981) (second) measure, which is defined as a variant of the P_α index function.

The Sen (1976b) index, which is defined as a normalized weighted sum of individual poverty gaps, also belongs to the GPG class. The weights in the Sen index are defined by the Borda method of rank ordering, applied to the income distribution of the poor. The Sen index satisfies the properties of monotonicity, weak transfer, symmetry and focus and therefore is a monotonically decreasing, Schur-convex function of the income distribution of the poor. The Sen index also satisfies replication invariance and scale invariance, however, it does not satisfy additive separability and continuity.[10]

[10] It should also be noted that the Sen index does not satisfy the property of transfer sensitivity. A modification of the index that satisfies this property has been proposed by Kakwani (1980b). In this modified version the weights are raised to a power $k \in N$, large enough for the resulting index to satisfy the required property. Moreover, the property of replication invariance holds actually only asymptotically. A modification of the Sen index that satisfies continuity has been proposed by Shorrocks (1995), and is obtained replacing the given income distribution $x \in X$ by the income distribution truncated at the level of the poverty line $z \in R_+$.

4 Poverty orderings

Following the analysis of the previous sections, given an income distribution $x \in X$ and a poverty line $z \in R_{+}$, poverty indexes that satisfy desirable axiomatic properties can be defined by imposing particular restrictions on the poverty index function. However, when comparing poverty across different income distributions, the indications given by different poverty indexes may be different, even assuming that the indexes satisfy the same properties. Similarly, for a given poverty index function, the comparison between the poverty levels of different income distributions may vary with the choice of the poverty line.

Results advanced in Atkinson (1987) and Foster and Shorrocks (1988b, 1988c), show that it is possible to characterize the conditions that make poverty indexes with similar properties order different income distributions by poverty level in the same way and such that the resulting poverty ordering is defined for a range of poverty lines, or for a subset of the real line. In these studies it is also shown that the concept of poverty ordering can be related to different notions of stochastic dominance between income distributions.[11]

In order to review the most important results in this field, we introduce the concept of poverty ordering for a given class of poverty indexes $\mathcal{P}$ and a given admissible range of poverty lines $\mathcal{Z} \subset R_{+}$. Let $\mathcal{P}(\mathcal{Z})$ denote the poverty ordering related to the class of poverty indexes $\mathcal{P}$ and the range of poverty lines $\mathcal{Z}$. The poverty ordering defines a relation between different income distribution vectors for a population of a given size. In particular, given income distribution vectors $x, x' \in X$ for a population of size $n \in N$, we read $x'\mathcal{P}(\mathcal{Z})x$ as: "The income distribution $x' \in X$ poverty dominates the income distribution $x \in X$ for the class of poverty index functions $\mathcal{P}$ in the range of poverty lines $\mathcal{Z}$.".

The poverty relation is defined formally as follows:

Poverty ordering: Given two income distribution vectors $x, x' \in X$ for a population of a given size $n \in N$, a class of poverty indexes $\mathcal{P}$ and a range of poverty lines $\mathcal{Z} \subset R_{+}$, the poverty ordering $\mathcal{P}(\mathcal{Z})$ is defined such that $x'\mathcal{P}(\mathcal{Z})x$ if and only if $P(x'; z) \leq P(x; z)$ for all poverty index functions $P \in \mathcal{P}$ and all poverty lines $z \in \mathcal{Z}$.

Therefore, the income distribution $x' \in X$ poverty dominates the income distri-

[11] A review of the theory of stochastic dominance applied to the subject of inequality and poverty measurement is provided in Davidson and Duclos (2000). The relation between the theory of economic inequality and poverty measurement is described also in Foster and Shorrocks (1988a).

bution $x \in X$ in the class of poverty indexes $\mathcal{P}$ and for the range of poverty lines $\mathcal{Z} \subset R_+$, if and only if the poverty index for income distribution $x' \in X$ is lower than or equal to the poverty index for income distribution $x \in X$ for all poverty index functions in the class $\mathcal{P}$ and all poverty lines in the admissible range $\mathcal{Z} \subset R_+$.[12]
We restrict the analysis, as in previous sections, to functions that satisfy the symmetry and focus axioms and assume that the admissible range of poverty lines takes the form of a closed interval, such that $\mathcal{Z} \equiv [z^-, z^+]$ where $z^-, z^+ \in R_+$ denote the lower and upper bounds of the admissible range.
We consider in particular the class of poverty index functions that are monotonic decreasing in $x \in X$:

$$\mathcal{P}_1 \equiv \{P : X \times R_+ \rightarrow R : \ P \text{ is monotone decreasing in } x \in X\}$$

and the class of poverty index functions that are monotonic decreasing and Schur-convex in $x \in X$:

$$\mathcal{P}_2 \equiv \{P : X \times R_+ \rightarrow R\text{: } P \in \mathcal{P}_1 \text{ and } P \text{ is Schur-convex in } x \in X\}$$

In the definition of the poverty index classes $\mathcal{P}_1$ and $\mathcal{P}_2$, the assumption that the poverty indexes belonging to each class satisfy the properties of symmetry and focus is made implicitly. The definitions also imply that the class of poverty indexes $\mathcal{P}_2$ is a sub-class of the class of poverty indexes $\mathcal{P}_1$, such that for a given poverty index function $P : X \times R_+ \rightarrow R$, $P \in \mathcal{P}_2$ implies that $P \in \mathcal{P}_1$ while the converse does not necessarily hold, and therefore $\mathcal{P}_2 \subset \mathcal{P}_1$.
The results presented in Atkinson (1987) and Foster and Shorrocks (1988b, 1988c) imply that there is an equivalence relation between the poverty ordering defined by the class of poverty indexes $\mathcal{P}_1$, transformations of a given income distribution $x \in X$ in a income distribution $x' \in X$ through simple increments and the notion of first order stochastic dominance. The result is stated formally in the following theorem:

Theorem 4.1 (Atkinson (1987), Foster and Shorrocks (1988b, 1988c)): Given two income distribution vectors $x, x' \in X$ for a population of a given size $n \in N$, the class of poverty index functions $\mathcal{P}_1$ and an admissible range of poverty lines

[12] Given proper classes of poverty index functions a poverty ordering defined in this way is reflexive, transitive and antisymmetric and therefore defines a partial ordering in the convention adopted in Sen (1970). For an introduction to the notion of ordering relation see also Kreps (1988).

$\mathcal{Z} \equiv [z^-, z^+] \subset R_+$, the following conditions are equivalent:
(a) the income distribution $x' \in X$ is obtained from the income distribution $x \in X$ through a sequence of simple increments, such that $x' \geq x$ and $x'_i \geq x_i$ for at least one individual $i = 1, ..., n$ such that $x_i \in Z$ for some $z \in \mathcal{Z}$;
(b) the income distribution $x' \in X$ poverty dominates the income distribution $x \in X$ for the class of poverty indexes $\mathcal{P}_1$ and the range of poverty lines $\mathcal{Z}$: $x'\mathcal{P}_1(\mathcal{Z})x$;
(c) there is a first order stochastic dominance relation between the income distribution $x' \in X$ and the income distribution $x \in X$ such that $H(x'; z) \leq H(x; z)$ for all poverty lines $z \in [0, z^+]$.

Proof: Appendix A.

We note that while the poverty ordering relation corresponding to the class of poverty index functions $\mathcal{P}_1$ is defined for a subset of the real line that takes the form of a closed interval $\mathcal{Z} \equiv [z^-, z^+] \subset R_+$, the first order stochastic dominance relation is defined in correspondence of the closed half line $[0, z^+]$. This follows since the poverty ordering is the intersection quasi-ordering derived from the class of monotonic poverty index functions $\mathcal{P}_1$. Instead, the stochastic dominance relation is defined with reference to the headcount ratio. The extension of the dominance condition to the closed half line $[0, z^+]$, allows therefore to restrict the partial ordering defined by the headcount ratio, conformably to the poverty ordering defined by the set of monotonic poverty index functions.
Theorem 4.1 admits an important characterization in relation to the class of monotone decreasing and additive separable poverty index functions that take the form of equation (2.1). We therefore define the class of poverty index functions:

$$\mathcal{P}'_1 \equiv \left\{ P : X \times R_+ \to R\text{: } P \in \mathcal{P}_1 \text{ and } P(x; z) = \textstyle\sum_{i=1}^{q(x;z)} p(x_i; z)/n(x) \right\}$$

The class of poverty indexes $\mathcal{P}'_1$ is a sub-class of the class of poverty indexes $\mathcal{P}_1$, since for a given poverty index function $P : X \times R_+ \to R$, $P \in \mathcal{P}'_1$ implies that $P \in \mathcal{P}_1$ while the converse does not necessarily hold, and therefore $\mathcal{P}'_1 \subset \mathcal{P}_1$.
There exist an equivalence relation between the poverty ordering defined by the class of poverty indexes $\mathcal{P}'_1$ and the notion of first order stochastic dominance:

Corollary 4.1: Given two income distribution vectors $x, x' \in X$ for a population of a given size $n \in N$, the class of poverty index functions $\mathcal{P}'_1$ and an admissible range of poverty lines $\mathcal{Z} \equiv [z^-, z^+] \subset R_+$, the following conditions are equivalent:

(a) the income distribution $x' \in X$ poverty dominates the income distribution $x \in X$ for the class of poverty indexes $\mathcal{P}_1'$ and the range of poverty lines $\mathcal{Z}$: $x'\mathcal{P}_1'(\mathcal{Z})x$;
(b) there is a first order stochastic dominance relation between the income distribution $x' \in X$ and the income distribution $x \in X$ such that $H(x'; z) \leq H(x; z)$ for all poverty lines $z \in [0, z^+]$.

Proof: Appendix A.

This result is particularly important since it shows that given two income distributions, if a poverty ordering relation can be established for the class of monotone decreasing and additive separable poverty index functions that take the form (2.1), then the same poverty ordering relation holds for the more general class of monotone decreasing functions. Therefore, if the purpose of the analysis is that of making ordinal comparisons, the analysis can be restricted to the class of poverty index functions $\mathcal{P}_1'$.
The results presented in Atkinson (1987) and Foster and Shorrocks (1988b, 1988c) also imply that there is an equivalence relation between the poverty ordering defined by the class of poverty indexes $\mathcal{P}_2$, transformations of a given income distribution $x \in X$ in an income distribution $x' \in X$ through simple increments and rank preserving progressive transfers and the notion of second order stochastic dominance. The result is stated formally as follows:

Theorem 4.2 (Atkinson (1987), Foster and Shorrocks (1988b, 1988c)): Given two income distribution vectors $x, x' \in X$ for a population of a given size $n \in N$, the class of poverty index functions $\mathcal{P}_2$ and an admissible range of poverty lines $\mathcal{Z} \equiv [z^-, z^+] \subset R_+$, the following conditions are equivalent:
(a) the income distribution $x' \in X$ is obtained from the income distribution $x \in X$ through a sequence of simple increments and rank preserving progressive transfers such that $x' \geq Bx$, where B is an appropriate bistochastic matrix of order n;
(b) the income distribution $x' \in X$ poverty dominates the income distribution $x \in X$ for the class of poverty indexes $\mathcal{P}_2$ and the range of poverty lines $\mathcal{Z}$: $x'\mathcal{P}_2(\mathcal{Z})x$;
(c) there is a second order stochastic dominance relation between the income distribution $x' \in X$ and the income distribution $x \in X$ such that $P_G(x'; z) \leq P_G(x; z)$ for all poverty lines $z \in [0, z^+]$.

Proof: Appendix A.

We note again that the poverty ordering relation corresponding the class of poverty index functions $\mathcal{P}_2$ is defined for a subset of the real line that takes the form of a closed interval $\mathcal{Z} \equiv [z^-, z^+] \subset R_+$, while the second order stochastic dominance relation is defined with reference to the closed half line $[0, z^+]$. This follows since the poverty ordering is the intersection quasi-ordering resulting from the class of monotonic decreasing and Schur-convex poverty index functions $\mathcal{P}_2$. The stochastic dominance relation is defined instead with reference to the normalized poverty gap index. The extension of the dominance condition to the closed half line $[0, z^+]$, allows therefore to restrict the partial ordering defined by the normalized poverty gap index, conformably to the poverty ordering defined by the set of monotonic and Schur-convex poverty index functions.
Theorem 4.2 admits an important characterization for the class of monotone decreasing, Schur-convex and additively separable functions that take the form (2.1). We therefore define the class of poverty index functions:

$$\mathcal{P}'_2 \equiv \left\{ P : X \times R_+ \rightarrow R\text{: } P \in \mathcal{P}_2 \text{ and } P(x;z) = \textstyle\sum_{i=1}^{q(x;z)} p(x_i;z)/n(x) \right\}$$

The class of poverty indexes $\mathcal{P}'_2$ is a sub-class of the class of poverty indexes $\mathcal{P}_2$ since for a given poverty index function $P : X \times R_+ \rightarrow R$, $P \in \mathcal{P}'_2$ implies that $P \in \mathcal{P}_2$ while the converse does not necessarily hold, and therefore $\mathcal{P}'_2 \subset \mathcal{P}_2$.
There exist an equivalence relation between the poverty ordering defined by the class of poverty indexes $\mathcal{P}'_2$ and the notion of second order stochastic dominance:

Corollary 4.2: Given two income distribution vectors $x, x' \in X$ for a population of a given size $n \in N$, the class of poverty index functions $\mathcal{P}'_2$ and an admissible range of poverty lines $\mathcal{Z} \subset R_+$, the following conditions are equivalent:
(a) the income distribution $x' \in X$ poverty dominates the income distribution $x \in X$ for the class of poverty indexes $\mathcal{P}'_2$ and the range of poverty lines $\mathcal{Z}$: $x'\mathcal{P}'_2(\mathcal{Z})x$;
(b) there is a second order stochastic dominance relation between the income distribution $x' \in X$ and the income distribution $x \in X$ such that $P_G(x';z) \leq P_G(x;z)$ for all poverty lines $z \in [0, z^+]$.

Proof: Appendix A.

This result is important because it shows that given two income distributions, if a poverty ordering relation can be established for the class of monotone decreasing, Schur-convex and additive separable poverty index functions that take the form defined in (2.1), then the same poverty ordering relation holds for the more general class of monotone decreasing and Schur-convex functions. Therefore, if the purpose of the analysis is that of making ordinal comparisons, the analysis can be restricted to the class of poverty index functions $\mathcal{P}'_2$.

We note finally, that the structure of the results presented in theorems 4.1 and 4.2 is similar to the one that characterizes the analogous results that were proposed within the theory of economic inequality in Atkinson (1970), Dasgupta, Sen and Starrett (1973) and Rothschild and Stiglitz (1973). These works were concerned with finding a relation between the inequality partial orderings that can be defined from the sets of welfare functions that have well defined monotonicity and concavity properties and the notion of Lorenz dominance. They showed that for income distributions that have the same mean income, the inequality ordering defined by the set of Schur-concave welfare functions is equivalent to the inequality ordering relation defined by the Lorenz curve. These results were later extended in Shorrocks (1983), where in order to allow for comparisons of income distributions with different mean income the notion of generalized Lorenz dominance is introduced. The results in this latter work show that the inequality ordering defined by the set of monotonic increasing and Schur-concave welfare functions is equivalent to the inequality ordering relation defined by the generalized Lorenz curve.

The results reviewed in theorems 4.1 and 4.2 imply that there is a close relation between the study of economic inequality and the analysis of poverty, since the notion of generalized Lorenz dominance can be related to the notions of first order and second order stochastic dominance. Note, however, that within the poverty domain the comparison between different income distributions requires the definition of an admissible range of poverty lines. Given the range of poverty lines the comparison is then restricted to a partition of the income distribution, a feature that adds additional dimensions to the analysis.

5 The Data

We use as main source of data the Household Budget Survey (HBS) which is carried out on a representative sample of Italian households by the Italian National Statistical Institute (Istat) on an annual basis.

The HBS is conducted yearly with the purpose of measuring the structure and level of household consumption expenditure and to relate the observed household consumption expenditure patterns to the most important household characteris-

tics, such as the household socio-economic status and its location in the Italian territory.
The statistical unit of analysis of the HBS is the household, defined by Istat (2006a) as a group of persons living together and characterized by a family relationship. For each household every person living normally within the family is considered an household member. The population of the HBS is defined by all the households that are regularly resident in Italy at the time of the survey.[13]
The main economic variable reported by the HBS is the household consumption expenditure on goods and services. For each household, additional information regarding the household characteristics is also provided. Household characteristics include informations on gender, age, education and employment status of each individual member of the household, a description of the housing arrangements and of the main features of other housing ownerships and measures of household's income and savings.
The survey data are used for the determination of the private consumption expenditure component in the national income and product accounts and for the official governmental estimates of relative poverty.
In each year a sample of about 28.000 families is surveyed and interviews are conducted monthly on randomly selected households. For each household in the sample the survey reports the monthly average household expenditure along with the information on the household characteristics.[14]
In order to develop the analysis of poverty patterns in Italy for the 1997-2005 period we follow a variant of the methodology employed by Istat (2006b) to provide the annual official estimates of relative poverty.
Given the structure of the survey data, we take household consumption expenditure as the basic indicator of individual welfare. Following the official definition, we measure household consumption net of expenditure for extraordinary household maintenance, life insurance and perpetual rents premiums and mortgages repayments and loan refunds.
There are several advantages in using household consumption expenditure as an indicator of individual welfare. Household consumption expenditure can be re-

[13]For the purposes of the survey Istat (2006a) adopts a broad notion of family, that is defined as a group of persons living together and characterized by a relationship of care, marriage, parenthood, affinity, adoption or tutorship.

[14]The sampling design of the HBS is composed of two stages. The first stage is stratified according to territorial location, in order to ensure that all provinces are covered by the survey. The sampling units at the first stage are the municipalities. In the second stage the sampling units are the households, selected by simple random sampling out of the civic lists. In each month 231 municipalities and an average of 2350 households are involved with the survey.

garded as preferred to income as a measure of welfare, because according to the life-cycle/permanent income theory of consumption it is an indicator of the household's life time resources. Moreover, the survey information on household consumption is more accurate than the corresponding information on household income, since the purpose of the survey is to measure household consumption.[15]
We convert the consumption expenditures of households with different socio-economic characteristics in comparable units using the equivalence scale introduced by Buhmann et. al. (1988) in the context of the Luxembourg Income Study (LIS). This equivalence scale adjusts household consumption expenditure for household size, dividing household consumption expenditure by households size raised to a power $\beta \in [0, 1]$. For $\beta = 0$ this amounts to using household consumption expenditure without adjustment, while for $\beta = 1$ the indicator of economic welfare is household's per-capita consumption. In the intermediate range the equivalence scale results in an indicator of economic welfare, that takes into account of the economies of scale enjoyed by the individual members of a given household, living together and therefore sharing common resources.
A research work by Atkinson, Rainwater and Smeeding (1995) shows that with a parameter $\beta = 0.5$ the power equivalence scale provides a reasonable approximation to the equivalence scales used in many different OECD countries for the purposes of inequality and poverty comparisons. The square root scale is also close to the OECD and modified OECD equivalence scales, that take into account both of household size and of household composition, and it provides an approximation to the equivalence scale used by Istat (2006b) for the compilation of the official governmental poverty estimates, which is derived using the Engel method.[16]
We take as unit of analysis the individual and define the poverty line at one half of the household average equivalent consumption expenditure. We consider as poor all individuals that live in households with equivalent consumption expenditure lower than or equal to the poverty line.

[15] Reviews of the theory of consumption that are useful for the present purposes are provided in Deaton (1992, 1997). For some considerations on the subject of the choice between income and consumption for the measurement of economic welfare see also Abul Naga (2005).

[16] In an important study Coulter, Cowell and Jenkins (1992) have shown, with reference to the power scale, that measures of income inequality and poverty display a tendency towards a U-shaped pattern, as the parameter β varies between 0 and 1, reaching a minimum when the parameter is in the range of 0.5. Their analysis shows that the choice of the power parameter can have important implications for both income inequality and poverty comparisons. In the present study we adopt a parameter $\beta = 0.5$, because this is the conventional choice made in several studies in this field. For a more general discussion of the subject of the choice of equivalence scale see among others Atkinson (1983, 1992), Deaton and Muellbauer (1980) and Deaton (1997).

6 Poverty in Italy in the 1997-2005 period

Table 1 reports the estimates of the headcount ratio, the income gap ratio and the poverty gap prevailing in each area in 2005 and the variations of these measures occurred during the 1997-2005 period. The first panel of the table shows that in 2005 the headcount ratio in Italy is on average equal to 15.8 per cent, a figure that reflects however wide regional differences.

In the same year the income gap ratio is equal to 22.6 per cent while differences across macro-regions appear less pronounced for this quantity.

The poverty gap is equal to 3.6 per cent and the regional differences for this indicator reflect the ones observed for the headcount ratio.

The second panel of the table shows that during the 1997-2005 period there has been a tendency for the headcount ratio to decrease in the northern and central regions and to increase in the southern ones, as a result the headcount ratio has remained relatively stable in the national average. In the same period, similar movements are observed for the poverty gap.[17]

The last columns of the table reports the population share of each macro-region, along with the poor share and the share of the cumulative income gap of each area. The table shows that while the Italian population is relatively evenly distributed across macro-regions, the poor appear to be relatively concentrated. The southern regions account for 68.6 per cent of the Italian poor and the cumulative income gap for these regions amounts to 73.5 per cent.

In order to assess the sensitivity of these results to the choice of the poverty index, table 2 reports for each macro-region the headcount ratio, the poverty gap index and the P_α indexes with parameter $\alpha = 2$ and $\alpha = 3$ for each year in the 1997-2005 period.

The indexes reported in the table confirm the view that relative poverty has remained relatively stable during the 1997-2005 period. The differences in poverty levels across macro-regions appear to be more important.

Table 2 also reports the poverty lines for each year in the 1997-2005 period, measured at constant 2000 prices. These quantities are obtained by dividing the nominal poverty lines computed from the HBS with the methodology illustrated in the previous section, with the private consumption expenditure implicit de-

[17] It is interesting to note that in the 1997-2005 period the income gap ratio decreases in the North and in the South and increases in the Centre. This indicator seems to be thus characterized by the sort of measurement error problems described in previous sections. We should also mention that all reported figures in the present application should be taken with the benefit of hindsight, because they are characterized by statistical uncertainty and the information currently released by Istat does not allow us to compute standard errors.

flator. The reported poverty lines show that during the 1997-2005 period the average household consumption expenditure has remained relatively constant in real terms.[18]

When interpreting these data attention should be paid to the implications of defining the poverty line as a fraction of average equivalent household consumption expenditure. The use of a relative poverty line implies that movements in average equivalent consumption expenditure over time are assumed away in the computations, therefore comparisons of poverty over time reflect only movements in the distribution of equivalent consumption expenditure. However, since the poverty line is defined as a fraction of a national average, comparisons of poverty across areas reflect both differences in average equivalent consumption expenditure and differences in the distribution of equivalent consumption expenditure.[19]

In order to further investigate the movements over time in the poverty rate, we computed for each macro-region the headcount ratio for levels of the poverty line ranging from 20 per cent to 60 per cent of average household equivalent consumption expenditure. The resulting distribution curve for Italy is depicted in figure 1 and is reproduced, along with the distributions curves for each macro-region, in appendix B (table B.1).

The figure shows that the headcount ratio in the year 2005 is slightly lower than in the year 1997 for all levels of the poverty line. According to the results described in previous sections, the headcount ratio can be interpreted as an indicator of first order stochastic dominance, if it is considered as a function of the poverty line. The results depicted in figure 1 and reproduced in table B.1 show that the condition of first order stochastic dominance between the income distributions in 1997 and 2005 holds for Italy.

The headcount ratio curves for the macro-regions reported in table B.1 show that the first order stochastic dominance condition holds also for the North, where the headcount ratio decreases between 1997 and 2005 for all levels of the poverty line, but is not satisfied neither for the Centre nor for the South. However, the area under the headcount ratio curve as a function of the poverty line is an indicator

[18] The private consumption expenditure deflator is taken from the recent revision of the national income and product accounts, that was released by Istat (2005).

[19] The implications of the adoption of a relative poverty line can be tested by using as an absolute line a relative poverty line defined with reference to a given year and updated for other years in real terms. In this application we used as absolute line the relative poverty line for the last year of the sample period. As shown in table 2 this poverty line is equal to a monthly expenditure of 675.7 euros per person at constant 2000 prices. The results do not differ substantially from the ones reported, given the small differences that actually occur in each year between the relative poverty line and the absolute line.

of second order stochastic dominance, since for each level of the poverty line this area is equal to the product between the poverty gap index and the poverty line, $zP_G(x; z)$. From graphical inspection of the headcount ration curves for the Centre and the South we are able to conclude that a condition of second order stochastic dominance does hold for both macro-regions. As indicated by the second order dominance conditions, in the Centre the poverty level displays a decrease between 1997 and 2005 and in the South an increase.

Finally, the headcount ratio curves in table B.1, show that there are stochastic dominance relations between the income distribution of the different macro-regions. In particular, in each year of the sample period there appear to hold first order stochastic dominance relations between the income distribution of the North and the income distributions of the Centre or of the South. In 1997, however, the stochastic dominance relation between the North and the Centre is only a second order one. Moreover, there is in each year of the sample period a first order stochastic dominance relation between the income distribution of the Centre and the income distribution of the South.

These results are broadly consistent with the ones reported in Table 2, though the latter ones do not display the variation in dominance conditions that can be inferred from the headcount ratio curves.

The movements in the distribution of equivalent consumption expenditure can be further analyzed decomposing the population by population components and analyzing the behavior of the headcount ratio for each population component. We consider here in particular the population decomposition by age and distinguish between the age classes of individuals with 24 years or less, 25-34 years, 35-44 years, 45-54 years and 55 years of age or more.

The headcount ratio curves, as functions of a poverty line ranging from 20 to 60 per cent of average household equivalent consumption expenditure, are reproduced for each age class, for each year of the sample period 1997-2005, in appendix B (table B.2). Graphical examination of the curves shows that during the sample period the poverty rate has a tendency to increase for the age classes of individuals with less than 24 years, 25-34 years and 35-44 years and to decrease for the age classes of individuals with 45-54 years and 55 years or more. However, between 1997 and 2005 there are only second order stochastic dominance relations for the first three age classes and for the 45-54 age class. There is instead a first order stochastic dominance relation for the age class of individuals with 55 years of age or more. The headcount ratio curve for the 35-44 age class is depicted for illustrative purposes in figure 2.

These results are quite striking, since they occur during a period of economic reforms, that have substantially increased the flexibility of the labor market and the accountability of the pensions system in Italy. A decomposition of the patterns of the headcount ratio by age class and macro-region shows, that the decrease in poverty for the older individuals is concentrated in the regions of the North and of the Centre while the increase for the younger individuals is concentrated in the South. The decomposition of poverty by age class therefore seems to provide an explanation to the changes in poverty rates that are observed in the different macro-regions in the period 1997-2005.

7 Poverty indexes by population components

The property of decomposability of the poverty index function can be used to provide further evidence on the impact of different socio-economic factors on the level of poverty. We consider in this case, in addition to the population decomposition by age, the population decompositions by gender and by years of education and analyze the behavior of the sub-group poverty indexes along these dimensions. The population decomposition by gender distinguishes between males and females, the decomposition by years of education is provided for individuals between 25 and 54 years of age and distinguishes between the educational levels represented by primary and secondary school, high school and university.[20]

Tables 3 and 4 report for each macro-region and the years 1997 and 2005 the population decompositions for each socio-economic dimension. The poverty indexes considered in the tables are as above the headcount ratio, the poverty gap index and the P_α indexes for parameter $\alpha = 2$ and $\alpha = 3$. The first panel of each table reports the sub-group indexes for each population component. The second panel reports the population shares by socio-economic component and, for each poverty index function, the contribution share of each sub-group index to the overall index. With reference to the population decomposition by gender, we note that, in both the reference and the comparison year, there appears to be a tendency for the poverty level to be lower for the male component and greater for the female one.

[20] According to the survey data, the fraction of the population composed by individuals that don't have a degree is very small in all geographical areas. Therefore, in the primary school category we include all individuals with at most a primary school degree, including those that have not yet achieved this educational level. We follow in this way the official methodology employed by Istat (2006b), because considering individuals with no degree as a separate category would not lead to statistically significant inferences, given the sampling size of this sub-group of the population.

The male component accounts also for a lower share of the population. These differences imply, that the contribution share of the male component to the overall poverty rate, is smaller than the corresponding share of the female one. These results are common to each macro-region.

The population decomposition by age shows that the level of poverty is characterized by a typical pattern. The poverty rates take intermediate values for the class of individuals with less than 24 years of age, decline with the age class reaching a minimum for the 45-54 age class and take the greatest values for the class of individuals with 55 years of age or more. This age pattern is common across macro-regions in both 1997 and 2005 and admits a life-cycle interpretation once long term movements in productivity and labor market and other imperfections are taken into account.

In particular, the intermediate poverty level that characterizes the age class of individuals with 24 years or less, can in our view be explained mainly with reference to features of the labor market, which in Italy severely adversely affects the younger cohorts. Similarly, the poverty level for the population with 55 years of age or more is determined by several factors. Most importantly, individuals in this age class belong to the older cohorts of the population and are therefore on average characterized by a lower income relatively to the younger cohorts. In addition, the disposable income for individuals in this age class declines as a consequence of retirement.

The tables also show that in both 1997 and 2005 the contribution share of individuals with 24 years of age or less is lower than the national average in the North and in the Centre and greater than the national average in the South. At the same time the contribution share of individuals in the age group of 55 years or more tends to be greater than the national average in the North and in the Centre and lower than the national average in the South. These results are partly explained by population structure prevailing in each macro-region, the North and the Centre being characterized by a relatively older population and the South by a relatively younger one.

For the group of individuals with 25-54 years of age, the decomposition by level of educational attainment provides some additional interesting information on the structural features of poverty in Italy. The tables show that in each macro-region the poverty rates decrease with the educational level. Moreover, the differences between the poverty rates prevailing at different levels of educational attainment appear to be very substantial. In both 1997 and 2005 the difference between the headcount ratio of individuals in the 25-54 age class that have at most a primary school degree and the one prevailing for individuals in the same age class with university education is of the order of 20 percentage points. This in turn implies, that while the share of individuals in the 25-54 age class with a primary or secondary school degree is at most of the order of fifty per cent, the contribution to overall poverty of individuals belonging to these educational classes is of the order of seventy percent. The comparisons by macro-region also reveal that poverty rates tend to be relatively higher in the Centre and in the South in all of the educational classes and substantially so in the South.

These figures show that policies aimed at reducing poverty in Italy should be targeted towards the groups of less educated individuals. This consideration is perhaps reinforced considering that the levels of educational attainment have shown a tendency to increase during the sample period, such that in the final year despite variations in all macro-regions a greater share of the population is accounted for by individuals with high school or university education [21]

8 Conclusions

The paper reviews the economic literature on poverty measurement, paying special attention to the analysis of the desirable properties of the poverty index function and of the implications of these properties for the notion of poverty ordering.

The previous research in this field has been mainly concerned with describing the relation between the level and distribution of income and the level of poverty. The analysis presented in the paper reviews the main elements of this relation using well-known results in the theory of economic inequality.

The paper includes an empirical application to the analysis of poverty patterns in Italy in the 1997-2005 period. The main source of data used for this application is the Household Budget Survey, conducted yearly by the Italian National Statistical Institute on a representative sample of Italian households. The empirical application uses as basic measure of economic welfare household consumption expenditure. The LIS-OECD square root equivalence scale is used to convert the consumption expenditure of households with different socio-economic characteristics in comparable units and the analysis of poverty is then performed at the level

[21] According to the information on educational attainament provided in the HBS the average years of schooling between 1997 and 2005 the average years of schooling have increased in the national average by almost one year from 12.0 to 12.8. This trend has been common to all regions though the increase has been relatively greater in the North and in the Centre.

of the individual household member. The reference poverty line is defined at one half of the average household equivalent consumption expenditure.
An analysis of stochastic dominance conditions is also carried out letting the poverty line vary between 20 per cent and 60 per cent of the average household equivalent consumption expenditure.
The main findings of the empirical analysis are that the income distribution has remained relatively stable during the 1997-2005 period in Italy however this occurs as a result of different patterns by macro-region. Poverty rates have shown a tendency to decline in the North and in the Centre and to increase in the South. Moreover, the decomposition by population components shows that poverty rates have increased in the younger age classes and decreased in the older ones. Since there are variations in the age structure of the population by macro-region the decomposition of poverty patterns by age components provides an explanation for the observed differences in the movements of poverty during the sample period. Additional analysis shows that in all macro-regions socio-economic factors such as the level of educational attainment have a distinguishable effect on the poverty rates and suggests that poverty reducing policies should be primarily directed towards the less educated individuals

Tables and figures

Table 1: Headcount ratio by macro-region, 1997-2005

	Poverty Indexes			Poverty Shares			
	Headcount Ratio	Income Gap Ratio	Poverty Gap	Population	Headcount Ratio	Income Gap Ratio	Poverty Gap
				levels			
North	0.073	0.186	0.014	0.452	0.209	-	0.172
Centre	0.087	0.200	0.017	0.192	0.105	-	0.093
South	0.306	0.242	0.074	0.356	0.686	-	0.735
Italy	0.158	0.226	0.036	1.000	1.000	-	1.000
				growth 1997-2005			
North	-0.011	-0.018	-0.004	0.003	-0.024	-	-0.036
Centre	-0.011	0.014	-0.001	0.004	-0.008	-	0.001
South	0.012	-0.002	0.002	-0.007	0.032	-	0.035
Italy	-0.004	-0.003	-0.001	-	-	-	-

Note: Estimates are obtained from Istat's HBS official publications for the years 1997-2005. The population estimates are reported in thousands. The headcount ratio and the income gap ratio are compiled using equivalent consumption expenditure as indicator of economic welfare. Household consumption expenditure is converted in equivalent units using the LIS-OECD power scale with parameter $\beta = 0.5$. The poverty line is set at 0.5 times average equivalent consumption expenditure. Shares represent the fraction of poor accounted for by each macro-region for the headcount ratio and the fraction of the cumulative income gap accounted by each macro-region for the poverty gap.

Table 2: Poverty indexes by macro-region, 1997-2005

	1997	1998	1999	2000	2001	2002	2003	2004	2005
					North				
H	0.084	0.083	0.078	0.087	0.076	0.081	0.082	0.073	0.073
P_G	0.017	0.016	0.015	0.017	0.014	0.016	0.016	0.013	0.014
P_2	0.0056	0.0053	0.0048	0.0053	0.0043	0.0050	0.0053	0.0041	0.0041
P_3	0.0023	0.0021	0.0020	0.0021	0.0016	0.0020	0.0022	0.0015	0.0016
					Centre				
H	0.098	0.111	0.123	0.147	0.129	0.106	0.091	0.105	0.087
P_G	0.018	0.022	0.026	0.031	0.025	0.022	0.018	0.020	0.017
P_2	0.0057	0.0073	0.0086	0.0101	0.0074	0.0069	0.0056	0.0060	0.0055
P_3	0.0023	0.0030	0.0035	0.0042	0.0027	0.0028	0.0022	0.0023	0.0021
					South				
H	0.293	0.289	0.289	0.298	0.297	0.276	0.268	0.303	0.306
P_G	0.072	0.073	0.074	0.075	0.072	0.067	0.064	0.076	0.074
P_2	0.0257	0.0270	0.0277	0.0274	0.0257	0.0239	0.0229	0.0280	0.0269
P_3	0.0111	0.0122	0.0124	0.0121	0.0112	0.0104	0.0100	0.0123	0.0119
					Italy				
H	0.163	0.163	0.162	0.174	0.165	0.156	0.150	0.161	0.158
P_G	0.037	0.038	0.038	0.040	0.037	0.035	0.034	0.037	0.036
P_2	0.0129	0.0135	0.0138	0.0142	0.0125	0.0122	0.0117	0.0130	0.0125
P_3	0.0055	0.0059	0.0060	0.0061	0.0053	0.0052	0.0050	0.0055	0.0054
Poverty line	667.9	672.3	665.1	683.6	659.4	647.8	668.9	679.4	675.7

Note: Estimates are obtained from Istat's HBS official publications for the years 1997-2005. The poverty indexes are compiled using equivalent consumption expenditure as indicator of economic welfare. Household consumption expenditure is converted in equivalent unites using the LIS-OECD power scale with parameter $\beta = 0.5$. The poverty line is set at 0.5 times average equivalent consumption expenditure and is reported in monthly euro at constant 2000 prices.

Table 3a: Poverty indexes by socio-economic dimension and macro-region, 1997

	Gender		Age					Education			
	Males	Females	<=24	25-34	35-44	45-54	>=55	Primary School	Secondary School	High School	University
						North					
H	0.076	0.092	0.065	0.066	0.063	0.048	0.136	0.104	0.080	0.037	0.017
P_G	0.015	0.020	0.011	0.012	0.012	0.008	0.031	0.022	0.014	0.006	0.003
P_2	0.0046	0.0066	0.0032	0.0034	0.0037	0.0026	0.0110	0.0075	0.0042	0.0016	0.0008
P_3	0.0018	0.0028	0.0011	0.0012	0.0014	0.0010	0.0048	0.0033	0.0016	0.0005	0.0003
						Centre					
H	0.094	0.101	0.081	0.071	0.066	0.079	0.147	0.130	0.100	0.048	0.020
P_G	0.017	0.019	0.013	0.011	0.011	0.016	0.030	0.030	0.018	0.006	0.002
P_2	0.0053	0.0059	0.0034	0.0032	0.0030	0.0055	0.0096	0.0119	0.0053	0.0015	0.0002
P_3	0.0022	0.0024	0.0013	0.0012	0.0011	0.0027	0.0040	0.0065	0.0019	0.0005	0.0000
						South					
H	0.277	0.309	0.280	0.273	0.262	0.226	0.377	0.426	0.317	0.162	0.070
P_G	0.066	0.077	0.065	0.062	0.061	0.054	0.104	0.113	0.073	0.032	0.014
P_2	0.0234	0.0279	0.0218	0.0200	0.0207	0.0191	0.0412	0.0426	0.0239	0.0097	0.0037
P_3	0.0101	0.0121	0.0090	0.0080	0.0087	0.0081	0.0192	0.0192	0.0096	0.0036	0.0012
						Italy					
H	0.153	0.172	0.162	0.142	0.135	0.112	0.212	0.237	0.171	0.079	0.035
P_G	0.034	0.040	0.035	0.030	0.029	0.025	0.053	0.060	0.037	0.014	0.006
P_2	0.0116	0.0142	0.0114	0.0094	0.0096	0.0085	0.0200	0.0223	0.0117	0.0042	0.0016
P_3	0.0049	0.0061	0.0046	0.0037	0.0040	0.0037	0.0090	0.0102	0.0046	0.0015	0.0005

Note: Estimates are obtained from Istat's HBS official publications for the years 1997-2005. The poverty indexes are compiled using equivalent consumption expenditure as indicator of economic welfare. Household consumption expenditure is converted in equivalent unites using the LIS-OECD power scale with parameter $\beta = 0.5$. The poverty line is set at 0.5 times average equivalent consumption expenditure. The decomposition by educational level considers only individuals in the 25-54 age class. Panel 3a reports the sub-group indexes by socio-economic dimension, panel 3b reports the contribution share of each sub-group index to the overall index.

Table 3b: Poverty indexes by socio-economic dimension and macro-region, 1997

	Gender		Age					Education			
	Males	Females	<=24	25-34	35-44	45-54	>=55	Primary School	Secondary School	High School	University
						North					
Pop. share	0.485	0.515	0.237	0.166	0.145	0.142	0.311	0.132	0.361	0.409	0.098
H	0.439	0.561	0.181	0.130	0.109	0.080	0.500	0.230	0.489	0.254	0.028
P_G	0.413	0.587	0.156	0.113	0.100	0.070	0.561	0.267	0.481	0.228	0.024
P_2	0.395	0.605	0.133	0.100	0.095	0.065	0.607	0.306	0.469	0.202	0.023
P_3	0.385	0.615	0.114	0.090	0.090	0.064	0.642	0.349	0.455	0.174	0.022
						Centre					
Pop. share	0.485	0.515	0.256	0.147	0.148	0.141	0.307	0.123	0.330	0.439	0.108
H	0.467	0.533	0.213	0.108	0.101	0.115	0.463	0.221	0.458	0.291	0.030
P_G	0.466	0.534	0.182	0.094	0.090	0.127	0.507	0.286	0.478	0.221	0.015
P_2	0.460	0.540	0.159	0.085	0.080	0.141	0.534	0.377	0.450	0.166	0.007
P_3	0.460	0.540	0.143	0.078	0.075	0.167	0.538	0.488	0.389	0.120	0.002
						South					
Pop. share	0.489	0.511	0.336	0.160	0.143	0.120	0.241	0.161	0.388	0.361	0.091
H	0.462	0.538	0.321	0.149	0.128	0.092	0.310	0.267	0.479	0.229	0.025
P_G	0.452	0.548	0.301	0.137	0.121	0.091	0.350	0.306	0.476	0.198	0.021
P_2	0.446	0.554	0.285	0.124	0.115	0.089	0.387	0.343	0.464	0.176	0.017
P_3	0.443	0.557	0.270	0.114	0.111	0.087	0.417	0.375	0.452	0.160	0.013
						Italy					
Pop. share	0.487	0.513	0.276	0.160	0.145	0.134	0.285	0.140	0.365	0.398	0.097
H	0.457	0.543	0.276	0.140	0.120	0.092	0.372	0.254	0.479	0.241	0.026
P_G	0.445	0.555	0.260	0.128	0.114	0.090	0.408	0.297	0.477	0.205	0.021
P_2	0.437	0.563	0.245	0.116	0.109	0.089	0.442	0.340	0.464	0.179	0.017
P_3	0.433	0.567	0.231	0.107	0.105	0.089	0.469	0.381	0.447	0.159	0.014

Note: Estimates are obtained from Istat's HBS official publications for the years 1997-2005. The poverty indexes are compiled using equivalent consumption expenditure as indicator of economic welfare. Household consumption expenditure is converted in equivalent unites using the LIS-OECD power scale with parameter $\beta = 0.5$. The poverty line is set at 0.5 times average equivalent consumption expenditure. The decomposition by educational level considers only individuals in the 25-54 age class. Panel 3a reports the sub-group indexes by socio-economic dimension, panel 3b reports the contribution share of each sub-group index to the overall index.

Table 4a: Poverty indexes by socio-economic dimension and macro-region, 2005

	Gender		Age					Education			
	Males	Females	<=24	25-34	35-44	45-54	>=55	Primary School	Secondary School	High School	University
						North					
H	0.067	0.078	0.068	0.054	0.059	0.044	0.101	0.126	0.079	0.034	0.018
P_G	0.012	0.015	0.011	0.009	0.010	0.008	0.021	0.025	0.015	0.005	0.003
P_2	0.0037	0.0045	0.0030	0.0025	0.0029	0.0025	0.0067	0.0084	0.0044	0.0012	0.0007
P_3	0.0014	0.0018	0.0011	0.0009	0.0011	0.0009	0.0027	0.0036	0.0017	0.0004	0.0002
						Centre					
H	0.079	0.094	0.083	0.058	0.076	0.050	0.119	0.141	0.097	0.045	0.015
P_G	0.015	0.019	0.015	0.011	0.014	0.009	0.025	0.029	0.017	0.009	0.003
P_2	0.0048	0.0059	0.0044	0.0034	0.0043	0.0027	0.0084	0.0082	0.0048	0.0029	0.0009
P_3	0.0019	0.0024	0.0015	0.0014	0.0015	0.0012	0.0035	0.0028	0.0018	0.0013	0.0003
						South					
H	0.290	0.316	0.299	0.288	0.280	0.232	0.364	0.440	0.336	0.197	0.113
P_G	0.069	0.077	0.071	0.068	0.064	0.051	0.094	0.126	0.079	0.038	0.023
P_2	0.0250	0.0279	0.0261	0.0245	0.0221	0.0170	0.0350	0.0509	0.0280	0.0113	0.0067
P_3	0.0110	0.0123	0.0119	0.0107	0.0093	0.0071	0.0156	0.0241	0.0121	0.0042	0.0024
						Italy					
H	0.148	0.165	0.168	0.142	0.138	0.108	0.187	0.287	0.181	0.087	0.044
P_G	0.033	0.038	0.037	0.031	0.030	0.023	0.045	0.077	0.040	0.016	0.009
P_2	0.0115	0.0131	0.0129	0.0108	0.0098	0.0074	0.0159	0.0299	0.0135	0.0048	0.0025
P_3	0.0049	0.0056	0.0057	0.0046	0.0040	0.0030	0.0069	0.0139	0.0057	0.0018	0.0009

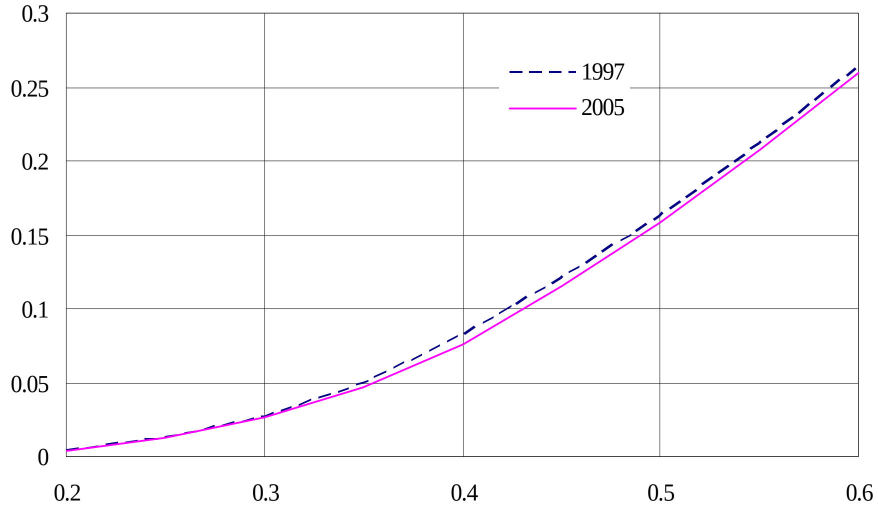
Note: Estimates are obtained from Istat's HBS official publications for the years 1997-2005. The poverty indexes are compiled using equivalent consumption expenditure as indicator of economic welfare. Household consumption expenditure is converted in equivalent unites using the LIS-OECD power scale with parameter $\beta = 0.5$. The poverty line is set at 0.5 times average equivalent consumption expenditure. The decomposition by educational level considers only individuals in the 25-54 age class. Panel 4a reports the sub-group indexes by socio-economic dimension, panel 4b reports the contribution share of each sub-group index to the overall index.

Table 4b: Poverty indexes by socio-economic dimension and macro-region, 2005

	Gender		Age					Education			
	Males	Females	<=24	25-34	35-44	45-54	>=55	Primary School	Secondary School	High School	University
						North					
Pop. share	0.487	0.513	0.223	0.134	0.163	0.144	0.335	0.050	0.359	0.463	0.128
H	0.448	0.552	0.211	0.101	0.133	0.087	0.469	0.120	0.540	0.296	0.044
P_G	0.444	0.556	0.185	0.090	0.124	0.088	0.513	0.133	0.573	0.255	0.039
P_2	0.438	0.562	0.164	0.083	0.118	0.087	0.547	0.157	0.593	0.217	0.033
P_3	0.433	0.567	0.151	0.080	0.112	0.084	0.574	0.183	0.603	0.185	0.029
						Centre					
Pop. share	0.480	0.520	0.232	0.128	0.160	0.145	0.336	0.049	0.322	0.481	0.148
H	0.438	0.562	0.224	0.087	0.141	0.084	0.465	0.112	0.505	0.348	0.035
P_G	0.432	0.568	0.210	0.082	0.136	0.074	0.500	0.125	0.466	0.369	0.040
P_2	0.429	0.571	0.190	0.080	0.127	0.074	0.529	0.115	0.447	0.399	0.039
P_3	0.423	0.577	0.168	0.085	0.114	0.081	0.551	0.100	0.413	0.450	0.037
						South					
Pop. share	0.486	0.514	0.295	0.141	0.153	0.133	0.278	0.095	0.403	0.401	0.101
H	0.464	0.536	0.291	0.134	0.141	0.101	0.333	0.156	0.506	0.295	0.042
P_G	0.459	0.541	0.286	0.131	0.134	0.092	0.357	0.196	0.519	0.249	0.037
P_2	0.458	0.542	0.290	0.130	0.128	0.085	0.367	0.227	0.529	0.213	0.032
P_3	0.459	0.541	0.300	0.129	0.122	0.081	0.370	0.252	0.536	0.186	0.027
						Italy					
Pop. share	0.485	0.515	0.250	0.135	0.159	0.140	0.315	0.065	0.367	0.445	0.123
H	0.458	0.542	0.267	0.122	0.139	0.097	0.375	0.145	0.513	0.300	0.042
P_G	0.454	0.546	0.261	0.119	0.133	0.090	0.397	0.181	0.523	0.259	0.038
P_2	0.453	0.547	0.263	0.119	0.126	0.085	0.407	0.210	0.531	0.226	0.032
P_3	0.453	0.547	0.269	0.119	0.120	0.081	0.411	0.234	0.535	0.203	0.028

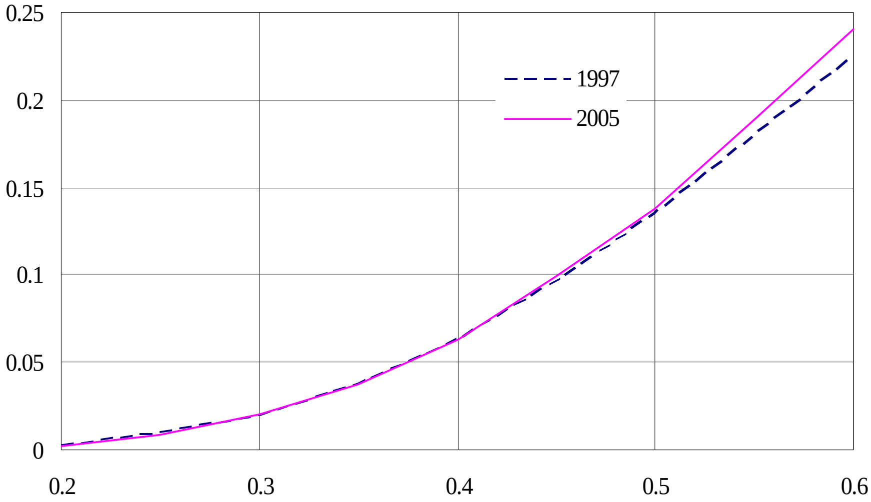
Note: Estimates are obtained from Istat's HBS official publications for the years 1997-2005. The poverty indexes are compiled using equivalent consumption expenditure as indicator of economic welfare. Household consumption expenditure is converted in equivalent unites using the LIS-OECD power scale with parameter $\beta = 0.5$. The poverty line is set at 0.5 times average equivalent consumption expenditure. The decomposition by educational level considers only individuals in the 25-54 age class. Panel 4a reports the sub-group indexes by socio-economic dimension, panel 4b reports the contribution share of each sub-group index to the overall index.

Figure 1: Headcount ratio at different levels of the relative poverty line



Note: Estimates are obtained from Istat's HBS official publications for the years 1997-2005. The headcount ratio is compiled using equivalent consumption expenditure as indicator of economic welfare. Household consumption expenditure is converted in equivalent units using the LIS-OECD power scale with parameter $\beta = 0.5$. The poverty line ranges between 0.2 and 0.6 times average equivalent consumption expenditure.

Figure 2: Headcount ratio at different levels of the relative poverty line, 35-44 age class



Note: Estimates are obtained from Istat's HBS official publications for the years 1997-2005. The headcount ratio is compiled using equivalent consumption expenditure as indicator of economic welfare. Household consumption expenditure is converted in equivalent units using the LIS-OECD power scale with parameter $\beta = 0.5$. The poverty line ranges between 0.2 and 0.6 times average equivalent consumption expenditure.

A Proofs of propositions

In order to define the background for the formal proofs of the statements made in the main text, we first provide a version of an important result that is due to Hardy, Littlewood and Polya (1934) and that forms the basis of the theory of economic inequality. The result establishes an equivalence relation between the inequality ordering that can be defined on the basis of the set of additively separable, monotonic decreasing and convex inequality functions and transformations of a given income distribution by means of simple increments and rank preserving progressive transfers.

Theorem A.1 (Hardy, Littlewood and Polya (1934)): Given two income distribution vectors $x, x' \in X$ for a population of a given size $n \in N$ the following conditions are equivalent:
(a) $x' \geq Bx$ where B is a bistochastic matrix of order n;
(b) for any monotone decreasing and convex real valued function $\phi : R_+ \rightarrow R$, with image $\phi(\omega) \in R$ for $\omega \in R_+$, it holds that: $\sum_{i=1}^{n} \phi(x'_i) \leq \sum_{i=1}^{n} \phi(x_i)$;
(c) for all integer numbers $k = 1, \ldots, n$ it holds that: $\sum_{i=1}^{k} x'_i \geq \sum_{i=1}^{k} x_i$;
(d) the income distribution $x' \in X$ is obtained from the income distribution $x \in X$ through a sequence of simple increments and rank preserving progressive transfers.

Proof: We provide the main elements of the proof in four steps showing that (a) implies (b), (b) implies (c), (c) implies (d) and (d) implies (a):
(a) implies (b): take first the income distribution $x'' = Bx$ where B is a bistochastic matrix of order n and note that any bistochastic matrix of order n can be written as a weighted sum of m permutation matrixes of order n such that $B = \sum_{i=1}^{m} \lambda_i \Pi_i$ where $0 \leq \lambda_i \leq 1$ for all $i = 1, \ldots, m$, $\sum_{i=1}^{m} \lambda_i = 1$ and $m \leq (n-1)^2 + 1$ (Berge (1963) pp. 180-184). Convexity of the function ϕ then implies that $\sum_{i=1}^{n} \phi(x''_i) \leq \sum_{i=1}^{n} \phi(x_i)$. Next, since by assumption $x' \geq x''$ and the function ϕ is monotonically decreasing, it follows that $\sum_{i=1}^{n} \phi(x'_i) \leq \sum_{i=1}^{n} \phi(x''_i)$. The latter two inequalities together imply that $\sum_{i=1}^{n} \phi(x'_i) \leq \sum_{i=1}^{n} \phi(x_i)$ as required;
(b) implies (c): for given $v \in R_+$ define the function ϕ as $\phi(\omega) = v - \omega$ for $\omega < v$ and $\phi(\omega) = 0$ for $\omega \geq v$ and note that this is a monotonic decreasing and convex function. Now take the number $v \in R_+$ such that $v = x_k$, for integer number $k = 1, \ldots, n$. The definition of the function ϕ then implies $\sum_{i=1}^{n} \phi(x_i) = \sum_{i=1}^{k} x_k - x_i$ and $\sum_{i=1}^{n} \phi(x'_i) \geq \sum_{i=1}^{k} x_k - x'_i$. By assumption $\sum_{i=1}^{n} \phi(x'_i) \leq \sum_{i=1}^{n} \phi(x_i)$, taken together these inequalities imply $\sum_{i=1}^{k} x_k - x'_i \leq \sum_{i=1}^{k} x_k - x_i$ and this leads to

the required result (Berge (1963) pp. 184-188);
(c) implies (d): for this part of the proof we note that it is possible to find an income distribution vector $x'' \in X$ such that $\sum_{i=1}^{k} x_i'' \geq \sum_{i=1}^{k} x_i$ for all integer numbers $k = 1, \ldots, n$, $\sum_{i=1}^{n} x_i'' = \sum_{i=1}^{n} x_i$ and $x' \geq x''$. It is then possible to show that the income distribution x'' can be obtained from the income distribution x by sequence of rank preserving progressive transfers (Berge (1963) pp. 184-188). It follows that x' can be obtained from x by a sequence of simple increments and rank preserving progressive transfers;
(d) implies (a): the steps that allow to show that condition (c) imply condition (d) also allow to identify a bistochastic matrix B of order n such that $x'' = Bx$. It follows that $x' \geq Bx$ as required.

In the proof of theorem A.1 we should take note of the separate roles played by the assumptions of monotonicity and convexity of the function $\phi : R_+ \rightarrow R$. The assumption of convexity is used to transform the income distribution vector $x \in X$ in the income distribution vector $x'' \in X$ through rank preserving progressive transfers. The assumption of monotonicity to transform the income distribution vector $x'' \in X$ in the income distribution vector $x' \in X$ through simple increments. In the present context we use the theorem in order to provide a relation between the poverty orderings that can be defined on the basis of the set of monotonic decreasing and Schur-convex poverty index functions and the notions of first order and second order stochastic dominance. We begin by proving first the intermediate results provided in section 2.

Proof of Lemma 2.1: (a) The assumption that the poverty index satisfies the property of monotonicity is equivalent to the assumption that the poverty index function is monotonically decreasing by construction.
(b) In order to prove sufficiency note that if the poverty index function is Schur-convex, then given an income distribution vector $x \in X$ with population size $n \in N$ and number of poor $q = q(x; z)$, for every bistochastic matrix B of order n that takes the form $B = B_P \otimes I_{n-q}$, where B_P is a bistochastic matrix of order q, it follows that $P(Bx; z) \leq P(x; z)$. Moreover, given two distribution vectors $x, x' \in X$ for a population of a given size $n \in N$, if the distribution x' is obtained from x by a rank preserving progressive transfer between two individuals i and j such that $x_i, x_j \in Z$, there exist a bistochastic matrix B of order n such that $B = B_P \otimes I_{n-q}$, where B_P is a bistochastic matrix of order q, I_{n-q} is an $(n - q)$-dimensional identity matrix and $x' = Bx$. The matrix $B_P = [b_{ij}]$ for $i = 1, \ldots q$ and $j = 1, \ldots q$ is defined by a coefficient $0 \leq \lambda \leq 1$ and letting $b_{ii} = b_{jj} = \lambda$,

$b_{ij} = b_{ji} = 1 - \lambda$ and $b_{kl} = \delta_k^l$ for $k, l \neq i, j$, where δ_k^l is the Kronecker symbol $\delta_k^l = 0$ for $k \neq l$ and $\delta_k^l = 1$ for $k = l$ (Berge (1963) pp. 180-184). It follows that $P(x'; z) \leq P(x; z)$.
To prove necessity we need to show that weak transfer implies that for every income distribution vector $x \in X$ of a given population size $n \in N$ and every bistochastic matrix B of order n that takes the form $B = B_P \otimes I_{n-q}$, where B_P is a bistochastic matrix of order $q = q(x; z)$, it holds true that $P(Bx; z) \leq P(x; z)$. For a given income distribution vector $x \in X$ of population size $n \in N$ take thus any such bistochastic matrix B of order n and define $x' = Bx$. Theorem A.1 then implies that the distribution x' can be obtained from x by a sequence of rank preserving progressive transfers. In particular, given the block diagonal form of the bistochastic matrix B and the income vector partitions $x' = (x'_P, x'_{NP})$ and $x = (x_P, x_{NP})$, where $x'_P = (x'_1, \ldots, x'_q)$, $x'_{NP} = (x'_{q+1}, \ldots, x'_n)$, $x_P = (x_1, \ldots, x_q)$, $x_{NP} = (x_{q+1}, \ldots, x_n)$, it holds that $x'_P = B_P x_P$ and $x'_{NP} = x_{NP}$ and therefore by theorem A.1 the poor income vector x'_P is obtained from the poor income vector x_P by a sequence of rank preserving progressive transfers. This in turn implies that the income vector x' is obtained from the income vector x through a sequence of rank preserving progressive transfers between individuals whose income belongs to the poverty domain Z. Since by assumption the poverty index satisfies weak transfer and $x' = Bx$, it follows that $P(Bx; z) \leq P(x; z)$. Note finally that this result does not depend on the choice of the income distribution vector x or of the matrix B_P.

The proof of corollary 2.1 follows along the same lines of the proof of Lemma 2.1 but we apply the latter one to the more restrictive case of an additively separable function that takes the form of equation (2.1).

Proof of corollary 2.1: (a) If the individual poverty index function p is monotonically decreasing then by Lemma 2.1 the poverty index satisfies monotonicity. Conversely, if the poverty index satisfies monotonicity then p must be monotonically decreasing.
(b) In order to prove this part of the corollary consider an income distribution vector $x \in X$ for a population of size $n \in N$ and denote with x' a permutation of x such that $x'_j = x_i$ and $x'_i = x_j$ for $i, j = 1, \ldots, n$ such that $x_i, x_j \in Z$ and $x_i \leq x_j$, and $x_k = x'_k$ for all $k \neq i, j$. A rank preserving progressive transfer between individuals at income levels i and j can then be represented by a vector $x'' = \lambda x + (1-\lambda)x'$ for some $0 \leq \lambda \leq 1$, where x'' represents the income distribution obtained from the rank preserving progressive transfer. Now note that if the

individual index function p is convex then $P(x''; z) \leq P(x, z)$, by definition of convexity. Conversely, if the poverty index satisfies weak transfer then $P(x''; z) \leq P(x; z)$ for all values of λ such that $0 \leq \lambda \leq 1$. Since the latter result does not depend on the choice of the vector $x \in X$ this in turn implies that the individual index function p is convex.

Lemma 2.1 is used in the proofs of the main theorems of the paper, that are stated in section 4.

Proof of Theorem 4.1: We provide the proof in three steps, showing that (a) implies (b), (b) implies (c) and (c) implies (a):
(a) implies (b): take $z \in \mathcal{Z}$ and suppose that $x' \geq x$ with $x'_i \geq x_i$ for at least one $i = 1, \ldots, n$ such that x_i belongs to the poverty domain or $x_i \in Z$. Now note that by Lemma 2.1 all indexes in the class $\mathcal{P}_1$ satisfy monotonicity and hence $P(x'; z) \leq P(x; z)$ for all poverty index functions $P \in \mathcal{P}_1$. Instead if the poverty line $z \in \mathcal{Z}$ is such that there does not exist $i = 1, \ldots, n$ such that $x'_i \geq x_i$ and $x_i \in Z$ then $P(x'; z) = P(x; z)$ for all poverty index functions $P \in \mathcal{P}_1$ since we are assuming that the focus axiom is satisfied.
(b) implies (c): the class of additive separable monotonic functions $\mathcal{P}'_1$ is a subset of the class of monotonic poverty index functions $\mathcal{P}_1$ and therefore $x'\mathcal{P}_1(\mathcal{Z})x$ implies $x'\mathcal{P}'_1(\mathcal{Z})x$; the result then follows using standard arguments in the theory of stochastic dominance, see for example Fishburn (1980).
(c) implies (a): the headcount ratio, as a function of the poverty line, takes the form $H(x'; z) = k - 1$ for $x'_{k-1} \leq z < x'_k$ and $k = 1, \ldots, n$, where we assume $x'_0 = 0$ given the income distribution $x' \in X$ and the form $H(x; z) = k - 1$ for $x_{k-1} \leq z < x_k$ and $k = 1, \ldots, n$, where we assume $x_0 = 0$ given the income distribution $x \in X$. Now suppose that $x'_k < x_k$ for some $k = 1, \ldots, q(x; z)$ and some $z \in [0, z^+]$, then it would follow that $H(x'; z) > H(x; z)$ for $x'_k \leq z < x_k$, contrary to the assumptions in part (c) of the proposition. Hence, $x'_k \geq x_k$ for all $k = 1, \ldots, q(x; z)$ and all $z \in [0, z^+]$.

Proof of Corollary 4.1: We prove this result noting that condition (a) implies condition (b) by conventional arguments in the theory of stochastic dominance, since $\mathcal{P}'_1$ is the class of additive separable monotonic poverty index functions that take the form defined in equation (2.1). Conversely, given condition (b) by Theorem 4.1 the income distribution $x' \in X$ poverty dominates the income distribution $x \in X$ for the class of poverty indexes $\mathcal{P}_1$ and the range of poverty lines $\mathcal{Z} \equiv [z^-, z^+]$ and therefore $x'\mathcal{P}_1(\mathcal{Z})x$. Condition (a) then follows since the class of poverty indexes $\mathcal{P}_1'$ is a subclass of the class of poverty indexes $\mathcal{P}_1$.

Proof of Theorem 4.2: We provide the proof in three steps showing that (a) implies (b), (b) implies (c) and (c) implies (a):
(a) implies (b): we consider in logical sequence first the effect of rank preserving progressive transfers and then the effect of simple increments.
Suppose that there are K such rank preserving progressive transfers. For the $k-th$ transfer for $k = 1, \ldots, K$ and for a given poverty line $z \in \mathcal{Z}$ there are three cases: (i) the income distribution vector $x^{(k-1)} \in X$ is transformed into an income distribution vector $x^{(k)} \in X$ through a rank preserving progressive transfer between individuals i and j such that $x_i, x_j \in Z$; (ii) the rank preserving progressive transfer occurs between individuals i and j such that $x_i \in Z$ and $x_j \notin Z$; (iii) the rank preserving progressive transfer occurs between individuals i and j such that $x_i, x_j \notin Z$. In case (i) theorem A.1 implies that there exist a bistochastic matrix $B^{(k)}$ of order n, that takes the form $B^{(k)} = B_P^{(k)} \otimes I_{n-q}$ where $B_P^{(k)}$ is a bistochastic matrix of order $q = q(x; z)$ and I_{n-q} is the identity matrix of order $n-q$ such that $x^{(k)} = B^{(k)}x^{(k-1)}$; in case (ii) we reclassify the rank preserving progressive transfer as a simple increment and put $B^{(k)} = I_n$ and $x^{(k)} = x^{(k-1)}$; in case (iii) by the focus axiom the rank preserving progressive transfer can be ignored and therefore also in this case we can put for convenience $B^{(k)} = I_n$ and $x^{(k)} = x^{(k-1)}$. We let $x^{(k-1)} = x$ for $k = 1$. Proceeding recursively through the sequence of K transfers, we get an income distribution vector $x'' \in X$ that is obtained from the income distribution vector $x \in X$ through the sub-sequence of rank preserving transfers that occur between individuals i and j such that $x_i, x_j \in Z$. This in turn implies that there exist a bistochastic matrix B of order n such that $x'' = Bx$. The bistochastic matrix B of order n can be computed as the product of the bistochastic matrixes that are used in each step of the sequence, such that $B = B^{(1)}B^{(2)} \cdots B^{(K)}$.
Next, we note that simple increments transform the income distribution vector $x'' \in X$ into an income distribution vector $x' \in X$ such that $x' \geq x''$.
By assumption, there exist some poverty line $z \in \mathcal{Z}$ such that some of the rank preserving progressive transfers fall in case (i). For all poverty lines of this type and for all poverty index functions belonging to the class $\mathcal{P}_2$ it follows that $P(x''; z) \leq P(x; z)$, because all poverty index functions in $\mathcal{P}_2$ are Schur-convex and therefore by Lemma 2.1 all these functions satisfy the property of weak transfer. Instead, for the poverty lines $z \in \mathcal{Z}$ such that all of the rank preserving progressive transfers fall

in cases (ii) and (iii), $P(x''; z) = P(x; z)$ for all poverty index functions belonging to the class $\mathcal{P}_2$, since for these cases we have put for convenience $x'' = x$.
Finally, since all poverty index functions belonging to the class $\mathcal{P}_2$ are monotonic decreasing, and therefore by Lemma 2.1 they satisfy the property of monotonicity, and given that the income distribution vector $x'' \in X$ is transformed into an income distribution vector $x' \in X$ through a sequence of simple increments such that $x' \geq x''$, it holds that $P(x'; z) \leq P(x''; z)$ for all poverty lines $z \in \mathcal{Z}$.
The above arguments imply that $P(x'; z) \leq P(x; z)$ for all poverty lines $z \in \mathcal{Z}$.
(b) implies (c): the class of additive separable, monotonic and Schur-convex functions $\mathcal{P}'_2$ is a subset of the class $\mathcal{P}_2$ and therefore $x'\mathcal{P}_2(\mathcal{Z})x$ implies $x'\mathcal{P}'_2(\mathcal{Z})x$. By theorem A.1 this in turn implies that $\sum_{i=1}^{k} x'_i \geq \sum_{i=1}^{k} x_i$ for all $k = 1, \ldots, q(x; z)$ for all poverty lines $z \in \mathcal{Z}$. The result follows upon noting the poverty gap is defined as: $P_G(x; z) = 1/n(x) \sum_{i=1}^{q(x;z)} (z - x_i)/z$.
(c) implies (a): by theorem A.1 the inequalities $\sum_{i=1}^{k} x'_i \geq \sum_{i=1}^{k} x_i$ for all $k = 1, \ldots, q(x; z)$ for all poverty lines $z \in \mathcal{Z}$ imply that the income distribution vector $x' \in X$ is obtained from the income distribution vector $x \in X$ through a sequence of simple increments and rank preserving progressive transfers that occur for individuals i such that $x_i \in Z$ and between individuals i and j such that $x_i, x_j \in Z$ for some $z \in \mathcal{Z}$. This in turn implies that there exist a suitable bistochastic matrix B of order n, that takes the block diagonal form $B = B_P \otimes I_{n-q}$ where B_P is a bistochastic matrix of order $q = q(x; z)$ and I_{n-q} is the identity matrix of order $n - q$, such that $x' \geq Bx$.

Proof of Corollary 4.2: We prove this result noting that condition (a) implies condition (b) by theorem A.1, since $\mathcal{P}'_2$ is the class of additive separable, monotonic and Schur-convex poverty index functions that take the form defined in equation (2.1). Conversely, given condition (b) by Theorem 4.2 the income distribution $x' \in X$ poverty dominates the income distribution $x \in X$ for the class of monotonic and Schur-convex poverty indexes $\mathcal{P}_2$ and the range of poverty lines $\mathcal{Z}$ and therefore $x'\mathcal{P}_2(\mathcal{Z})x$. Condition (a) then follows since the class of poverty indexes $\mathcal{P}'_2$ is a subclass of the class of poverty indexes $\mathcal{P}_2$.

B Statistical appendix

Table B.1: Headcount ratio by macro-region at different levels of the relative poverty line, 1997-2005

	0.2	0.25	0.3	0.35	0.4	0.45	0.5	0.55	0.6
					North				
1997	0.001	0.005	0.012	0.021	0.038	0.057	0.084	0.120	0.162
1998	0.002	0.004	0.011	0.019	0.035	0.056	0.083	0.114	0.153
1999	0.002	0.004	0.009	0.018	0.033	0.051	0.078	0.110	0.145
2000	0.001	0.005	0.010	0.020	0.034	0.056	0.087	0.121	0.157
2001	0.001	0.003	0.006	0.016	0.030	0.050	0.076	0.111	0.146
2002	0.001	0.004	0.010	0.021	0.033	0.053	0.081	0.115	0.153
2003	0.001	0.005	0.010	0.019	0.034	0.054	0.082	0.117	0.156
2004	0.000	0.002	0.008	0.016	0.027	0.045	0.073	0.106	0.142
2005	0.001	0.003	0.007	0.015	0.029	0.048	0.073	0.106	0.145
					Centre				
1997	0.002	0.004	0.011	0.020	0.038	0.064	0.098	0.139	0.184
1998	0.002	0.007	0.014	0.028	0.047	0.074	0.111	0.148	0.203
1999	0.003	0.006	0.016	0.033	0.058	0.088	0.123	0.169	0.216
2000	0.003	0.009	0.021	0.035	0.066	0.099	0.147	0.202	0.246
2001	0.001	0.004	0.012	0.032	0.051	0.089	0.129	0.179	0.231
2002	0.003	0.006	0.011	0.024	0.049	0.074	0.106	0.148	0.192
2003	0.001	0.004	0.009	0.022	0.038	0.059	0.091	0.133	0.176
2004	0.002	0.004	0.009	0.022	0.043	0.071	0.105	0.148	0.198
2005	0.001	0.004	0.012	0.023	0.035	0.059	0.087	0.129	0.168
					South				
1997	0.009	0.027	0.055	0.099	0.160	0.227	0.293	0.361	0.430
1998	0.011	0.029	0.058	0.104	0.159	0.222	0.289	0.357	0.419
1999	0.010	0.030	0.062	0.108	0.165	0.225	0.289	0.351	0.425
2000	0.011	0.029	0.061	0.108	0.163	0.234	0.298	0.368	0.428
2001	0.009	0.025	0.055	0.100	0.157	0.225	0.297	0.367	0.431
2002	0.009	0.025	0.052	0.092	0.148	0.209	0.276	0.350	0.424
2003	0.009	0.023	0.047	0.089	0.143	0.199	0.268	0.344	0.411
2004	0.010	0.030	0.063	0.109	0.170	0.234	0.303	0.373	0.442
2005	0.010	0.029	0.061	0.102	0.159	0.229	0.306	0.379	0.455
					Italy				
1997	0.004	0.013	0.027	0.049	0.082	0.120	0.163	0.211	0.263
1998	0.005	0.014	0.029	0.052	0.082	0.120	0.163	0.208	0.259
1999	0.005	0.014	0.029	0.053	0.085	0.120	0.162	0.207	0.259
2000	0.005	0.014	0.030	0.054	0.086	0.128	0.174	0.225	0.271
2001	0.004	0.011	0.025	0.049	0.079	0.120	0.165	0.215	0.264
2002	0.004	0.012	0.025	0.047	0.078	0.113	0.156	0.206	0.258
2003	0.004	0.011	0.023	0.045	0.074	0.107	0.150	0.201	0.251
2004	0.004	0.012	0.028	0.050	0.081	0.118	0.161	0.209	0.260
2005	0.004	0.012	0.027	0.047	0.076	0.115	0.158	0.207	0.260

Note: Estimates are obtained from Istat's HBS official publications for the years 1997-2005. The headcount ratio is compiled using equivalent consumption expenditure as indicator of economic welfare. Household consumption expenditure is converted in equivalent units using the LIS-OECD power scale with parameter $\beta = 0.5$. The poverty line ranges between 0.5 and 0.6 times average equivalent consumption expenditure.

Table B.2: Headcount ratio by age class at different levels of the relative poverty line, 1997-2005

	0.2	0.25	0.3	0.35	0.4	0.45	0.5	0.55	0.6
					Age <=24				
1997	0.003	0.010	0.021	0.044	0.079	0.118	0.162	0.213	0.267
1998	0.003	0.011	0.024	0.047	0.076	0.116	0.160	0.206	0.259
1999	0.004	0.011	0.026	0.050	0.081	0.118	0.159	0.200	0.258
2000	0.003	0.009	0.026	0.050	0.081	0.126	0.172	0.224	0.272
2001	0.004	0.010	0.022	0.047	0.076	0.119	0.167	0.217	0.267
2002	0.004	0.011	0.022	0.044	0.076	0.112	0.156	0.209	0.268
2003	0.004	0.010	0.019	0.039	0.068	0.103	0.149	0.204	0.257
2004	0.004	0.011	0.025	0.046	0.078	0.114	0.158	0.210	0.264
2005	0.005	0.014	0.028	0.048	0.075	0.119	0.168	0.221	0.276
					Age 25-34				
1997	0.002	0.006	0.017	0.035	0.068	0.104	0.142	0.187	0.240
1998	0.004	0.011	0.023	0.043	0.073	0.108	0.148	0.190	0.237
1999	0.003	0.010	0.022	0.040	0.065	0.095	0.133	0.173	0.220
2000	0.004	0.010	0.023	0.043	0.071	0.106	0.152	0.204	0.248
2001	0.004	0.009	0.021	0.039	0.065	0.097	0.137	0.180	0.225
2002	0.004	0.010	0.019	0.036	0.060	0.093	0.134	0.181	0.232
2003	0.004	0.010	0.019	0.036	0.062	0.089	0.129	0.179	0.225
2004	0.004	0.011	0.023	0.043	0.071	0.106	0.144	0.188	0.238
2005	0.004	0.010	0.026	0.041	0.066	0.100	0.142	0.184	0.235
					Age 35-44				
1997	0.002	0.010	0.019	0.037	0.063	0.096	0.135	0.179	0.225
1998	0.002	0.008	0.019	0.038	0.061	0.094	0.131	0.175	0.226
1999	0.003	0.011	0.024	0.043	0.070	0.101	0.137	0.178	0.226
2000	0.002	0.008	0.019	0.037	0.063	0.101	0.142	0.188	0.232
2001	0.002	0.006	0.016	0.037	0.059	0.100	0.140	0.184	0.230
2002	0.003	0.010	0.017	0.034	0.058	0.087	0.125	0.174	0.225
2003	0.002	0.006	0.014	0.031	0.053	0.083	0.121	0.170	0.218
2004	0.004	0.011	0.023	0.042	0.068	0.099	0.138	0.185	0.239
2005	0.002	0.009	0.020	0.037	0.063	0.099	0.138	0.189	0.241
					Age 45-54				
1997	0.003	0.008	0.018	0.032	0.053	0.082	0.112	0.151	0.189
1998	0.003	0.008	0.015	0.029	0.050	0.077	0.109	0.143	0.181
1999	0.003	0.008	0.016	0.033	0.057	0.081	0.115	0.152	0.197
2000	0.002	0.008	0.019	0.037	0.058	0.090	0.123	0.167	0.203
2001	0.002	0.004	0.012	0.028	0.047	0.077	0.111	0.152	0.193
2002	0.002	0.006	0.014	0.031	0.053	0.079	0.111	0.144	0.188
2003	0.002	0.006	0.013	0.027	0.047	0.072	0.107	0.145	0.190
2004	0.002	0.007	0.017	0.032	0.052	0.078	0.114	0.150	0.194
2005	0.003	0.005	0.015	0.027	0.049	0.075	0.108	0.147	0.194
					Age >=55				
1997	0.008	0.024	0.046	0.075	0.117	0.160	0.212	0.267	0.326
1998	0.010	0.023	0.045	0.077	0.116	0.159	0.211	0.265	0.321
1999	0.008	0.021	0.044	0.074	0.116	0.160	0.211	0.266	0.320
2000	0.010	0.026	0.050	0.080	0.123	0.173	0.229	0.285	0.336
2001	0.006	0.018	0.039	0.072	0.115	0.163	0.214	0.277	0.330
2002	0.005	0.016	0.039	0.067	0.107	0.151	0.201	0.257	0.308
2003	0.006	0.018	0.037	0.068	0.105	0.146	0.194	0.249	0.299
2004	0.005	0.017	0.039	0.067	0.105	0.150	0.199	0.253	0.304
2005	0.005	0.016	0.035	0.062	0.098	0.139	0.187	0.238	0.292

Note: Estimates are obtained from Istat's HBS official publications for the years 1997-2005. The headcount ratio is compiled using equivalent consumption expenditure as indicator of economic welfare. Household consumption expenditure is converted in equivalent units using the LIS-OECD power scale with parameter $\beta = 0.5$. The poverty line ranges between 0.5 and 0.6 times average equivalent consumption expenditure.

References

Abul Naga R. H. (2005) 'Social Welfare Orderings: A Life-Cycle Perspective', Economica, Vol. 72, August, pp. 497-514.

Arrow K. J. (1963) 'Social Choice and Individual Values', New York, John Wiley and Sons Inc..

Atkinson A. B. (1970) 'On the Measurement of Inequality', Journal of Economic Theory, Vol. 2, pp. 244-263.

Atkinson A. B. (1983) 'The Economics of Inequality', Oxford, Clarendon Press.

Atkinson A. B. (1987) 'On the Measurement of Poverty', Econometrica, Vol. 55, No. 4, July, pp. 749-764.

Atkinson A. B. (1992) 'Measuring Poverty and Differences in Family Composition', Economica, Vol. 59, No. 233, February, pp. 1-16.

Atkinson A. B. (1998) 'Poverty in Europe', Oxford, Basil Blackwell.

Atkinson A. B., Rainwater L. and Smeeding T. M. (1995) 'Income Distribution in OECD Countries: Evidence from the Luxemburg Income Study', Social Policy Studies No. 18, Paris, OECD.

Berge C. (1963) 'Topological Spaces', New York, Dover Publications.

Buhmann B., Rainwater L., Schmaus G. and Smeeding T. M. (1988) 'Equivalence Scales, Well Being, Inequality and Poverty: Sensitivity Estimates Across Ten Countries Using the Luxembourg Income Study (LIS) Database', The Review of Income and Wealth, Vol. 34, No. 2, June, pp. 115-142.

Clark S., Hemming R. and Ulph D. (1981) 'On Indices for the Measurement of Poverty', The Economic Journal, Vol. 91, June, pp. 515-26.

Coulter A. E. F., Cowell F. A. and Jenkins S. P. (1992) 'Equivalence Scale Relativities and the Extent of Inequality and Poverty', The Economic Journal, Vol. 102, No. 414, September, pp. 1067-1082.

Dasgupta P., Sen A. and Starrett D. (1973) 'Notes on the Measurement of Inequality', Journal of Economic Theory, Vol. 6, pp. 180-187.

Davidson R. and Duclos J-Y. (2000) 'Statistical Inference for Stochastic Dominance and for the Measurement of Poverty and Inequality', Econometrica, Vol. 68, No. 6, pp. 1435-1464.

Deaton A. and Muellbauer J. (1980) 'Economics and Consumer Behavior', Cambridge, New York, Port Chester, Melbourne and Sydney, Cambridge University Press.

Deaton A. (1992) 'Understanding Consumption', Oxford, Clarendon Press, Clarendon Lectures in Economics.

Deaton A. (1997) 'The Analysis of Household Surveys: a Microeconometric Approach to Development Policy', Baltimore, The Johns Hopkins University Press.

Fishburn P. C. (1980) 'Continua of Stochastic Dominance Relations for Unbounded Probability Distributions', Journal of Mathematical Economics, Vol. 7, pp. 271-285.

Foster J. E and Sen A. (1997) 'On Economic Inequality after a Quarter Century', in Sen (1997) 'On Economic Inequality', Oxford, Clarendon Press, pp. 105-219.

Foster J. E. and Shorrocks A. F. (1988a) 'Inequality and Poverty Orderings', European Economic Review, Vol. 32, pp. 654-662.

Foster J. E. and Shorrocks A. F. (1988b) 'Poverty Orderings', Econometrica, Vol. 56, No. 1, January, pp. 173-177.

Foster J. E. and Shorrocks A. F. (1988c) 'Poverty Orderings and Welfare Dominance', Social Choice and Welfare, Vol. 5, No. 2/3, pp. 179-198.

Foster J. E. and Shorrocks A. F. (1991) 'Subgroup Consistent Poverty Indices', Econometrica, Vol. 59, No. 3, May, pp. 687-709.

Foster J. E., Greer J. and Thorbecke E. (1984) 'A Class of Decomposable Poverty Measures', Econometrica, Vol. 52, No. 3, May, pp. 761-765.

Hardy G., Littlewood J. and Polya G. (1934) 'Inequalities', London, Cambridge University Press.

Istat (2005) 'Conti Economici Nazionali Anni 1992-2000', Nota Informativa, Roma, Istituto Nazionale di Statistica.

Istat (2006a) 'I Consumi delle Famiglie: Anno 2004', Annuario N. 11 - 2006, Roma, Istituto Nazionale di Statistica.

Istat (2006b) 'La Povertà Relativa in Italia nel 2005', Statistiche in Breve, Roma, Istituto Nazionale di Statistica.

Jenkins S. P. and Lambert P. J. (1997) 'Three 'I's of poverty curves, with an analysis of UK poverty trends', Oxford Economic Papers, Vol. 49, pp. 317-327.

Kakwani N. C. (1980a) 'Income Inequality and Poverty: Methods of Estimation and Policy Applications', Oxford, Oxford University Press.

Kakwani N. C. (1980b) 'On a Class of Poverty Measures', Econometrica, Vol. 48, No. 2, March, pp. 437-446.

Kreps D. M. (1988) 'Notes on the Theory of Choice', Boulder, Colorado, Westview Press.

Ravallion M. (1994) 'Poverty Comparisons', London, Routlege.

Rawls J. (1971) 'A Theory of Justice', Cambridge, Mass., Harvard University Press.

Rothschild M. and Stiglitz J. E. (1973) 'Some Further Results on the Measurement of Inequality', Journal of Economic Theory, Vol. 6, No. 2, April, pp. 188-204.

Sen A. (1970) 'Collective Choice and Social Welfare', San Francisco, Holden-Day Inc..

Sen A. (1976a) 'Real National Income', The Review of Economic Studies, Vol. 43(1), No. 133, February, pp. 19-39.

Sen A. (1976b) 'Poverty: an Ordinal Approach to Measurement', Econometrica, Vol. 44, No. 2, March, pp. 219-231.

Sen A. (1997) 'On Economic Inequality', Oxford, Clarendon Press.

Shorrocks A. F. (1983) 'Ranking Income Distributions', Economica, Vol. 50, No. 197, Feb., pp. 3-17.

Shorrocks A. F. (1995) 'Revisiting the Sen Poverty Index', Econometrica, Vol. 63, No. 5, September, pp. 1225-1230.

Shorrocks A. F. and Foster J. E. (1987) 'Transfer Sensitive Inequality Measures', Review of Economic Studies, Vol. 54, pp. 485-497.

Watts H. (1968) 'An Economic Definition of Poverty', in Moynihan D. P. (ed.) 'On Understanding Poverty', New York and London, Basic Books, pp. 316-29.

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2006

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2007

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P. ANGELINI and F. LIPPI, *Did prices really soar after the euro cash changeover? Evidence from ATM withdrawals,* International Journal of Central Banking, **TD No. 581 (March 2006)**.

S. FEDERICO and G. A. MINERVA, *Outward FDI and local employment growth in Italy,* Review of World Economics, **TD No. 613 (February 2007).**

F. BUSETTI and A. HARVEY, *Testing for trend,* Econometric Theory **TD No. 614 (February 2007).**

B. ROFFIA and A. ZAGHINI, *Excess money growth and inflation dynamics,* International Finance, **TD No. 629 (June 2007)**.

M. DEL GATTO, GIANMARCO I. P. OTTAVIANO and M. PAGNINI, *Openness to trade and industry cost dispersion: Evidence from a panel of Italian firms,* Journal of Regional Science, **TD No. 635 (June 2007)**.