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Keyword: Gini Index, Web Experiment, Progressive Transfers, Social Welfare Functions, Inequality, Utilitarianism, Extended Gini, Ethical Preferences

JEL Classification: C51, C99, D31, D63

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Gaëlle Aymeric,[†] and Brice Magdalou[‡]

November 2, 2024

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1. Introduction

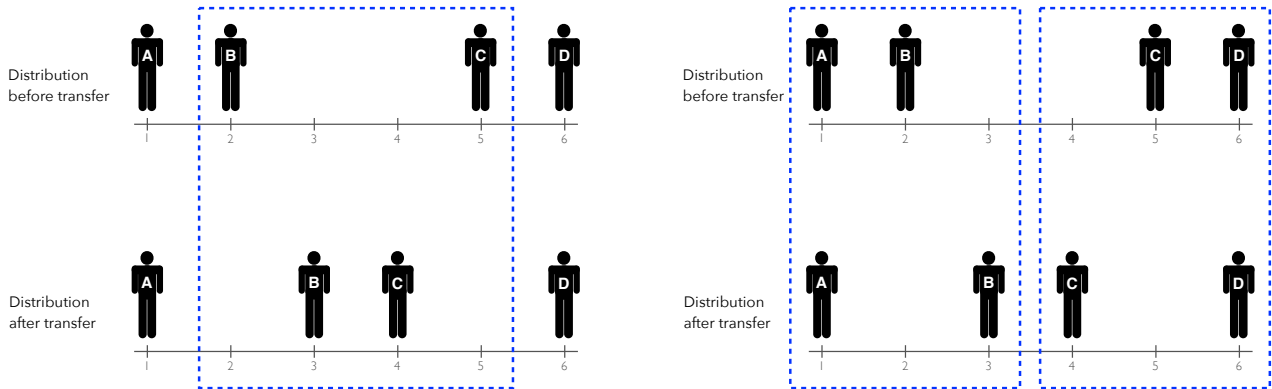
Since the seminal work of [Kolm \(1969\)](#) and [Atkinson \(1970\)](#), the *Pigou-Dalton principle of transfers* is the cornerstone of the theory of income inequality measurement. According to this normative principle, a mean-preserving transfer of income from one individual to another who is relatively poorer, without reversing the initial positions on the income scale, always reduces overall income inequality. Almost all the income inequality indices used today, both in academic research and by official statistical institutes, conform to this principle. The Gini index, which is by far the most widely used, is a prime example.

In this paper, we look at whether this approach is compatible with people's views on inequality. We report the results of a web-experiment conducted on a representative sample of the French population, with 1,028 participants. Subjects were asked to compare, in terms of inequality, pairs of income distributions for an hypothetical society, where all individuals are clones. We test the acceptability of the principle of transfers, but also of three alternative principles that impose constraints on recipients and donors in transfers. Then, assuming that individual preferences of participants can be represented by a social welfare function we estimate, parametrically and non-parametrically, two functions commonly used in the literature: *utilitarianism* and *extended Gini*. Since participants' preferences are heterogeneous, we focus on the preferences of the *median individual*. We then compare our estimates with the social welfare functions used in the empirical literature, in particular the one underlying the Gini index. To our knowledge, this is the first study of its kind involving a representative sample of a country's population, and testing alternatives to the principle of transfers. It is also the first experimental study which investigates the extended Gini model, making it possible to test the relevance of Gini as an index representing people's views on inequality.

Why should the principle of transfers pose a problem? Obviously, income inequality is reduced between the two people involved in a progressive transfer. However, the effect of such a transfer on the overall inequality in the distribution may be open to discussion. By way of illustration, let's consider a society consisting of 4 individuals who are perfectly identical, apart from their income. Let's call these individuals A, B, C and D and say that they have, respectively, 1, 2, 5 and 6 income units. Suppose a transfer of 1 unit of income is made from individual C to B. The left-hand side of [Figure 1](#) illustrates the fact that these two individuals get closer on the income scale. The (relative) situation of the individuals not concerned by the transfer is highlighted in the right-hand side. After the transfer, the poorest individual A is left behind. Even if she can be considered a priority target for redistribution, her situation remains unchanged, whereas it is improved for individual B, who was already richer than her before the transfer. On the other side of the distribution, individual C contributes to the transfer, while the richest individual D does

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Figure 1: *Impact of a progressive transfer on the global distribution*



not. For these reasons, some people may consider that a distribution obtained by means of certain progressive transfers is not necessarily more equal than the distribution before transfer.

The previous example illustrates a deep-seated problem with the principle of transfers: It associates the notion of ‘reduction of a partial statistic distance’ to the notion of ‘reduction in global inequality’. As inequality is a normative concept, the equivalence between these two notions is not immediate. [Amiel and Cowell \(1992\)](#) were the first to observe, through a questionnaire experiment with students, the low approval of certain progressive transfers, particularly those not involving individuals at the extremes of the distribution. Despite the fact that this finding has been confirmed by numerous subsequent experiments ([Amiel and Cowell, 2002](#); [Gaertner and Namazie, 2003](#); [Amiel et al., 2012](#), to name a few), few studies have sought to find an alternative to this principle that is more in line with people’s preferences.

This low approval rate of the principle of transfers may be explained by the way people assess their own position in the income distribution (even if they are not involved in the distributions they have to compare). Although individuals attach importance to the absolute level of income, it is now generally accepted that they attach as much, if not more, importance to the *relative position* on the income scale ([Clark et al., 2008](#)). They are also sensitive to changes in their own situation, relative to individuals in their *reference group*, which can be defined on the basis of social, professional or neighborhood considerations. In various branches of economic literature (macroeconomics, finance, labour economics, etc.), this robust fact has been referred to the *keeping up with the Joneses* effect ([Abel, 1990](#)). Comparable considerations are also found, for example, in sociology through the notion of *deprivation* ([Runciman, 1966](#)), or in philosophy with the notion of *complaint* ([Temkin, 1986, 1993](#)). In the example given in Figure 1, we can see that the initial distribution is in some sense polarised, with a homogeneous group of two individuals at the bottom

of the distribution, and the same at the top. After the transfer, individual B's income gain is associated with a deterioration in the relative situation of individual A in the bottom group, and individual C in the top group. These cumulative changes may therefore not be seen as reducing overall inequality.

Chateauneuf and Moyes (2006) proposed three possible alternatives to the principle of transfers. This principle (PT hereafter) imposes no restrictions on the income transfers, other than the fact that the transfer must be mean-preserving, and that the donor must be and remain richer than the recipient. The alternative principles impose a form of solidarity (or uniformity) at the bottom and/or the top of the distribution. At the bottom of the distribution, if an individual receives a certain amount of income, the same amount at least must be received by those poorer than him. This is called a *uniform-on-the-left* transfer (UL). At the top of the distribution, if an individual is a donor, all those richer than him must contribute, at least as much. This is called a *uniform-on-the-right* transfer (UR). A transfer that combines the two restrictions is called a *uniform-on-the-right-and-left* transfer (URL). These authors then identified the preorder relations (comparable to the Lorenz criterion for the principle of transfers) and the restrictions to be placed on the extended Gini class of social welfare functions, to make inequality assessment compatible with these new principles.

Our results can be summarised as follows. If we focus on the numerical questions, where participants have to compare pairs of distributions, the Pigou-Dalton principle of transfers is validated in only 38% of cases (Table 8). This result, which is very low, is comparable to that observed in the literature. Uniform transfers receive significantly more support, up to 62% for URL transfers. If uniformity is imposed on only one side of the distribution, UL transfers (solidarity among the poor) seem to be preferred. We then focus on the sub-sample of participants who correctly answered the 4 test questions we set up (to ensure they understood the experiment). The trend observed in the full sample is confirmed (Table 9), but with an increase in acceptance rate of all transfers (from 52% for the principle of transfers to 67% for URL). This trend remains robust, whatever the initial distribution considered before transfer, and whatever the socio-economic characteristics of the participants (gender, level of education, political views, employment status). We find similar results in questions where transfers (with or without solidarity) are described in text form (Table 12), but with smaller differences in acceptance rates (UR and UL are not significantly different here).

The econometric estimation of social welfare functions for each participant also provides interesting results. We first compare the parametric estimations of the utilitarian function underlying the *Atkinson-Kolm-Sen inequality indices* (Kolm, 1969; Atkinson, 1970; Sen, 1973), to the weighting function underlying the *extended Gini indices* (Yaari, 1987; Donaldson and Weymark, 1980). The two functions are one-parameter power functions. Consistency with the principle of trans-

fers is captured in the two models, respectively, by the concavity of the utility function and the convexity of the weighting function. This is what we observe for over 80% of participants in the restricted sample (Table 15). The median value of the utility function parameter varies according to the estimation method (Table 16), while that of the weighting function always remains very close to that characterising the Gini index (Table 17 and Figure 2). If we compare the two approaches using the *Akaike Information Criterion*, we see that the extended Gini model fits the data better for 70% of participants (Table 18). Hence, the extended Gini model seems to have an empirical advantage here. Chateauneuf and Moyes (2006) have also shown that this model is sufficiently flexible to distinguish between the different transfer principles (URL, UL, UR, PT), which is not possible for the utilitarian model. In the latter case, consistency with all the principles always comes down to the concavity of the utility function. We provide, in a second step, a non-parametric (point-by-point) estimation of the weighting function for each participant. Our descriptive results are confirmed: the classes of functions compatible with uniform transfers represent a larger proportion of participants, with a clear hierarchy: URL > UL > UR > PT, ranging from [76%-77%] of the participants for URL to [10%-36%] for PT, depending on the estimation methods (Table 19). Nevertheless, for the median individual, we obtain a result similar to the parametric estimate: the weighting function characterising the Gini index approximates fairly closely that of the median individual (Figure 3).

The rest of the paper is organised as follows. In Section 2, we outline the normative theory of inequality measurement, based on the Pigou-Dalton principle of transfers. We set out the notation, the main income inequality measurement tools and the alternatives to this principle. We also discuss some experimental results which, although they do not address precisely the same issues as we do, seem to confirm the empirical relevance of the new principles. We present our experimental design in Section 3. We detail the successive stages of the web-experiment, and we show how the pairs of income distributions under comparison are constructed. The sample of participants is described in Section 4. Section 5 discusses the acceptance rates for the different transfer principles. We focus first on the numerical questions and we look at whether the initial distributions, or the socio-economic characteristics of the participants, have an influence on these acceptance rates. We then present the acceptance rates in the text-based questions. The econometric estimations of the social welfare function for each participant is detailed in Section 6, by distinguishing the parametric and non-parametric approaches. Finally, Section 7 concludes.

2. The normative approach to measuring income inequality

2.1. The framework

NOTATION. We consider a population consisting of $n \geq 2$ individuals, identical in every respects other than their income. Income of individual i is denoted by $x_i \in \mathcal{D}$, where \mathcal{D} is an interval of the non-negative real numbers, and an income distribution is a list $\mathbf{x} = (x_1, x_2, \dots, x_n)$. We restrict attention to non-decreasingly ordered distributions, and the set of these distributions is denoted \mathcal{D}^n .¹ The mean income of distribution \mathbf{x} is indicated by $\mu(\mathbf{x}) = \sum_{i=1}^n x_i/n$.

INEQUALITY REDUCTION. In the inequality measurement literature, it is usually assumed that a mean-preserving transfer of income from one individual to another who is relatively poorer, without reversing the initial positions on the income scale, always reduces inequality. Such a transfer is known as a Pigou-Dalton progressive transfer, and is formally defined as follows:

Definition 1 (Pigou-Dalton Transfer). *Given two income distributions $\mathbf{x}, \mathbf{y} \in \mathcal{D}^n$, we say that \mathbf{x} is obtained from \mathbf{y} by means of a Pigou-Dalton progressive transfer, if there exists $\delta > 0$ and two individuals $1 \leq h < k \leq n$ such that $\mathbf{x} = \mathbf{y} + \mathbf{t}$ and:*

INDIVIDUAL =	1	...	$h-1$	h	$h+1$...	$k-1$	k	$k+1$...	n
$\mathbf{t} =$	(0	...	0	δ	0	...	0	$-\delta$	0	...	0)

Acceptance of the inequality-reducing nature of such a transfer is known as the Pigou-Dalton principle of transfers.

SOCIAL WELFARE FUNCTIONS. According to the so-called ethical approach to measuring inequality (Blackorby *et al.*, 1999), it is used to assess the inequality of a distribution $\mathbf{x} \in \mathcal{D}^n$ on the basis of a social welfare function $W : \mathcal{D}^n \rightarrow \mathbb{R}$.² Traditionally two subclasses of the *rank-dependent expected utility model* popularized by Quiggin (1993) are considered in the literature. Firstly, there is the *utilitarian approach*, which assumes that social welfare is the average of the utilities obtained by individuals, denoted by:

$$W_u(\mathbf{x}) = \frac{1}{n} \sum_{i=1}^n u(x_i), \quad \forall \mathbf{x} \in \mathcal{D}^n, \quad (1)$$

¹ This framework is deliberately simplified, and it is defined without lost of generality. The inequality measures we present in this paper are all consistent with the symmetry axiom (invariance with respect to a permutation of the distribution) and Dalton's principle of populations (invariance to an identical replication of the population).

² A relative inequality index can be written as $I(\mathbf{x}) = 1 - \Xi(\mathbf{x})/\mu(\mathbf{x})$, where the *equally distributed equivalent income* $\Xi(\mathbf{x})$ is the income which, if received by each individual, gives rise to a distribution socially indifferent to \mathbf{x} . $\Xi(\mathbf{x})$ is implicitly defined by $W(\mathbf{x}) = W(\Xi(\mathbf{x}), \dots, \Xi(\mathbf{x}))$.

where $u \in \mathcal{U} = \{u : \mathcal{D} \rightarrow \mathbb{R} \mid u \text{ continuous and non-decreasing}\}$ is the utility function (defined up to an increasing affine transformation). Secondly, there is the *extended Gini approach*, with the social welfare function:

$$W_f(\mathbf{x}) = \sum_{i=1}^n \left[f\left(\frac{n-i+1}{n}\right) - f\left(\frac{n-i}{n}\right) \right] x_i, \quad \forall \mathbf{x} \in \mathcal{D}^n, \quad (2)$$

where $f \in \mathcal{F} = \{f : [0, 1] \rightarrow [0, 1] \mid f \text{ continuous, non-decreasing, } f(0) = 0, f(1) = 1\}$ is the weighting function.

EQUIVALENCE RESULT. The main result in the literature on income inequality measurement is the Hardy-Littlewood-Polya theorem (HLP hereafter, see [Magdalou, 2021](#)), which establishes the equivalence between several statements. To be precise, each statement defines a preorder relation (incomplete ranking) which describes a situation where a distribution \mathbf{x} provides more social welfare than a distribution \mathbf{y} . Because the averages of the two distributions are equal, this also means that \mathbf{x} is less unequal. Formally, we have:³

Proposition 1. *Let $\mathbf{x}, \mathbf{y} \in \mathcal{D}^n$ such that $\mu(\mathbf{x}) = \mu(\mathbf{y})$. The following statements are equivalent:*

- (a) \mathbf{x} is obtained from \mathbf{y} by means of a sequence of Pigou-Dalton transfers,
- (b1) $W_u(\mathbf{x}) \geq W_u(\mathbf{y})$, for all concave functions $u \in \mathcal{U}$,
- (b2) $W_f(\mathbf{x}) \geq W_f(\mathbf{y})$, for all convex functions $f \in \mathcal{F}$,
- (c) $\frac{1}{n} \sum_{i=1}^h x_i \geq \frac{1}{n} \sum_{i=1}^h y_i$, for all $h = 1, \dots, n-1$.

The first statement describes an unambiguous reduction of inequality, in the sense of the principle of transfers view on inequality. The second statement presents the condition to be placed on the utility function to obtain an utilitarian social ranking of the distributions, consistent with the principle of transfers. The third statement is the same, but within the extended Gini framework. Finally, statement (c) corresponds to the well-known Lorenz criterion.

2.2. Alternatives to the principle of transfers

While a progressive transfer indisputably reduces inequality between the individuals concerned by the transfer, it is less clear that inequality is reduced in the entire distribution, as illustrated in [Figure 1](#). [Chateauneuf and Moyes \(2006\)](#) have proposed three possible restrictions to be applied to a transfer to be considered as inequality reducing.

³ In fact, the Hardy-Littlewood-Polya theorem is the equivalence between statements (a), (b1) and (c). The equivalence with statement (b2) can be derived from Theorem 2 in [Yaari \(1987\)](#).

The first one is *uniform transfers on the right and on the left* (URL). According to this alternative view, an income transfer reduces the inequality only if three conditions are satisfied. First, when an amount of income is taken to one individual, the same amount has to be taken to all the individuals richer than her. Symmetrically, when an individual receives an amount of income, the same amount has to be received by all the individuals poorer than her. Moreover, the mean income must be preserved after transfer. By definition, an URL transfer is a (sequence of) progressive transfer(s), but most of the progressive transfers are not URL transfers.

Definition 2 (URL Transfer). *Given two income distributions $\mathbf{x}, \mathbf{y} \in \mathcal{D}^n$ such that $\mu(\mathbf{x}) = \mu(\mathbf{y})$, we say that \mathbf{x} is obtained from \mathbf{y} by means of a uniform-on-the-right-and-left progressive transfer, if there exist $\delta, \epsilon > 0$ and two individuals $1 \leq h < k \leq n$ such that $\mathbf{x} = \mathbf{y} + \mathbf{t}$ and:*

$$\begin{array}{rcccccccccccc} \text{INDIVIDUAL} = & 1 & \dots & h-1 & h & h+1 & \dots & k-1 & k & k+1 & \dots & n \\ \mathbf{t} = & (\delta & \dots & \delta & \delta & 0 & \dots & 0 & -\epsilon & -\epsilon & \dots & -\epsilon) \end{array}$$

The second restriction refers to *uniform transfers on the right* (UR). In this case, only the mean-preserving condition and the condition related to the right-hand side of the distribution (solidarity among the rich) need to be applied. By definition, an URL transfer is an UR transfer, but the converse is not true.

Definition 3 (UR Transfer). *Given two income distributions $\mathbf{x}, \mathbf{y} \in \mathcal{D}^n$ such that $\mu(\mathbf{x}) = \mu(\mathbf{y})$, we say that \mathbf{x} is obtained from \mathbf{y} by means of a uniform-on-the-right progressive transfer, if there exist $\delta, \epsilon > 0$ and two individuals $1 \leq h < k \leq n$ such that $\mathbf{x} = \mathbf{y} + \mathbf{t}$ and:*

$$\begin{array}{rcccccccccccc} \text{INDIVIDUAL} = & 1 & \dots & h-1 & h & h+1 & \dots & k-1 & k & k+1 & \dots & n \\ \mathbf{t} = & (0 & \dots & 0 & \delta & 0 & \dots & 0 & -\epsilon & -\epsilon & \dots & -\epsilon) \end{array}$$

Uniform transfers on the left (UL) are the symmetric counterpart of UR transfers. The mean-preserving condition is associated to the condition related to the left-hand side of the distribution (solidarity among the poor). Hence, an URL transfer is also an UL transfer (converse not true), but an UR transfer and an UL transfer are of different nature (neither is implied by the other).

Definition 4 (UL Transfer). *Given two income distributions $\mathbf{x}, \mathbf{y} \in \mathcal{D}^n$ such that $\mu(\mathbf{x}) = \mu(\mathbf{y})$, we say that \mathbf{x} is obtained from \mathbf{y} by means of a uniform-on-the-left progressive transfer, if there exist $\delta, \epsilon > 0$ and two individuals $1 \leq h < k \leq n$ such that $\mathbf{x} = \mathbf{y} + \mathbf{t}$ and:*

$$\begin{array}{rcccccccccccc} \text{INDIVIDUAL} = & 1 & \dots & h-1 & h & h+1 & \dots & k-1 & k & k+1 & \dots & n \\ \mathbf{t} = & (\delta & \dots & \delta & \delta & 0 & \dots & 0 & -\epsilon & 0 & \dots & 0) \end{array}$$

Chateauneuf and Moyes (2006) have established equivalence results comparable to Proposition 1, but by substituting the Pigou-Dalton transfers with the various alternatives presented here. First, they demonstrated that the utilitarian model is not flexible enough to distinguish between different principle of transfers. In each case, an equalising transfer (of whatever type) implies an increase in social welfare if and only if the utility function $u \in \mathcal{U}$ is concave. Hence, they obtain equivalence results between comparable statements (a), (b2) and (c), but not with (b1). For each equalising transfer (Definitions 2, 3 and 4), they identified the restriction to be placed on the weighting function $f \in \mathcal{F}$, and the corresponding implementation preorder (to be used instead of the Lorenz criterion).

The theory presented in this section can be used to replace the traditional theory based on the Pigou-Dalton principle of transfers. Nevertheless, the question of the relevance of the different definitions of what we call an equalising transfer, is purely normative. The aim of this paper is to check whether these views on inequality are in line with people's preferences.

2.3. An overview of some existing experimental results

The Pigou-Dalton principle of transfers has already been explored in the experimental literature (initiated by Amiel and Cowell, 1992). When the questions asked to the respondents are pairwise comparisons of income distributions (one before transfer, the other after, as in Figure 1), asking which is less unequal, the acceptance rates are generally little more than 50%. At the opposite, the alternative principles of transfers, as presented in the previous section, have never been directly tested. We report here the results of several papers in the same series, in which the respondents were asked the same list of numerical questions (with some nuances between papers, mainly on the description of the context presented to the subject). Even if this was not the direct objective of these studies, some questions were compatible with the different principles. These papers are: Amiel and Cowell (2002), Gaertner and Namazie (2003), Amiel *et al.* (2004), Amiel *et al.* (2009) and Amiel *et al.* (2012).

The common questions asked to the respondents are presented in Table 1. The initial distribution, denoted A, represents the income of 5 individuals, presented as identical in every respect other than their incomes. Incomes range from 2 units to 30. We also note that distribution B is always obtained from distribution A by a Pigou-Dalton transfer. The questionnaire, which included other questions depending on the specific theme of each experiment, was distributed to a group of students at different universities. The particularities of each experiment are briefly presented in Table 2.

The results are reported in Table 3. We also indicate the types of transfer with which each question is compatible. Only UL transfers are not represented. Then, we know that URL, UR and

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Table 1: *The questionnaire*

QUESTIONS	Is the inequality higher in A or in B?									
	DISTRIBUTION A					DISTRIBUTION B				
	Q1	2	5	9	20	30	2	6	8	20
Q2	2	5	9	20	30	3	5	9	20	29
Q3	2	5	9	20	30	2	6	9	20	29
Q4*	2	5	9	20	30	2	10	9	15	30
Q5	10	10	10	10	30	10	10	10	20	20
Q6	2	5	9	20	30	2	6	9	19	30

*: Distribution B does not preserve the ranks of distribution A.

Table 2: *Details on the experimental studies*

PAPERS	YEAR OF THE EXPE.	SUBJECTS (country & number)	COMMENTS
A & C (2002)	1998/1999	587 students, 7 countries	Comparison inequality vs. risk perceptions
G & N (2003)	1999/2000	159 students from Germany	Inequality vs. risk, plus 'income gap' perceptions
A, C & S (2004)	1994	510 students, 17 univ. in USA	Impact of socio-demo characteristics
A, C & G (2009)	from 2003 to 2006	653 students, Germany, Israel, UK	Position (involved or not) of the respondent
A, C & G (2012)	2003	134 students, Germany, Israel, UK	7 presentations for the same distributional problem

Table 3: *The results for all the experiments*

QUESTIONS*	PERCENTAGE OF ANSWER A**						ANSWER A TO ALL QUESTIONS
	Q2	Q5	Q3	Q4	Q6	Q1	
	URL	UR	UR	PT	PT	PT	
Amiel, and Cowell (2002)	74%	72%	61%	60%	48%	40%	17%
Gaernter and Namazie (2003)	63%	70%	57%	54%	40%	33%	13%
Amiel, Cowell and Slottje (2004)	54%	54%	47%	45%	Not tested	34%	10%
Amiel, Cowell and Gaertner(2009)	80%	77%	71%	61%	58%	58%	26%
Amiel, Cowell and Gaertner (2012)	80%	75%	59%	57%	44%	36%	13%

*: Questions are ordered according to decreasing acceptance rates in Amiel and Cowell (2002).
 **: For all studies but A, C & G (2009), we only report the results of the inequality questionnaire;
 For A, C & G (2009), we only report the results of the "respondent as external observer" scenario.

PT transfers are not independent. When PT is written in the table, it refers to a transfer that is not of a UR or URL type (hence, without any restriction on the right or on the left). Similarly, UR is not a URL type transfer. We can immediately see that the acceptance rates vary greatly between the questions, in an order that is compatible with the ethical requirements described above: On average, URL transfers are considered to be more equalising than UR transfers, and UR transfers more than (standard) PT transfers. We can conclude that the distinctions made between the different types of transfer in the previous section are echoed in the population of respondents (in this case, students).

Strictly speaking, individuals with preferences compatible with the Pigou-Dalton principle of transfers should answer A to all the questions. We note that the percentage of subjects in this case is very low: it never exceeds a quarter of the population (last column in the table). Even if uniform transfers were not formally defined and directly tested in these experiments, the intuition was already there. In [Amiel and Cowell \(2002\)](#) it is written, pages 90 and 91: ‘*Accordingly it may also be useful to consider a weaker version of same idea (namely, the principle of transfers) that allows for the possibility that more complex criteria could be applied by individuals to inequality or risk comparison. An obvious example would be this criterion . . . If ceteris paribus a small amount of income is transferred from the person with the lowest income to the person with the highest income inequality must rise.*’

3. Experimental design

AN EXPERIMENT IN THREE PARTS. The experiment was divided into three parts. In the first part, the respondents were presented with a list of numerical questions, in which they had to compare a pair of distributions A and B. They were asked to indicate which distribution they thought was less unequal. A brief justification of the existence of the distributions was proposed in the instructions. The questions were presented one by one on the screen. In the second part, the acceptability of the uniform transfers was tested on the basis of text-based questions. The last part was a socio-demographic questionnaire. Detailed instructions can be found in [Appendix A.1](#).

CONSTRUCTION OF DISTRIBUTION PAIRS. The pairs of distributions under comparison were constructed as follows. First, we considered 5 initial distributions, denoted \mathbf{y}^1 , \mathbf{y}^2 , \mathbf{y}^3 , \mathbf{y}^4 and \mathbf{y}^5 in [Table 4](#). Each distribution is an income list for 5 individuals, presented as perfectly identical apart from their income. The income scale was between 2 and 18 income units. These 5 distributions were designed to consider different distribution profiles, with a uniform distribution (\mathbf{y}^1) and different unimodal, skewed, and/or polarised distributions (\mathbf{y}^2 , \mathbf{y}^3 , \mathbf{y}^4 and \mathbf{y}^5). The objective was to find out whether the initial distributional structure could affect the acceptance of the various transfers.

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Table 4: *Initial distributions*

DISTRIB.	INCOME SCALE								
	2	4	6	8	10	12	14	16	18
\mathbf{y}^1	2	-	6	-	10	-	14	-	18
\mathbf{y}^2	2	4	-	-	-	-	14	16	18
\mathbf{y}^3	2	4	6	-	-	-	-	16	18
\mathbf{y}^4	2	-	-	8	10	12	-	-	18
\mathbf{y}^5	2	4	-	-	10	-	-	16	18

We then considered all possible transfers of each type, limited to transfers between two individuals and of a single unit of income, as detailed in Table 5. *URL transfers* indicates uniform-

Table 5: *Equalising transfers*

TRANSFERS		e_1	e_2	e_3	e_4	e_5
\mathbf{t}^1	URL	+1	0	0	0	-1
\mathbf{t}^2	UR	0	+1	0	0	-1
\mathbf{t}^3	UR	0	0	+1	0	-1
\mathbf{t}^4	UR	0	0	0	+1	-1
\mathbf{t}^5	UL	+1	0	0	-1	0
\mathbf{t}^6	UL	+1	0	-1	0	0
\mathbf{t}^7	UL	+1	-1	0	0	0
\mathbf{t}^8	PT	0	0	+1	-1	0
\mathbf{t}^9	PT	0	+1	-1	0	0
\mathbf{t}^{10}	PT	0	+1	0	-1	0

on-the-right-and-left transfers. *UR transfers* indicate uniform-on-the-right transfers, which are not uniform-on-the-left. *UL transfers* are defined symmetrically. *PT transfers* are progressive transfers that are neither uniform on the right, nor on the left.⁴ We obtain one URL transfer and three transfers for all the other types (hence a total of 10 possible transfers). Finally, we have considered all possible combinations of initial distributions and transfers, so that the final distribution can be written as $\mathbf{x}^i = \mathbf{y}^j + \mathbf{t}^k$.

For each initial distribution, we have also added a *test question*. In each case, the final distribution was the perfectly egalitarian distribution resulting from the initial distribution. For example, for $\mathbf{y}^1 = (2, 6, 10, 14, 18)$, the final distribution is $\mathbf{x} = (10, 10, 10, 10, 10)$. As control is non-existent in a web-experiment, we wanted to ensure that respondents did not answer completely randomly. In the case of the test questions, it seems obvious that the most egalitarian distribution is the

⁴ It is important to note that all the transfers considered here are, by definition, progressive transfers. In the same way, a URL transfer is also, by definition, a UR transfer or a UL transfer. In the analysis, we have organised the results in this way, in order to focus on the specific characteristics of each type of transfers.

one after transfer(s). We therefore used the results to these questions as a filter. The full list of distribution pairs is shown in Table 23 in Appendix A.2.

SEQUENCE OF QUESTIONS. The initial distribution, before transfer, was always indicated as distribution A, and placed on the left of the screen. The idea was not to generate too much confusion among respondents, as numerical questions are already complex enough for some people. In the same vein, the questions corresponding to the same initial distribution were presented in a single block. Including the 10 transfers and the test question, each block consisted of 11 questions. Within each block, the questions appeared on the screen (one per screen) in a random order.

The block corresponding to the initial distribution \mathbf{y}^1 always appeared first. This distribution being uniform, the answers to the corresponding questions could not be ‘altered’ by the degree of polarisation of this distribution. Also, as this block appeared first, the answers to the other blocks could not affect the answers to this one (controlling for a possible learning effect). Consequently, the acceptance rate of the transfers in this block can be considered as the best representation of respondents’ preferences.

The order of the other initial distributions was randomly selected. In order to limit the number of questions, we presented the respondent with only 4 of the 5 initial distributions: distributions \mathbf{y}^1 , \mathbf{y}^2 and \mathbf{y}^3 and, by a 50/50 draw, either \mathbf{y}^4 or \mathbf{y}^5 . In total, the respondent had to answer 44 questions. After each block of 11 questions, the respondent saw a screen, summarising their answers to that block. They could then modify their answers to the questions in that block.

TEXT-BASED QUESTIONS. The preceding questions, which involve comparing lists of numbers, may prove complex for some participants. In order to corroborate or refute the results on these numerical questions, the 4 principles of transfers have also been presented to the participant in the form of text-based-questions, one per principle (see Appendix A.1, Screen 4). The possible answers, for each question, were: Strongly disagree / Somewhat disagree / No opinion / Somewhat agree / Strongly agree. As with the numerical questions, to make sure that the participants had understood, we asked the following question at the end: ‘Did you find these questions clear?’ The possible answers were: Not clear at all / Not clear / No opinion / Rather clear / Really clear. In analysing the results, we first look at the responses from the full sample, and then at those from participants who considered the questions to be (rather or really) clear.

4. Sample of participants

FULL SAMPLE OF RESPONDENTS. The web-experiment was conducted in January 2021, with a sample of 1,028 respondents. The sample was representative of the French population (quota sampling method), taking into account the following selection criteria: gender, age (18 and over,

including retired people), employment statuses and income. Sampling was carried out by a private company and the respondents were paid approximately €2 for their participation.⁵ The fact of having a representative sample of a country’s population is a specific feature of our paper that, to our knowledge, is not found in any other study on the same subject.

The full sample of participants is described in Table 24, Appendix A.3. In addition to the criteria used to construct the sample, we also have socio-demographic information on the following variables: number of children, marital status, occupation category, level of education, whether or not they voted in the last presidential election, and their political opinions (right-left). Information we have but not included in the table are citizenship (97.67% are French citizen) and department of residence (all French departments are represented, in comparable proportions). In order to check the representativeness of the sample, we have added a column indicating the percentages in each category, as computed by the official French statistical institute (INSEE). Note that all statistics are based on people aged 15 and over, so that some INSEE values have had to be recalculated (e.g. employment status, for which INSEE statistics are provided for individuals aged 15-64). Whatever the socio-demographic variable (including those not used for sampling), our full sample is very close to the national distribution. The main differences are as follows:

- We have an under-representation of both the youngest and oldest age groups. The minimum age observed is 21, while the first age group defined by INSEE includes individuals aged 15-29. Additionally, recruiting older participants for studies of this kind is often challenging. In our sample, only one person fell into the oldest age group, being 94 years old at the time of the study.
- The difference in the number of children is due to the fact that INSEE only considers children under 25, whereas we consider all children. Thus, we have an under-representation for the category ‘no children’.
- The levels of education observed in the sample are quite different from national data. We have a very clear under-representation of the lowest level, namely ‘primary education’ (3% in our sample, compared with 22% nationally). At the opposite, the three highest levels are over-represented. There are at least two reasons for this. Firstly, level of education was not a sampling criterion. Secondly, such studies are conducted online, which implies that participants are familiar with digital tools. We can reasonably assume that they are less accessible to the less educated.

⁵ More details are available upon request. The experiment was made possible thanks to the financial support of the research project *RediPref* (Contract ANR-15-CE26-0004).

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- We have a slight under-representation of the highest decile in gross monthly income. This is a frequent problem of access to high incomes through surveys.

TEST-QUESTIONS AND RESTRICTED SAMPLE. For both the numerical and text-based questions, we included test questions to check the respondents’ understanding. For the 5 numerical questions (see Table 23), the more equal distribution was undoubtedly distribution B (10 income units for each). Any other answer was considered an error. On average, 61.75% of the test questions were answered correctly (21.45% for ‘Distribution A’ and 16.80% for ‘Neutrality’). This is a low percentage, which calls into question the respondents’ overall understanding of our study. Our main concern here is that all respondents may have made at least one error. Fortunately, this is not the case. Table 6 groups the subjects by the number of errors made. Remember that the subjects were confronted with only 4 of the 5 possible blocks of questions, which implies that the maximum number of errors is 4. We note that 43.58% of them answered the 4 questions correctly. If we combine this result with the overall percentage of errors, this number is quite satisfactory.

Table 6: *Number of errors on numerical test questions*

	4 ERRORS	3 ERRORS	2 ERRORS	1 ERRORS	0 ERROR
Number of subjects	205	136	106	133	448
Percentage of subjects	19.94%	13.23%	10.31%	12.94%	43.58%

In Table 24, where the socio-demographic characteristics of the sample are described, we have added a column entitled ‘restricted sample’, taking into account only respondents who made no errors in the test questions. Globally, the representativeness of the restricted sample, is not called into question: The percentage of respondents in each category rarely varies by more than 4% compared to the full sample. The most notable change concerns the level of education: the restricted sample accentuates the under-representation of lower education levels, favoring higher levels (a result we could have anticipated).

In the analysis of the results, we first present those related to the full sample, followed by those concerning the restricted sample. The econometric analyses are focused on the restricted sample. This is an arbitrary choice. The aim here is not to exclude people on the basis of criteria such as mathematical reasoning ability. The problem is that the answers to the test questions are the only controls for this web-experiment. Unfortunately, among the respondents who made errors, we cannot distinguish those who had difficulty understanding the questions (whom we could have retained in the main sample) from those who answered randomly, or not seriously. To ensure that the responses given could be reasonably linked to the true preferences of the participants we chose to include, in the main analyses, only those who answered all the test

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questions correctly (448 persons). The only relative loss in terms of representativeness, compared to the overall French population, concerns the level of education. In our defense, we note that almost all comparable academic papers focus on samples of higher education students, hence the most educated individuals.

In Table 7, we present the responses to the question "Did you find these questions clear?" asked at the end of the 4 text-based questions (Appendix A.1, Screen 4). We note that 43.87% of

Table 7: *Number of errors on text-based test questions*

	NOT CLEAR AT ALL	NOT CLEAR	NO OPINION	RATHER CLEAR	REALLY CLEAR
Number of subjects	109	289	179	377	74
Percentage of subjects	10.60%	28.11%	17.41%	36.67%	7.20%

respondents found the questions clear (rather clear + really clear). This percentage is comparable to that of respondents who did not make any errors on the numerical test questions. However, as shown in the Figure 4, Appendix A.3, the correlation between the number of errors on the numerical test questions, and the level of understanding of the text-based questions, is almost null.

5. Acceptance rates of the different principle of transfers

5.1. Numerical questions

FULL SAMPLE. First, we present in Table 8 the results for the full sample (1,028 people). We distinguish between four types of transfer: URL transfers, UR transfers, UL transfers and the standard PT transfers. We recall that, in all the tables presented below, a ‘PT transfer’ indicates a progressive transfer that is neither uniform on the right nor on the left. An ‘UR transfer’ is a uniform-on-the-right transfer, which is not uniform-on-the-left. Finally, an ‘UL transfer’ indicates a uniform-on-the-left transfer, which is not uniform-on-the-right. We make a distinction between strict acceptance, neutrality and rejection. Strictly speaking, as transfers are generally defined in a weak sense, neutrality is consistent with the underlying principle of transfers. To avoid any ambiguity, we have nevertheless chosen to separate acceptance and neutrality. All transfers (uniform or not) being progressive transfers, the rate of acceptance of the principle of transfers is 38.04%. This is relatively low compared to comparable studies, particularly those summarised in Table 3. If we focus on non-uniform progressive transfers (PT transfers in the table), the acceptance rate is significantly lower (31.75%). This indicates that transfers involving neither the

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Table 8: *Acceptation rates for the numerical questions (all the subjects)*

TRANSFERS	ACCEPTED	REJECTED	NEUTRALITY
URL	45.06%	16.76%	38.18%
UL	41.67%	19.33%	39.00%
UR	38.36%	19.64%	42.00%
PT	31.75%	22.05%	46.20%
All transfers	38.04%	19.98%	41.98%

poorest nor the richest are perceived as the most ambiguous in terms of reducing inequality. Such a low rate can be partly explained by the results obtained for the test questions recalling that, on average, respondents answered 61.75% of these questions correctly.

NO ERRORS IN THE TEST QUESTIONS. The results for the restricted sample of 448 people are presented in Table 9. We note that the overall rate of acceptance of the principle of transfers has increased considerably (51.88%), which makes it more comparable to that of the studies in Table 3. Despite this, acceptance of non-uniform progressive transfers (PT) remains low, at less than 40%. Overall, acceptance rates differ between the types of transfer. First, uniform transfers are much

Table 9: *Acceptation rates for the numerical questions (no errors in the test questions)*

TRANSFERS	ACCEPTED	REJECTED	NEUTRALITY
URL	66.80%	8.43%	24.78%
UL	59.30%	12.02%	28.68%
UR	51.97%	14.08%	33.95%
PT	39.38%	18.47%	42.15%
All transfers	51.88%	14.21%	33.91%

widely accepted than non-uniform transfers. By far, the most widely accepted transfers are those that combine uniformity on the right and left (URL). While this result seems fairly intuitive, the comparison of UR and UL transfers is not. We find that respondents perceive uniform transfers to the left as having a greater capacity to reduce inequalities. This is an important result of our analysis: when a reduction in inequality is suitable, it seems preferable to give priority to reducing poverty, rather than reducing the gap with the rich. All the differences between the acceptance rates are significant (χ^2 statistics), as shown in Table 10.

IMPACT OF INITIAL DISTRIBUTIONS. In Table 11, we distinguish the results for the five initial distributions (before transfers). The aim was to see whether the acceptability of the various transfers could be affected by the structure, more or less polarised, of the initial distribution. No clear trend emerges from this table. The results are fairly similar to those in Table 9. We simply

Table 10: *Equality tests of the acceptance rates on the numerical questions*

χ^2 STATISTICS	DL	VALUE	PROB.
Global	3	614.86	< 0.0001
URL versus UR	1	119.70	< 0.0001
URL versus UL	1	31.80	< 0.0001
URL versus P	1	406.45	< 0.0001
UR versus UL	1	58.49	< 0.0001
UR versus P	1	171.79	< 0.0001
UL versus P	1	426.80	< 0.0001

Notes. Null hypothesis \rightarrow equality of the acceptance rates.

Table 11: *Acceptation rates by initial distribution*

TRANSFERS	y^1	y^2	y^3	y^4	y^5
URL	66.96%	66.74%	66.29%	67.42%	66.96%
UL	58.04%	60.71%	57.89%	60.48%	60.65%
UR	47.84%	52.68%	54.84%	51.58%	53.45%
PT	31.62%	42.71%	41.29%	42.08%	41.70%
All transfers	47.95%	53.50%	52.83%	52.99%	53.44%

note that the lowest acceptance rates concern the uniform initial distribution. The fact that the initial distribution has no impact on acceptability is consistent with the theory, which always defines a transfer that reduces inequality, independently of the initial distribution.

GENDER. The influence of socio-economic variables on the results is presented in the various tables in Appendix A.4. The results by gender are shown in Table 25. The first observation is that the ranking of acceptance rates $URL > UL > UR > PT$ is found for both men and women (the differences are significant, see Table 26). Another interesting result is that, whatever the type of transfer, apart from non-uniform transfers (PT), the acceptance rate is always significantly higher for men than for women (see Table 27).

LEVEL OF EDUCATION. In Tables 28 to 30, we distinguish results by level of education. A first signal is the low acceptance rate for people with a ‘before high school’ level of education, for all transfers. One possible explanation is that these people may have difficulty understanding the questions, as they may not be at ease with the mathematical formalism. Such an interpretation seems plausible, especially if we focus on URL transfers. Indeed, it is difficult to consider that such transfers (involving only the richest and the poorest in this study), are not perceived as reducing inequality. We note here that the acceptance rate increases significantly with the degree (ranging from 45.83% to 71.18%). For UR and URL transfers, we also note an increase in acceptance with the degree, except between the last two levels (‘short tertiary education’ and ‘university degree’). On the other hand, for PT transfers, although the differences are significant (Table 30),

the differences are smaller. This confirms the fact that non-uniform transfers are perceived as having an ambiguous effect on overall inequality. Finally, in Table 29, we note that the ranking $URL > UL > UR > PT$ is significant whatever the level of education, except for ‘before high school’.

POLITICAL OPINIONS. Political opinions also have a significant influence on results. Whatever the type of transfer, the acceptance rates are significantly different (see Table 33). If we look in detail, the ranking $URL > \dots > PT$ is again found, for all political opinions (sometimes non-significant differences, see Table 32). A first strong result is a decrease in the acceptance of URL transfers, as we move from ‘far left’ opinions to ‘far right’ opinions (Table 31). Another interesting result is the comparison of UR and UL transfers. For UR transfers, which include a form of solidarity among the rich (who are donors) but which do not involve solidarity among the poor (who are receivers), acceptance is higher among ‘far right’ people than among ‘far left’ people (54.58% vs. 47.78%). On the other hand, for UL transfers (which imply solidarity in the other direction), the result is reversed (65.00% for ‘far left’ vs. 55.83% for ‘far right’).

PROFESSIONAL STATUS. The latest analyses, in Tables 34 to 36, focus on professional status. Here, the results are much more ambiguous. For instance, for many statuses, the difference between URL and UL, or between UR and UL, is not significant. The only really striking result is the greater acceptance of all transfers, except PT, by ‘part-timers’ compared with ‘full-timers’.

5.2. Text-based questions

The text-based questions are presented in Appendix A.1, Screen 4. The results for the full sample of participants are centralised in Table 12. As with the numerical questions, a majority of partic-

Table 12: *Acceptation rates for the text-based questions (all the subjects)*

TRANSFERS	ACCEPTED	REJECTED	NEUTRALITY
URL	50.78%	20.53%	28.70%
UL	47.76%	29.28%	22.96%
UR	49.12%	26.17%	24.71%
PT	46.30%	35.12%	18.58%
All transfers	48.49%	27.77%	23.74%

ipants rejected the principle of transfers: this is validated in only 48.49% of the responses. The hierarchy of acceptance rates between PT, UR, UL and URL observed in the numerical questions is confirmed, with a slight reverse for UR and UL (although the difference is very small). Generally speaking, the difference between the acceptance rates is much smaller (only a difference of

4% between PT and URL). The acceptance rates for the sample restricted to participants who found the questions clear, is presented in Table 13. It confirms the hierarchy between the different

Table 13: *Acceptation rates for the text-based questions (questions perceived as clear)*

TRANSFERS	ACCEPTED	REJECTED	NEUTRALITY
URL	68.96%	19.07%	11.97%
UL	62.08%	28.16%	9.76%
UR	64.30%	23.50%	12.20%
PT	57.21%	34.81%	7.98%
All transfers	63.14%	26.38%	10.48%

principles, with always a very small gap between the different rates. However, we note that the acceptance rates increase sharply compared to the full sample. In Table 14, we test the significance of the differences between the rates. As these rates are very close, many of the differences are not significant. This is particularly the case for the UR versus UL comparison. The dominance of UL over UR, as observed in the numerical questions, is therefore not called into question here.

Table 14: *Equality tests of the acceptance rates on the text-based questions*

χ^2 STATISTICS	DL	VALUE	PROB.
Global	3	13.86	0.003
URL versus UR	1	2.20	0.138
URL versus UL	1	4.72	0.030
URL versus PT	1	13.37	< 0.0001
UR versus UL	1	0.48	0.490
UR versus PT	1	4.76	0.029
UL versus PT	1	2.23	0.135

Notes. Null hypothesis \rightarrow equality of the acceptance rates.

6. Econometric estimations of the social welfare functions

6.1. Econometric strategy

The theory of inequality measurement assumes that individual preferences can be represented by a social welfare function. The two models considered in this paper are the utilitarian approach W_u and the extended Gini approach W_f (see Section 2.1). To the best of our knowledge, attempts to estimate the utility model have been proposed by Amiel *et al.* (1999) and Carlsson *et al.* (2005), but no paper has studied the extended Gini approach. The paper closest to ours, in terms of methodology, is Hey and Orme (1994)'s, but applied to individual decisions under risk.

In each of the 40 numerical questions (test questions are excluded), the respondent has to compare two distributions \mathbf{x} and \mathbf{y} . By indicating which distribution is considered as more equal, the respondent provides an indication on $\Delta_W(\mathbf{x}, \mathbf{y}; \alpha)$, defined as follows:

$$\Delta_W(\mathbf{x}, \mathbf{y}; \alpha) = \alpha [W(\mathbf{x}) - W(\mathbf{y})] , \quad (3)$$

with $\alpha > 0$ a free parameter. If distribution \mathbf{x} (resp. \mathbf{y}) is strictly preferred, then $\Delta_W(\mathbf{x}, \mathbf{y}; \alpha) > 0$ (resp. < 0). If the level of inequality is considered to be the same in both distributions, then $\Delta_W(\mathbf{x}, \mathbf{y}; \alpha) = 0$. Although preferences are assumed to be deterministic (and representable by a social welfare function), some errors are possible when the respondent answers the questions. To this end we add a white noise, normally distributed. We obtain a stochastic specification for the estimation model:

$$\Delta_W^*(\mathbf{x}, \mathbf{y}; \alpha) = \Delta_W(\mathbf{x}, \mathbf{y}; \alpha) + \varepsilon , \quad \text{where } \varepsilon \sim N(0; 1) .$$

Whereas $\Delta_W(\mathbf{x}, \mathbf{y}; \alpha)$ is positive if the distribution \mathbf{x} is *preferred* by the respondent, we only observe $\Delta_W^*(\mathbf{x}, \mathbf{y}; \alpha)$, which is positive if \mathbf{x} is *chosen*. Then, given that only the ordinal information of Δ is meaningful here (the intensity of the difference in social welfare cannot be interpreted) we replace, for econometric estimation purposes, Δ by a discrete variable γ , such as:

$$\begin{cases} \gamma = 0 & \text{if } \Delta_W^* < \tau_1 , \\ \gamma = 1 & \text{if } \tau_1 \leq \Delta_W^* \leq \tau_2 , \\ \gamma = 2 & \text{if } \Delta_W^* > \tau_2 . \end{cases}$$

The threshold parameters τ_1 and τ_2 have to be estimated, with $\tau_1 \leq 0$ and $\tau_2 \geq 0$. We obtain an *ordered probit model*, estimated by applying *maximum log-likelihood methods*.⁶

As different optimisation algorithms can lead to different results, we propose to apply two approaches. First, we apply a quasi-Newton method, called *Broyden-Fletcher-Goldfarb-Shanno* (BFGS). The algorithm iteratively updates parameter estimates by considering both the gradient of the objective function (in our case, the opposite of the log-likelihood function, which is minimised) and an approximation of the inverse Hessian matrix. Then, we apply the *Simulated Annealing* (SANN) algorithm. In each iteration, the algorithm considers moves to both better and occasionally worse solutions, allowing it to escape local optima and explore a broader range of potential solutions. The likelihood of accepting a worse solution decreases over time, which gradually refines the search around the most promising parameter values.

⁶ We use the *maxLik* function in the library of the same name, available in the freeware R.

6.2. Parametric estimations

The *Atkinson-Kolm-Sen class of inequality indices* (Kolm, 1969; Atkinson, 1970; Sen, 1973) is derived from the utilitarian social welfare function W_u , with the following utility function:

$$u_\epsilon(x_i) = \begin{cases} \frac{1}{\epsilon} x_i^\epsilon, & \text{if } \rho \neq 0, \\ \ln x_i, & \text{if } \rho = 0, \end{cases} \quad (4)$$

where $\epsilon \leq 1$ is the inequality aversion parameter: the lower it is, the greater the aversion ($\epsilon = 1$ indicates neutrality to inequality). This utility function is by definition concave, hence consistent with the Pigou-Dalton principle of transfers. The estimation is based on:

$$\Delta_\epsilon(\mathbf{x}, \mathbf{y}; \alpha) = \frac{\alpha}{5} \sum_{i=1}^5 [u_\epsilon(x_i) - u_\epsilon(y_i)], \quad (5)$$

where α and ϵ are the parameters to be estimated. Whereas α is constrained to be positive, no restriction is placed on ϵ , so that u_ϵ can be concave, linear or convex.

Alternatively, under the extended Gini approach, the *Donaldson-Weymark class of inequality indices* (Donaldson and Weymark, 1980) is derived from the social welfare function W_f , with the following weighting function:

$$f_\eta(t) = t^\eta, \quad \eta \geq 1. \quad (6)$$

The higher η is, the greater the inequality aversion. This function, convex, is consistent with the principle of transfers. The Gini index is obtained with $\eta = 2$. We first note that $W_f(\mathbf{x}) = \sum_{i=1}^n f\left(\frac{n-i+1}{n}\right)(x_i - x_{i-1})$. By letting $d_i = (x_i - x_{i-1}) - (y_i - y_{i-1})$ and $x_0 = y_0 = 0$, and observing that in our experiment $\mu(\mathbf{x}) = \mu(\mathbf{y})$ in each question, the estimation is based on:

$$\Delta_\eta(\mathbf{x}, \mathbf{y}; \alpha) = \Delta_\eta(\mathbf{x}, \mathbf{y}; \alpha) - \alpha [\mu(\mathbf{x}) - \mu(\mathbf{y})], \quad (7)$$

$$= \alpha \sum_{i=1}^5 f_\eta\left(\frac{5-i+1}{5}\right) d_i - \alpha \sum_{i=1}^5 \left(\frac{5-i+1}{5}\right) d_i, \quad (8)$$

$$= \alpha \sum_{i=2}^5 \left[f_\eta\left(\frac{5-i+1}{5}\right) - \left(\frac{5-i+1}{5}\right) \right] d_i. \quad (9)$$

Again, $\alpha > 0$ a parameter to be estimated. We impose η to be positive (to have $f \in \mathcal{F}$), and f_η can be concave, linear or convex.

The estimation results for the utility function u_ϵ and the weighting function f_η are presented in Table 15, for all the participants in the restricted sample. As expected, whatever the optimisation method (SANN or BFGS), the preferences of a large majority of respondents are represented,

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Table 15: *Shapes of the utility function u_ϵ and the the weighting function f_η*

MODEL	SANN ALGORITHM			BFGS ALGORITHM		
	Concave	Linear	Convex	Concave	Linear	Convex
Utilitarianism (ϵ)	87.72%	–	12.28%	98.44%	–	1.56%
Extended Gini (η)	18.75%	–	81.25%	2.90%	–	97.10%

respectively, by a concave utility function and a convex weighting function. This observation is all the more true for BFGS, where the rate is almost 100% in both cases. We precise that convergence rate for the function u_ϵ is 100% for SANN, and 77.90% for BFGS. For the function f_η , it is 100% for SANN, and 84.38% for BFGS. The first method therefore seems more appropriate for estimating our models.

An overview of the parameters for all participants is presented in Table 16. The mean and standard-deviation of the parameter ϵ are shown first, and then the median, the 1st and 3rd quartiles. Due to the high variability of the parameter between individuals, the median is here a

Table 16: *Estimation of ϵ for the utility function u_ϵ*

STATISTICS	SANN ALGORITHM	BFGS ALGORITHM
	Parameter ϵ	Parameter ϵ
Mean	0.67	0.43
Standard-Deviation	0.42	0.51
Median	0.69	0.26
1st Quartile	0.34	0.07
3rd Quartile	0.84	0.76

better indicator of the centre of distribution. The median parameter estimated with the SANN algorithm, equal to 0.69, is close to that of Amiel *et al.* (1999), where a value of 0.75 is found. The median value estimated by BFGS is lower, indicating a stronger aversion to inequality. By taking as lower and upper bounds the union of, respectively, the 1st and 3rd quartiles for the two estimation methods, we find a range $\epsilon \in [0.07, 0.84]$, which is not so large. A Kernel density estimate of ϵ is provided in Figure 5, Appendix A.5. Parameter ϵ is clearly not normally distributed, each method finding a bimodal distribution, but with different shapes.

The same estimations are provided in Table 17 for the weighting function and the parameter η . We also provide the difference between the estimated median value of η and the value characterising the Gini index, $\eta = 2$. We first note that the two algorithms converge towards a value for the median that is roughly equal. What’s more, this value is almost identical to that for the Gini.

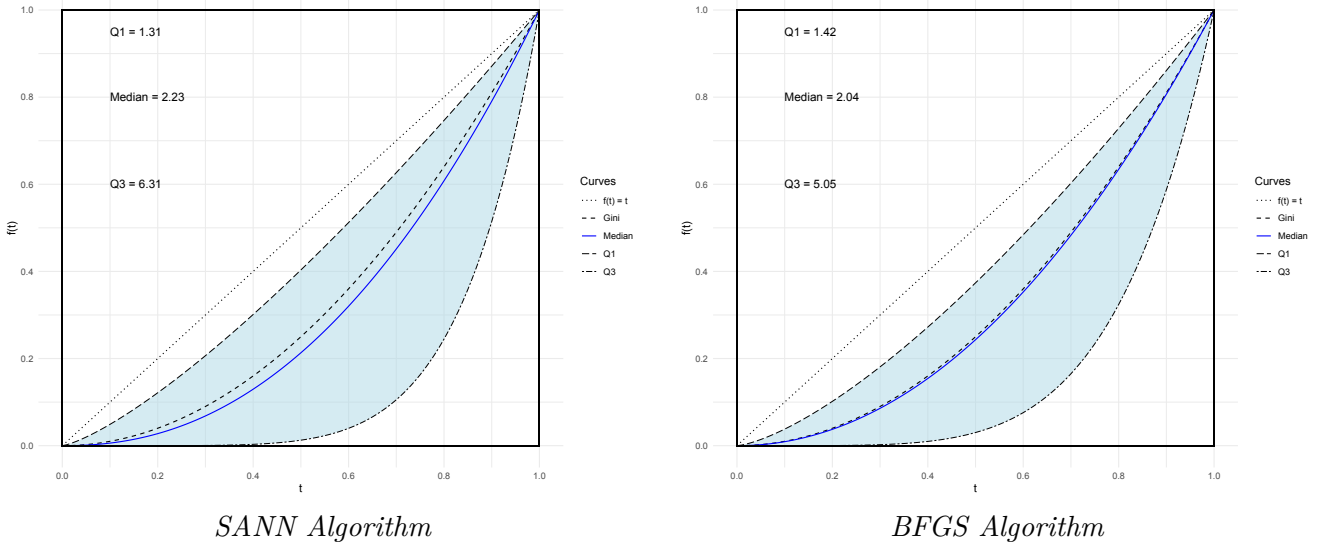
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Table 17: *Estimation of η for the weighting function f_η*

STATISTICS	SANN ALGORITHM	BFGS ALGORITHM
	Parameter η	Parameter η
Mean	4.90	7.38
Standard-Deviation	5.89	12.97
Median	2.23	2.04
1st Quartile	1.31	1.42
3rd Quartile	6.31	5.05
Gini - Median	-0.23	-0.04

This is a strong result which has never been observed, to our knowledge, in the literature. To confirm the closeness of our estimates, we have plotted the median value of η , as well as the 1st and 3rd quartiles (lower and upper bounds), against Gini in Figure 2. The social welfare function

Figure 2: *Median value of η for weighting function f_η*



underlying the Gini index is therefore a perfect proxy of the preferences of the median individual. A Kernel density estimate of η is also provided in Figure 6, Appendix A.5. The different with the estimated density of ϵ is important. First, the distributions obtained with the two algorithms are similar, and unimodal. Both show a thick distribution tail on the right, suggesting the presence of individuals with a strong aversion to inequality.

We then compare the parameter estimates of the two models, utilitarianism and Extended Gini. We note that the structure of these two models is theoretically similar, in the sense that there is only one main parameter to be estimated, that of a power function. The difference between

the two approaches is that utilitarianism weights income levels, whereas Extended Gini weights rank in the distribution. We compare the models using the *Akaike Information Criterion* (AIC). The results are presented in Table 18. This criterion highlights the model with the highest log-

Table 18: *Which parametric model best fits the data according to AIC?*

MODEL	SANN ALGORITHM	BFGS ALGORITHM
Utilitarianism (ϵ)	19.64%	17.63%
Extended Gini (η)	71.43%	68.08%

likelihood.⁷ We note a clear advantage for Extended Gini, dominating utilitarianism for around 70% of participants. Once again, this is an argument in favour of the Gini index over, for example, the Atkinson index.

6.3. Non-parametric estimations of the extended Gini model

One of the main objectives of this paper is to see whether alternative principles to the Pigou-Dalton principle of transfers are more in line with individuals' preferences. Utilitarianism is not flexible enough, in the sense that a transfer (uniform or not) increases social welfare if and only if the utility function $u \in \mathcal{U}$ is concave. The Extended Gini model makes it possible to distinguish between the two. Chateauneuf and Moyes (2006) have established that the class of weighting functions $f \in \mathcal{F}$ consistent with URL transfers is as follows:

$$\mathcal{F}_{URL} = \{f \in \mathcal{F} \mid \forall t, f(t) \leq t\}. \quad (10)$$

In that case, the function f needs to be below the first diagonal. For the other uniform transfers, we first need to introduce the following definition. A function $f \in \mathcal{F}$ is said *star-shaped* (from above) at $\xi \in [0, 1]$ if and only if:

$$\forall s, t \in [0, 1] \setminus \xi, \quad s < t \implies \frac{f(s) - f(\xi)}{s - \xi} \leq \frac{f(t) - f(\xi)}{t - \xi}. \quad (11)$$

One obtains the following classes of transfers, respectively, for the UR and UL transfers. \mathcal{F}_{UR} is the class of functions f star-shaped at 0, and \mathcal{F}_{UL} is the class of functions f star-shaped at 1. Finally, the class of functions f consistent with the Pigou-Dalton principle of transfers is denoted \mathcal{F}_{PT} , and corresponds to the class of convex functions.

⁷ As there are the same number of observations and the same number of parameters to estimate in the two models the BIC, for example, would have given the same results.

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In this section we propose a non-parametric (point-by-point) estimation of each participant's f function, to see if one class represents their preferences better than the others. We first note that $\mathcal{F}_{PT} \subset \mathcal{F}_{UR} \subset \mathcal{F}_{URL}$ and $\mathcal{F}_{PT} \subset \mathcal{F}_{UL} \subset \mathcal{F}_{URL}$. At first sight, it may seem strange that a class of functions compatible with transfers that are more restrictive than usual PT transfers should be larger. However, this is logical given the HLP theorem (see Section 2.1). In Statement (b2) of this theorem, we can associate a particular convex function with a particular social decision maker. If \mathbf{x} is obtained from \mathbf{y} by means of a sequence of Pigou-Dalton transfers, then Statement (b1) tells us that the social welfare function must be higher in \mathbf{x} than in \mathbf{y} for all social decision makers with a convex function f . If transfers are more restrictive in Statement (a), then it seems obvious that unanimity of rankings between \mathbf{x} and \mathbf{y} must be sought in a larger set of social decision makers (those accepting PT transfers, as restricted transfers are also PT transfers, plus those accepting only restricted transfers). Formally, the preorder relation identified is 'less complete'.

The estimation procedure is comparable to the parametric approach. Based on Equation 9, we have $\Delta_f(\mathbf{x}, \mathbf{y}; \alpha) = \alpha \sum_{i=2}^5 [f(\frac{5-i+1}{5}) - (\frac{5-i+1}{5})] d_i$. By letting $\beta_i = f(\frac{5-i+1}{5}) - (\frac{5-i+1}{5})$, we have to estimate the following (linear) model:

$$\Delta_f(\mathbf{x}, \mathbf{y}; \alpha) = \alpha \sum_{i=2}^5 \beta_i d_i, \quad (12)$$

where the parameters to be estimated are $\alpha > 0$ and all the β_i . The restrictions to be placed on the β_i only guarantee that $f \in \mathcal{F}$. We deduce from these estimates the following points: $f(0.2)$, $f(0.4)$, $f(0.6)$, $f(0.8)$ recalling that, by definition, $f(0) = 0$ and $f(1) = 1$.

We estimate this model for each participant. As in the parametric approach, the convergence rate of the SANN algorithm is better. It is 100%, as compared to 89.29% for BFGS. We present in Table 19 the distribution of each participant, in each class of f functions. Unsurprisingly,

Table 19: *Percentage of participants in each class of weighting functions*

ALGORITHM	$f \in \mathcal{F}_{URL}$	$f \in \mathcal{F}_{UL}$	$f \in \mathcal{F}_{UR}$	$f \in \mathcal{F}_{PT}$
SANN	76.34%	57.14%	23.44%	10.49%
BFGS	77.01%	64.06%	55.13%	36.38%

class \mathcal{F}_{URL} gathers the majority of participants (about 75%). This percentage decreases with uniform transfers on one side only, with a clear advantage for uniform transfers on the left (UL). In contrast, a very large number of subjects are lost by the usual Pigou-Dalton approach: with the SANN algorithm, only 10% of subjects are in class \mathcal{F}_{PT} . As a consequence, a convex function f is not representative of the preferences, if each participant is considered individually.

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In order to have results comparable to those in Section 5, we present in Table 20 the gain in number of participants that we obtain when we move from one class to a larger class, starting with \mathcal{F}_{PT} . The marginal gain from switching from \mathcal{F}_{UL} to \mathcal{F}_{URL} is relatively small. On the other hand,

Table 20: *Percentage of participants in each class of weighting functions*

ALGORITHM	$(\mathcal{F}_{URL} - \mathcal{F}_{UL})$	$(\mathcal{F}_{UL} - \mathcal{F}_{PT})$	$(\mathcal{F}_{URL} - \mathcal{F}_{UR})$	$(\mathcal{F}_{UR} - \mathcal{F}_{PT})$	\mathcal{F}_{PT}
SANN	19.20%	46.65%	52.90%	12.95%	10.49%
BFGS	12.95%	27.68%	21.88%	18.75%	36.38%

the gain between \mathcal{F}_{UL} and \mathcal{F}_{PT} is high. The situation is reversed if \mathcal{F}_{UL} is replaced by \mathcal{F}_{UR} . This result reinforces our descriptive results in Section 5, given an advantage to uniformity-on-the-left.

The values for $f(0.2)$, $f(0.4)$, $f(0.6)$, $f(0.8)$, representative of our restricted sample of participants is presented in Table 21. Again we show the mean and standard-deviation, but also the median, the 1st and 3rd quartiles. We also compute the difference with the different values for the

Table 21: *Representative weighting functions over all the participants*

STATISTICS	SANN ALGORITHM				BFGS ALGORITHM			
	$f(0.2)$	$f(0.4)$	$f(0.6)$	$f(0.8)$	$f(0.2)$	$f(0.4)$	$f(0.6)$	$f(0.8)$
Mean	0.09	0.25	0.41	0.60	0.08	0.24	0.42	0.63
Standard-Deviation	0.11	0.19	0.20	0.18	0.12	0.18	0.19	0.17
Median	0.04	0.24	0.40	0.58	0.01	0.18	0.38	0.62
1st Quartile	0.01	0.10	0.25	0.45	0.00	0.12	0.30	0.56
3rd Quartile	0.14	0.33	0.51	0.71	0.10	0.30	0.49	0.69
Gini - Median	0	-0.08	-0.04	0.06	0.03	-0.02	-0.02	0.02

Gini index, recalling that it is characterised by $f(t) = t^2$. The SANN and BFGS algorithms provide comparable results. Moreover, and surprisingly enough, the median values of each computed point for $f(t)$ are almost identical to those of the Gini index. This is surprising because convex weighting functions f poorly represent the preferences of each participant, taken individually. We plot the estimates in Figure 3, including the *Interquartile Range* (Q3-Q1) for each point $f(t)$. The result observed in the parametric approach is repeated here. The f function characterising the Gini index very faithfully represents the preferences of the median individual (particularly with the BFGS algorithm). However, we must qualify this observation slightly, particularly for the estimate produced by the SANN algorithm. We check in Table 22 to which class the non-parametric function f of the median individual belongs. If it is indeed convex for BFGS, it is star-shaped at 0 and 1 for SANN (i.e. in classes \mathcal{F}_{URL} , \mathcal{F}_{UL} and \mathcal{F}_{UR}), but not convex.

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Figure 3: *Point-by-point representation of the median weighting function*

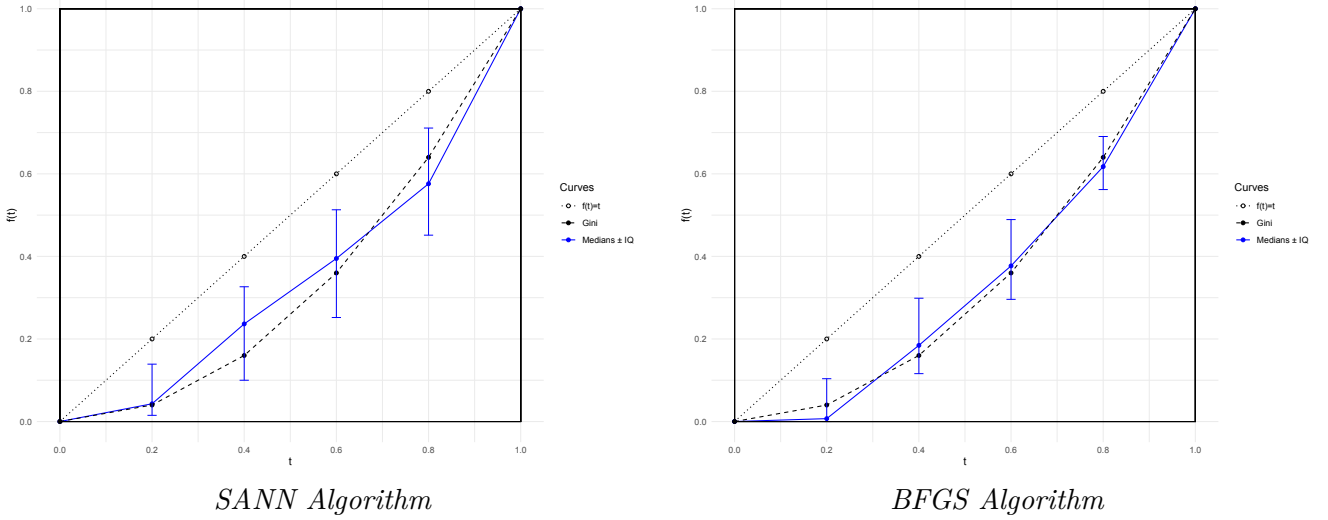


Table 22: *Median individual preferences and weighting functions classes*

ALGORITHM	$f \in \mathcal{F}_{URL}$	$f \in \mathcal{F}_{UL}$	$f \in \mathcal{F}_{UR}$	$f \in \mathcal{F}_{PT}$
SANN	Yes	Yes	Yes	No
BFGS	Yes	Yes	Yes	Yes

7. Discussion

The results of our web-experiment indicate a clear rejection of progressive transfers in the middle of the income distribution—those that do not involve the poorest or the richest individuals. A majority of participants in our study believe that such transfers do not reduce overall inequality. This finding aligns with trends observed in other experimental analyses, although previous studies did not formally distinguish between uniform and non-uniform transfers. In contrast, transfers that promote solidarity at both the top and bottom of the distribution (referred to as URL transfers) receive significantly higher approval in our sample. Additionally, we observe a stronger preference for solidarity among the poor (UL transfers) compared to that among the rich (UR transfers), indicating a greater prioritization of poverty reduction over the mitigation of extreme wealth. This also suggests that the theoretical distinction between uniform and non-uniform transfers is relevant in the context of our experiment.

The other question investigated in this paper, related to the previous observations, concerns the relevance of the inequality indices used in the empirical literature, in light of individual preferences. Since all standard indices conform to the Pigou-Dalton principle of transfers, which is rejected by a majority of our subjects, their legitimacy is called into question. First, the Extended

Gini Donaldson-Weymark approach fits individual preferences much better than indices of the Atkinson-Kolm-Sen class. Focusing on the first approach, we observe that the subclass compatible with the principle of transfers (characterized by a convex weighting function) poorly aligns with preferences when considering individuals in isolation. As a consequence, the Gini index represents the preferences of very few individuals. However, when we focus on the median individual preferences, the Gini index adjusts extraordinarily well. These results are summarised in Figure 2 for parametric estimates, and in Figure 3 for non-parametric estimates.

Based on these results, several research avenues can be explored. First, the higher acceptance of transfer principles that impose solidarity among donors or recipients, warrants confirmation through various experimental designs and diverse subject populations. Another potential project could involve identifying and empirically estimating a parametric class of star-shaped weighting functions $f \in \mathcal{F}$ that better align with individual preferences. Such a model could also more accurately capture the preferences of the median individual, as estimated, for instance, by the SANN algorithm in Figure 3.

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A. Appendix

A.1. Instructions provided to respondents (translated from French)

SCREEN 1: General description of the study.

The study you have agreed to take part in is being carried out by several French university research centres, specialised in the study of inequality. Our aim is to construct inequality indicators in order to measure the impact on income distribution of government interventions in the economic sphere. These interventions may concern areas as diverse as taxation, family policy, the pension system, housing subsidies and the financing of the healthcare system, to name but a few.

These different government interventions are likely to modify the incomes of members of society. We believe that the indicators used to assess the impact of these interventions on income distribution should reflect, as far as possible, the point of view of members of society, who are the first to be affected. Your participation in this study will enable us to gather a range of opinions representative of the different points of view on inequality within French society.

SCREEN 2: This study is in three parts.

The first part consists of 44 questions. For each question, we will present you with two income distributions and ask you to indicate which of these two distributions you think is the least unequal.

After each group of 11 questions, you will be able to consult your answers and, if you wish, modify them. We would like to stress that there are no right or wrong answers: we are only interested in your personal opinion.

In the second part, we will ask you whether you agree or disagree with a number of statements about the impact on inequality of different types of income redistribution between individuals. Again, there is no right or wrong answer: you are free to agree or disagree with the statements.

In the third part, we will ask you a series of personal questions to help us situate you in French society. The aim here is to ensure that all the people who took part in this study are as faithful a representation of French society as possible.

We would like to stress that your answers will remain anonymous. Similarly, all personal information collected will remain confidential. It will only be used for our research work and it will not be possible to identify you from the information collected. It is imperative for the success of this study that you take the utmost care when reading the questions and answering them. It is also important that you complete the questionnaire to the end. We estimate that the average time spent answering the questionnaire should not exceed 30 minutes. When we have completed our survey, you will receive an e-mail with a link to the results.

SCREEN 3: Part One.

Imagine a society consisting of 5 perfectly identical individuals: there are no personal characteristics to distinguish them from one another. There is no reason why they should be treated differently.

We are interested in the level of inequality in this society by considering only the income of individuals, expressed in thousands of euros. In each question in this first part, two competing economic policies are considered, each leading to a particular income distribution: Distribution A and Distribution B.

The sum of distributed income is the same in both distributions.

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You are asked to compare these two distributions from the point of view of inequality:

- If you consider that Distribution A is less unequal than Distribution B, then tick the 'Distribution A' box.
- If you consider that Distribution B is less unequal than Distribution A, then tick the 'Distribution B' box.
- Finally, if you are unable to decide, or if you consider that the two distributions are equivalent, then tick the 'Equivalent' box.

Sample question:

In your opinion, which distribution is the least unequal?

Distribution A (2,6,10,14,18)	Equivalent	Distribution B (3,6,10,14,17)
----------------------------------	------------	----------------------------------

Reading: Distribution A gives an income of €2,000 to the 1st person, €6,000 to the 2nd person, €10,000 to the 3rd person, €14,000 to the 4th person and €18,000 to the 5th person.

The questionnaire will now begin (then, presentation of the 44 questions, one screen for each question).

SCREEN 4: Part Two.

Here again we are considering a fictive society consisting of perfectly identical individuals: there is still no reason to favour one individual over another. You are asked to indicate the extent to which you agree with a number of statements concerning the impact on inequality of different ways of redistributing income between individuals.

To the following statement: 'a transfer of income from individual X to individual Y (who is poorer than the first) always reduces inequality in society as a whole', do you...?

Strongly disagree / Somewhat disagree / No opinion / Somewhat agree / Strongly agree

To the following statement: 'a transfer of income from individual X to individual Y (poorer than the former) reduces inequality in society as a whole, on the sole condition that individuals poorer than Y receive at least the same amount of income as that received by Y', do you :

Strongly disagree / Somewhat disagree / No opinion / Somewhat agree / Strongly agree

To the following statement: 'a transfer of income from an individual X to an individual Y (poorer than the former) reduces inequalities in society as a whole, on the sole condition that individuals richer than X give at least the same amount of income as that given by X', do you :

Strongly disagree / Somewhat disagree / No opinion / Somewhat agree / Strongly agree

To the following statement: 'a transfer of income from an individual X to an individual Y (poorer than the former) reduces inequality in society as a whole, on the sole conditions that (a) individuals poorer than Y receive at least the same amount of income as that received by Y and (b) individuals richer than X give at least the same amount of income as that given by X', do you :

Strongly disagree / Somewhat disagree / No opinion / Somewhat agree

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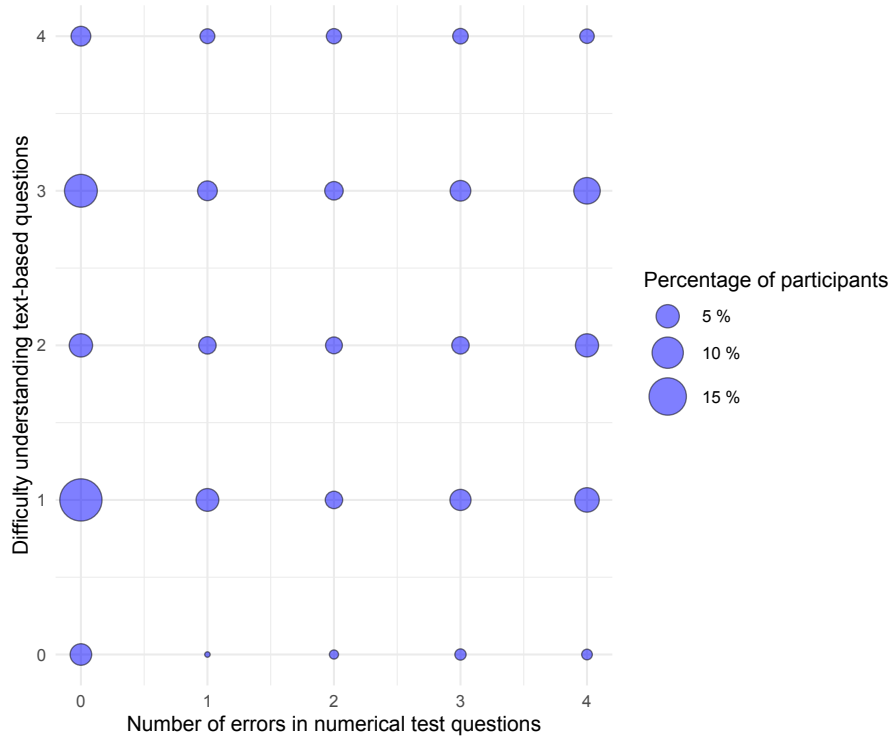
A.2. List of the numerical questions

Table 23: List of the 55 possible questions

INITIAL DISTRIB.	FINAL DISTRIB.	DISTRIBUTION A					DISTRIBUTION B					TRANSFER				
y^1	$y^1 + t^1$	2	6	10	14	18	3	6	10	14	17	+1	0	0	0	-1
	$y^1 + t^2$	2	6	10	14	18	2	7	10	14	17	0	+1	0	0	-1
	$y^1 + t^3$	2	6	10	14	18	2	6	11	14	17	0	0	+1	0	-1
	$y^1 + t^4$	2	6	10	14	18	2	6	10	15	17	0	0	0	+1	-1
	$y^1 + t^5$	2	6	10	14	18	3	6	10	13	18	+1	0	0	-1	0
	$y^1 + t^6$	2	6	10	14	18	3	6	9	14	18	+1	0	-1	0	0
	$y^1 + t^7$	2	6	10	14	18	3	5	10	14	18	+1	-1	0	0	0
	$y^1 + t^8$	2	6	10	14	18	2	6	11	13	18	0	0	+1	-1	0
	$y^1 + t^9$	2	6	10	14	18	2	7	9	14	18	0	+1	-1	0	0
	$y^1 + t^{10}$	2	6	10	14	18	2	7	10	13	18	0	+1	0	-1	0
	TEST y^1	2	6	10	14	18	10	10	10	10	10					
y^2	$y^2 + t^1$	2	4	14	16	18	3	4	14	16	17	+1	0	0	0	-1
	$y^2 + t^2$	2	4	14	16	18	2	5	14	16	17	0	+1	0	0	-1
	$y^2 + t^3$	2	4	14	16	18	2	4	15	16	17	0	0	+1	0	-1
	$y^2 + t^4$	2	4	14	16	18	2	4	14	17	17	0	0	0	+1	-1
	$y^2 + t^5$	2	4	14	16	18	3	4	14	15	18	+1	0	0	-1	0
	$y^2 + t^6$	2	4	14	16	18	3	4	13	16	18	+1	0	-1	0	0
	$y^2 + t^7$	2	4	14	16	18	3	3	14	16	18	+1	-1	0	0	0
	$y^2 + t^8$	2	4	14	16	18	2	4	15	15	18	0	0	+1	-1	0
	$y^2 + t^9$	2	4	14	16	18	2	5	13	16	18	0	+1	-1	0	0
	$y^2 + t^{10}$	2	4	14	16	18	2	5	14	15	18	0	+1	0	-1	0
	TEST y^2	2	4	14	16	18	10	10	10	10	10					
y^3	$y^3 + t^1$	2	4	6	16	18	3	4	6	16	17	+1	0	0	0	-1
	$y^3 + t^2$	2	4	6	16	18	2	5	6	16	17	0	+1	0	0	-1
	$y^3 + t^3$	2	4	6	16	18	2	4	7	16	17	0	0	+1	0	-1
	$y^3 + t^4$	2	4	6	16	18	2	4	6	17	17	0	0	0	+1	-1
	$y^3 + t^5$	2	4	6	16	18	3	4	6	15	18	+1	0	0	-1	0
	$y^3 + t^6$	2	4	6	16	18	3	4	5	16	18	+1	0	-1	0	0
	$y^3 + t^7$	2	4	6	16	18	3	3	6	16	18	+1	-1	0	0	0
	$y^3 + t^8$	2	4	6	16	18	2	4	7	15	18	0	0	+1	-1	0
	$y^3 + t^9$	2	4	6	16	18	2	5	5	16	18	0	+1	-1	0	0
	$y^3 + t^{10}$	2	4	6	16	18	2	5	6	15	18	0	+1	0	-1	0
	TEST y^3	2	4	6	16	18	10	10	10	10	10					
y^4	$y^4 + t^1$	2	8	10	12	18	3	8	10	12	17	+1	0	0	0	-1
	$y^4 + t^2$	2	8	10	12	18	2	9	10	12	17	0	+1	0	0	-1
	$y^4 + t^3$	2	8	10	12	18	2	8	11	12	17	0	0	+1	0	-1
	$y^4 + t^4$	2	8	10	12	18	2	8	10	13	17	0	0	0	+1	-1
	$y^4 + t^5$	2	8	10	12	18	3	8	10	11	18	+1	0	0	-1	0
	$y^4 + t^6$	2	8	10	12	18	3	8	9	12	18	+1	0	-1	0	0
	$y^4 + t^7$	2	8	10	12	18	3	7	10	12	18	+1	-1	0	0	0
	$y^4 + t^8$	2	8	10	12	18	2	8	11	11	18	0	0	+1	-1	0
	$y^4 + t^9$	2	8	10	12	18	2	9	9	12	18	0	+1	-1	0	0
	$y^4 + t^{10}$	2	8	10	12	18	2	9	10	11	18	0	+1	0	-1	0
	TEST y^4	2	8	10	12	18	10	10	10	10	10					
y^5	$y^5 + t^1$	2	4	10	16	18	3	4	10	16	17	+1	0	0	0	-1
	$y^5 + t^2$	2	4	10	16	18	2	5	10	16	17	0	+1	0	0	-1
	$y^5 + t^3$	2	4	10	16	18	2	4	11	16	17	0	0	+1	0	-1
	$y^5 + t^4$	2	4	10	16	18	2	4	10	17	17	0	0	0	+1	-1
	$y^5 + t^5$	2	4	10	16	18	3	4	10	15	18	+1	0	0	-1	0
	$y^5 + t^6$	2	4	10	16	18	3	4	9	16	18	+1	0	-1	0	0
	$y^5 + t^7$	2	4	10	16	18	3	3	10	16	18	+1	-1	0	0	0
	$y^5 + t^8$	2	4	10	16	18	2	4	11	15	18	0	0	+1	-1	0
	$y^5 + t^9$	2	4	10	16	18	2	5	9	16	18	0	+1	-1	0	0
	$y^5 + t^{10}$	2	4	10	16	18	2	5	10	15	18	0	+1	0	-1	0
	TEST y^5	2	6	10	14	18	10	10	10	10	10					

A.3. Details on the sample of participants

Figure 4: *Difficulties encountered by the participants in the questions*



Notes. On the y-axis: 0 = 'Really clear' to 4 = 'Not clear at all'.

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Table 24: Sociodemographic variables and descriptive statistics (15 years and over)

VARIABLES		FULL SAMPLE		RESTRICTED		(R-F)	INSEE
NAME	VALUE	Nb.	%	Nb.	%	%	%
Gender	Woman	531	51.65	232	51.79	0.14	51.6
	Man	497	48.35	216	48.21	-0.14	48.4
Age	15 – 29 years	123	11.96	53	11.83	-0.13	21.2
	30 – 44 years	236	22.96	102	22.77	-0.19	22.5
	45 – 59 years	281	27.33	105	23.44	-3.89	23.9
	60 – 74 years	240	23.35	108	24.11	0.76	20.7
	75 – 89 years	147	14.30	79	17.63	3.33	10.0
	≥ 90 years	1	00.01	1	00.22	0.21	01.6
Number of children	No children	384	37.35	172	38.39	1.04	49.4
	1 child	190	18.48	76	16.96	-1.52	21.9
	2 children	285	27.72	128	28.57	0.85	19.6
	3 children	125	12.16	46	10.27	-1.89	06.7
	4 children or more	44	04.28	26	05.81	1.53	02.4
Marital status	Married/Civil-union	516	50.19	230	51.34	1.15	47.5
	Cohabiting/Common-law	101	09.82	50	11.16	1.34	11.0
	Widower	37	03.60	18	04.02	0.42	06.8
	Single	374	36.38	150	33.48	-2.90	34.7
Employment status	Employed	530	51.56	221	49.34	-2.22	49.3
	Active but unemployed	76	07.39	25	05.58	-1.81	06.8
	Student	66	06.42	34	07.59	1.17	07.9
	Retired	278	27.04	140	31.25	4.21	29.4
	Other inactivity situation	78	07.59	28	06.25	-1.34	06.6
Occupation category	Farmers	16	01.56	7	01.56	0.00	01.3
	Artisans/shopkeepers/company owners	49	04.77	23	05.13	0.36	06.6
	Managers/higher intellectual professions	217	21.11	124	27.68	6.57	17.2
	Intermediate occupations	215	20.91	105	23.44	2.53	22.4
	Employees	297	28.89	115	25.67	-3.22	22.6
	Manual workers	145	14.11	35	07.81	-6.30	19.9
	Not concerned	89	08.66	39	08.71	0.05	10.0
Education	Primary education	34	03.31	6	01.34	-1.97	22.2
	Lower secondary education	92	08.95	18	04.02	-4.93	06.0
	Upper secondary education	338	32.88	123	27.46	-5.42	38.2
	Short cycle tertiary education	224	21.79	98	21.88	0.09	11.8
	Bachelor	144	14.01	84	18.75	4.74	11.2
	Master/Doctorate	196	19.07	119	26.56	7.49	10.6
Gross monthly income	≤ €1,200	132	12.84	43	09.60	-3.24	D1
	€1,201 – €1,500	113	10.99	36	08.04	-2.95	D2
	€1,501 – €1,800	85	08.27	33	07.37	-0.90	D3
	€1,801 – €2,200	112	10.89	56	12.50	1.61	D4
	€2,201 – €2,600	117	11.38	52	11.61	0.23	D5
	€2,601 – €3,000	104	10.12	38	08.48	-1.64	D6
	€3,001 – €3,500	90	08.75	34	07.59	-1.16	D7
	€3,501 – €4,200	118	11.48	67	14.96	3.48	D8
	€4,201 – €5,400	93	09.05	58	12.95	3.90	D9
	> €5,400	64	06.23	31	06.92	0.69	D10
Vote last presidential election	Yes	847	82.39	381	85.04	2.65	85.0
	No	181	17.61	67	14.96	-2.65	15.0
Political opinion	Do not wish to reply	338	32.88	99	22.10	-10.78	–
	Extreme left	21	02.04	15	03.35	1.31	–
	Left	224	21.79	121	27.01	5.22	–
	Centre	214	20.82	120	26.79	5.97	–
	Right	162	15.76	73	16.29	0.53	–
	Extreme Right	69	06.71	20	04.46	-2.25	–
Number of observations		1028		448			

Notes. ‘Restricted sample’ corresponds to the participants who have correctly answered to all the test questions. INSEE Data come from ‘*RP2021, exploitations principales, géographie au 01/01/2024*’.

A.4. Acceptation rates by socio-economic characteristicsTable 25: *Acceptation rates by gender*

TRANSFERS		ACCEPTED	REJECTED	NEUTRALITY	<i>N</i>
URL	Women	61.31%	8.19%	30.50%	928
	Men	72.69%	8.68%	18.63%	864
UL	Women	56.18%	10.09%	33.73%	2784
	Men	62.65%	14.08%	23.26%	2592
UR	Women	47.59%	12.79%	39.62%	2784
	Men	56.67%	15.47%	27.85%	2592
PT	Women	39.66%	15.63%	44.72%	2784
	Men	39.08%	21.53%	39.39	2592
All transfers	Women	49.16%	12.37%	38.47%	9280
	Men	54.79%	16.19%	29.02%	8640

Table 26: *Equality tests of the acceptance rates by gender*

χ^2 STATISTICS		DL	VALUE	PROB.
Global	Women	3	213.09	< 0.0001
	Men	3	438.33	< 0.0001
URL versus UR	Women	1	52.44	< 0.0001
	Men	1	69.62	< 0.0001
URL versus UL	Women	1	7.51	0.006
	Men	1	28.72	< 0.0001
URL versus PT	Women	1	131.89	< 0.0001
	Men	1	293.43	< 0.0001
UR versus UL	Women	1	41.09	< 0.0001
	Men	1	19.26	< 0.0001
UR versus PT	Women	1	35.67	< 0.0001
	Men	1	160.73	< 0.0001
UL versus PT	Women	1	152.28	< 0.0001
	Men	1	288.14	< 0.0001

Notes. Null hypothesis \rightarrow equality of the acceptance rates.

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Table 27: *Equality tests of the acceptance rates between gender*

χ^2 STATISTICS		DL	VALUE	PROB.
URL	(Men/Women)	1	26.08	< 0.0001
UL	(Men/Women)	1	23.33	< 0.0001
UR	(Men/Women)	1	44.35	< 0.0001
PT	(Men/Women)	1	0.18	0.667

Notes. Null hypothesis \rightarrow equality of the acceptance rates.

Table 28: *Acceptation rates by level of education*

TRANSFERS		ACCEPTED	REJECTED	NEUTRALITY	<i>N</i>
URL	Before high school	45.83%	19.79%	34.38%	96
	High school	60.98%	11.38%	27.64%	492
	Short tertiary educ.	70.15%	8.93%	20.92%	392
	University degree	71.18%	5.05%	23.77%	812
UL	Before high school	45.14%	20.83%	34.03%	288
	High school	53.73%	15.51%	30.76%	1476
	Short tertiary educ.	63.61%	13.27%	23.13%	1176
	University degree	62.27%	8.25%	29.47%	2436
UR	Before high school	35.42%	21.18%	43.40%	288
	High school	47.09%	17.75%	35.16%	1476
	Short tertiary educ.	56.04%	14.46%	29.51%	1176
	University degree	54.93%	10.84%	34.24%	2436
PT	Before high school	34.72%	24.31%	40.97%	288
	High school	36.11%	23.17%	40.72%	1476
	Short tertiary educ.	42.94%	17.86%	39.20%	1176
	University degree	40.19%	15.23%	44.58%	2436
All transfers	Before high school	39.17%	21.88%	38.96%	960
	High school	47.17%	18.07%	34.76%	4920
	Short tertiary educ.	55.79%	14.57%	29.64%	3920
	University degree	54.33%	10.80%	34.86%	8120

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Table 29: *Equality tests of the acceptance rates by level of education*

χ^2 STATISTICS		DL	VALUE	PROB.
Global	Before high school	3	10.19	0.017
	High school	3	135.53	< 0.0001
	Short tertiary educ.	3	140.64	< 0.0001
	University degree	3	351.58	< 0.0001
URL versus UR	Before high school	1	3.32	0.069
	High school	1	28.48	< 0.0001
	Short tertiary educ.	1	24.32	< 0.0001
	University degree	1	66.53	< 0.0001
URL versus UL	Before high school	1	0.01	0.906
	High school	1	7.85	0.005
	Short tertiary educ.	1	5.56	0.018
	University degree	1	21.11	< 0.0001
URL versus PT	Before high school	1	3.79	0.051
	High school	1	93.45	< 0.0001
	Short tertiary educ.	1	87.08	< 0.0001
	University degree	1	234.40	< 0.0001
UR versus UL	Before high school	1	5.66	0.017
	High school	1	13.01	< 0.0001
	Short tertiary educ.	1	14.01	< 0.0001
	University degree	1	27.11	< 0.0001
UR versus PT	Before high school	1	0.03	0.861
	High school	1	36.60	< 0.0001
	Short tertiary educ.	1	40.34	< 0.0001
	University degree	1	106.07	< 0.0001
UL versus PT	Before high school	1	6.51	0.011
	High school	1	92.55	< 0.0001
	Short tertiary educ.	1	100.86	< 0.0001
	University degree	1	237.78	< 0.0001

Notes. Null hypothesis \rightarrow equality of the acceptance rates.

Table 30: *Equality tests of the acceptance rates between level of education*

χ^2 STATISTICS		DL	VALUE	PROB.
URL	(Before high school/High school/.../Univ. degree)	3	35.57	< 0.0001
UL	(Before high school/High school/.../Univ. degree)	3	60.89	< 0.0001
UR	(Before high school/High school/.../Univ. degree)	3	62.04	< 0.0001
PT	(Before high school/High school/.../Univ. degree)	3	16.14	0.001

Notes. Null hypothesis \rightarrow equality of the acceptance rates.

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Table 31: *Acceptation rates by political views*

TRANSFERS		ACCEPTED	REJECTED	NEUTRALITY	N
URL	Wish not to answer	59.34%	12.37%	28.28%	396
	Far Left	73.33%	3.33%	23.33%	60
	Left	70.25%	5.58%	24.17%	484
	Centre	70.83%	8.33%	20.83%	480
	Right	64.38%	7.53%	28.08%	292
	Far Right	62.50%	13.75%	23.75%	80
UL	Wish not to answer	54.38%	14.90%	30.72%	1188
	Far Left	65.00%	4.44%	30.56%	180
	Left	60.95%	9.64%	29.41%	1452
	Centre	60.90%	13.19%	25.90%	1440
	Right	60.39%	10.73%	28.88%	876
	Far Right	55.83%	15.42%	28.75%	240
UR	Wish not to answer	46.72%	15.82%	37.46%	1188
	Far Left	47.78%	5.56%	46.67%	180
	Left	54.89%	12.47%	32.64%	1452
	Centre	53.96%	15.00%	31.04%	1440
	Right	51.14%	13.01%	35.84%	876
	Far Right	54.58%	20.00%	25.42%	240
PT	Wish not to answer	33.75%	18.86%	47.39%	1188
	Far Left	48.33%	7.22%	44.44%	180
	Left	38.36%	17.29%	44.35%	1452
	Centre	40.90%	20.83%	38.26%	1440
	Right	42.81%	15.98%	41.21%	876
	Far Right	45.00%	27.08%	27.92%	240
All transfers	Wish not to answer	46.39%	16.11%	37.50%	3960
	Far Left	55.67%	5.50%	38.83%	600
	Left	53.29%	12.38%	34.34%	4840
	Centre	53.81%	15.54%	30.65%	4800
	Right	52.74%	12.67%	34.59%	2920
	Far Right	52.88%	20.13%	27.00%	800

DOES THE GINI INDEX REPRESENT PEOPLE'S VIEWS ON INEQUALITY?

Table 32: *Equality tests of the acceptance rates by political views*

χ^2 STATISTICS		DL	VALUE	PROB.
Global	Wish not to answer	3	133.51	< 0.0001
	Far left	3	22.40	< 0.0001
	Left	3	221.65	< 0.0001
	Centre	3	181.65	< 0.0001
	Right	3	72.01	< 0.0001
	Far Right	3	10.07	< 0.0001
URL versus UR	Wish not to answer	1	18.94	< 0.0001
	Far left	1	11.84	0.001
	Left	1	35.33	< 0.0001
	Centre	1	42.13	< 0.0001
	Right	1	15.48	< 0.0001
	Far Right	1	1.53	0.216
URL versus UL	Wish not to answer	1	2.97	0.085
	Far left	1	1.42	0.234
	Left	1	13.50	< 0.0001
	Centre	1	15.30	< 0.0001
	Right	1	1.47	0.225
	Far Right	1	1.09	0.296
URL versus PT	Wish not to answer	1	80.93	< 0.0001
	Far left	1	11.35	0.001
	Left	1	148.44	< 0.0001
	Centre	1	129.14	< 0.0001
	Right	1	40.83	< 0.0001
	Far Right	1	7.35	0.007
UR versus UL	Wish not to answer	1	13.94	< 0.0001
	Far left	1	10.86	0.001
	Left	1	10.94	0.001
	Centre	1	14.20	< 0.0001
	Right	1	15.18	< 0.0001
	Far Right	1	0.08	0.783
UR versus PT	Wish not to answer	1	41.51	< 0.0001
	Far left	1	0.01	0.916
	Left	1	79.70	< 0.0001
	Centre	1	49.22	< 0.0001
	Right	1	12.21	< 0.0001
	Far Right	1	4.41	0.036
UL versus PT	Wish not to answer	1	102.50	< 0.0001
	Far left	1	10.18	0.001
	Left	1	148.19	< 0.0001
	Centre	1	115.24	< 0.0001
	Right	1	54.20	< 0.0001
	Far Right	1	5.63	0.018

Notes. Null hypothesis \rightarrow equality of the acceptance rates.

DOES THE GINI INDEX REPRESENT PEOPLE'S VIEWS ON INEQUALITY?

Table 33: *Equality tests of the acceptance rates between political views*

χ^2 STATISTICS		DL	VALUE	PROB.
URL	(No answer/Far Left/.../F. right)	5	18.63	0.002
UL	(No answer/Far Left/.../F. right)	5	19.15	0.002
UR	(No answer/Far Left/.../F. right)	5	22.54	< 0.0001
PT	(No answer/Far Left/.../F. right)	5	31.31	< 0.0001

Notes. Null hypothesis \rightarrow equality of the acceptance rates.

Table 34: *Acceptation rates by employment status*

TRANSFERS		ACCEPTED	REJECTED	NEUTRALITY	N
URL	Full-time	66.76%	6.39%	26.85%	704
	Part-time	76.39%	5.56%	18.06%	72
	Self-employed	50.93%	12.96	36.11%	108
	Seeking employment	70.00%	14.00%	16.00%	100
	Student	55.15%	12.50%	32.35%	136
	Unempl. not seeking	58.93%	8.93%	32.14%	112
	Retired	72.50%	8.39%	19.11%	560
UL	Full-time	57.58%	11.08%	31.34%	2112
	Part-time	69.91%	7.41%	22.69%	216
	Self-employed	47.53%	16.05%	36.42%	324
	Seeking employment	62.00%	17.67%	20.33%	300
	Student	49.02%	15.69%	35.29%	408
	Unempl. not seeking	55.06%	10.42%	34.52%	336
	Retired	65.24%	11.43%	23.33%	1680
UR	Full-time	50.05%	14.54%	35.42%	2112
	Part-time	61.11%	14.35%	24.54%	216
	Self-employed	33.64%	16.67%	49.69%	324
	Seeking employment	53.00%	17.67%	29.33%	300
	Student	43.14%	16.67%	40.20%	408
	Unempl. not seeking	49.40%	13.39%	37.20%	336
	Retired	59.23%	11.85%	28.93%	1680
PT	Full-time	37.64%	17.19%	45.17%	2112
	Part-time	35.65%	25.93%	38.43%	216
	Self-employed	28.70%	20.37%	50.93%	324
	Seeking employment	42.00%	22.67%	35.33%	300
	Student	31.37%	21.08%	47.55%	408
	Unempl. not seeking	46.13%	15.77%	38.10%	336
	Retired	44.23%	17.92%	37.86%	1680
All transfers	Full-time	50.26%	13.48%	36.26%	7040
	Part-time	57.64%	14.86%	27.50%	720
	Self-employed	38.06%	17.22%	44.72%	1080
	Seeking employment	54.10%	18.80%	27.10%	1000
	Student	42.57%	17.28%	40.15%	1360
	Unempl. not seeking	51.07%	12.77%	36.16%	1120
	Retired	57.86%	13.20%	28.95%	5600

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Table 35: *Equality tests of the acceptance rates by employment status*

χ^2 STATISTICS		DL	VALUE	PROB.
Global	Full-time	3	256.44	< 0.0001
	Part-time	3	67.53	< 0.0001
	Self-employed	3	34.63	< 0.0001
	Seeking employment	3	35.56	< 0.0001
	Student	3	36.72	< 0.0001
	Unempl. not seeking	3	8.56	0.036
	Retired	3	216.09	< 0.0001
URL versus UR	Full-time	1	59.43	< 0.0001
	Part-time	1	5.54	0.019
	Self-employed	1	10.27	0.001
	Seeking employment	1	8.86	0.003
	Student	1	5.92	0.015
	Unempl. not seeking	1	3.05	0.081
	Retired	1	31.59	< 0.0001
URL versus UL	Full-time	1	18.54	< 0.0001
	Part-time	1	1.11	0.291
	Self-employed	1	0.37	0.541
	Seeking employment	1	2.08	0.149
	Student	1	1.53	0.216
	Unempl. not seeking	1	0.51	0.475
	Retired	1	10.03	0.002
URL versus PT	Full-time	1	180.95	< 0.0001
	Part-time	1	36.10	< 0.0001
	Self-employed	1	17.76	< 0.0001
	Seeking employment	1	23.53	< 0.0001
	Student	1	24.65	< 0.0001
	Unempl. not seeking	1	5.50	0.019
	Retired	1	134.39	< 0.0001
UR versus UL	Full-time	1	24.08	< 0.0001
	Part-time	1	3.70	0.054
	Self-employed	1	12.96	< 0.0001
	Seeking employment	1	4.97	0.026
	Student	1	2.84	0.092
	Unempl. not seeking	1	2.15	0.142
	Retired	1	12.92	< 0.0001
UR versus PT	Full-time	1	66.00	< 0.0001
	Part-time	1	28.04	< 0.0001
	Self-employed	1	1.84	0.175
	Seeking employment	1	7.28	0.007
	Student	1	12.08	0.001
	Unempl. not seeking	1	0.72	0.396
	Retired	1	75.69	< 0.0001
UL versus PT	Full-time	1	168.22	< 0.0001
	Part-time	1	50.86	< 0.0001
	Self-employed	1	24.34	< 0.0001
	Seeking employment	1	24.04	< 0.0001
	Student	1	26.43	< 0.0001
	Unempl. not seeking	1	5.36	0.021
	Retired	1	149.68	< 0.0001

Notes. Null hypothesis \rightarrow equality of the acceptance rates.

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Table 36: *Equality tests of the acceptance rates between employment status*

χ^2 STATISTICS		DL	VALUE	PROB.
URL	(Full-time/Part-time/.../Retired)	6	35.38	< 0.0001
UL	(Full-time/Part-time/.../Retired)	6	77.09	< 0.0001
UR	(Full-time/Part-time/.../Retired)	6	103.16	< 0.0001
PT	(Full-time/Part-time/.../Retired)	6	54.17	< 0.0001

Notes. Null hypothesis \rightarrow equality of the acceptance rates.

A.5. Econometric estimates

Figure 5: *Kernel density of ϵ for the utility function u_ϵ*

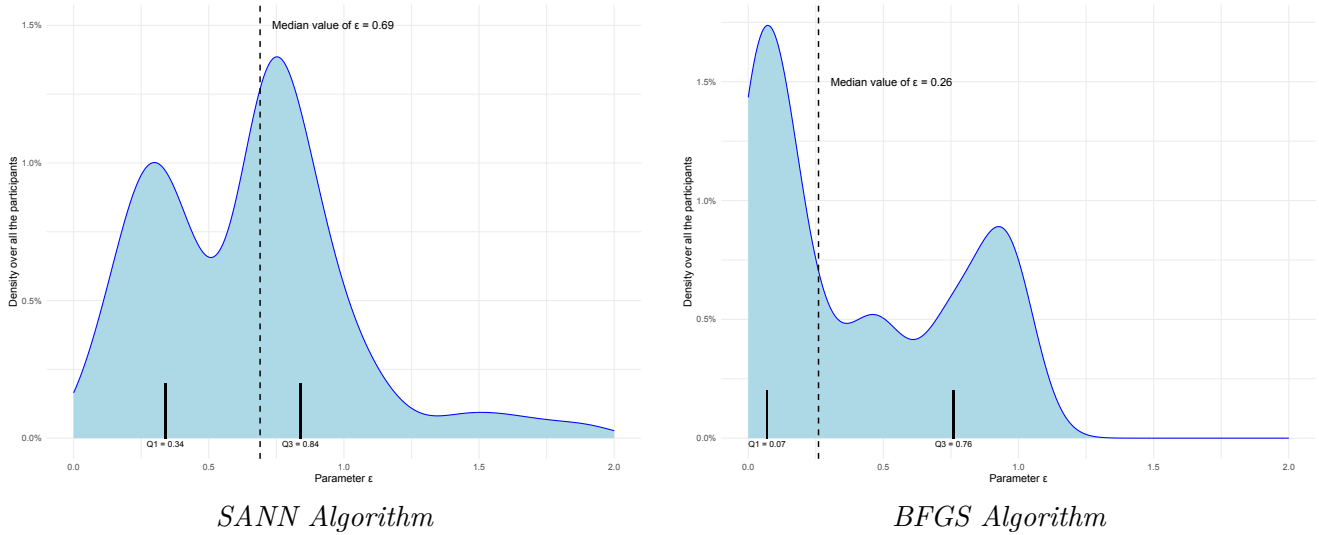


Figure 6: *Kernel density estimation of η for the weighting function f_η*

