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On the Measurement of Polarisation: A Questionnaire Study

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ABSTRACT

On the Measurement of Polarisation: A Questionnaire Study*

Starting from the axiomatisation of polarisation contained in Esteban and Ray (1994) and Chakravarty and Majumdar (2001) we investigate whether people's perceptions of income polarisation is consistent with the key axioms. This is carried out using a questionnaire-experimental approach that combines both paper questionnaires and on-line interactive techniques. The responses suggest that important axioms which serve to differentiate polarisation from inequality – e.g. increased bipolarization – as well as other distinctive features of polarisation, i.e. the non-monotonous behaviour attributed to polarisation, are not widely accepted.

JEL Classification: D63

Keywords: polarisation, income distribution, inequality

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1 Introduction

The topic of income polarisation has come to play a key role in the analysis of the evolution of income distribution, of the consequences of economic growth and of social conflict. In order to make use of this concept in economic models the idea of polarisation has to be transformed into a precise criterion that can be applied to income distributions: typically some kind of polarisation measure is used. The approach to the measurement of polarisation is usually based on a specific axiom system such as those introduced by Esteban and Ray (1994) and others. However, although the recent work on polarisation is persuasive, it is not clear that the particular axiomatic structures that have been suggested capture the meaning of polarisation as it is commonly understood by social commentators and lay people.

The purpose of this paper is to fill this gap by investigating the way distributional comparisons are actually perceived. In doing so we focus on ordinal issues concerning the measurement of polarisation rather than on specific polarisation measures. The paper is organised as follows. Section 2 examines the meaning that has been given to the concept of polarisation in the recent literature. Section 3 explains the approach we have adopted in eliciting people's views and perceptions of polarisation. Sections 4 and 5 present the sample used for our study and examine the results. Section 6 concludes.

2 The meaning of polarisation

In other social-science disciplines polarisation is often considered as a *process*. In politics, it is a process by which the public opinion divides and goes to the extremes. In communications and psychology the process involves a social or political group dividing into two opposing sub-groups with fewer and fewer members of the group remaining neutral or holding an intermediate position. In the case of income polarisation the accepted meaning is less clear cut, but no less interesting.

The concept of polarisation assumes the existence of poles – normally two. It also assumes the agglomeration of members of the community at more than one pole. In the context of income polarisation the poles are simply income levels. Beyond this one needs to provide some kind of structure that gives meaning to the concept as well as the basis for deriving computable indices. This is the role played by the introduction of an explicit axiomatisation as in the classic study by Esteban and Ray (1994) and the recent paper by

Chakravarty and Majumdar (2001).[1] The typical axiom systems and the meaning of individual axioms are discussed below in section 2.1.

Some of the axioms used to pin down the meaning of polarisation comparisons have a similar flavour to those used in the literature on income inequality, social welfare and poverty and we will find that it is appropriate to analyse these in a manner that draws on the empirical literature concerning attitudes to distributional comparisons that have been developed in those related fields. However not too much should be made of this similarity because polarisation is a distinct concept and requires a distinct axiomatisation.

In particular it is important to recognise the essential differences between inequality and polarisation. Indeed it is arguable that one of the driving forces that led to the formulation of an explicit concept of income polarisation in the 1990s was the recognition that inequality, as conventionally defined, misses out on some key aspects of the evolution of income distributions over time that should be of concern to policy analysts and social commentators (Wolfson 1994, 1997). The key to the conventional approach to inequality is the transfer principle but it is not clear that respect for this principle is always appropriate for distributional comparisons in terms of polarisation.

2.1 Axioms

In the literature there are a number of alternative axiom systems for polarisation; we concentrate here on those in Esteban and Ray (1994) and Chakravarty and Majumdar (2001) and present them in a uniform notation. An income distribution is given by a pair $(\mathbf{p}, \mathbf{x})$ where $\mathbf{p} \in \mathbb{R}^n_+$, $\mathbf{x} \in \mathbb{R}^n$ and the set of all such pairs is denoted by $\mathcal{D}$; in other words we characterise a distribution as a vector of population masses $(p_1, p_2, ..., p_n)$ located on the "rungs" of an income ladder $(x_1, x_2, ..., x_n)$. A polarisation index is a function $P : \mathcal{D} \to \mathbb{R}_+$.

For any $(\mathbf{p}, \mathbf{x}) \in \mathcal{D}$ let the median be given by

$$\hat{x} = \hat{x}(\mathbf{p}, \mathbf{x}) = \max \left\{ x_j : \sum_{i=1}^{j} p_i \leq \frac{1}{2} \sum_{i=1}^{n} p_i \right\}.$$

The median can be used to divide the population into two groups ("poorer", "richer") that provide intuition for some of the axioms. In the following description of the axioms the labels "ERx" means "Axiom x in Esteban and Ray (1994)"; the others are those used by Chakravarty and Majumdar (2001) or are in common use elsewhere.

[1] See also the contributions by Wang and Tsui (2000), Rodriguez and Salas (2003), Bossert and Schworm (2006) and Esteban et al. (2007).

Axiom 1 (Increased spread) *Consider* $(\mathbf{p}, \mathbf{x}')$, $(\mathbf{p}, \mathbf{x}) \in \mathcal{D}$ *such that* $x'_h = x_h$, $h \neq i$ *and let* $\delta > 0$. *If either (a)* $x_i < \hat{x}$ *and* $x'_i = x_i - \delta$ *or (b)* $x_i > \hat{x}$ *and* $x'_i = x_i + \delta$ *then* $P(\mathbf{p}, \mathbf{x}') > P(\mathbf{p}, \mathbf{x})$.

Axiom 2 (Increased bipolarity; ER1) *Consider* $(\mathbf{p}, \mathbf{x}')$, $(\mathbf{p}, \mathbf{x}) \in \mathcal{D}$ *such that* $x'_i = x_i - \delta$, $x'_j = x_j + \delta$, $x'_h = x_h$, $h \neq i, j$ *where* $x_i + 2\delta \leq x_j$ *and* $\delta > 0$. *If either (a)* $x_i < x_j < \hat{x}$ *or (b)* $\hat{x} > x_j > x_i$ *then* $P(\mathbf{p}, \mathbf{x}') > P(\mathbf{p}, \mathbf{x})$.

Axiom 3 (Principle of population) *For any* $(\mathbf{p}, \mathbf{x}) \in \mathcal{D}$ *and any positive integer* m, $P(m\mathbf{p}, \mathbf{x}) = P(\mathbf{p}, \mathbf{x})$

Axiom 4 (Scale independence) *For any* $(\mathbf{p}, \mathbf{x}) \in \mathcal{D}$ *and any* $\lambda > 0$, $P(\mathbf{p}, \lambda\mathbf{x}) = P(\mathbf{p}, \mathbf{x})$

Axiom 5 (Translation independence) *For any* $(\mathbf{p}, \mathbf{x}) \in \mathcal{D}$ *and any* $\delta \in \mathbb{R}$, $P(\mathbf{p}, \mathbf{x} + \delta\mathbf{1}^n) = P(\mathbf{p}, \mathbf{x})$

Axiom 6 (ER2) *Consider* $(\mathbf{p}, \mathbf{x}')$, $(\mathbf{p}, \mathbf{x}) \in \mathcal{D}$ *such that* $x'_j = x_j + \delta$, $x'_h = x_h$, $h \neq j$ *where* $x_j - x_i > x_k - x_j > 0$, *and* $p_i > p_k > 0, p_j > 0$. *Then there exists a small positive* δ *such that* $P(\mathbf{p}, \mathbf{x}') > P(\mathbf{p}, \mathbf{x})$

Axiom 7 (ER3) *Consider* $(\mathbf{p}', \mathbf{x})$, $(\mathbf{p}, \mathbf{x}) \in \mathcal{D}$ *such that* $p'_i = p_i + \delta$, $p'_j = p_j - 2\delta$, $p'_k = p_k + \delta$, $p'_h = p_h$, $h \neq i, j, k$, *where* $p_i > 0$, $p_j \geq 2\delta > 1$ *and* $x_k - x_j = x_j - x_i > 0$. *Then* $P(\mathbf{p}', \mathbf{x}) > P(\mathbf{p}, \mathbf{x})$

Axiom 8 (ER4) *Consider* $(\mathbf{p}', \mathbf{x})$, $(\mathbf{p}, \mathbf{x}) \in \mathcal{D}$ *such that* $p'_i = p_i - \delta$, $p'_k = p_k + \delta$, $p'_h = p_h$, $h \neq i, k$, *where* $p_i > 0$, $p_j > p_k > 0$,, $x_k - x_j = x_j - x_i > 0$. *Then, for* p_i *and* $p_j - p_k$ *sufficiently small,* $P(\mathbf{p}', \mathbf{x}) \geq P(\mathbf{p}, \mathbf{x})$

The interpretation of the Chakravarty and Majumdar (2001) axioms is as follows. Polarisation must increase if you decrease the income of someone in the poorer group or if you increase the income of someone in the richer group (Axiom 1), or if you bunch incomes closer together within the poorer group or within the richer group (Axiom 2). Polarisation remains unchanged if you replicate the population (Axiom 3). If we accept Axiom 4 then merely rescaling all incomes together leaves polarisation unchanged; but if we accept Axiom 5 then adding (or subtracting) the same absolute amount to all incomes leaves polarisation unchanged. Clearly it may also make sense to consider alternatively an "intermediate" position between scale-independence and translation independence.[2] In addition (from Esteban and Ray 1994),

[2]This is analogous to intermediate inequality measures (Bossert and Pfingsten 1990); other forms of systematic income-dependence may also be relevant (Amiel and Cowell 1999a).

moving population mass from the middle outwards increases polarisation (Axiom 7) and a migration from a very small population mass at a low income to a moderately-sized high income increases polarisation (Axiom 8).

It is interesting to compare these with axioms that are commonly invoked in other topics within the field of distributional analysis. Axiom 3 and Axioms 4 or 5 of course appear in many contexts including poverty and inequality. Axiom 1 part (a) corresponds to the monotonicity axiom in poverty analysis if the poverty line is below median income. The income transformation implied in Axiom 7 is consistent with an inequality change that respects the transfer principle (Dalton 1920): i.e. in this special case polarisation and inequality move in the same direction. But it is a very special case. Contrast this with the income transfers implied in Axiom 2 where the implied transfer is entirely on one side of the median and it is clear that polarisation must go up exactly where inequality must go down according to the transfer principle.

Finally note that some axioms are closely related: for example Axiom 6 and part (b) of Axiom 1. By contrast some axioms potentially conflict: as an example, if negative incomes are allowed (as in Esteban and Ray 1994) consider the income distribution

$$([1,1,1];[-1,0,+1])$$

i.e. a distribution with a population mass 1 at each of the income values -1, 0 and $+1$. Now reduce the first income and increase the third income by 1 unit, to give the distribution

$$([1,1,1];[-2,0,+2])$$

By Axiom 1 polarisation has gone up, but Axiom 4 would imply that the the two distributions exhibit the same polarisation. Evidently one could avoid this problem by insisting on positive incomes only (as in Chakravarty and Majumdar 2001) but we prefer to leave the matter open before eliciting the views of our respondents.

2.2 Measures

Corresponding to specific subsets of the axioms introduced in section 2.1 we find specific classes of polarisation measure. For example, by focusing on the partition induced by the median (Axioms 1 to 3) one is led naturally to the following class of measures

$$P^I(\mathbf{p},\mathbf{x}) := \phi\left(I\left(\mathbf{p}^-,\mathbf{x}\right), I\left(\mathbf{p}^+,\mathbf{x}\right), \hat{x}, \mu^-, \mu^+\right) \tag{1}$$

where ϕ is strictly decreasing in each of its first two arguments, I is an inequality index satisfying the transfer principle, $\hat{x} := \hat{x}(\mathbf{p}, \mathbf{x})$ and

$$p_i^- := \begin{cases} p_i & \text{if } x_i < \hat{x} \\ \\ 0 & \text{otherwise} \end{cases},$$

$$p_i^+ := \begin{cases} p_i & \text{if } x_i > \hat{x} \\ \\ 0 & \text{otherwise} \end{cases},$$

$$\mu^- := \frac{\sum_{i=1}^n p_i^- x_i}{\sum_{i=1}^n p_i^-},$$

$$\mu^+ := \frac{\sum_{i=1}^n p_i^+ x_i}{\sum_{i=1}^n p_i^+}.$$

This is the approach of Chakravarty and Majumdar (2001) and Wang and Tsui (2000).[3] By contrast, by invoking Axioms 2, 6 and 7 and assuming a quasi-additive structure for the polarisation index, Esteban and Ray (1994) derived the index

$$P^\alpha(\mathbf{p}, \mathbf{x}) := \sum_{i=1}^n \sum_{j=1}^n p_i^{1+\alpha} p_j \left| x_j - x_i \right|, \tag{2}$$

where α is a positive parameter.[4]

Of course this still leaves the exact characterisation of the polarisation measure open-ended. For the measure P^I one still has to specify the index I – Chakravarty and Majumdar (2001) suggest the Atkinson index, Wang and Tsui (2000) suggest the Gini. For the measure P^α one still has to specify the parameter α – Esteban and Ray (1994) provide an argument that it must be less than 1.6 (implicit in the proof of their Theorem 1) and, if Axiom 8 is invoked, it must be greater than 1.[5] Clearly, whether P^I satisfies Axiom 4 or Axiom 5 or some other general principle of income levels (see footnote 2 above) will depend in part on the properties of the I that has been specified; clearly also P^α satisfies Axiom 5 but not Axiom 4.

[3] In addition to Axioms 1, to 3, Chakravarty and Majumdar (2001) invoke three other properties, symmetry, normalisation and continuity, to derive their measure (see their Proposition 1).

[4] See Esteban and Ray (1994) Theorem 1.

[5] See Esteban and Ray (1994) Theorem 3.

3 The Approach

3.1 Questionnaires

We used a standard technique to investigate whether this formulation of polarisation is "appropriate" in that it corresponds with individuals' views. The method follows that of earlier work on inequality, poverty and social welfare (Amiel and Cowell 1992, 1999b).

The basic idea is to set up a number of income-distribution comparisons and to invite respondents to state which of the two distributions represents greater polarisation. So the approach is purely ordinal and, given an appropriate collection of income-distribution pairs, it is possible to get some insight on whether the structures imposed by the axiomatisation are consistent with the principles that underlie people's perceptions of polarisation.

Of course, as in the inequality and other studies, we also need to check on whether respondents are influenced by the way questions are presented. In the present case this takes two forms:

- Within a questionnaire we pose questions both in the form os specific numerical problems and, later, also in terms of principles expressed verbally.

- We used a variety of formats for the questionnaire concurrently. Since the initial contributions to the polarisation literature appealed strongly to individual intuition in establishing the concept it is clearly important to use alternative representations in order to appeal to our respondents' intuition. Some respondents completed the questionnaire on-line in an interactive environment, VLAB, established at the Distributional Research Programme, of STICERD, LSE. Others completed the questionnaire in the corresponding hardcopy form. Both versions were prepared in three forms of questionnaire that presented the numerical representation in different ways, as follows.

    1. *With hints.* The two distributions are presented as simple vectors, written out in full. Where components differ between the two income vectors these are highlighted in bold to emphasise to the respondent what particular implied change in the distribution he or she ought to be looking at.
    2. *No hints.* As above, but without putting particular vector components in bold.

Axiom	*Answers consistent with axiom*
Axiom 1	1A, 9A, 10A, 7B, 11aC, 11bB, 19A
Axiom 2	2A, 12B
Axiom 3	3AB, 13C
Axiom 4	4AB, 5A, 14A, 15A
Axiom 5	5AB, 4B, 15B, 14B
Axiom 6	6B, 16A
Axiom 7	7B, 17A
Axiom 8	8B, 18A
Relevance of isolated ind. (Esteban and Ray 1994)	1AB, 11aB, 11bC
Non-monotonicity (Esteban and Ray 1994)	1B, 9B, 10A, 19D

Table 1: Axioms and questions

3. *Pictures.* We use a simple graphic based on the usage in Amiel and Cowell (1999b) to represent the two distributions on an income line.

The questionnaire themselves – all three types of the hardcopy form – are set out in the Appendix. We also used a cut-down form of the questionnaire with minimalist verbal questions to run as a check on the main study – see Section 5.11.

3.2 Axioms and questions

Many of the questions to be addressed concern the extent to which respondents' views correspond to individual axioms or principles employed in the polarisation literature. The relationship between the question used in our study, the Axioms set out in section 2.1 and other properties highlighted in Esteban and Ray (1994) are given in Table 1. If a substantial proportion of respondents answer questions in a way that is systematically different from the entry on the right-hand side of the table, there is *prima facie* reason to call into question the corresponding axiom or principle.

Are there specific axioms in this list that should be of special interest as being central to the idea of polarisation? If we were to single out just one or two from Table 1, perhaps the most relevant are Axiom 2 and the non-monotonous behaviour attributed to polarisation (Esteban and Ray 1994). The former "explicitly demonstrates that polarisation and inequality are two different concepts" (Chakravarty and Majumdar 2001, p.6). Furthermore, Axiom 2 captures a very similar idea to the one encapsulated in Axiom 1

of Esteban and Ray (1994) as well as in the discussion of the behaviour of P^α (for $\alpha \geq 1$) under progressive transfers (p.844). Non-monotonicity is potentially important for at least two reasons. First, it clashes with Axiom 1 (described by Chakravarty and Majumdar (2001) as a monotonicity property). Now, if Esteban and Ray (1994)'s measure does not satisfy this property (see below) it could be a first indication as to whether Esteban and Ray (1994)'s measure is preferred to the others, say Chakravarty and Majumdar (2001)'s. Second, it can provide some insight as to whether lay people give more importance to "intergroup differences" or to "within group homogeneity" , which in turn drive Esteban and Ray (1994)'s model (i.e. alienation and identification).

In discussing the "intermediate behaviour" of their measure Esteban and Ray (1994) show that if initial polarisation is relatively large then as population moves away from, say, two central masses, to the extremes, polarisation as measured by P^α first decreases and then increases if $\alpha \geq 1$.[6] Such a transition is captured by question 9 where initial polarisation is large as in Esteban and Ray (1994). Therefore, we can check whether respondents are giving coherent or consistent answers by checking whether their answers comply with the four axioms used in Theorem 3 of Esteban and Ray (1994) while also answering that polarisation should not be monotonous in situations such as that depicted in Figure 1.[7] In terms of our questions this implies the following sequence:

Axiom 2	$\rightarrow$	2A (12B)
Axiom 6	$\rightarrow$	6A (16B)
Axiom 7	$\rightarrow$	7A (17B)
Axiom 8	$\rightarrow$	8A (18B)
Nonmonotonicity in Figure 1	$\rightarrow$	1B, 9B, 10A (19D)

3.3 Relations among axioms

We can do more than examine individual principles using the questionnaire-experimental approach. The proportion of the sample who simultaneously give the responses listed in rows 2, 6 and 7 of Table 1 can be taken as an indication of the extent to which individuals intuit polarisation in a manner consistent with Esteban and Ray (1994)'s polarisation index, P^α (2).

[6] See their Figures 5 and 6 (Esteban and Ray 1994 p. 848) : the interesting transition in Figure 5 (our Figure 1) is from panels (a) to (b).

[7] This is taken from Esteban and Ray (1994) Figure 5.

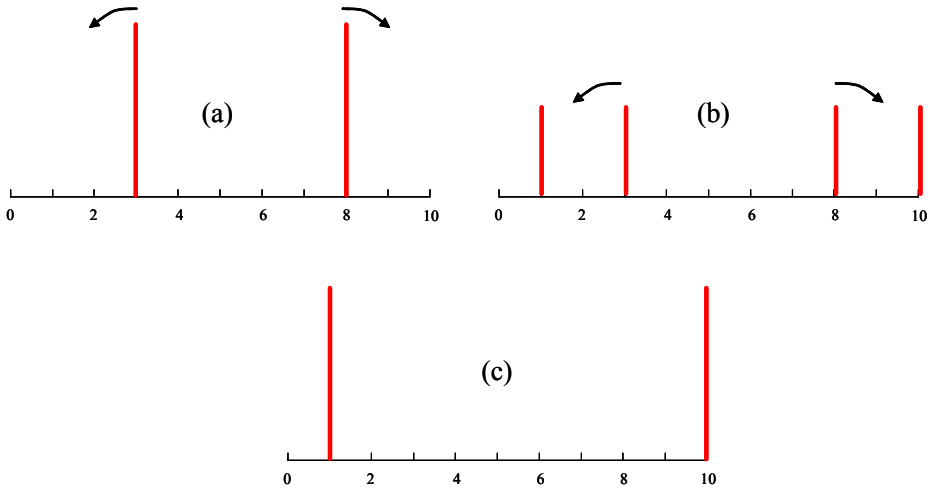

Figure 1: Nonmonotonicity in polarisation

Likewise the proportion of the sample who, in addition to the above, also give the responses of row 8 can be taken as an indication of the extent to which polarisation is perceived in the narrower form of P^α with $\alpha \geq 1$.[8]

In addition the proportion of the sample who respond in line with rows 1, 2, 3 of Table 1 can be taken as an indication of the extent of "support" for the P^I index (1) suggested by Chakravarty and Majumdar (2001).

3.4 Additional checks

We also check on 'symmetry' regarding the constituent parts (a) and (b) Axiom 1, using questions 11a and 11b. It may also be thought that the arguments given in the options of the verbal questions could drive individuals towards the 'right' answer. To check that, we also ran some questionnaires with bare verbal answers, i.e. increase, decrease, remains the same.

4 The Sample

Our sample consists of main subsample of 1521 students from eleven universities spread amongst six countries, which we use for the main study, and two smaller samples that we use to test several hypothesis or conjectures which arose from the analysis of the main sample. The three samples are shown

[8]This means that sensitivity parameter is sufficiently large that P^α is not close to an inequality index (Gini defined on log incomes) – see Esteban and Ray (1994) Theorem 3.

in Table 2. Average age in the main sample is 22, and the gender composition is fairly equally balanced. Most of them are economics and business students but we also sampled students from other social sciences, and to a lesser extent from other disciplines. Notice that the distribution of the type of questionnaire is also balanced, with the pictorial version being slightly more used than the other two. Average political views lay in the mid-point of the support and, on average, respondents expect to be financially better-off in ten years' time than were their families ten years ago.

5 Results

Next we report the extent to which individuals' perceptions of polarisation accord to the axioms or features commonly used in the economics literature and outlined above.

5.1 Axiom 1: Increased Spread

Question 1 (Q1) shows that there seems to be an overwhelming majority that supports this property (60%) – see Table 3. The corresponding verbal questions 11a and 11b yield similar results (69 and 71%, respectively), which is a clear sign of symmetry in the evaluation of (similar) changes when occurring at different ends (or halves) of the distribution. That is, individuals do not seem to give more importance to a given "gap" at the lower rather than the upper half of the distribution.

The overwhelming evidence in favour of Axiom 1 remains when other numerical questions (7, 9, 10) are used. Notwithstanding this, one should interpret the evidence from these questions with caution. These three questions involve somewhat larger changes than question 1, and thus other properties may be driving the answer. Take question 10. On the one hand, the transition from distribution B to A should increase polarisation, according to Axiom 1 – which is the answer we mostly get. On the other hand, however, one should bear in mind that Q10 is moving the two poles further apart without creating any dispersion around any of them, i.e. in Esteban and Ray (1994)'s terms, it increases alienation without introducing any loss in identification. Question 1, instead, proposes a change in the income of only one individual, thus implying a loss in identification and no increase in alienation.

	Main		Exp. Polarisation		Exp. Inequality	
Variable	*N*	*Mean or %*	*N*	*Mean or %*	*N*	*Mean or %*
Age	1445	22.11	128	20.45	118	19.94
Political views	1392	3.61	123	3.06	108	3.17
Family income in 1995	1425	4.09	125	3.89	112	4.03
Income prospects in 2015	1422	4.68	126	4.90	111	5.17
Gender	1449		128		116	
Female	757	52.24	79	61.72	68	58.62
Male	692	47.76	49	38.28	48	41.38
Employed before university	1403		127		117	
No	733	52.25	37	29.13	42	35.90
Yes	670	47.75	90	70.87	75	64.10
Subject of study	1478		131		128	
Economics	632	42.76	51	38.93	48	37.5
Business	591	39.99	41	31.30	40	31.25
Social Sciences	175	11.84	39	29.77	40	31.25
Other	80	5.41	0	0.00	0	0.00
Language of questionnaire	1521		131		128	
Catalan	550	36.16	131	100.00	128	100.00
English	363	23.87	0	0.00	0	0.00
Spanish	608	39.97	0	0.00	0	0.00
Country	1521		131		128	
Spain	973	63.97	131	100.00	128	100.00
Uruguay	185	12.16	0	0.00	0	0.00
England	83	5.46	0	0.00	0	0.00
Australia	129	8.48	0	0.00	0	0.00
US	87	5.72	0	0.00	0	0.00
Turkey	64	4.21	0	0.00	0	0.00
University	1521		131		128	
LSE	83	5.46	131	0.00	0	0.00
UAB	343	23	0	100.00	128	100.00
UB	145	9.53	0	0.00	0	0.00
UEC	87	5.72	0	0.00	0	0.00
UHOB	60	3.94	0	0.00	0	0.00
UI	64	4.21	0	0.00	0	0.00
UMON	69	4.54	0	0.00	0	0.00
UOC	94	6.18	0	0.00	0	0.00
UR	185	12.16	0	0.00	0	0.00
URJC1	210	13.81	0	0.00	0	0.00
UV	181	11.9	0	0.00	0	0.00
Type of Questionnaire	1521		131		128	
Hints	426	28.01	46	35.11	44	34.38
No Hints	454	29.85	45	34.35	42	32.81
Pictures	641	42.14	40	30.53	42	32.81

Table 2: Descriptive Statistics of our Sample

	Question 1	Question 11a	Question 11b	Question 10
Increases	*59.5*	*68.8*	*70.5*	*75.8*
Same	6.1	12.0	11.0	8.9
Decreases	34.4	13.2	12.2	15.3
Depends		6.0	6.3	
N	1507	1497	1486	1506

Note: 'Orthodox' answers in italics

Table 3: Increased Spread

5.2 Axiom 2: Increased Bipolarisation

This property does not seem to enjoy much support, in whatever form the issue is posed. This result is remarkable – perhaps unfortunate – because the property provides a clear distinction between polarisation and inequality. As shown in Table 4, only 30% of the sample provides an answer to Q2 that is consistent with the axiom. This percentage falls to 20% in the verbal question 12. Perhaps our representation of the property is too weak to transmit the essence of the axiom in that respondents might consider that such small changes do not make any difference; 16 and 48% view the changes proposed in Q2 and Q12, respectively, as having no effect on polarisation. Interestingly, the option enjoying the largest support is that an equalizing transfer decreases polarisation. Our interpretation of this result is different for the two questions. In the numerical question 2 this may be influenced by the lowest income in distribution B being smaller than the corresponding one in distribution A (together with the fact that the transfer is small in absolute terms). Such a result in Q2 could also arise because the equalizing transfer implies a loss in identification (the pole at 10 loses one fourth of its mass, and the movement does not generate another pole but creates a somewhat blurred picture at the bottom end of the distribution). The rather large support for a decrease in the verbal question 12, however, might be due to a different reason. Our conjecture is that the suggested explanations in the first two options may trick the respondent. Put crudely, option a) suggests that polarisation falls because a certain gap increases, while option b) suggests that it has actually increased because the distance between two individuals becomes smaller. Now, if individuals let these two distances drive their answer, a likely outcome is concluding that polarisation has decreased. In order to test such conjecture, we have used a version of the questionnaire with bare verbal questions – that is, without expl anations – , and have used regression analysis to test the (statistical) significance of the variable that identifies this 'experiment' – i.e. that identify the questionnaires with bare

	Question 2	Question 12
Increases	*30.1*	*19.7*
Same	16.2	47.8
Decreases	53.7	32.5
N	1497	1441

Note: 'Orthodox' answers in italics

Table 4: Increased Bipolarisation

verbal answers.. The answers given by this 'bare-verbal-questions' sample support our conjecture: now individuals do not favour the 'decrease' option as much (being now the 'decrease' answer as popular as the 'increase' option) and tend to think instead that an equalising transfer leaves polarisation unchanged – see Table 23.

As outlined above, increased bipolarisation is about equalizing transfers, and to the eyes of many such transfers decrease inequality (Amiel and Cowell 1992, 1999b). Thus, another possibility is that respondents be heavily influenced by the notion of inequality when assessing the equalizing transfer which takes place from distribution B to A in Q2 or when deciding about the effect of the rich-to-poor income transfer of Q12. We study this issue in section 5.11.

Finally, from the answers to this question one could surmise that the level of income of the poorest individual may have a large impact on individual's polarisation assessment. This conjecture also arises when trying to understand the answers to some other questions.

5.3 Axiom 3: Population Principle

Table 5 shows that a large majority of the sample gives responses in line with the population principle– 57% and 83% in the numerical and the verbal questions, respectively. Actually, the verbal question is more convincing or persuasive than the numerical one (69% of those who did not answer in line with the principle in the numerical question did so in the verbal one). Given the above, it is no surprise that nearly everyone who answered in line with the population principle in the numerical question 3 also answered in agreement with the principle in Q13 (only 7% did not).

	Question 3	Question 13
Increases	29.3	12.8
Same	*57.1*	*82.9*
Decreases	13.6	4.3
N	1496	1468

Note: 'Orthodox' answers in italics

Table 5: Population Principle

	Question 4	Question 5	Question 14	Question 15
Increases	**61.5**	18.0	**30.3**	6.7
Same	*28.2*	**50.2**	*53.9*	**64.9**
Decreases	10.3	*31.8*	10.8	*20.7*
Depends			5.0	7.6
N	1507	1497	1468	1466

Note: Answers consistent with *scale invariance* in italics;
answers consistent with **translation invariance** in bold

Table 6: Scale or Translation Invariance?

5.4 Scale or Translation Invariance?

Translation invariance looks like winning the contest here, though scale invariance does not enjoy little support, especially in the verbal question – see Table 6. In both cases, the verbal questions seem more persuasive than the numerical ones – the short argument provided in the different options may drive individuals to the answers that are consistent with the axioms. One could be suspicious of the short argument provided in the different options as driving individuals to the answers that are consistent with the axioms. However, the analysis of our "bare-verbal-questions" sample reveals it to be an unfounded suspicion. For instance, in the case of scale invariance (Q14), the brief explanations seem to have the opposite effect, so that when explanations are dropped, increases (to 69%) the percentage of respondents who agree with the axiom – see Table 25.

As far as the consistency between numerical and verbal questions is concerned, both pairs of questions provide larger support for translation than for scale invariance. The cross-tab of questions 4 and 14 presented in Table 7 shows that while only 21% consistently agree with scale invariance, those answering in line with translation invariance represent 24% of the sample.

	Question 14				
Question 4	Increases	Same	Decreases	Depends	Total
Increases	**24.1**	27.8	6.9	2.9	61.7
Same	3.9	*21.4*	1.7	1.1	28.1
Decreases	2.2	4.8	2.1	1.0	10.2
Total	30.2	54.0	10.7	5.0	100

	Question 15				
Question 5	Increases	Same	Decreases	Depends	Total
Increases	2.8	9.6	3.5	1.9	17.8
Same	1.9	**41.2**	4.4	2.9	50.5
Decreases	2.0	14.3	*12.6*	2.8	31.7
Total	6.7	65.1	20.6	7.6	100

Note: Answers consistent with *scale invariance* in italics;
answers consistent with **translation invariance** in bold

Table 7: Scale or Translation Invariance? Consistency between Numerical and Verbal Answers

On the other hand, as much as 41% do consistently respond in line with translation invariance in questions 5 and 15.

When the answers to both numerical questions (4 and 5) are simultaneously analysed, a smaller percentage of the sample gives consistent responses to either of the postulates. Still, as Table 8 shows, translation invariance continues to gather more support than scale invariance – 32 and 10%, respectively. As pointed out above, answers to both verbal questions provide large support for both properties. Hence, when the two verbal questions 14 and 15 are crossed, fewer individuals than before – with the numerical questions– provide consistent support for either of the two axioms (8 and 18%, respectively). Interestingly, the most popular response that arises from the cross-tab of the two verbal questions (39%) is in line with the property being tested by each question. Such a pattern is not so important in the numerical questions – though it is the third most populated option, behind the consistent answers to the two properties.

	Question 5			
Question 4	Increases	Same	Decreases	Total
Increases	11.5	**32.0**	17.9	61.4
Same	2.8	15.2	*10.3*	28.3
Decreases	3.7	3.1	3.6	10.3
Total	18.0	50.3	31.7	100

	Question 15				
Question 14	Increases	Same	Decreases	Depends	Total
Increases	2.3	**18.2**	7.5	2.4	30.3
Same	3.3	39.5	*8.5*	2.5	53.8
Decreases	0.9	5.1	3.4	1.5	10.9
Depends	0.3	2.2	1.3	1.2	5.0
Total	6.7	64.9	20.8	7.7	100

Note: Answers consistent with *scale invariance* in italics;
answers consistent with **translation invariance** in bold

Table 8: Scale or Translation Invariance? Consistency Across Questions

5.5 Axioms 6 and 7: ER2 and ER3

Now consider axioms 6 and 7.[9] Both of them receive overwhelming support from our sample respondents. A look at the responses to each question reveals that in both cases more than 65% of the respondents answer in line with the axiom being tested. Moreover, more than half of the whole sample provides consistent answers to the numerical and verbal questions.

[9] Axioms 2 and 3 in Esteban and Ray (1994).

	Axiom 2 in ER		*Axiom 3 in ER*	
	Question 6	Question 16	Question 7	Question 17
Increases	*71.8*	*65.8*	*76.9*	*67.4*
Same	8.3	10.3	5.8	15.2
Decreases	19.9	15.1	17.3	8.6
Depends		8.9		8.7
N	1506	1460	1506	1458

Note: 'Orthodox' answers in italics

Table 9: Axioms 2 and 3

	Question 8	Question 18
Increases	*38.9*	*27.4*
Same	3.1	9.6
Decreases	58.1	63.0
N	1507	1439

Note: 'Orthodox' answers in italics

Table 10: Axiom 4

5.6 Axiom 8: ER4

Axiom 8 receives somewhat less support – see Table 10. No more than 40% of the respondents provides a response in line with this axiom in both the numerical and verbal questions, and only one sixth agrees with the axiom in both questions simultaneously. In fact, when crossing the responses from the numerical and the verbal questions, consistent rejection of the axiom is the option that gathers the largest support (44%). The 'importance-of-the-income-of-the-poorest-individual' effect outlined above could be an explanation. Note that in the verbal question 18 our "justification" or "explanation" for a decrease (option b)) is that the lowest income group disappears; and when explanations are dropped from the answers, the 'decrease' response looses strength: 15 percentage points that could be attributed to the 'importance-of-the-income-of-the-poorest-individual' effect. Furthermore, in the numerical question 8, the poorest group in distribution A could be identified with individuals belonging to the richest one in distribution B.

5.7 On the relevance of isolated individuals

Consider now the issue of whether small groups or isolated individuals are insignificant in terms of polarisation – compare panels (a) and (b) in Figure 2.[10] The message that comes out of the answers to questions 1, 11a and 11b – shown in Table 3 – seems to be clear-cut: few individuals do make a difference. Notwithstanding this, notice that 1 individual in 10 can be viewed as substantial part of society if seen as being 10% of the population or as an isolated individual if interpreted from the absolute perspective. Likewise, in the verbal question "few" is certainly not "very few", which admittedly would capture rather better the essence of what an "isolated individual" is.

[10] This is taken from Figure 3 in Esteban and Ray (1994).

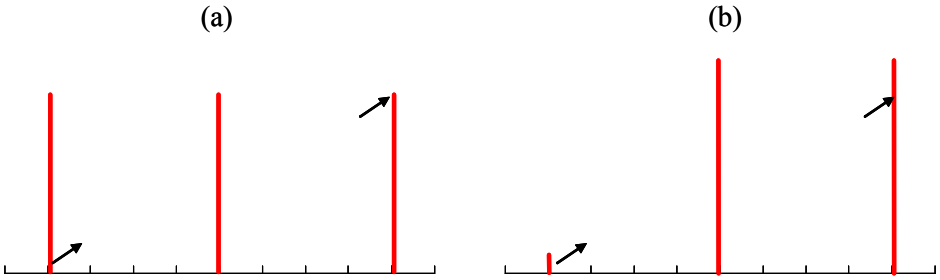

Figure 2: Insignificance of small groups

5.8 Non-monotonicity

Esteban and Ray (1994) argue that in Figure 1[11] polarisation does not behave monotonically as population moves to the extremes from two central masses, and provided that initial polarisation is rather large. The reported support for the Axiom 1 above implies that the support for this feature should be rather weak. Indeed this is what we find. The interesting transition in Figure 1 – from panels (a) to (b) – is captured by our question 9. Since there is no ground to allow for polarisation to decrease in the transition from panels (b) to (c), a non-monotonous behaviour implies that people should perceive a decrease in polarisation in the transformation going from panels (a) to (b). Now, only about one third of the sample considers that such a transformation implies a decrease in polarisation – see Table 11. Additional evidence in the same direction is provided by the responses to the same question 1 which was used to analyse people's support for the Increased Spread axiom. Here, again only about one third of the sample considers that a small outward movement away from one of the poles decreases polarisation. The verbal question 19 also tackles this point. The responses in favour of non-monotonicity amount to a mere 32% of the sample – monotonicity attracting more than half of the whole sample. Crossing the responses to questions 9 and 19 shows complete consistency between the numerical and the verbal questions. Finally, adding the responses to question 1 halves the above support to 5%.

5.9 Axioms required by polarisation indices

Only a small proportion of the sample seems to endorse all the axioms required to build the most popular indices in the literature. The three axioms

[11] This is their Figure 5 (p.828).

Question 9		Question 19	
Increases	56.2	Increases always	42.5
Same	6.7	Decreases always	8.5
Decreases	*37.1*	Increases first, then decreases	*12.1*
		Decreases first, then increases	*20.3*
		Same	9.5
		None	7.1
N	1498	N	1415

Note: 'Orthodox' answers in italics

Table 11: Non-Monotonicity in Figure 5

used in Theorem 1 in Esteban and Ray (1994) (questions 2, 6 and 7) gather 16% of support. When Axiom 8 is also considered – having thus the 4 axioms required to arrive at the preferred measure in Esteban and Ray (1994), theorem 3– support goes down to 6%. As far as Chakravarty and Majumdar (2001) is concerned, we can only test for 3 of the 6 axioms used in Proposition 1 – questions 1 to 3. None the less, our test on these 3 axioms provides little support. Hence, proposition 1 is very likely to enjoy very little support.

Finally, consistency of the responses is virtually zero if tested by means of checking whether their answers comply with the four axioms used in Esteban and Ray (1994) (Theorem 3) to derive P^α with the restriction $\alpha \geq 1$ and the property that polarisation should not be monotonic in situations such as that posed in Figure 1.

5.10 What affects polarisation perceptions?

Are individual characteristics or circumstances, such as the country of residence or parental income, important to understand the perception people have of polarisation? Or is it rather (the result of) certain individual choices like the subject of study what drive their perceptions? May be it is nothing to do with them but to their responses to different ways of eliciting their perceptions, such as the way questions are posed or presented or the means used to do so (i.e. on paper or virtually and by internet).

In order to examine the extent to which reported polarisation perceptions depend on all those aspects, we followed a fourfold strategy. We asked all respondents to give us some basic information about themselves, we have run the questionnaire in six countries and in three different languages, we posed numerical and verbal questions, and finally we have also employed three versions of the questionnaire. We investigate what affects polarisation

perceptions by means of multinomial regressions – one for each of the nineteen questions. Relative risk ratio estimates are shown in Tables 12 to 19.

The way questions are presented some times influences polarisation perceptions. As pointed out above in the analysis of the axioms, the relationship between the answers given to numerical and verbal questions is rather loose for many questions. None the less, most times such (quantitative) discrepancies do not alter the qualitative conclusion. Perhaps not surprisingly, the way numerical questions are presented – with hints, with no hints, or by means of pictures– seems to influence the answers to some numerical questions. Interestingly, the type of questionnaire has a significant impact on the answers to the questions related to the axioms that receive the least support, i.e. questions 2 (Axiom 2), 4 (Axiom 5), 8 (Axiom 8), and 9 (Non-monotonicity feature). Take increased bipolarity; respondents answering the pictorial version of the questionnaire are twice as likely to agree with the axiom than those who answered either of the two non-pictorial versions; but even among those who had the pictorial version those who responded in accordance with the axiom were in a minority (37%). They are also more than twice as likely to reject scale invariance in favour of reporting larger polarisation as the income gap between two poles remains constant in relative but increases in absolute terms. On the contrary, individuals who answered a questionnaire with no visual hints behave the opposite way. That is, they are twice as likely to reject scale invariance in favour of reporting smaller polarisation when the income gap between two poles remains constant in relative but increases in absolute terms (question 4).

As explained above, translation invariance is favoured over scale invariance. The regression estimates on question 5 reveal that those who faced the pictorial version of the questionnaire are twice as likely to give support to the translation invariance axiom than to reporting a decrease in polarisation as the income gap increases in absolute terms but decreases in relative ones. Amongst those who reject Axiom 8, the questionnaire with no visual hints seems to induce individuals to think that the position of intermediate poles matter for polarisation. Finally, both questionnaires with pictures and no hints have a positive impact on the likelihood that the non-monotonic behaviour of polarisation in the transition of two poles getting closer or further apart be shared.

The type of questionnaire affects also the answer to questions that test axioms which gather large support. For instance, individuals who answered to pictorial version of the questionnaire are also more likely to agree with Axiom 6 than those who used the questionnaire with visual hints. In sum, influence of the type of questionnaire on perceptions does not show any systematic pattern; in particular, for some questions the pictorial version of the

questionnaire seems to exert an influence in line with the axiom, while for some other questions the influence goes in the opposite direction. Moreover, the presentation of the numerical questions also seems to influence the answer to some verbal questions – which, recall, are identical across type of questionnaire.

Some of our respondents answered the questionnaire by internet using the Virtual Lab. The advantages of the Virtual Lab are many, but we should make sure that it does not systematically affect individual perceptions. Indeed, this is the overall conclusion which could be drawn from our multinomial estimates since the internet variable is only significant for some few cases.

Previous studies show that when it comes to reporting one's perceptions to distributive concepts such as inequality or poverty cultural background matters (Amiel and Cowell 1992, 1999b). We capture cultural differences by the subject of study and the country/language in which the questionnaire was run. Instruction in economics matters for one of the important axioms that gathered little support, increased bipolarity. As compared to individuals being taught other social sciences, economics students are far more inclined to think in accordance with the axiom, instead of reporting that an equalising transfer decreases polarisation. However, when answering question 14 – to test scale and translation invariance – , social science students are more likely to answer against both axioms. Here, social science students may be influenced (more than other students) by the poverty-related explanation provided in the answer choice – where it is suggested that doubling incomes may cover basic needs of low-income groups. Students from other disciplines are also more inclined than economics students to give answers that are not consistent with the axioms (questions 1, 3, 6, 9, 10).

In order to examine the influence of societies and the common features of their culture on individual perceptions of polarisation we have defined a variable – which is a combination of the language used and the place the questionnaire was run– that identifies Catalan, Spanish, Anglo-Saxon in England, the US and Australia, Uruguayan and Turkish. Students belonging to these cultures do not respond differently to the numerical questions that test the axioms that receive the least support (e.g. questions 2, 4, 8 and 9). As concerns the verbal questions, the most remarkable feature is the persistency of the Turkish respondents in providing answers that differ from those of the other groups.

"orthodox" answer	A		A		AB		AB		AB	
Question	1		2		3		4		5	
	RRR	p-value	RRR	p-value	RRR	p-value	RRR	p-value	RRR	p-value
	AB		A		A		A		A	
Age	1.07	0.02	1.02	0.30	0.97	0.29	0.99	0.63	1.03	0.07
Male	0.68	0.13	1.13	0.37	1.15	0.45	0.90	0.63	1.80	0.00
Employed	0.73	0.25	1.28	0.08	1.69	0.01	1.80	0.01	1.08	0.60
Subject study										
Business	1.39	0.31	0.97	0.84	1.55	0.07	1.39	0.22	1.21	0.28
Social Sciences	0.91	0.83	0.58	0.02	1.50	0.20	0.83	0.65	1.23	0.36
Other	0.76	0.74	0.58	0.11	2.98	0.01	2.88	0.01	1.12	0.76
Language										
English	1.43	0.38	1.39	0.14	4.26	0.00	2.02	0.02	1.84	0.01
Spanish	1.03	0.93	1.41	0.07	1.14	0.62	0.76	0.39	0.90	0.60
Uruguayan	0.97	0.95	1.32	0.24	1.61	0.17	0.92	0.85	1.67	0.03
English (Turkey)	0.41	0.41	0.95	0.88	5.48	0.00	0.37	0.35	1.77	0.09
Version										
No Hints	1.01	0.97	1.09	0.63	1.28	0.30	1.82	0.03	1.09	0.61
Pictures	2.34	0.01	1.85	0.00	1.16	0.52	1.31	0.31	0.46	0.00
Internet	0.86	0.82	1.03	0.94	1.06	0.91	1.32	0.62	0.59	0.18
Political view										
Centre	1.11	0.75	0.98	0.93	1.07	0.78	1.37	0.29	0.88	0.46
Right	1.08	0.85	1.08	0.72	1.12	0.71	0.99	0.99	0.88	0.55
Income parents										
Middle	0.94	0.85	1.30	0.13	1.39	0.17	1.02	0.95	0.98	0.91
High	1.13	0.75	1.39	0.11	1.09	0.77	1.22	0.54	0.98	0.92
Mobility prospects										
Same as parents	1.14	0.73	1.10	0.63	0.78	0.36	1.50	0.18	0.91	0.64
Better than parents	1.07	0.86	1.37	0.13	0.88	0.64	1.10	0.77	0.77	0.20

Reference group: female, not employed, studies economics, answers catalan questionnaire with hints on paper, politically left, with low income parents and expecting to do worse than them.

The comparison answer is always the most frequent one.

Table 12: Effect of individual characteristics on answers to questions 1 to 5. Relative Risk Ratios (part 1)

"orthodox" answer	A		A		AB		AB		AB	
Question	1		2		3		4		5	
	RRR	p-value	RRR	p-value	RRR	p-value	RRR	p-value	RRR	p-value
	B		AB		B		AB		B	
Age	1.04	0.03	1.02	0.32	0.96	0.04	0.99	0.65	1.02	0.30
Male	0.98	0.86	1.09	0.59	1.02	0.86	1.16	0.26	0.97	0.86
Employed	0.82	0.14	1.20	0.30	1.35	0.04	0.89	0.44	1.35	0.08
Subject study										
Business	1.54	0.01	1.23	0.34	1.30	0.14	0.56	0.00	1.26	0.26
Social Sciences	1.45	0.08	0.70	0.21	1.55	0.05	0.71	0.13	1.02	0.94
Other	3.85	0.00	0.29	0.02	2.61	0.01	0.94	0.87	1.64	0.19
Language										
English	1.20	0.41	1.17	0.56	4.04	0.00	0.79	0.30	2.78	0.00
Spanish	1.40	0.06	0.79	0.34	1.66	0.01	1.11	0.58	1.51	0.07
Uruguayan	1.38	0.15	1.23	0.47	1.82	0.01	0.77	0.28	1.21	0.55
English (Turkey)	2.54	0.00	0.67	0.40	6.24	0.00	1.19	0.59	0.99	0.98
Version										
No Hints	1.25	0.19	0.73	0.17	1.20	0.34	1.25	0.18	1.09	0.68
Pictures	1.41	0.03	1.17	0.44	1.37	0.06	0.49	0.00	0.77	0.19
Internet	0.70	0.33	1.24	0.62	1.12	0.77	1.32	0.47	0.83	0.68
Political view										
Centre	1.42	0.05	1.24	0.35	1.10	0.60	1.12	0.52	1.00	0.99
Right	1.41	0.11	1.40	0.23	0.96	0.87	1.04	0.88	1.06	0.84
Income parents										
Middle	1.10	0.55	0.91	0.68	1.01	0.98	1.25	0.19	0.75	0.16
High	0.96	0.86	1.02	0.95	0.98	0.93	1.07	0.75	0.78	0.31
Mobility prospects										
Same as parents	1.09	0.66	1.13	0.63	0.74	0.13	1.49	0.05	1.34	0.26
Better than parents	1.06	0.76	1.05	0.86	0.74	0.15	1.39	0.11	1.05	0.86

Reference group: female, not employed, studies economics, answers catalan questionnaire with hints on paper, politically left, with low income parents and expecting to do worse than them.

The comparison answer is always the most frequent one.

Table 13: Effect of individual characteristics on answers to questions 1 to 5
Relative Risk Ratios (part 2)

"orthodox" answer	B		B		B		B		A	
Question	6		7		8		9		10	
	RRR	p-value	RRR	p-value	RRR	p-value	RRR	p-value	RRR	p-value
	A		A		A		AB		AB	
Age	0.90	0.00	0.94	0.01	1.05	0.22	1.00	0.88	1.01	0.76
Male	0.79	0.12	1.16	0.34	1.14	0.70	0.79	0.33	0.92	0.69
Employed	1.14	0.39	1.04	0.83	0.70	0.34	1.91	0.01	1.14	0.57
Subject study										
Business	1.27	0.22	0.88	0.52	0.77	0.55	1.21	0.55	0.80	0.44
Social Sciences	1.69	0.04	0.81	0.47	1.04	0.95	0.90	0.82	1.12	0.76
Other	1.43	0.34	2.68	0.00	0.65	0.62	1.34	0.62	4.89	0.00
Language										
English	1.18	0.51	1.46	0.13	1.97	0.17	1.71	0.16	0.94	0.87
Spanish	1.62	0.02	1.72	0.01	0.81	0.67	1.56	0.19	1.71	0.07
Uruguayan	0.72	0.29	0.93	0.81	0.46	0.29	0.90	0.82	0.66	0.32
English (Turkey)	3.10	0.00	0.43	0.13	1.79	0.42	1.62	0.47	2.36	0.06
Version										
No Hints	0.70	0.06	1.03	0.87	2.05	0.14	0.88	0.72	1.14	0.68
Pictures	0.66	0.02	1.00	0.98	2.09	0.12	2.07	0.01	1.97	0.01
Internet	3.34	0.01	1.70	0.27	1.55	0.62	1.58	0.44	1.94	0.22
Political view										
Centre	1.35	0.14	1.12	0.59	1.58	0.37	0.83	0.55	1.27	0.43
Right	0.91	0.70	0.72	0.22	1.16	0.82	0.74	0.45	1.27	0.51
Income parents										
Middle	0.82	0.28	0.90	0.61	0.69	0.38	1.14	0.69	1.05	0.86
High	0.79	0.31	0.84	0.45	0.47	0.15	1.59	0.21	0.93	0.83
Mobility prospects										
Same as parents	1.16	0.53	0.94	0.81	1.29	0.65	1.40	0.41	1.23	0.56
Better than parents	1.19	0.45	1.20	0.45	1.02	0.97	2.08	0.07	1.44	0.29

Reference group: female, not employed, studies economics, answers catalan questionnaire with hints on paper, politically left, with low income parents and expecting to do worse than them.

The comparison answer is always the most frequent one.

Table 14: Effect of individual characteristics on answers to questions 6 to 10. Relative Risk Ratios (part 1)

"orthodox" answer	B		B		B		B		A	
Question	6		7		8		9		10	
	RRR	p-value	RRR	p-value	RRR	p-value	RRR	p-value	RRR	p-value
	AB		AB		B		B		B	
Age	0.96	0.17	0.95	0.11	1.04	0.01	1.03	0.04	0.97	0.24
Male	0.90	0.63	0.70	0.19	0.81	0.08	0.69	0.00	0.92	0.60
Employed	1.24	0.36	4.41	0.00	0.81	0.10	0.92	0.54	1.34	0.10
Subject study										
Business	1.12	0.71	0.99	0.97	1.02	0.88	1.15	0.39	1.56	0.04
Social Sciences	0.76	0.53	1.10	0.83	0.97	0.87	1.43	0.08	1.25	0.48
Other	4.11	0.01	0.41	0.42	2.40	0.00	1.85	0.05	3.85	0.00
Language										
English	0.75	0.49	0.77	0.57	1.09	0.67	1.30	0.21	1.97	0.01
Spanish	1.02	0.95	1.20	0.60	1.27	0.17	1.14	0.45	1.49	0.09
Uruguayan	1.33	0.48	0.56	0.29	0.99	0.95	1.09	0.70	0.80	0.54
English (Turkey)	2.16	0.16	0.00	1.00	1.33	0.37	1.70	0.10	1.59	0.34
Version										
No Hints	0.90	0.72	0.51	0.05	1.06	0.71	1.68	0.00	1.16	0.49
Pictures	0.76	0.31	0.60	0.10	1.11	0.50	1.57	0.00	0.83	0.37
Internet	4.92	0.00	4.84	0.01	1.31	0.42	0.60	0.17	1.93	0.14
Political view										
Centre	1.48	0.22	1.28	0.48	1.05	0.77	0.81	0.19	1.05	0.83
Right	1.00	0.99	1.89	0.15	1.27	0.23	0.82	0.32	1.38	0.25
Income parents										
Middle	1.18	0.58	0.73	0.35	0.91	0.53	0.85	0.32	0.99	0.95
High	1.17	0.66	0.87	0.72	0.90	0.58	0.67	0.03	0.70	0.17
Mobility prospects										
Same as parents	1.39	0.29	1.05	0.89	1.15	0.45	1.22	0.29	1.26	0.37
Better than parents	0.95	0.89	0.93	0.85	1.03	0.86	0.99	0.97	1.03	0.90

Reference group: female, not employed, studies economics, answers catalan questionnaire with hints on paper, politically left, with low income parents and expecting to do worse than them.

The comparison answer is always the most frequent one.

Table 15: Effect of individual characteristics on answers to questions 6 to 10. Relative Risk Ratios (part 2)

"Orthodox" Answer	C		B		C		A		B	
Question	11		12		13		14		15	
	RRR	p-value	RRR	p-value	RRR	p-value	RRR	p-value	RRR	p-value
	a		a		a		b		a	
Age	1.01	0.59	0.99	0.74	0.98	0.39	1.02	0.26	1.02	0.21
Male	1.34	0.09	2.20	0.00	1.37	0.07	1.68	0.00	2.19	0.00
Employed	1.01	0.97	1.03	0.86	1.01	0.96	0.95	0.72	1.08	0.65
Subject study										
Business	1.06	0.81	0.88	0.45	0.86	0.51	1.16	0.39	1.14	0.51
Social Sciences	0.82	0.53	0.97	0.88	0.92	0.79	0.90	0.63	1.37	0.20
Other	2.02	0.10	0.34	0.00	1.64	0.23	0.73	0.36	0.52	0.08
Language										
English	1.06	0.84	1.57	0.04	1.00	1.00	1.12	0.60	2.73	0.00
Spanish	1.22	0.41	0.68	0.04	1.09	0.73	0.75	0.13	0.69	0.10
Uruguayan	1.03	0.92	0.87	0.57	0.83	0.57	0.88	0.58	1.50	0.13
English (Turkey)	0.99	0.99	1.93	0.08	2.80	0.01	0.94	0.89	0.95	0.92
Version										
No Hints	0.93	0.78	1.02	0.91	0.67	0.10	0.66	0.02	1.31	0.17
Pictures	1.67	0.02	0.99	0.96	0.97	0.89	0.86	0.34	0.80	0.23
Internet	1.61	0.29	0.85	0.68	1.39	0.52	1.78	0.13	0.36	0.04
Political view										
Centre	1.28	0.31	0.78	0.16	0.93	0.76	0.89	0.49	1.09	0.66
Right	1.44	0.21	0.63	0.04	0.77	0.37	1.20	0.41	0.84	0.49
Income parents										
Middle	1.28	0.29	1.08	0.66	1.39	0.16	0.63	0.01	0.82	0.32
High	0.99	0.98	1.17	0.46	1.59	0.09	1.07	0.73	0.88	0.59
Mobility prospects										
Same as parents	0.89	0.67	0.82	0.32	0.62	0.07	1.05	0.81	1.74	0.02
Better than parents	0.92	0.75	0.88	0.53	1.06	0.82	0.97	0.90	1.26	0.36

Reference group: female, not employed, studies economics, answers catalan questionnaire with hints on paper, politically left, with low income parents and expecting to do worse than them. The comparison answer is always the most frequent one.

Note: answers (d) have not been considered in the above multinomial regressions

Table 16: Effect of individual characteristics on answers to questions 11 to 15. Relative Risk Ratios (part 1)

"Orthodox" Answer	C		B		C		A		B
Question	11		12		13		14		15
	RRR	p-value	RRR	p-value	RRR	p-value	RRR	p-value	RRR
	b		b		b		c		c
Age	1.04	0.08	0.99	0.72	1.00	0.93	1.00	0.90	0.97
Male	0.98	0.91	1.38	0.05	1.40	0.25	1.98	0.00	1.65
Employed	0.75	0.15	1.29	0.14	0.88	0.67	0.94	0.78	1.71
Subject study									
Business	1.52	0.11	1.23	0.34	3.62	0.00	2.44	0.00	0.79
Social Sciences	0.84	0.56	0.70	0.22	2.25	0.16	2.48	0.01	0.95
Other	2.28	0.06	0.98	0.95	7.12	0.00	1.56	0.32	1.81
Language									
English	1.29	0.42	2.54	0.00	0.95	0.92	1.64	0.12	2.29
Spanish	0.78	0.38	0.94	0.81	0.45	0.07	0.55	0.04	1.16
Uruguayan	3.46	0.00	2.65	0.00	1.08	0.90	0.71	0.41	2.54
English (Turkey)	0.92	0.89	2.74	0.03	7.50	0.00	5.87	0.00	7.91
Version									
No Hints	0.70	0.16	1.30	0.24	0.98	0.96	1.18	0.53	1.56
Pictures	0.80	0.33	1.44	0.08	0.87	0.70	0.89	0.67	0.87
Internet	1.27	0.63	1.23	0.63	1.33	0.69	1.87	0.23	2.11
Political view									
Centre	1.19	0.50	0.94	0.79	1.32	0.53	1.27	0.41	1.50
Right	1.73	0.07	0.88	0.64	0.91	0.86	1.89	0.07	1.70
Income parents									
Middle	0.80	0.36	0.99	0.98	1.40	0.37	0.76	0.28	0.83
High	0.92	0.77	1.34	0.24	1.34	0.52	0.72	0.30	0.65
Mobility prospects									
Same as parents	1.05	0.87	0.67	0.09	1.16	0.76	0.83	0.54	0.74
Better than parents	0.99	0.98	0.70	0.14	2.01	0.14	0.96	0.90	0.81

Reference group: female, not employed, studies economics, answers catalan questionnaire with hints on paper, politically left, with low income parents and expecting to do worse than them. The comparison answer is always the most frequent one.

Note: answers (d) have not been considered in the above multinomial regressions

Table 17: Effect of individual characteristics on answers to questions 11 to 15. Relative Risk Ratios (part 2)

"Orthodox" Answer	A		A		A		B	
Question	16		17		18		19	
	RRR	p-value	RRR	p-value	RRR	p-value	RRR	p-value
	b		b		a		b	
Age	0.94	0.03	0.96	0.22	1.04	0.04	0.98	0.32
Male	0.69	0.03	1.31	0.23	1.10	0.47	0.76	0.04
Employed	1.03	0.85	0.83	0.43	0.90	0.49	0.98	0.86
Subject study								
Business	0.82	0.35	3.05	0.00	0.78	0.16	1.16	0.39
Social Sciences	0.75	0.35	1.16	0.75	0.97	0.88	1.30	0.23
Other	1.26	0.57	3.45	0.01	0.75	0.40	1.53	0.20
Language								
English	1.07	0.80	1.63	0.16	1.85	0.00	0.85	0.48
Spanish	0.88	0.58	0.45	0.03	1.13	0.53	1.02	0.92
Uruguayan	0.39	0.01	1.07	0.89	1.25	0.34	1.04	0.87
English (Turkey)	2.61	0.06	17.99	0.00	3.19	0.00	2.21	0.05
Version								
No Hints	1.07	0.78	1.08	0.80	0.90	0.55	0.92	0.66
Pictures	1.91	0.00	1.07	0.80	0.89	0.47	0.94	0.73
Internet	2.00	0.15	1.72	0.39	1.60	0.20	0.63	0.27
Political view								
Centre	0.92	0.69	1.26	0.48	0.81	0.23	1.26	0.20
Right	0.69	0.19	1.12	0.77	0.80	0.30	1.39	0.14
Income parents								
Middle	0.79	0.26	1.02	0.95	1.20	0.31	1.08	0.66
High	0.85	0.54	1.02	0.96	1.21	0.38	1.07	0.74
Mobility prospects								
Same as parents	0.92	0.75	1.27	0.49	1.01	0.96	0.95	0.81
Better than parents	1.23	0.42	1.28	0.48	0.98	0.94	1.03	0.88

Reference group: female, not employed, studies economics, answers catalan questionnaire with hints on paper, politically left, with low income parents and expecting to do worse than them. The comparison answer is always the most frequent one.

Note: answers (d) have not been considered in the above multinomial regressions

Table 18: Effect of individual characteristics on answers to questions 16 to 19. Relative Risk Ratios (part 1)

"Orthodox" Answer	A		A		A		B	
Question	16		17		18		19	
	RRR c	p-value	RRR c	p-value	RRR c	p-value	RRR c	p-value
Age	0.97	0.34	0.96	0.12	1.02	0.45	0.96	0.15
Male	1.27	0.23	0.83	0.28	0.96	0.84	0.83	0.37
Employed	0.81	0.34	1.25	0.21	1.02	0.93	1.09	0.69
Subject study								
Business	1.39	0.22	1.33	0.19	1.48	0.17	1.41	0.23
Social Sciences	1.13	0.73	1.06	0.85	1.18	0.65	2.47	0.01
Other	2.20	0.09	1.70	0.21	3.51	0.01	1.18	0.80
Language								
English	0.86	0.66	0.93	0.79	1.00	1.00	0.94	0.86
Spanish	0.65	0.14	0.99	0.95	1.05	0.88	1.38	0.26
Uruguayan	1.00	0.99	0.81	0.50	1.44	0.35	0.98	0.97
English (Turkey)	3.29	0.04	2.49	0.08	11.02	0.00	5.21	0.00
Version								
No Hints	0.74	0.25	1.08	0.72	0.91	0.74	0.99	0.96
Pictures	0.77	0.28	0.81	0.30	0.77	0.31	1.02	0.94
Internet	2.06	0.17	2.04	0.13	0.76	0.66	2.68	0.05
Political view								
Centre	1.14	0.64	1.36	0.18	0.85	0.56	1.01	0.97
Right	1.15	0.69	1.53	0.14	1.04	0.91	0.79	0.53
Income parents								
Middle	0.87	0.61	1.15	0.52	0.62	0.06	0.89	0.66
High	0.74	0.34	1.00	0.99	0.56	0.06	0.92	0.80
Mobility prospects								
Same as parents	1.22	0.49	1.16	0.55	2.01	0.03	0.89	0.71
Better than parents	0.87	0.65	0.88	0.62	1.10	0.78	1.03	0.93

Reference group: female, not employed, studies economics, answers catalan questionnaire with hints on paper, politically left, with low income parents and expecting to do worse than them. The comparison answer is always the most frequent one.

Note: answers (d) have not been considered in the above multinomial regressions

Table 19: Effect of individual characteristics on answers to questions 16 to 19. Relative Risk Ratios (part 2)

5.11 Do respondents think in terms of inequality?

Our findings suggest that important axioms which serve to differentiate polarisation from inequality – e.g. increased bipolarisation– as well as other distinctive features of polarisation, i.e. the non-monotonous behaviour at-

Responses in both questionnaires...		
... ought to	... actually	
	Coincide	Differ
Coincide	*I*	*II*
Differ	*III*	*IV*

Table 20: Combinations of actual and expected answers in the polarisation and inequality questionnaires

tributed to polarisation, are not widely accepted. Moreover, the answers obtained are those to be expected in the neighbouring field of inequality. These findings may indicate that respondents think in terms of inequality when answering our polarisation questionnaire. We investigate whether this is so by running a small 'experiment', which consists of using two parallel questionnaires, one on polarisation and another one on inequality. The latter, results from replacing the word polarisation with inequality in the 'bare-verbal questions' polarisation questionnaire (and adapting the introductory text).

To asses whether respondents think in terms of inequality when answering the polarisation questionnaire, we compare responses between the two samples. As table 20 shows, actual and expected responses can either coincide or differ between questionnaires. When disagreement between expectations and realisations (cells *II* and *III* in table 20) occurs because polarisation responses are not in line with the relevant axiom but inequality responses are, we will consider that respondents think in terms of inequality when answering the polarisation questionnaire.[12] Responses that fall in cell *IV*, however, may reveal that individuals are indeed thinking differently in each questionnaire.[13] Finally, notice that no information can be elicited from cell *I*, which describes the situation where responses ought to and indeed coincide in both questionnaires.

As shown in Table 21, expected answers differ in 40% of the questions, and most notably in those referring to Axiom 2 (Increased Bipolarity; ER1)

[12]Note that disagreement between expected and actual responses may also arise because inequality responses are not in line with the axiom and polarisation responses are, or because both inequality and polarisation responses are not in line with the respective relevant axioms. These two instances however do not provide any relevant information.

[13]That is, if answers differ because they are in line with the axiom. The case where answers happen to differ, but only because some of the responses do not accord with the relevant axiom does not provide any relevant information.

(questions 2 and 12) and to the non-monotonous behaviour of polarisation (questions 9 and 19). The answers obtained in question 2 may suggest that individuals think in terms of inequality when answering the polarisation questionnaire. Answers to this question ought to be different but, as shown in the appendix table 23, they are actually very similar (cell *III*): in both questionnaires more than half of the respondents choose distribution A as the most polarised or unequal. Notwithstanding that, responses to the companion verbal question 12 do not go in the same direction, and thus cast doubt on the robustness of the previous conclusion.

The responses to questions 9 and 19 also provide inconclusive evidence. Answers to question 9 should differ between both questionnaires. On the one hand, and according to the principle of transfers, distribution A should be more unequal, while the non-monotonous behaviour of polarisation would require distribution B to show more polarisation. Respondents to the inequality questionnaire do answer in line with the principle of transfers, but on the polarisation side both distributions gather similar support – the difference in appendix table 28 not being statistically significant ($z = 4.2$; $p - value < 0.001$)– , and support for distribution A is not as strong as it is among inequality respondents. Answers to the companion verbal question 19 give support to the possibility that polarisation-questionnaire respondents think in terms of inequality: irrespective of the questionnaire type the option that receives most support is that of a monotonous increase, consistent with inequality postulates but not with the non-monotonicity feature of polarisation. However, this conclusion is worth qualifying since the difference between monotonicity and non-monotonicity is much smaller in the polarisation sample than in the inequality sample.

Questions 6 and 16 are an interesting case, which suggests that respondents do not think in terms of inequality when confronted with the polarisation questions. Responses in both questionnaires are in line with the polarisation axiom 4 (ER2), thus being clearly at odds with the (demanding) set of axioms required by the generalised Lorenz dominance criteria. However, responses to questions 8 and 18 are consistent with the hypothesis that individuals do think in terms of inequality.

6 A brief conclusion

Do people view polarisation in the same way that economists do? In many respects yes. But in one vital respect – the issue of increasing bipolarisation

Question	*Expected answer in polarisation*	*Expected answer in inequality*[14]
1	A	A
2	*A*	*B*
3	AB	AB
4	AB	AB
5	AB	AB
6	*B*	*A*
7	B	B
8	*B*	*A*
9	*B*	*A*
10	A	A
11a	C	C
11b	B	B
12	*B*	*A*
13	C	C
14	A	A
15	B	B
16	*A*	*B*
17	A	A
18	*A*	*B*
19	*D*	*A*

Table 21: Expected answers in the polarisation and inequality questionnaires

– they certainly do not. This point, unfortunately, crucially undermines the standard approaches to polarisation that have been developed in the literature. What is more the conclusion is robust under alternative representations of the questionnaire (pictorial, numerical or verbal; with or without hints).

Do people view polarisation in the same way that they view inequality? Here the evidence is mixed. The responses to some questions suggest that individuals do think in terms of inequality while some others point to the opposite conclusion. Either way it suggests that there may be room for new thinking on the meaning of polarisation.

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A Comparison of polarisation and inequality questionnaires

Polarisation				
	Question 1	Question 11a	Question 11b	Question 10
Increases	*59.1*	*55.4*	*70.8*	*64.9*
Same	3.5	8.5	7.7	16.7
Decreases	37.4	24.6	14.6	18.4
Depends		11.5	6.9	
N	115	130	130	114

Inequality				
	Question 1	Question 11a	Question 11b	Question 10
Increases	*75.5*	*78.0*	*82.0*	*73.9*
Same	8.2	3.9	4.7	9.9
Decreases	16.4	10.2	9.4	16.2
Depends		7.9	3.9	
N	110	127	128	111

Note: 'Orthodox' answers in italics

Table 22: Increased Spread in experiment samples

Polarisation		
	Question 2	Question 12
Increases	*33.6*	*18.5*
Same	14.7	63.1
Decreases	51.7	18.5
N	116	130

Inequality		
	Question 2	Question 12
Increases	31.8	9.5
Same	14.6	52.4
Decreases	*53.6*	*38.1*
N	110	126

Note: 'Orthodox' answers in italics

Table 23: Increased Bipolarity in experiment samples

Polarisation		
	Question 3	Question 13
Increases	29.3	11.0
Same	*56.9*	*78.7*
Decreases	13.8	10.2
N	116	127

Inequality		
	Question 3	Question 13
Increases	27.36	12.6
Same	*58.49*	*79.53*
Decreases	14.15	7.87
N	106	127

Note: 'Orthodox' answers in italics

Table 24: Population Principle in experiment samples

Polarisation				
	Question 4	Question 5	Question 14	Question 15
Increases	57.4	27.0	18.6	13.2
Same	*32.2*	*48.7*	*69.0*	*57.4*
Decreases	10.4	24.4	1.6	15.5
Depends			10.9	14.0
N	115	115	129	129

Inequality				
	Question 4	Question 5	Question 14	Question 15
Increases	61.1	15.7	17.3	1.6
Same	*31.5*	*49.1*	*70.1*	*67.5*
Decreases	7.4	35.2	5.5	20.6
Depends			7.1	10.3
N	108	108	127	126

Note: 'Orthodox' answers in italics

Table 25: Scale and Translation Invariance in experiment samples

Polarisation				
	Axiom 2 in ER		*Axiom 3 in ER*	
	Question 6	Question 16	Question 7	Question 17
Increases	*67.5*	*53.2*	*64.9*	*48.4*
Same	9.7	12.7	8.8	27.3
Decreases	22.8	19.1	26.3	14.8
Depends		15.1		9.4
N	114	126	114	128

Inequality				
	Axiom 2 in ER		*Axiom 3 in ER*	
	Question 6	Question 16	Question 7	Question 17
Increases	62.7	48.4	*82.7*	*52.8*
Same	12.7	15.1	5.5	26.8
Decreases	*24.6*	*21.4*	11.8	11.8
Depends		15.1		8.7
N	110	126	110	127

Table 26: Axioms 2 and 3 in experiment samples

Polarisation		
	Question 8	Question 18
Increases	*40.7*	*32.5*
Same	6.8	19.8
Decreases	52.5	47.6
N	118	126

Inequality		
	Question 8	Question 18
Increases	18.9	15.7
Same	9.0	24.0
Decreases	*72.1*	*60.3*
N	111	121

Note: 'Orthodox' answers in italics

Table 27: Axiom 4 in experiment samples

Polarisation			
Question 9		Question 19	
Increases	49.6	Increases always	31.0
Same	7.8	Decreases always	8.7
Decreases	*42.6*	Increases first, then decreases	13.5
		Decreases first, then increases	*18.3*
		Same	18.3
		None	10.3
N	115	N	126

Inequality			
Question 9		Question 19	
Increases	*62.4*	*Increases always*	*38.7*
Same	5.5	Decreases always	9.2
Decreases	32.1	Increases first, then decreases	9.2
		Decreases first, then increases	11.8
		Same	25.2
		None	5.9
N	109	N	119

Note: 'Orthodox' answers in italics

Table 28: Non-monotonicity in experiment samples

B The questionnaires

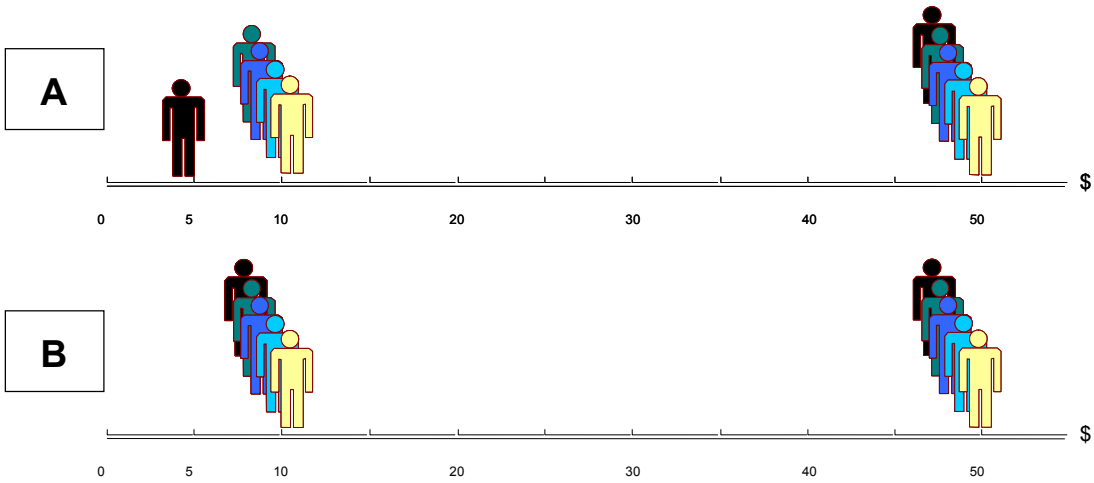
Following is an example of one of the three main types of questionnaire used in the present study – the pictorial version. Other versions used in the study can be found at http://darp.lse.ac.uk/polarisation/.

INCOME POLARISATION QUESTIONNAIRE

This questionnaire concerns people's attitude to income polarisation. We would be interested in **your** views, based on hypothetical situations. Because it is about attitudes there are no "right" answers. Some of the possible answers correspond to assumptions commonly made by economists: but these assumptions may not be good ones. Your responses will help to shed some light on this, and we would like to thank you for your participation. The questionnaire is anonymous. Please do not write your name on it.

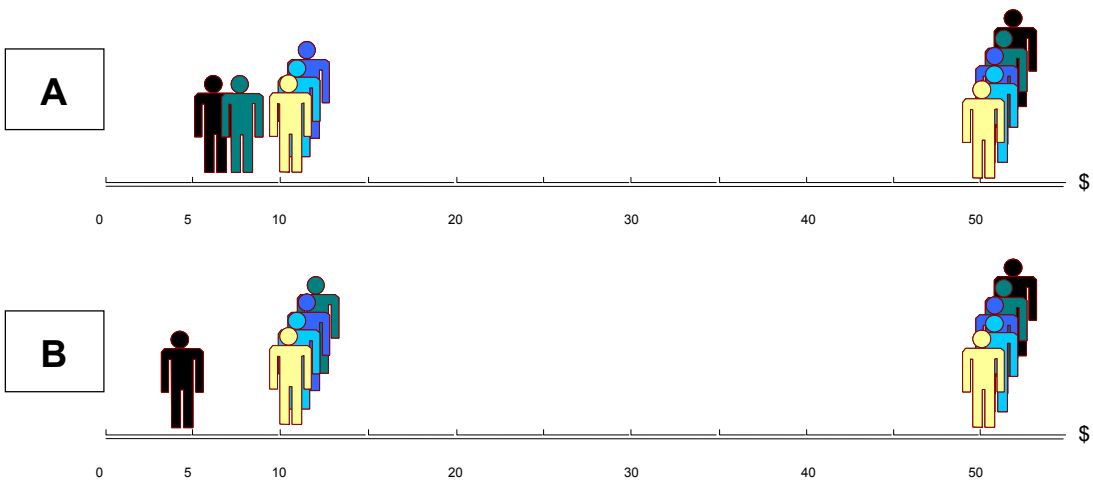
Alfaland is a small country for which two economic programmes have been proposed. It is known that the programmes will have an identical effect on the population — except in so far as incomes are concerned (all the people in Alfaland are identical in every respect other than income). In the pictogram questions 1 to 10 you are asked about two alternative lists of incomes A and B (in Alfaland local currency) which result from each of these programmes. Please state which programme you consider would make the community of Alfaland more polarised by ticking the appropriate box.

1: A=(5,10,10,10,10,50,50,50,50,50)
B=(10,10,10,10,10,50,50,50,50,50)



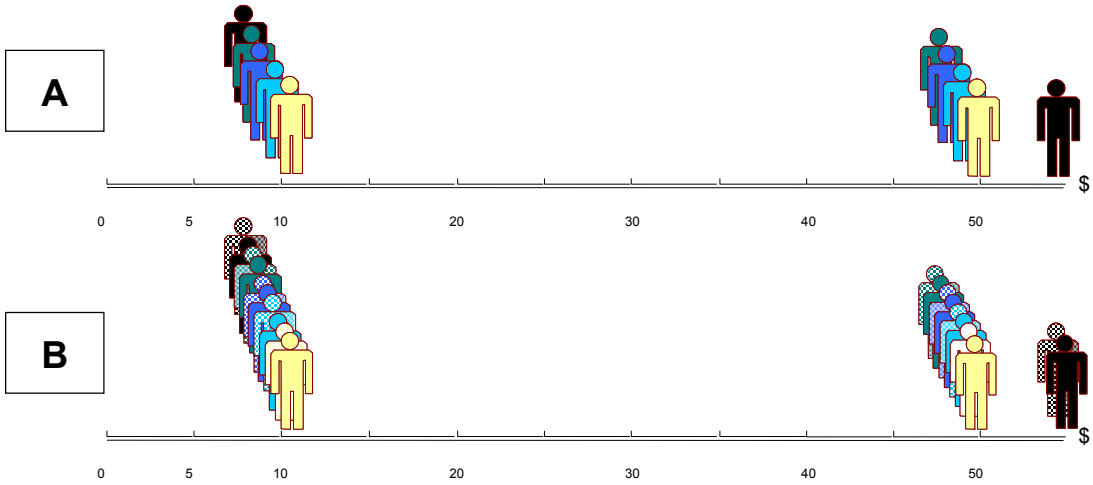
Please check (✔) one: ☐ A is more polarised
☐ B is more polarised
☐ polarisation is the same in A and B

2: A=(7,8,10,10,10,50,50,50,50,50)
B=(5,10,10,10,10,50,50,50,50,50)



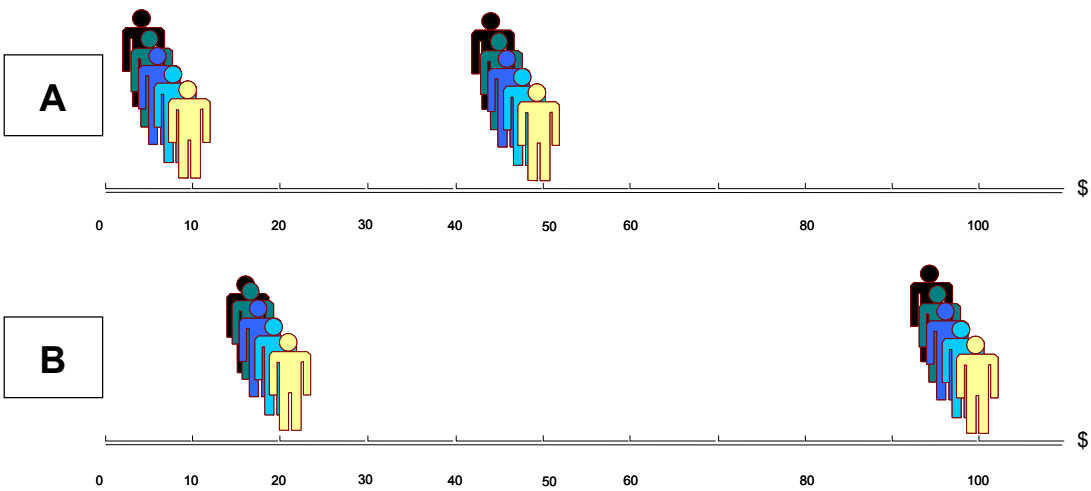
Please check (✔) one: ☐ A is more polarised
☐ B is more polarised
☐ polarisation is the same in A and B

3: A=(10,10,10,10,10,50,50,50,50,60)
B=(10,10,10,10,10,10,10,10,10,10,50,50,50,50,50,50,50,50,60,60)



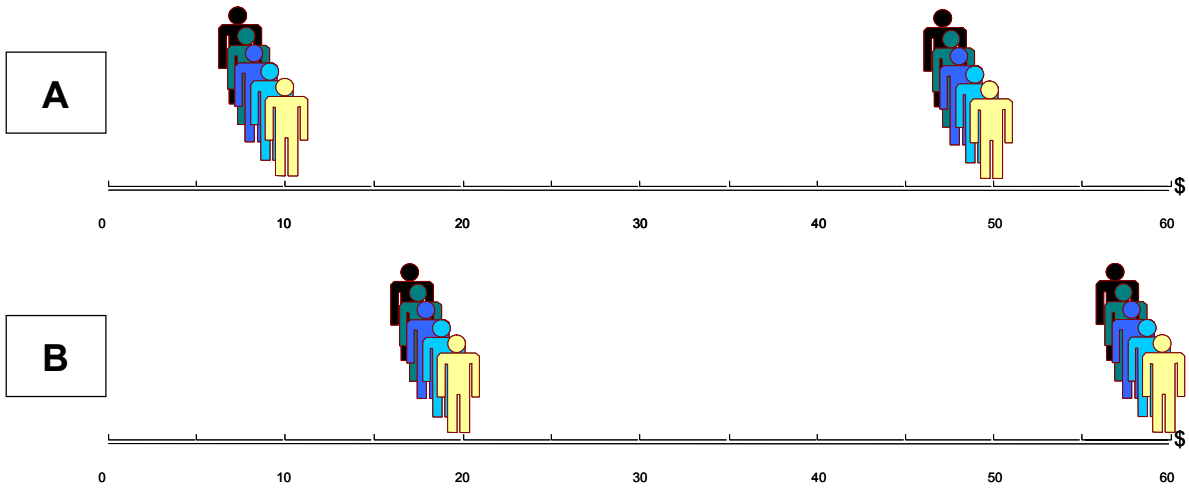
Please check (✔) one: ☐ A is more polarised
☐ B is more polarised
☐ polarisation is the same in A and B

4: A=(10,10,10,10,10,50,50,50,50,50)
B=(20,20,20,20,20,100,100,100,100,100)



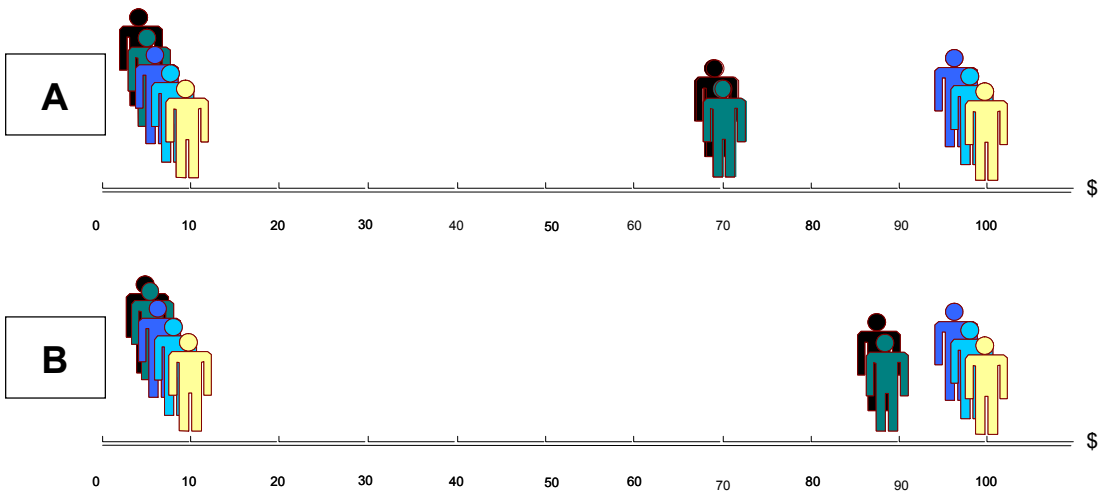
Please check (✔) one: ☐ A is more polarised
☐ B is more polarised
☐ polarisation is the same in A and B

5: A=(10,10,10,10,10,50,50,50,50,50)
B=(20,20,20,20,20,60,60,60,60,60)



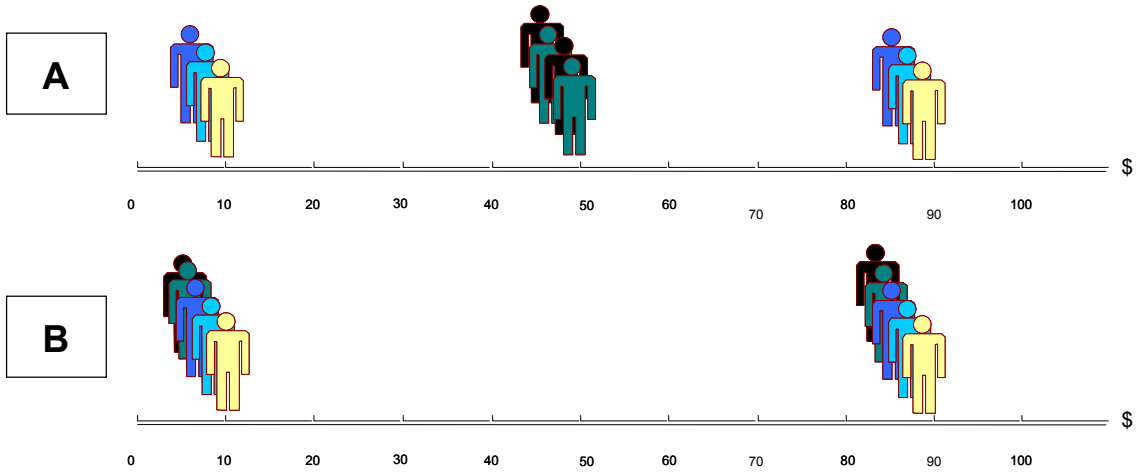
Please check (✔) one: ☐ A is more polarised
☐ B is more polarised
☐ polarisation is the same in A and B

6: A=(10,10,10,10,10,70,70,100,100,100)
B=(10,10,10,10,10,90,90,100,100,100)



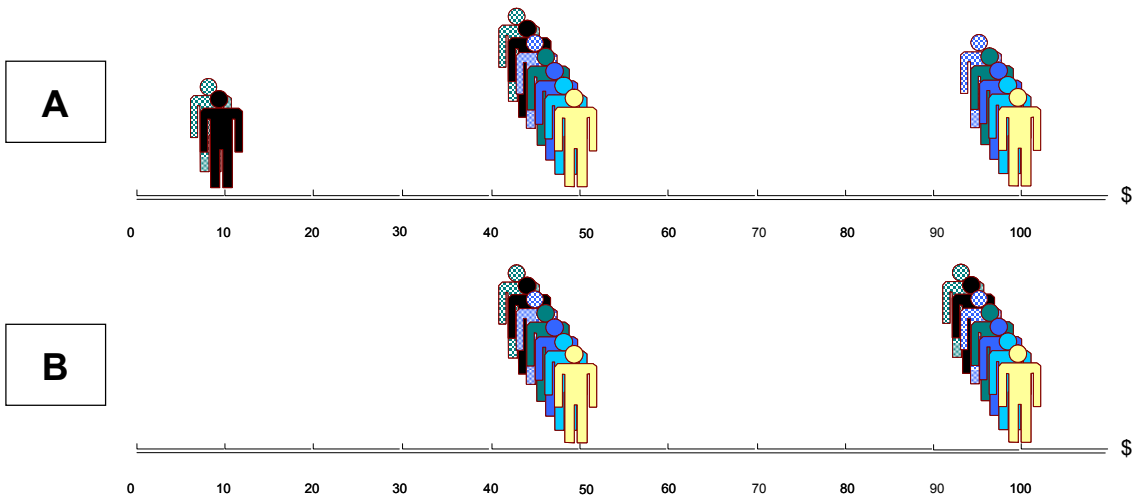
Please check (✔) one: ☐ A is more polarised
☐ B is more polarised
☐ polarisation is the same in A and B

7: A=(10,10,10,50,50,50,50,90,90,90)
B=(10,10,10,10,10,90,90,90,90,90)



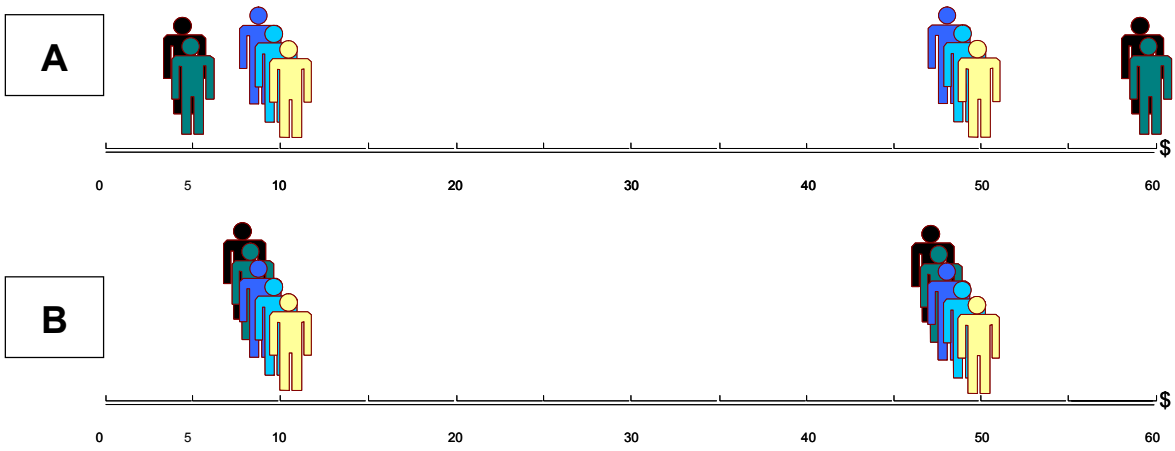
Please check (✔) one: ☐ A is more polarised
☐ B is more polarised
☐ polarisation is the same in A and B

8: A=(10,10,50,50,50,50,50,50,50,100,100,100,100,100)
B=(50,50,50,50,50,50,50,100,100,100,100,100,100,100)



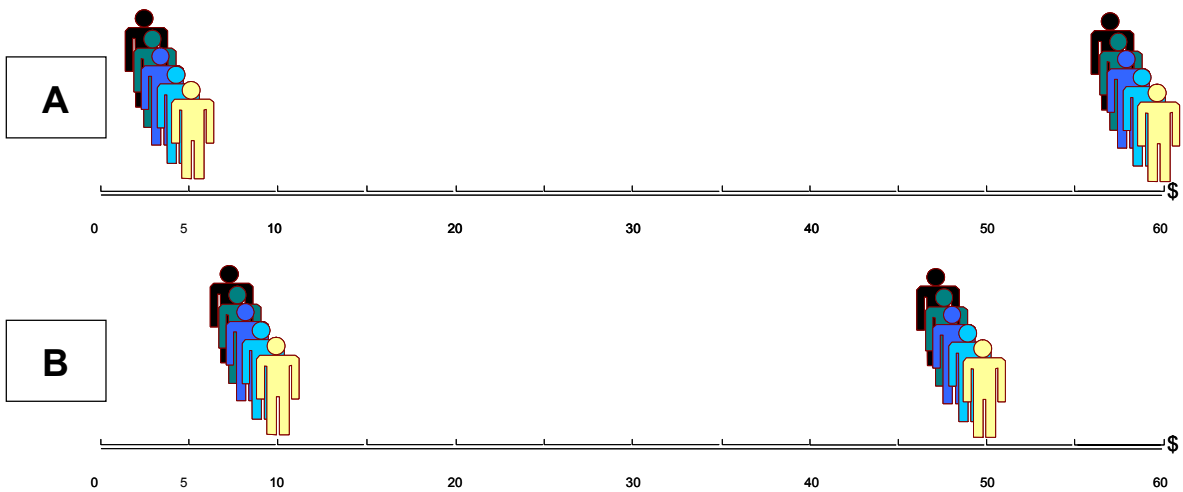
Please check (✔) one: ☐ A is more polarised
☐ B is more polarised
☐ polarisation is the same in A and B

9: A=(5,5,10,10,10,50,50,50,60,60)
B=(10,10,10,10,10,50,50,50,50,50)



Please check (✔) one: ☐ A is more polarised
☐ B is more polarised
☐ polarisation is the same in A and B

10: A=(5,5,5,5,5,60,60,60,60,60)
B=(10,10,10,10,10,50,50,50,50,50)



Please check (✔) one: ☐ A is more polarised
☐ B is more polarised
☐ polarisation is the same in A and B

In each of the questions 11 to 19 you are presented with a hypothetical change and some views about that change. Please circle the letter alongside the view that corresponds most closely to your own. Feel free to add any comments which explain the reason for your choice.

11) Suppose there is a society consisting of two groups of people with many individuals in each group. One of the groups contains identical low-income people while the other group contains identical high-income people. If a few of the low-income individuals see their income drop by half, then:

a) Income polarisation decreases because society is no longer structured in two sharply defined groups
b) Income polarisation remains the same because one or very few individuals do not make any difference.
c) Income polarisation increases because the income difference between the poorest and the richest is now larger.
d) Whether income polarisation increases/decreases/remains the same depends on the level of income

Suppose that instead of a few low-income individuals seeing their income drop by half, a few high-income individuals see their incomes double. Then income polarisation ...

a) decreases.
b) increases.
c) remains unchanged.
d) may move either way, depending on the level of income.

In the light of the above would you want to change your answer to question 1? If so please write your new response ("A" or "B" or "A and B") here:

12) Suppose we transfer income from a person who has more income to a person who has less, without changing anyone else's income. The two persons belong either to the poorest 50% or to the richest 50%, and after the transfer the person who formerly had more still has more. Income polarisation in this society...

a) has fallen because the person doing the transfer is further away after the transfer from the person who was immediately richer.
b) has increased because the two persons involved in the transfer are closer to each other after the transfer.
c) has not changed.

In the light of the above would you want to change your answer to question 2? If so please write your new response ("A" or "B" or "A and B") here:

In each of the questions 13 to 15, consider a society with only two groups which have different levels of income. All high-income people have the same income and all low-income people also have the same income.

13) Suppose we replicate this society with an exact copy of itself. After the replication, income polarisation

a) increases because there is more people in each group.
b) decreases.
c) remains the same because the percentage of people in each group is the same as before.

In the light of the above would you want to change your answer to question 3? If so please write your new response ("A" or "B" or "A and B") here:

14) Suppose we double the income of each person in the above society.

a) The two income groups have the same percentage of people and income share, and the relative income difference between the two groups has not changed, so income polarisation remains the same.
b) The income gap between the rich and the poor group has increased, so income polarisation has increased.
c) After doubling incomes the low-income group might have enough money for basic needs, so income polarisation has decreased.
d) Whether income polarisation increases/decreases/remains the same depends on the level of income

In the light of the above would you want to change your answer to question 4? If so please write your new response ("A" or "B" or "A and B") here:

15) Suppose we add the same fixed amount to the incomes of each person in the above society.

a) Income polarisation has fallen because the relative distance between the two groups has decreased.
b) Income polarisation remains the same because the absolute distance between the two groups has not changed.
c) Income polarisation has increased.
d) Whether income polarisation increases/decreases/remains the same depends on the level of income

In the light of the above would you want to change your answer to question 5? If so please write your new response ("A" or "B" or "A and B") here:

16) Consider a society with only three income groups where all persons within a group have the same income level. The first group is the most populated one and has the lowest income level. The second group is less populated than the first one but has the highest income level. The third group is the least populated one and has an intermediate income level, closer to the highest income level of the second group than to the lowest income level of the first group. Suppose we add some income to each person belonging to the third group.

a) Income polarisation increases because the third group is closer to the second group and further away from the first one, so the two least populated groups become closer to each other.
b) Income polarisation falls.
c) Income polarisation remains unchanged.
d) Whether income polarisation increases/decreases/remains the same depends on the levels of income in each group

In the light of the above would you want to change your answer to question 6? If so please write your new response ("A" or "B" or "A and B") here:

17) Consider a society with three income groups with similar population shares and where all persons within a group have the same income level. Suppose that half the population of the intermediate group moves to the lowest-income group and the other half moves to the highest-income one.

a) As the intermediate group disappears income polarisation increases
b) As the number of groups is smaller, income polarisation falls.
c) Income polarisation remains unchanged.
d) Whether income polarisation increases/decreases/remains the same depends on the levels of income in each group.

In the light of the above would you want to change your answer to question 7? If so please write your new response ("A" or "B" or "A and B") here:

18) Consider a society with three income groups where all persons within a group have the same income level: the income gap between those in the lowest income group and the middle group is about the same as the gap between those in the middle group and the highest income group. The lowest income group has a very small population; the middle group has a very large population. Suppose we add to the incomes of lowest-income group people an amount that is so large that they are lifted to the level of the high-income group.

a) Income polarisation increases because there are now two sharply defined groups.
b) Income polarisation decreases because the lowest income group disappears.
c) Income polarisation does not change.

In the light of the above would you want to change your answer to question 8? If so please write your new response ("A" or "B" or "A and B") here:

19) Consider a society consisting of two groups of people with many individuals in each group. One of the groups contains identical low-income people while the other group contains identical high-income people. Suppose that one by one, low-income individuals become equally poorer and high-income individuals become equally richer. When half of the individuals have moved away from the original groups, the society has four income groups, and as individuals keep on moving the society ends up having once again two groups of identical poorer and richer people.

a) Income polarisation increases continuously because persons are systematically moving further away from each other
b) Income polarisation decreases continuously
c) Income polarisation at first increases and then decreases because at first the number of groups doubles and then halves.
d) Income polarisation at first decreases and then increases because at first the number of groups doubles and then halves.
e) Income polarisation remains the same throughout
f) None of the above.

In the light of the above would you want to change your answer to questions 1, 9 and 10? If so please write your new responses here:

1:
9:
10:

Finally, we would be grateful for some information about yourself:

- *Are you male or female?* *M/F*
- *What is your age?* _____ *years*
- *What is your special subject of study?* _____
- *Were you employed before university?* *Yes / No*

- *How would you rate your political views? Please put a √ on this scale.*

"extreme left" "extreme right"

- *How would you rate your family's income in 1995? Please put a √ on this scale.*

"very Poor" "very Rich"

- *How would you rate your own income prospects in the year 2015? Please put a √ on this scale.*

"very Poor" "very Rich"

Thanks once again for your help!