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Risk and Inequality Perceptions

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Abstract

We examine the relationship between risk analysis and inequality analysis, using a questionnaire-experimental approach .The experiments focus on the effect of income transformations on the perceived rankings of income distributions in either a risk or inequality context. Both context and income levels are important in influencing rankings.

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1 Introduction

The literature on the ranking of probability distributions forms one of the most important intellectual sources of the modern inequality literature. Some of the seminal pieces in inequality analysis started from the insight that the problem of ordering income distributions in terms of inequality is essentially similar to the problem of ordering distributions in other contexts. Furthermore, some economists and philosophers have suggested a formal basis for social attitudes to inequality using individual attitudes to uncertainty. However, persuasive as those approaches may be to students of the formal of analysis of distributional comparisons, they are just based on one particular intellectual rationale for a welfare-economic approach to income distribution. It may be that, in practice, peoples' perceptions of inequality and of risk are based on quite different intellectual premises or that they find expression in different distributional rankings. In this paper we shed some light on this issue by examining experimental evidence of individual rankings in the comparison of risky situations and comparing these results with an identically structured experiment involving inequality.

Section 2 examines the theoretical roots of the risk-inequality analysis and the issues to be examined; sections 4 and 5 respectively describe the experiment and the results (details are in the Appendix); section 6 concludes.

2 Inequality and Risk

2.1 Points of comparison

If one were to pose the question "Is there a relationship between inequality measures and measures of risk?" then there would appear to be an immediate answer. Inequality measures such as the coefficient of variation and the variance of logarithms have obvious counterparts in the analysis of risk, since the standard deviation or variance is conventionally used as the measure of spread, either for "income" or its logarithm. The entropy measures of Theil (1967) have their roots in the economics of information and there is also a case for considering the generalised entropy concepts as a measure of risk.[1] However to focus solely the parallelism of approach between these two

[1] Note that much of the argument could be conducted with a weaker representation of attitudes to risk or inequality. For example one could discuss risk rankings rather than risk measures, inequality rankings rather than inequality measures. However, even with this weaker approach some difficulties remain. For example there is the issue of reversability. If it were found that for specific across-the-board income increases would reduce risk would it also true to say that under the corresponding reductions in incomes across the board

aspects of distributional analysis would be to omit three important issues for consideration.

1. The special interest of risk-analysis here is not just that one can find useful and suggestive parallels between the analysis of income distribution and the analysis of risk – as one can also with, say, the distribution of firms by size or the geographical dispersion of rainfall. On *a priori* grounds one can argue that the analysis of probability distributions may be an appropriate basis for the analysis of income distributions.

2. Second, there are other aspects of the risk-inequality relationship where the intellectual connection is less immediate than in the case of inequality measures and measures of risk. For example in the inequality literature there is an implied relationship between social welfare (W) and inequality (I)
$$W = \phi(I, \mu) \tag{1}$$
where μ is mean income: (1) may be used to map an inequality ordering into a welfare ordering and *vice versa.*[2]. Of course (1) has a counterpart in the special representation of investor's utility as a function of variance and the mean[3], but one might wonder whether there is in general an appropriate equivalent of (1) in the case of risk analysis and, if so, whether it can be used as a basis for establishing a formal link between inequality and risk rankings.

3. Perhaps more importantly, some researchers take the view that, rather than risk orderings being just an appropriate basis for comparison with inequality counterparts (as in point 1 above) they are *the essential* foundation for the axiomatisation of inequality comparisons. In some instances the argument linking the two would also invoke an explicit welfare-theoretic link as in point 2.[4]

To investigate further the potential links between the two fields let us consider some of the theoretical and practical difficulties that have to be addressed in order to give meaning to the comparative analysis of inequality and risk orderings.

risk will increase? We prefer to keep this question open for the present paper, although the conceptual and logical difficulties associated with it should not be understated.

[2]The exact nature of the function ϕ will depend upon the cardinalisation of the inequality index and the welfare function. However this technicality is not of special significance here.

[3]See, for example Hirshleifer (1970), chapter 10.

[4]See for example Harsanyi (1955).

2.2 Some difficulties

2.2.1 The nature of income and wealth

Some of the routine concerns about the definition of income or of wealth that arise in the context of applied social welfare analysis – such as the comprehensiveness of the definition and whether it is received by individual persons or households – will also apply to the comparison of income distributions in terms of risk. Here we will assume that income and income-recipient are unambiguously defined concepts. This sweeps aside all but one consideration concerning the nature of income and wealth; the remaining consideration arises in a major area of difficulty – the definition of the risk concept.

2.2.2 The definition of risk

Risk in the abstract is a concept that is somewhat elusive. Standard references fall back on either generalised descriptions such as "risk reflects the variability of future returns from a capital investment" (Pass et al. 1993) or enumeration of possible interpretations – Yates (1992) lists ten different definitions of risk on page 1.[5] Its relationship with the size of incomes involved is also unclear *a priori*.[6]. It is easy to concur with the view that "People disagree more about what risk is than about how large it is."(Fischhoff 1985)

However, one special connotation of the word "risk" is worth special mention: in many cases the concept is associated principally with the possibility of loss. (Yates 1992, page 17). Unlike the standard theory of distributional ordering in the welfare-theoretic analysis of income distribution risk analysis is usually carried out relative to specific initial wealth level. This is the one point where the definition of income or wealth has a significance beyond the routine practicalities noted in 2.2.1. There an analogy here with Temkin's (1986,1993) alternative philosophical approach to the foundations of inequality analysis. In Temkin's approach inequalities are defined in terms of "complaints" felt by individuals relative to a specified reference income level. These issues will turn out to be of special relevance to the experimental analysis discussed below.

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[5] Cf the nine different concepts of inequality listed in Rein and Miller (1974).

[6] "Risk should not, however, be confused with probability since it is an amalgam of both this probability and the size of the event. If the 1 in 10 chance of a loss is one of making a very big loss indeed, this can be a more risky event than one where the probable gains are exactly the same, but the risk of loss is much smaller." (Pearce 1983) page 287.

2.2.3 Risk and preferences

Now consider the issue raised above – the risk-counterpart to (1). The principal example of this relationship is the use of mean-variance analysis: this incorporates both a natural measure of risk and a simple preference structure, but of course this relies on the use of a specific, and perhaps questionable, utility function. By contrast comparatively little use is made of the more general counterpart to the Lorenz-curve approach as a means of characterising risk, although clearly one could "build" a Lorenz curve for risk upon the equivalent of the axioms used in inequality analysis (Cf Laffont 1989, page 27). However, this itself begs two questions

1. Whether the inequality axioms are themselves appropriate.

2. The nature of the relationship ϕ in (1).

A conventional microeconomic argument might suggest that these ambiguities could be disposed of by invoking the standard stochastic dominance approach (Hadar and Russell 1969) . If one is prepared to apply the criterion of second-order dominance to a set of distributions F one can clearly derive the Lorenz order for any subset $\mathsf{F}(\mu)$ of F in which all the distributions have the same mean μ. However, stochastic dominance is not principally about the nature of *risk* per se but about the structure of *preferences* under uncertainty.

The argument for the stochastic dominance approach encounters a further difficulty. In the literature on inequality and social welfare it is sometimes argued that the chain of connection from W to I introduces overly strong *a priori* assumptions. A similar claim may be made in the case of the analysis of preferences under uncertainty. There is a good case for arguing that the von-Neumann-Morgenstern formulation of preference structures does not adequately capture people's rankings of uncertain prospects. It should be recognised that, even if peoples' preferences violate the von-Neumann-Morgenstern assumptions, they may yet have a coherent perception of risk.[7] There are several strands to the argument:

- It is not clear that people think in terms of preferences over prospects as the standard theory suggests.

- If people do have well-defined preference orderings over prospects, it is not clear that their attitudes to uncertainty can be well represented by a utility function that conforms to the standard axioms.

[7]Cf the discussion by Laffont (1989) of alternative axiomatisations of preferences.

- There may be a confusion between "better-than" relationships and pure risk comparisons. However, it should be noted that in the corresponding discussion of inequality this confusion does not usually arise.

- People may or may not be risk-averse in the sense of disliking mean-preserving spreads.

A comprehensive study that successfully disentangled the concept of risk *per se* from the language of preference would clearly be demanding. For this reason we seek an alternative approach.

3 An Alternative Approach

The preference approach to the topic would take either a specific W (welfare or utility) on the left-hand side of (1) and infer a specific risk or inequality ordering or a class of such W-indices and, from the properties of that class, infer the corresponding properties of a class of risk or inequality orderings. As we have argued, the formal apparatus required to adopt this approach may be too demanding. It is appropriate to consider whether useful insights may be obtained by reversing the chain of thought in order to tackle the issue of risk orderings directly, rather than through the preference approach.

In previous contributions we have argued the case for thinking about inequality in a way that leaves open the question of whether the "basic" axioms are to be adopted or not.[8] What would emerge if one were to adopt the same kind of approach to an examination of the problem of comparing risky prospects?

3.1 Axioms: a brief overview

In principle a questionnaire approach could be adapted from questionnaires on inequality or social welfare; the second, indirect route would then make use of the type of relationship encapsulated in (1). The two types of questionnaire lead to different concepts in the analysis of individual preference orderings in the face of uncertainty. The inequality questions can be made to correspond to the concept of risk; on the other hand questions on social welfare rankings can be shown to be parallel to the questions on individual preference rankings of prospects.[9] Table 1 provides a brief comparative summary across the fields. Alternative commonly used distributional tools can be derived by selecting

[8] See for example Amiel and Cowell (1992)

[9] On risk and inequality see Rothschild and Stiglitz (1970, 1971, 1973), Nermuth (1993). On distributional rankings and first- and second-order concepts of dominance see for ex-

		Inequality	Risk	Social Welfare	Preferences over Prospects
1	*Anonymity*	√	√	√	√
2	*Monotonicity*			√	√
3	*Transfer*	√	√	√	√
4	*Population*	√	√	√	√
5	*Decomposability*	√	√	√	√
6	*Scale independence*	√	√	*	*
7	*Translation independence*	√	√	*	*

* In the case of social welfare and preference over prospects neither form of the independence axiom makes much sense, but scale- or translation-invariance (homotheticity to the origin or to negatve infinity) may make be relevant.

Table 1: Standard axioms in the analysis of income and probability distributions

different combinations of standard axioms from the list: for example, for the regular Lorenz curve one invokes Axioms 1,3,4 and 5. Some of the more recondite points in the two subject areas can also be related: for example the issue of violations of the independence axiom in the analysis of risk,[10] and the issue of externalities in the assessment of income distributions.

3.2 Experimental foundation

There is of course a substantial literature on the experimental approach to people's behaviour in situations of choice under risk and some well-known counterparts to the unconventional results that we have found from our own questionnaire experiments.[11] However to carry through an effective comparison of perceptions in the two fields it is more useful to mimic the approach to income distribution by constructing a questionnaire-experiment in the field of perceptions of risk and uncertainty of the same format. To that end we shall build upon the approach in Amiel and Cowell (1999a) – see section 4.

We have not attempted a comprehensive investigation of each of the axioms listed in Table 1. In this paper we concentrate just on issues arising

ample Atkinson and Bourguignon (1982), Saposnik (1981, 1983), Kolm (1969), Marshall and Olkin (1979), Shorrocks (1983). For higher-order concepts of dominance see Davies and Hoy (1995), Fishburn and Willig (1984), Kolm (1974, 1976), Shorrocks and Foster (1987),

[10]This is manifested in the phenomenon of "regrets" in choice under uncertainty.

[11]Perhaps one of the best known of these is the "Allais paradox" – Allais (1953), Allais and Hagen (1979), Drèze (1974), Raiffa (1968).

from axioms 6 and 7 in order to focus upon the relationships between changes in overall income levels and perceptions of risk. Issues raised by the other principles are examined elsewhere.[12]

3.3 Risk maps

In order to characterise key aspects of risk orderings it is useful to think of iso-risk contours in the space of income distributions, which is taken to be the set of all non-negative income vectors excluding the zero vector. Again it should be emphasised that this is a separate construct from the conventional approach where one examines *preferences* in a state space diagram. To fix ideas, three special cases where the risk map is homothetic to a point in R^2 are illustrated in Figure 1, where the axes measure the incomes x_{i} under two of the possible states of the world. If each state of the world corresponds to the identity of one population member then the axes can also be thought of measuring the incomes of two individuals from the population. Clearly the 45° line denotes zero risk and the contours further from the line correspond to progressively higher risk levels. In panel (a) uniform absolute additions to all incomes in the distribution would leave risk unchanged; in (c) uniform proportionate additions to all incomes would leave risk unchanged; panel (b) represents an intermediate case of a homothetic ranking where equal absolute additions to all incomes are perceived as reducing risk, but uniform proportionate additions to all incomes are perceived as increasing risk.[13]

However, these are only convenient constructs, and there is no special reason to suppose that any of the three patterns is theoretically appropriate on *a priori* grounds. For example, in the context of income inequality, Dalton argued that proportionate increases in income should lead to *lower* contours[14]

[12] The issue of the transfer principle is discussed in Amiel and Cowell (2001).

[13] The choice between relativism and absolutism could be resolved in several of ways. For example one might consider a specific "compromise" transformation types t such that $0 < t < 1$. Cf Kolm (1976) and Bossert and Pfingsten (1990) in the context of inequality.

[14] "we have [...] the principle of the proportional additions to incomes. It is sometimes suggested that proportionate additions to, or subtractions from, all incomes will leave inequality unaffected. But [... it] appears rather that proportionate additions to all incomes will decrease inequality and that proportionate subtractions increase it." – Dalton (1920), p355. Note that if this principle is to be adopted and the space of income distributions includes all positive income vectors it is logically impossible to have homothetic contours. The reason for this is that a homothetic set of contours with the property that uniform proportionate additions to incomes reduces risk must be homothetic to a point $(a, a, ..., a)$ on the 45° ray where $a > 0$. – the contours "fan out" more sharply than in Figure 1 (c). But this would mean that a prospect consisting of the positive income level a received with certainty would be regarded as zero risk and any arbitrary positive level of risk. Hence the sketch of the Dalton principle in Figure 2.

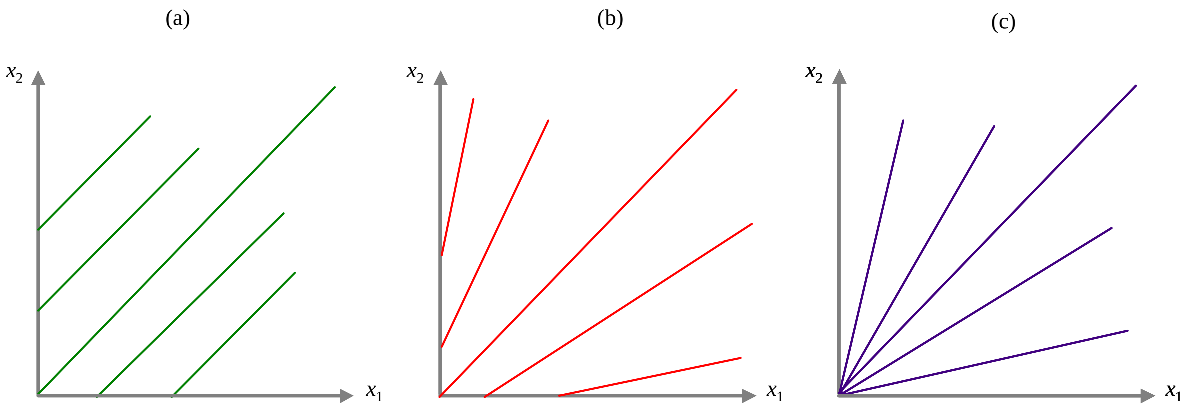

Figure 1: Iso-risk contours in the case of (a) translation independence (b) the intermediate case, and (c) scale independence

– for example as illustrated in Figure 2.

Furthermore it is not clear that any one specific pattern of contours corresponds to people's views on distributional orderings in terms of risk. For this reason we used a questionnaire-experimental technique to investigate the issue, a technique that has already been applied in the case of inequality and income transformations. The key questions to be addressed are, clearly, what is the appropriate shape of the risk-contour map and is it similar to that of the corresponding inequality-contour map?

4 The Experiments

4.1 The Questionnaire Structure

To investigate the issue of structure we used a questionnaire experiment that was formulated according the general pattern outlined in Amiel and Cowell (1999b). Groups of students were invited to fill out the questionnaire illustrated in Figures 3 and 4 in the Appendix. The questionnaire combines a set of numerical problems and a linked verbal question. The numerical problems (Figure 3) are set within the context of a mythical Alfaland: the reference income level is indicated by giving the average income in Alfaland as a whole and a poverty-line income. Respondents are told that there are marked differences in income levels between two of the constituent regions (A and B) of Alfaland, and within each region there is an equal number of rich and poor. There is assumed to be individual income risk for a potential migrant to

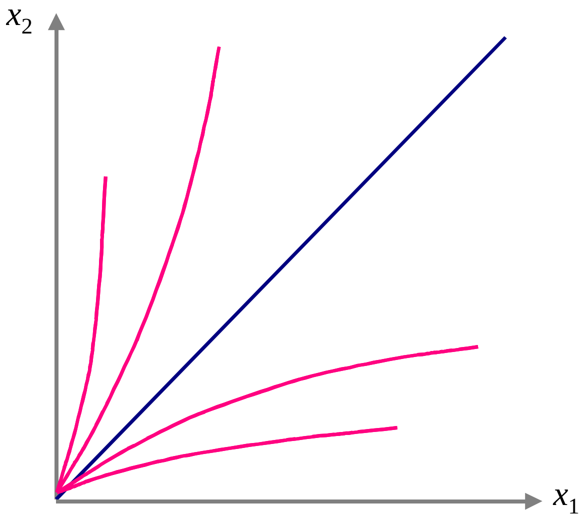

Figure 2: The Dalton principle of proportional additions to incomes

either region – such a person would have a 50-50 chance of belonging to the poor or the rich group. Respondents are invited to compare the individual income risk of regions A and B for different values of the (poor,rich)-income distribution on a purely ordinal basis. The numerical questions include cases where the implied additions to income are equal in absolute terms, where they are equi-proportional and intermediate cases; they also cover cases of low, medium and high incomes (relative to the reference incomes in Alfaland). The second part of the questionnaire-experiment (Figure 4) is mainly a verbal question that focuses on the same issues as the numerical problems; finally respondents are asked whether they wish to change their responses on the numerical part now that the issue has been explained to them in words.

For comparison the corresponding inequality questionnaire is also given in the Appendix – see Figures 5 and 6.

4.2 Running the experiment

The experimental sessions were run formally during class or lecture time so that a high rate of participation was ensured. The underlying economic theory was not explained to them beforehand.

In separate experimental sessions a combined group of 346 students completed the risk questionnaire: two groups at the LSE ($N = 41$ and 62), two at the Ruppin Institute ($N = 38$ and 85), and one group each at Massey

University, New Zealand ($N = 27$) and one group at Universität Osnabrück ($N = 93$). The method was identical in structure to the experiment conducted on income-inequality rankings ($N = 236$ – for further details see Amiel and Cowell 1999b) which will be used as a basis for comparison later in this paper.

5 The Results

5.1 Overview

The overview of results on the numerical questions (top part of Table 2) is arranged so that one can easily compare the results of making different types of income change at various income levels with reference to the three simplified patterns illustrated in Figure 1. For example, in part (a) a person whose risk perceptions were represented by the contours in part (a) of Figure 1 would respond "Same" at all three income levels represented by questions 1, 4 and 7, while a person with perceptions conforming to patterns (b) or (c) would respond "Down."

It is clear that, whether the question implied uniform absolute or uniform proportional additions, or something in between the dominant response is that the implied income change in going from distribution A to distribution B implies a reduction in risk. A sharper interpretation may be drawn. Note that triples of questions (q1-q3 etc.) can be used to determine whether, at each income level, responses are consistent with one of the standard patterns of contours illustrated in Figures 1 and 2 – for example someone whose views on the relationship between risk and income levels were strictly scale-independent would respond "Down", "Down", "Same" to all three triples of questions.[15] The results of this interpretation are shown in Table 3 from which it is evident that, with the exception of income changes at high income levels, the responses consistent with the Dalton pattern dominate. Of course it is possible that in each of the triples individuals could answer in a fashion

[15] Using the symbols D, U and S to correspond to the labels "Down", "Up" and "Same" for each set of responses (questions 1-3, questions 4-6, questions 7-9) in Table 3 the categorisation into the five possible cases is as follows

Translation-indep	SUU
Intermediate	DDU,DSU,DUU
Scale-indep	DDS
Dalton	DDD
Other	other D-U-S combinations

Note that "Other" covers the "Anti-Dalton" case and cases where responses were inconsistent.

			Down	Up	Same
		(a) Adding a fixed absolute sum			
q1	**A = (200,400)**	**B = (400,600)**	77%	9%	14%
q4	**A = (600,900)**	**B = (900,1200)**	65%	11%	24%
q7	**A = (1200,1800)**	**B = (1800,2400)**	53%	17%	29%
		(b) Adding a compromise sum (between absolute and prop.)			
q2	**A = (200,400)**	**B = (400,700)**	77%	17%	5%
q5	**A = (600,900)**	**B = (900,1300)**	61%	29%	9%
q8	**A = (1200,1800)**	**B = (1800, 2550)**	53%	34%	12%
		(c) Adding a fixed proportionate sum			
q3	**A = (200,400)**	**B = (400,800)**	70%	18%	12%
q6	**A = (600,900)**	**B = (900,1350)**	55%	32%	12%
q9	**A = (1200,1800)**	**B = (1800,2700)**	43%	38%	18%
		q10: **What income change will leave risk unchanged?**			
		proportionate additions	19%		
		fixed sum	13%		
		depends on levels	45%		
		none of these	14%		

For questions 1-9, *N=346*, for question 10, *N=253*

Table 2: Responses to numerical questions on risk

	low income (q1-q3)	*medium income (q4-q6)*	*high income (q7-q9)*
Translation-indep	6.6%	11.3%	11.6%
Intermediate	4.3%	13.0%	10.1%
Scale-indep	5.5%	4.6%	4.9%
Dalton	64.2%	44.5%	36.1%
Other	19.4%	26.6%	37.3%

Table 3: Structure of responses to numerical question on risk

that was mathematically inconsistent: about 12 percent responded in this way and these are included in the "Others" category of Table 3.

The responses to the verbal question are summarised in the lower part of Table 2. They show that the response "Whether the riskiness of the lottery remains unaltered depends not only on the changes but also on initial and final levels of the payoffs" commands as much support as any of the other responses combined (9% of the sample did not respond to this question). Finally, as with similar previous studies we found that very few individuals wanted to change their responses.

5.2 Breakdown by University

The details of the responses to the numerical questions are given in Table 7 in the Appendix where the dominant responses for each group on each question have been highlighted in bold. It is clear that at low income levels (where the income distributions cluster around Alfaland's hypothetical poverty line) there is virtually unanimous agreement in the "Down"-"Up"-"Same" responses across all the university subgroups. At higher income levels the unanimity is less clear-cut – students in one of the LSE groups and at Massey University sometimes reported that if the income increase were uniform proportional or an amount between proportional and absolute, this transformation would increase rather than reduce risk.

The responses to the verbal question are in Table 4. Again the results are consistent across the different subsamples – there is the same ordering of results across the four possible responses (*c*-*a*-*b*-*d*), with the one exception. This exception involves the same LSE group as noted in the discussion of the numerical questions and it is interesting to note that it and Massey both record especially high support for answer (d), "depends on levels"; in other words the verbal responses for these two groups match the way they responded to the numerical problems.

	N	(a) proportional additions	(b) fixed sum	(c) depends on levels	(d) none of these
LSE 1	41	15%	7%	54%	5%
LSE 2	62	19%	5%	45%	23%
Massey	27	15%	15%	56%	4%
Ruppin 1	38	29%	16%	39%	13%
Ruppin 2	85	19%	19%	40%	15%
All	*253*	*19%*	*13%*	*45%*	*14%*

N.B. Results of Osnabrück University are unavailable

Table 4: Responses to verbal question on risk

	q1	*q2*	*q3*	*q4*	*q5*	*q6*	*q7*	*q8*	*q9*
					Inequality				
Response "A"	78%	68%	40%	55%	40%	24%	51%	41%	16%
Response "A&B"	11%	3%	28%	23%	6%	22%	24%	5%	24%
Response "B"	10%	28%	29%	18%	52%	53%	24%	52%	59%
					Risk				
Response "A"	77%	77%	70%	65%	61%	55%	53%	53%	43%
Response "A&B"	14%	5%	12%	24%	9%	12%	29%	12%	18%
Response "B"	9%	17%	18%	11%	29%	32%	17%	34%	38%
prob	0.4276	0.0078	0.0000	0.0002	0.0000	0.0000	0.2125	0.0002	0.0000

Table 5: Comparison of risk and inequality

5.3 Comparison of risk with inequality

Now return to the question that was raised in section 3.3: the relationship between the "maps" of inequality and risk orderings.

The key comparison is illustrated in Table 5 that presents the results on a question-by-question basis. Response "A" means that individuals circled A on the questionnaire sheet and would be consistent with a view that the implied income transformation A→B reduces inequality or risk respectively. It is clear that individuals did usually respond "A" in both contexts. However, the final row of Table 5 gives the probability values for a χ^2-test taking each numerical question separately: it is clear that with the exception of the first and seventh questions (the cases where a fixed sum is added at low and

		proportional additions	fixed sum	depends on levels	None of these
Inequality	N =*186*	*32%*	*11%*	*41%*	*9%*
Risk	N =*235*	*19%*	*13%*	*45%*	*14%*
Prob	0.03237				

Table 6: "What income change will leave inequality or risk unchanged?"

high incomes respectively) we must reject the hypothesis that the risk and inequality responses have the same distribution. The responses to the verbal question reveal a similar story as Table 6 shows.

6 Conclusions

There is no single definition of risk that commands wide acceptance *a priori* and, therefore, no standard theory of how risk is associated with changes in the income distribution. Stochastic dominance analysis and its associated constructs focus upon preference under uncertainty rather than isolating a pure concept of risk per se. A Lorenz-style ranking approach would leave open the question of the relationship between income transformations of a distribution and its associated risk.

Our questionnaire approach provides some insight on the perceived nature of tis relationship. It turns out that the iso-risk map is markedly different from the iso-inequality map. However in both cases individuals' rankings conform to a pattern that is consistent with Dalton's principle of proportional additions to incomes – overwhelmingly so in the case of risk – and the results are fairly consistent across the subgroups drawn from different countries' universities.

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Appendix

(a)		q1			q4			q7		
		A = (200,400),B = (400,600)			A = (600,900),B = (900,1200)			A = (1200,1800),B = (1800,2400)		
	N	Down	Up	Same	Down	Up	Same	Down	Up	Same
LSE 1	41	**71%**	10%	19%	**61%**	7%	32%	**46%**	32%	20%
LSE 2	62	**81%**	10%	10%	**61%**	8%	31%	**60%**	6%	34%
Massey	27	**74%**	7%	19%	**41%**	22%	37%	**41%**	26%	33%
Osnabruck	93	**86%**	5%	9%	**80%**	6%	14%	**56%**	15%	27%
Ruppin 1	38	**79%**	0%	21%	**68%**	11%	21%	**58%**	16%	26%
Ruppin 2	85	**68%**	18%	14%	**60%**	15%	25%	**49%**	19%	31%
All	*346*	*77%*	*9%*	*14%*	*65%*	*11%*	*24%*	*53%*	*17%*	*29%*

(b)		q2			q5			q8		
		A = (200,400),B = (400,700)			A = (600,900),B = (900,1300)			A = (1200,1800),B = (1800, 2550)		
	N	Down	Up	Same	Down	Up	Same	Down	Up	Same
LSE 1	41	**63%**	27%	10%	42%	**51%**	5%	42%	**54%**	2%
LSE 2	62	**84%**	16%	0%	**66%**	23%	11%	**61%**	21%	18%
Massey	27	**67%**	30%	4%	**48%**	44%	7%	**48%**	44%	7%
Osnabrüück	93	**84%**	9%	8%	**72%**	18%	9%	**49%**	34%	15%
Ruppin 1	38	**79%**	8%	13%	**61%**	32%	8%	**55%**	32%	13%
Ruppin 2	85	**73%**	24%	2%	**60%**	28%	12%	**59%**	31%	11%
All	*346*	*77%*	*17%*	*5%*	*61%*	*29%*	*9%*	*53%*	*34%*	*12%*

(c)		q3			q6			q9		
		:A = (200,400),B = (400,800)			A = (600,900)B = (900,1350)			A = (1200,1800)B = (1800,2700)		
	N	Down	Up	Same	Down	Up	Same	Down	Up	Same
LSE 1	41	**39%**	39%	22%	32%	**54%**	12%	24%	**59%**	15%
LSE 2	62	**71%**	11%	18%	**61%**	21%	18%	**50%**	21%	29%
Massey	27	**70%**	22%	7%	44%	**52%**	4%	26%	**59%**	15%
Osnabrück	93	**81%**	10%	10%	**61%**	29%	10%	**45%**	34%	19%
Ruppin 1	38	**76%**	8%	16%	**58%**	29%	13%	**47%**	34%	16%
Ruppin 2	85	**68%**	25%	7%	**58%**	28%	14%	**49%**	38%	12%
All	*346*	*70%*	*18%*	*12%*	*55%*	*32%*	*12%*	*43%*	*38%*	*18%*

Table 7: Resposes to numerical questions : detail by individual subsamples

INCOME RISK QUESTIONNAIRE

This questionnaire concerns people's attitude to risk. We would be interested in ***your*** *view, 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.*

In Alfaland there are areas with different levels of income. All areas have the same number of people who are identical in every respect except their incomes: in each area half of the people have a relatively low income and the other half have a relatively high income. The income of a migrant into any area would effectively be determined by a lottery: the person would get the higher or the lower income of that area with probability 50%. The average income in Alfaland in terms of local currency is 1000 Alfa-dollars and the income that ensures a supply of basic needs is 400 Alfa-dollars.

In each of the following questions you are asked to compare two distributions of income, one per area. Please state which of the two you consider to be more risky to a potential migrant by circling A or B. If you consider that the distributions exhibit the **same** risk then circle **both** A and B.

1)	A = (200, 400)	B = (400, 600)
2)	A = (200, 400)	B = (400, 700)
3)	A = (200, 400)	B = (400, 800)
4)	A = (600, 900)	B = (900, 1200)
5)	A = (600, 900)	B = (900, 1300)
6)	A = (600, 900)	B = (900, 1350)
7)	A = (1200, 1800)	B = (1800, 2400)
8)	A = (1200, 1800)	B = (1800, 2550)
9)	A = (1200, 1800)	B = (1800, 2700)

Figure 3: The risk questionnaire: numerical part

In the next question you are presented with possible views about risk-comparisons labelled *a,b,c,d*. Please circle the letter alongside the view that corresponds most closely to your own. Feel free to add any comments to explain the reason for your choice.

10) Suppose we change all the payoffs in a lottery simultaneously:

a) *If we add to (or deduct from) each payoff an amount that is proportional to the original payoff then the riskiness of the lottery remains unchanged.*

b) *If we add to (or deduct from) each original payoff the same fixed amount then the riskiness of the lottery remains unchanged.*

c) *Whether the riskiness of the lottery remains unaltered depends not only on the changes but also on initial and final levels of the payoffs*

d) *None of the above.*

In the light of the above would you want to change your answers to questions 1-9? If so, please note your new responses here:

1)	6)
2)	7)
3)	8)
4)	9)
5)	

Figure 4: The risk questionnaire: verbal part

INCOME INEQUALITY QUESTIONNAIRE

*This questionnaire concerns people's attitude to income inequality. We would be interested in **your** view, based on hypothetical situations. Because it is about attitudes there are no "right" answers. Some of the possible answers correspond to assumptions consciously 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.*

In Alfaland there are areas with different levels of income. All areas have the same number of people which are identical except in their incomes. In each area half of the people have one level of income and the other half have another level of income. The average income in Alfaland in terms of local currency is 1000 Alfa-dollars and the income which ensures a supply of basic needs is 400 Alfa-dollars.

In each of the following questions you are asked to compare two distributions of income - one per area. Please state which of them you consider to be the more unequally distributed by circling A or B. If you consider that both of the distributions have the same inequality then circle both A and B.

1)	A = (200, 400)	B = (400, 600)
2)	A = (200, 400)	B = (400, 700)
3)	A = (200, 400)	B = (400, 800)
4)	A = (600, 900)	B = (900, 1200)
5)	A = (600, 900)	B = (900, 1300)
6)	A = (600, 900)	B = (900, 1350)
7)	A = (1200, 1800)	B = (1800, 2400)
8)	A = (1200, 1800)	B = (1800, 2550)
9)	A = (1200, 1800)	B = (1800, 2700)

Figure 5: The inequality questionnaire: numerical part

In the next question you are presented with possible views about inequality comparisons labelled *a,b,c,d*. 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.

10) Suppose we change the real income of each person in a society, when not all the initial incomes are equal.

a) If we add (or deduct) an amount to the income of each person that is proportional to his initial income then inequality remains unaltered.

b) If we add (or deduct) the same fixed amount to the incomes of each person inequality remains unaltered.

c) Inequality may remain unaltered: whether it does so depends not only on the change but also on initial and final levels of real income.

d) None of the above.

In the light of the above would you want to change your answers to questions 1-9? If so, please note your new responses here:

1)	6)
2)	7)
3)	8)
4)	9)
5	

Figure 6: The risk questionnaire: verbal part