

Choices in Egalitarian Distribution: Inequality Aversion versus Risk Aversion

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Abstract

Inequality aversion and risk aversion are widely assumed features of economic models. But a review of the literature revealed that inequality aversion and risk aversion are treated as separate variables. This paper presents exploratory research designed to separate aversion from risk aversion. In a set of laboratory experiments subjects chose between two alternatives with the same individual risk but different levels of egalitarianism. Thus, the choice of the more egalitarian alternative with constant risk level implies a higher level of inequality aversion. The experiment was conducted among 211 eight-year-old children, 107 of whom live on Kibbutz and 104 in the city. Most of the children preferred equal distribution of inequality. We found no significant difference between Kibbutz children and city children in inequality aversion.

Keywords: Inequality aversion; risk aversion; income distribution; egalitarianism; economic models.

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1. Introduction

The concept of inequality aversion is defined as the extent to which an individual prefers a society with a more equal distribution of income. However a more equal distribution of income not only diminishes inequality between individuals, but also reduces personal risk. The question therefore arises whether the choice of egalitarian distribution is motivated by aversion to inequality or aversion to risk. For example, on a kibbutz total income is divided more or less equally among all members; thus the personal income of each individual is independent of his or her personal skills or work effort. Thus we may ask whether the choice of an egalitarian lifestyle on a kibbutz is made in order to decrease the risk inherent in living in the city (risk aversion), or because of inequality aversion.

An individual is defined as a risk averter if he/she is willing to pay in order to reduce the uncertainty of his income.

Since the seminal work of Atkinson (1970) on the measurement of inequality, the concept has received substantial theoretical treatment. Atkinson constructed an inequality scale similar to the risk scale based on the social welfare function (see also Kolm, 1969). Atkinson in fact stated that the tools he used to compare inequality between two distributions were borrowed from the literature on risk measurement.¹ Accordingly, the degree of inequality aversion is measured by the amount society is willing to give up in order to achieve a more egalitarian distribution of income; that is,

¹ Atkinson relied on Rothschild and Stiglitz (1970) and Hanoch and Levy (1969). Because he builds the social utility function as the sum total of the individuals' utility, the more equal distribution is necessarily also the less risky one. According to his assumptions regarding identical individuals, the representative individual's degree of risk is also the society's degree of inequality.

the more convex the overall *social* indifference curve, the more averse the society is to inequality (see also Amiel *et al.*, 1996).

Rothschild and Stiglitz (1970) define an individual as a risk-averter when he/she prefers a less risky alternative over a more risky one, where “more risk” is defined by three equivalent rules. The same methods are used in empirical studies to identify inequality averters. Usually the subject has to compare, by means of a questionnaire, between two distributions of income that are usually mean preserved but have different variances (e.g. Amiel and Cowell, 1994).² If the less unequal state is preferred, then the individual is considered an inequality averter. The existing literature does not distinguish between inequality aversion and risk aversion.

Clearly, if the subject chose the distribution with the lower variance, he could be considered an inequality averter as well as a risk averter. In order to distinguish clearly between the two distinct concepts of inequality aversion and risk aversion we constructed an experimental research design, and we report here on exploratory work with this design.

The next section discusses some conceptual considerations and necessary definitions. The third section describes the empirical methods employed and presents the results. The analysis of the results concludes the paper.

2. Concepts and Definitions

The choice of the preferred distribution is made “under a veil of ignorance”; that is, when choosing the preferred distribution a veil of uncertainty blinds the individual, so that he cannot know his relative position within each of the distributions. This

² See also Amiel and Cowell (1992); Pfingsten (1988); Glejser *et al.* (1977).

approach, described in Rawls (1971), ensures procedural fairness in which decisions are guided by justice, without the temptation to distort social conditions to promote personal goals.

Our main objective is to define inequality aversion, not as preference for the more equal distribution, but as a response to an increase in perceived inequality among participants in the economy that does not affect any other features of personal income distribution.

In connection with this concept we use the following definitions:

Let x be a random variable of income with distribution function F on support X , which may be taken to be the set of non-negative numbers. Let us denote the *order statistics* of n -sample variants from F by (x_1, x_2, \dots, x_n) , where $x_i \in X \forall i$. By the definition of order statistics it must be true that $x_1 \leq x_2 \dots \leq x_n$. We also assume that individuals randomly sample their incomes from F . Let us define two alternative types of gamble:

Definition I: "Common Gamble" (CG) All participants sample the same $x_i \in X$ from F in one mutual gamble.

Definition II: "Individual Gamble" (IG) Each participant *independently* draws an income x_i from F .

In both cases the participants, who are behind a veil of ignorance, face the same distribution of income F .

Notice that a “common gamble” yields results that apply to all the individuals in the society. In the case of an “individual gamble” each individual carries out a separate gamble and receives a result that is specific to him. Thus, there can be no doubt that CG represents a complete *ex-ante* equality game while IG is potentially an *ex-ante* inequality game. The degree of the actual inequality (ex-post) depends on the properties of the distribution F as well as on the actual results of the draw.

Definition III: Preference for Equality If an individual prefers CG to IG he/she is an inequality averter.

The present study was designed to empirically examine inequality aversion using the above definitions. In contrast to previous studies mentioned earlier, the subject has to choose between CG and IG where the two alternatives have the same distribution of income, but representing different levels of equality. Under these circumstances, the choice of a more equal distribution (CG) indicates a preference for equality rather than risk aversion since the risk level remains constant.

As already mentioned, the present study is an exploratory one, designed to develop an improved method for assessing inequality aversion. The object of the study is to construct a tool that will permit us to isolate inequality aversion from risk aversion.

The study is based on a “laboratory experiment” indicating individuals’ retrospective preference, and may thus be considered superior to a questionnaire.³

³ Provided that the stakes in the game are meaningful to the subjects.

3. Method

The subjects were 211 eight-year-old children, 107 of whom live on kibbutz and 104 in the city.⁴ The experiments were conducted in urban and kibbutz schools in the central region of Israel. Since the eight-year-old children had not yet been taught about the concept of equality and inequality aversion, their choices should indicate their natural tendencies.

Reference Group

Amiel and Cowell (1999) define the notion of “reference group” as “one of the main components of income distribution analysis.” Runciman (1966) emphasizes the importance of defining the reference group. He states that people feel deprived in relation to others: it is others which constitute the reference group.

We wanted the children to feel obligated to their peer group so we asked the teacher to divide the class into three subgroups according to existing work-groups. The experiment was conducted separately with each group so that the children would feel an affiliation to their group.

Choices

Children were asked to choose between two lotteries with the same risk (standard deviation), but which differed in the way the prize was to be distributed among the

⁴ The population sample included children who lived and were educated in their place of residence for at least three years (i.e., from the beginning of the first grade).

participant's companions: an equal distribution (CG) or individual distribution (IG) that could vary from child to child.

Tasks and rewards

The children were given a questionnaire in which they had to distinguish between “animate” and “inanimate” objects.

Once the children had finished the assignment, the experimenter told them that they were entitled to a prize, but that they would participate in a game to determine which prize they would get. The size of the reward would be determined by throwing dice. An even number meant “win” and an odd number meant “lose”.⁵ However, the participants would determine the method of throwing the dice. Participants made their choice “under a veil of ignorance”, so that the child did not know, prior to choosing, how large a prize he or his companions would receive in each alternative.

In order to encourage the children to write their own answers and not to consult with their friends, they were told that they were participating in an experiment on children's thought processes and therefore there were no “right” or “wrong” answers. The children were promised candy in return for their participation and they all expressed their willingness to participate in the experiment.

Choosing the method of throwing the dice was the essence of the experiment. Recall that the previous task was just a manipulation designed to distract the children's attention from the final task and give the children the feeling that they deserved a reward for their “work”.

⁵ The experimenter verified that the children understood the concepts “even number” and “odd number”, and that they had equal chances of “winning” or “losing”.

The children were offered two methods for throwing the dice:

- In method 1 (CG), the experimenter would throw the dice once for the whole class and all the children would receive the same amount of candy indicated on the dice.
- In method 2 (IG), the experimenter would throw the dice once for each child who would receive his reward according to the number indicated on the dice.

It is important to emphasize that the risk level taken by the child in both games is identical (a probability of 0.5 to win). The only difference between the two games is the method of distribution. Game 1 is a CG resulting in an equal distribution among the children, while in game 2 (IG) it is reasonable to assume that the distribution among the children would not be egalitarian.

After the experimenter verified that the children understood the rules and meaning of the game, the participants wrote down their game preference on a piece of paper. If they were indifferent, they could mark “I don’t care which”.

The participants did not write their names on the paper. They were told that no one would know what they had chosen and that the majority of the group would determine the method of throwing the dice.

Prizes

Participants could choose prizes from a variety of candies and chocolate bars. The prizes were chosen so as to be significant to the children, and so that they would want to accumulate as many as possible and not be satisfied with only one. The price of a candy bar was around 1 NIS (about 30 U.S. cents). In a pre-test we asked the children about the importance of the prize: all were keen to respond and expressed their hopes of winning. Note that performing behavioral experiments with valuable incentives is

crucial for obtaining significant results (Kroll *et al.*, 1988; Kachelmeier and Shehata, 1992).

Each participant could receive only his or her own prize and the children were told that they could not accumulate prizes collectively.

Experimental Conditions

The experiment was conducted in each class in three different variations. Each participant took part in the experiment only once. A “group” refers to all children from a particular classroom who played under similar experimental conditions.

For all three groups, if the dice showed an uneven number the child was rewarded by one candy bar whichever game he chose. The prizes for an even number depended on the type of game chosen and on the experimental conditions.

The prizes in the three experimental conditions were as follows:

- Group A: we offered the children 5 candy bars for CG and 4 candy bars for IG.
- Group B: we offered the children 4 candy bars for CG and 4 candy bars for IG.
- Group C: we offered the children 3 candy bars for CG and 4 candy bars for IG.

The different prizes for each group enabled us to check the design of the experiment.

First we wished to check that the prizes were meaningful and that the monotonicity

rule6 applied and secondly, we wished to check the impact of the “leaky bucket”, based upon Okun (1975), in terms of the willingness to “pay” for equality.

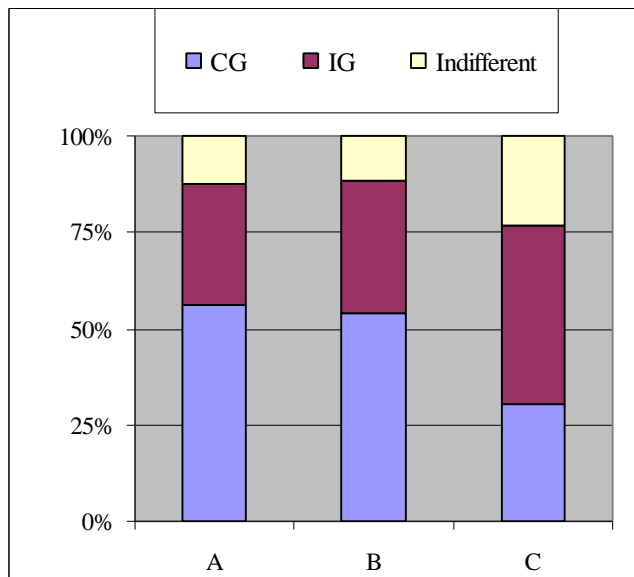
4. Results

The dependent variable was the children’s choice of their game while the independent variables were game condition (group) and place of residence. In a two-variable analysis of variance we found a significant main effect ($F=4.44$, $v=3$, $p<0.049$). This significant difference resulted from the effect of group, which was found to be significant at the 0.04 level ($F=5.59$, $v=2$), while the effect of place of residence was not significant. No interaction was found between group and place of residence.

The method suggested here for examining inequality aversion is consistent with the principle of monotonicity (see Table 1).

	<i>Group</i>			
	<i>A</i>	<i>B</i>	<i>C</i>	
CG	32	46	21	
IG	18	29	32	
Indifferent	7	10	16	
N	57	85	69	211

Table 1: All Participants



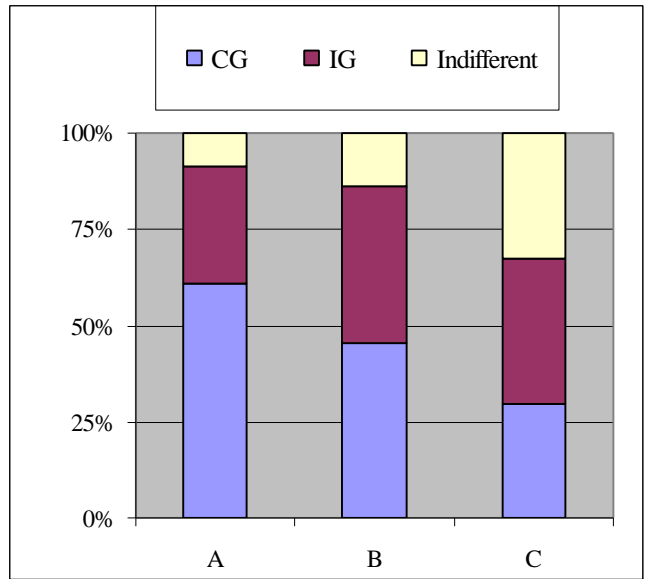
⁶ According to this principle, the frequency of selection of one type of game increases when its prize increased relative to the prize of the alternative.

In group A, in which a prize of five candy bars was promised for the common game (CG) compared with only four pieces in the individual game (IG), 56% of the children chose CG. In group B, in which identical prizes were promised for both game methods, 54% of the children chose CG, while in group C, in which only three candy bars were promised for CG and four for IG, only 30% chose CG.

As described earlier, the experiment was conducted among urban and kibbutz children. Tables 2 and 3 show the choice of the urban children and those of the kibbutz children, respectively. Urban children showed a preference for CG that declined as the value of its prize decreased. However among kibbutz children in group A, where the prize for CG was larger than the prize for IG, relatively less children chose CG (53%) and more children were indifferent (15%) than among group B children who faced identical prizes. (In group B, 63% chose CG and only 10% were indifferent.) An explanation for this phenomenon can be found in Sen (1993), who described the lack of internal consistency in decision-making: Even if we always want the larger slice of cake, polite manners dictate that we choose the larger but not the largest piece. In our experiment, choosing CG meant asking for the largest prize and being “impolite.” This may be the reason why the children did not choose the collective game and instead preferred the indifference option. See also Baigent and Gaertner (1996) on choices involving a norm that supercedes an ordinary preference optimization.

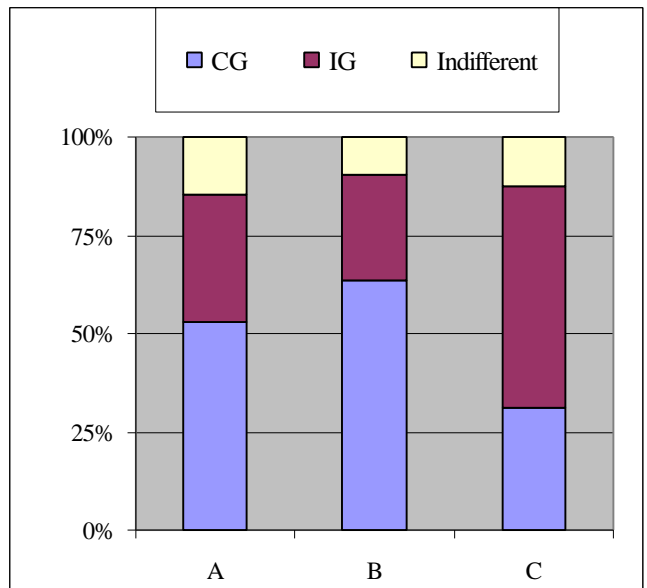
	<i>Group</i>			
	<i>A</i>	<i>B</i>	<i>C</i>	
CG	14	20	11	
IG	7	18	14	
Indifferent	2	6	12	
N	23	44	37	104

Table 2:City Children



	<i>Group</i>			
	<i>A</i>	<i>B</i>	<i>C</i>	
CG	18	26	10	
IG	11	11	18	
Indifferent	5	4	4	
N	34	41	32	107

Table 3:Kibbutz Children



We now present the findings for each of the experimental conditions (groups).

To find the preference for CG, we calculated the proportion of children that chose this kind of game out of the total number who made a clear choice. (i.e., did not

mark “Indifferent”). We used the χ^2 test to test the data for goodness of fit.⁷ The results showed that, for group A, the choice distribution was not random, and there was a preference for CG ($\chi^2=16.5$, $\nu=2$, $p<0.0002$). Sixty-seven percent of the urban children who expressed a clear preference chose CG (a percentage significantly larger than the random probability of 0.5). Among the kibbutz children who chose a particular game, 63% chose CG, although this preference was not overly significant ($Z=1.3$, $p<0.08$). However one should keep in mind that the prize received for CG was higher than that for IG.

In group B, whose prizes were identical for both games, a significant non-random distribution of preference was found in the general population sample for CG ($\chi^2=22.9$, $\nu=2$, $p<0.00001$). The kibbutz children significantly preferred CG ($Z=2.5$, $p<0.006$). However, no significant preference was found among the urban children. (Nonetheless, no significant differences were found between kibbutz and urban children in this group which will be discussed later on.)

In group C, whose prize for CG was lower than that for IG, a significant preference was found in the general population sample for IG ($\chi^2=5.8$, $\nu=2$, $p<0.04$). The kibbutz children preferred IG to a certain degree ($Z=1.5$, $p<0.06$). However, no significant preference was found among the urban children who divided almost equally among the three choices. The results indicate that even if the children preferred egalitarian distribution, they were unwilling to pay the price that was required in this experiment.

⁷ See the explanations and example in Ben-Horin and Levy (1984), pp. 490-496.

Results by social system

Tables 4 to 6 present comparisons between the urban and kibbutz children, with the effect of group kept constant. The tables present data both in terms of the number of participants and percentages. No significant differences were found between kibbutz and urban children.

	Kibbutz	City
CG	18	14
IG	11	7
Indifferent	5	2
N	34	23

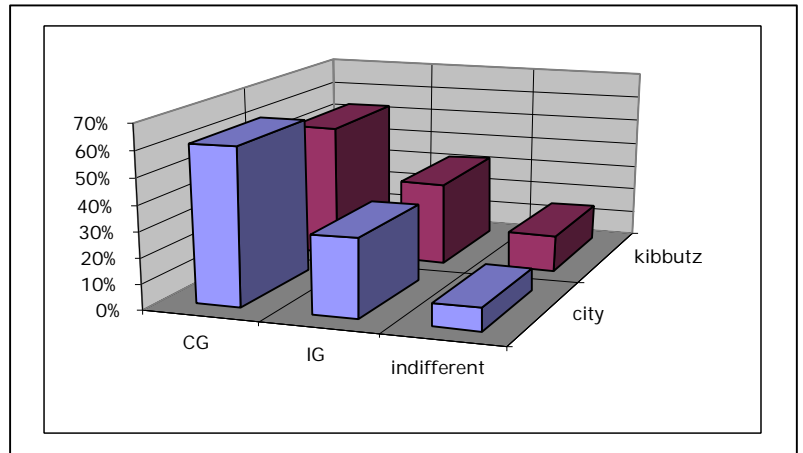


Table 4: Group A

Only in group C was there a difference between kibbutz and urban children which was barely significant ($\chi^2=4.3$, $\nu=2$, $p<0.10$). The kibbutz children somewhat preferred IG (56% of participants), while the urban children were almost equally divided between the three possibilities: 30% chose CG, 38% chose IG and 32% were indifferent.

	Kibbutz	City
CG	26	20
IG	11	18
Indifferent	4	6
N	41	44

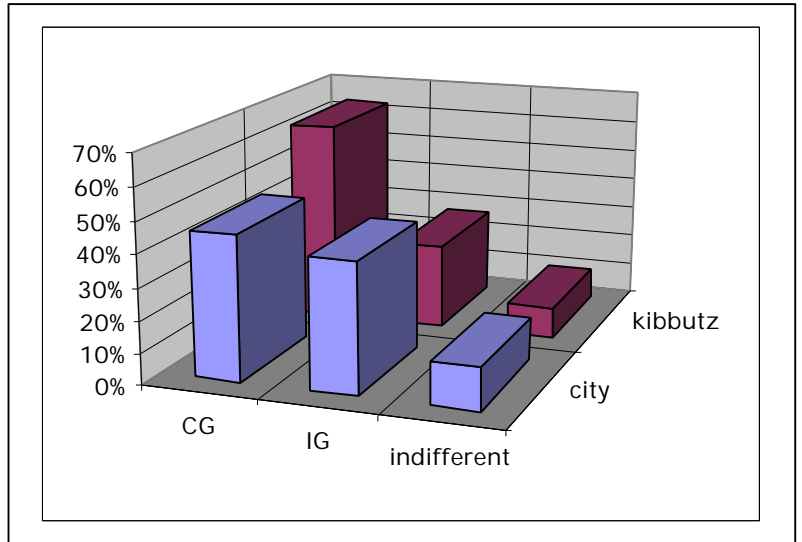


Table 5: Group B

	Kibbutz	City
CG	10	11
IG	18	14
Indifferent	4	12
N	32	37

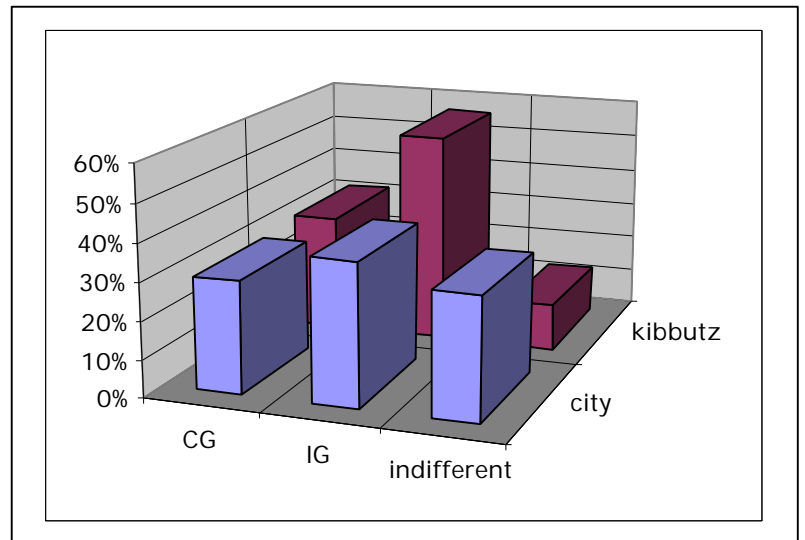


Table 6: Group C

5. Discussion and Summary

The main objective of the present study was to suggest a different method for defining and testing the existence of inequality aversion and to distinguish it from risk

aversion. This is an explorative study designed to construct an instrument allowing the identifying of inequality aversion.

The experimental method presented was found to have internal consistency (in accordance with the monotony principle) as well as validity.

In this study, an individual was considered an inequality averter if he/she preferred a personal income distribution X over an identical personal income Y, where X results in a more egalitarian income distribution in the population. These results when X is the income from a common game (CG) and Y is the income from an individual game (IG), and both possess identical distribution of income.

Preference for X over Y means that the individual's expected utility in face of X is higher than in Y and therefore the individual should be willing to "pay" to shift from Y to X.

The children usually preferred an egalitarian distribution to non-egalitarian one. However, when they had to give up part of their reward in order to shift to an egalitarian distribution, they chose not to do so. It is possible that the cost of CG, in terms of the difference in rewards was too high, and that a lower price might have yielded different results.

No significant differences were found in inequality aversion between kibbutz and urban children. Both groups of children generally preferred CG.

The experiment was conducted among young urban and kibbutz children. This sample is not representative of the general population and therefore the study does not claim to examine differences between the kibbutz and the city. (As mentioned earlier, this is only an exploratory study) Young children were chosen in order to preclude any bias that could result from previous knowledge of egalitarian theories.

The children's choice of CG, with the same risk level as IG, indicated a preference for egalitarian distribution. Therefore we can conclude that, according to our definition, these children are inequality averters.

It should be noted that we did not examine the reasons behind the children's preference for equality. In other words, we do not distinguish between those who prefer equality in order that no one should receive less than they do, and those who prefer it so that no one should receive more than they do. The object of the study was only to more accurately define individuals' equality preference by holding risk constant.

This distinction is also important in explaining the existence of the kibbutz. Preservation of the kibbutz's egalitarian nature is important if the individual's motivation for choosing kibbutz life stems from inequality aversion. On the other hand, if the choice of kibbutz life is motivated by risk aversion, then we must examine the kibbutz's survival ability in terms of the cost of alternative income "insurance" options.

In order to draw conclusions regarding the preferences of kibbutz members, this study should be replicated with adults. The method suggested here measures inequality aversion while holding risk constant.

References

- Amiel, Y., Creedy, J. and Hurn, S. (1996) "Measuring Inequality Aversion", University of Melbourne, Research Paper 507.
- Amiel, Y. and Cowell, F.A. (1992) "Measurement of Income Inequality: Experimental Test by Questionnaire", *Journal of Public Economics*, Vol. 40, pp. 3-26.
- Amiel, Y. and Cowell, F.A. (1994) "Income Inequality and Social Welfare", In J. Creedy (Ed.) *Taxation, Poverty and Income Distribution*, pp. 193-219. Edward Elgar.
- Amiel, Y. and Cowell, F.A. (1999), *Thinking about Inequality*, Cambridge University Press, Cambridge.
- Atkinson, A.B. (1970) "On the Measurement of Inequality", *Journal of Economic Theory*, Vol. 2, pp.244-263.
- Baigent, N. and Gaertner, W. (1996) "Never Choose the Uniquely Largest: A Characterization", *Economic Theory*, Vol. 8, pp. 239-249.
- Ben-Horin, M. and Levy, H. (1984) *Decisions and Applications in Business and Economics*, Random House, N.Y.
- Glejser, H., Gevers, L. Lambot, P. and Morales, J.A. (1977) "An Econometric Study of the Variables Determining Inequality Aversion among Students", *European Economic Review*, Vol. 10, pp. 173-188.
- Hanoch, G. and Levy, H. (1969) "The Efficiency Analysis of Choices Involving Risk", *Review of Economic Studies*, Vol. 36, pp.334-346.
- Kachelmeier, S.J. and Shehata, M. (1992) "Examining Risk Preferences Under High Monetary Incentives. Experimental Evidence from the People's Republic of China", *American Economic Review*, Vol. 82, pp.1120-1141.
- Kolm, S.-Ch. (1969) "The Optimal Production of Social Justice", in Margolis, J. and Guitton, H. (eds.) *Public Economics*, Macmillan, London.
- Kroll, Y., Levy, H. and Rapaport, A. (1988) "Experimental Tests of the Separation Theorem and the Capital Asset Pricing Model", *American Economic Review*, Vol. 78, pp. 500-519.
- Okun. A.M. (1975) *Equality and Efficiency, The Big Trade-off*, Brookings Institution, Washington.

- Pfingsten, A. (1988) "Empirical Investigation of Inequality Concept: A Method and First Results", Working Paper, Karlsruhe University.
- Rawls, J. (1971) *A Theory of Justice*, Harvard University Press, Cambridge, Massachusetts.
- Rothschild, M. and Stiglitz, J.E. (1970) "Increasing Risk: A Definition and Its Economic Consequences", *Journal of Economic Theory*, Vol. 2, pp. 225-243.
- Runciman, W.G. (1966) *Relative Deprivation and Social Justice*, Routledge and Kegan Paul, London.
- Sen, A. (1993) "Internal Consistency of Choice", *Econometrica*, Vol. 61, pp. 495-521.