A 'Leaky Bucket' in the Real World: Estimating Inequality Aversion using Survey Data

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Existing evidence of inequality aversion relies on data from class-room experiments where subjects face hypothetical questions. This paper estimates the magnitude of inequality aversion using representative survey data, with questions related to the real-economy situations the respondents face. The results reveal that inequality aversion can be measured in a meaningful way using survey data, but the magnitudes of the estimates depend dramatically on how inequality aversion is measured. No matter how measured, the revealed inequality aversion predicts opinions on a wide range of questions related to the welfare state, such as the level of taxation, tax progressivity and the structure of unemployment benefits.

INTRODUCTION

The conflict between efficiency and equality lies at the heart of modern welfare economics. When (re)distribution matters, society is willing to suffer efficiency costs to obtain a more desirable income distribution. Recent evidence also suggests that inequality aversion or, more broadly, a preference for fairness is a key determinant of human choices.[1] (For a review of this work, see Camerer and Fehr 2006.)

But a mere qualitative statement—e.g. that equality matters—is not very helpful in determining the appropriate extent of distortions the government ought to impose. For this purpose, one must measure the magnitude of the inequality aversion of those whose welfare the social planner wishes to maximize. The issue has been studied extensively in work on optimal income taxation (e.g. Tuomala 1990; Saez 2002). Recently, the views on inequality aversion have been at the heart of the debate on climate change. The influential *Stern Review on the Economics of Climate Change* uses a logarithmic utility function, implying an inequality aversion parameter equal to 1 on the Atkinson (1970) scale.[2] Dasgupta (2006) criticizes the *Review* for choosing an unacceptably small value for inequality aversion; a higher value would dramatically slow down the optimal emission cuts to reduce the burden on today's poor.

As inequality aversion cannot be directly measured, earlier work has mainly utilized a questionnaire approach for quantifying the level of inequality aversion.[3] Perhaps the best known way of contrasting efficiency and equity is the 'leaky bucket' idea, due to Okun (1975). An amount of money is transferred from the rich to the poor, but a certain fraction of it is lost when doing so, for instance because of administrative costs. The extent of the loss, or *leakage*, in the transfer that society can accept determines the level of inequality aversion. The higher the tolerable leakage, the more will society wish to avert inequality. Following this method, Amiel *et al.* (1999) conduct experiments for groups of students from two different countries. They find that inequality aversion can be measured in a reasonably precise way. The estimated median inequality aversion is between 0.1 and 0.2, much lower than values typically used by economists in simulations.

An alternative way of formalizing the efficiency–equity tradeoff is to present the respondents with a choice between different income distributions in a hypothetical

society. In one of the options the mean income is low and the income dispersion small; in another the mean income is higher but the income distribution more dispersed. Using this approach in an experiment with Swedish students, Carlsson *et al*. (2005) found that the median inequality aversion lies between 1 and 2. Their estimate is ten times larger than the one deduced by Amiel *et al*. (1999).[4]

The evidence above, and all the other evidence we are aware of, is obtained from experiments typically conducted by university students. As in other experimental work, it is not clear how well this evidence can be generalized for real populations. Even within experimental studies, it has been shown that the composition of the participants (for example economics students *v*. students from other disciplines) can have large effects on the estimates of inequality aversion (Engelman and Strobel 2004; Fehr *et al*. 2006). The experiments also rely on situations in which the sums of money are unrelated to any real-world situation with which the respondents are familiar.

This paper attempts to contribute to the literature in several ways. First, we estimate the extent of inequality aversion using questionnaire data from a representative survey of Finnish people. Second, we use questions related to real-world circumstances that the respondents face. In our survey the 'leaky bucket' question concerns respondents' willingness to have the tax schedule adjusted so that those in the highest income decile pay €100 more and only part of the money reaches the lowest decile. The wage distribution question asks respondents to compare the existing Finnish wage distribution (without telling the respondents what this is) and alternative distributions with a higher mean and a larger dispersion of income.

If the 'classroom' experiment approach has its problems, we do not wish to maintain that our approach is immune to weaknesses. The questions we ask of the general public are difficult, and therefore the response rate could be better. It is also not clear how familiar a respondent is with current economic affairs. It seems to us that the two approaches are complementary and that both are needed to get a broad view on inequality aversion.

The respondents' choices in our survey can, of course, be determined both by their 'true' preferences for equity and their own position in society. Our second main task is to examine the importance of these two concerns. We first calculate the impact of the proposed alternatives on the respondents' own position, and we then use this measure to explain the choices in inequality aversion questions. In this way we are therefore able to compare the relative importance of the direct effect on the respondents themselves with a general preference for equity. In this sense, our paper is most closely related to the work by Beckman *et al*. (2004), who examine how the actual position of respondents affects the answers in a 'leaky bucket' experiment.[5]

We present the same individuals with questions on both the 'leaky bucket' and the preferred wage distribution. This allows us to compare the results of two previous approaches that have produced very different estimates of inequality aversion. On a more general level, this comparison illustrates how differences in the way the questions are asked may have dramatic effects on the responses.

Finally, the survey also collects information on the background of respondents, including their political views and income level as well as their opinions on other policy questions related to the welfare state. Our paper is therefore also related to earlier survey evidence of the support for the welfare state, such as Boeri *et al*. (2001), Corneo and Grüner (2002) and Hills (2004). In addition, since aggregated happiness can be regarded as one welfare measure, the literature dealing with the link between inequality and happiness, such as Alesina *et al*. (2004) and Schwarze and Häpfer (2003) and the references therein, forms part of the background for our work.

While the present paper deals with inequality aversion, its motivation is very similar to the work by Barsky *et al.* (1997), who measure the extent of risk aversion using survey data. Like them, we explain the determinants of the aversion parameter and test its validity in predicting other opinions—in our case, attitudes towards the desirability of income transfers and tax progression.

The paper proceeds as follows. Section I describes the survey and the key questions used. Section II presents the results, and Section III examines how the individuals' background affects their choices. Section IV looks at the role of inequality aversion as an explanatory variable for opinions on the welfare state, and Section V concludes.

I. Data and Methodology

The data are based on a random sample of 3000 Finnish people aged between 18 and 75 years. These individuals received a detailed questionnaire on their opinions about taxation, inequality and the welfare state. The survey was conducted by mail in the spring/summer of 2006. The survey instrument included specific questions on reforming the welfare state, with 'price-tagged' alternatives along the lines of Boeri *et al.* (2001). The survey was obviously challenging and time-consuming to fill in, and therefore the response rate was relatively low (45%).

To account for possible non-random attrition in our survey, we reweighted the data using information from the annual tables of the latest available *Labour Force Survey* (*Statistics Finland* 2004). We first cross-tabulated the survey respondents according to sex, ten-year age category, education (three levels) and main activity (employed, unemployed, student, pensioner, other) and calculated the number of survey respondents in each of these 180 cells. We then created a cross-classification table based on that of the *Labour Force Survey*. Our survey weights were calculated as a ratio of population frequencies based on estimates from the *Labour Force Survey* and cell frequencies in our survey.

After reweighting the data, the gender, age, education and main activity distributions in the survey correspond exactly to those in the *Labour Force Survey*. Reweighting therefore removed any systematic bias in the responses that would be due to different response rates across these categories. All tables and estimation results are based on the weighted data. Naturally, we can still not be sure that opinions regarding the desirability of government interventions are not correlated with the response rates, which would produce a non-representative sample of attitudes towards the welfare state.

The 'leaky bucket' question

As in much of the earlier literature, the numerical values presented to respondents were based on a social welfare function proposed by Atkinson (1970). This functional form represents the standard way of measuring inequality aversion, and therefore estimating its values using survey data is a natural starting point. The social welfare function (SWF) is given by

$$(1) \qquad SWF = \sum_i \frac{x_i^{1-e}}{1-e} \text{ for } e \neq 1 \text{ and } SWF = \sum_i \ln x_i \text{ for } e = 1,$$

where x denotes income of person I and e refers to the extent of inequality aversion. If e is equal to zero the social welfare function is linear in income, and the income differences do not matter. When e increases, inequality aversion increases.

Note that in this and the following section we interpret the survey responses as choices made by persons whose social preferences can be represented by this social welfare function with possibly differing parameters. We can therefore compare the survey respondents' answers to those derived in experiments in earlier literature. In Section III we explicitly study the importance of the respondents' background for the answers, and thus allow their 'egoistic' concerns to affect the chosen social weights.

The idea in the 'leaky bucket' question is to ask whether a transfer from those in the highest income decile (arranged according to disposable income) to those in the lowest decile would be acceptable. To prevent dealing with equivalence scales—which must be hard for people to grasp—the example deals with one-person households.

The maximum tolerable leakage rate (l) corresponding to each level of inequality aversion (e) is calculated as follows:

$$(2) \qquad l = \frac{\mathrm{d}x_{10} - \mathrm{d}x_1}{\mathrm{d}x_{10}} = 1 - \left(\frac{x_1}{x_{10}}\right)^e,$$

where x_1 is the average income in the lowest decile and x_{10} is the average income in the highest decile. The actual income levels we use in the question are based on Statistics Finland's Finnish Income Distribution Survey of 2003, inflated to 2006 values by the consumer price index.

Since in a general questionnaire the clarity and comprehensiveness of the question setup are of key importance, we decided to ask each respondent only one question, where the loss parameter had been calculated on the basis of one of the following values of inequality aversion: 0.5, 1.2 and 3. These values were randomly allocated so that each value of e was used in a quarter of the questionnaires. For example, for the value of $e = 1$, the question was the following:[6]

What is your opinion of the following reform proposal?

The taxation of all high-income earners, whose disposable income exceeds €3300 per month, is increased. The money is spent for the benefit of those low-income earners whose disposable income is less than €800 per month.

The high-income earners can, however, react to the tax increase by reducing their work effort, and part of the money goes to administrative expenses. Therefore, for each €100 paid by the high-income earners, only €25 can be spent for the benefit of low-income earners.

Are you, nevertheless, in favour of this proposal?

1. Yes
2. No
3. Cannot say

Table 1 depicts the loss-percentage and the euro value that the low-income earner gets for the different values of e.

Once we have a large number of respondents, the distribution of the inequality aversion parameter can be estimated, even though each individual answers a question calculated on the basis of only a single value for e. For example, if the majority of respondents reject the transfer when the loss is calculated according to $e = 3$ but accept it when $e = 2$, the revealed median inequality aversion parameter lies between 2 and 3. A logical requirement for consistency of responses is that when e increases the proportion of the population supporting the transfer must not increase.

TABLE 1
Loss Percentages for the 'Leaky Bucket' Question

Inequality aversion	0.5	1	2	3
Loss (%)	50	75	94	98.5
EUR for the low-income earner	50	25	6	1.5

The wage distribution question

The idea in this question is to compare a more compressed wage distribution with a more dispersed wage distribution that has a higher average wage. The more equal distribution of the question resembles the real Finnish wage distribution. The distribution of pretax wages is used, since we believe that the public has a better understanding of gross than of net wages.

The wage distributions were derived as follows. We first fitted a log-normal distribution to Finnish wage distribution, based on 2003 data converted to 2006 level by the Statistics Finland index of wage and salary earnings. On the basis of this distribution, we calculated three wage levels, corresponding to the median and the upper thresholds of the 1st and the 9th decile. We then increased the mean income level by 10%, and adjusted the variance so that someone with a given level of e would be just indifferent between the original distribution and the new, more unequal, distribution.

Again, the alternative distribution was calculated for the same four different values of inequality aversion. We used the resulting mean and variance to calculate same wage quantiles from this more dispersed distribution and asked the respondents which distribution they would prefer. Each respondent answered only one wage distribution question, but the proposed wage quantiles differed across respondents according to the value of e. For each respondent, the value of e was the same in the wage distribution and 'leaky-bucket' questions. Therefore, we can directly compare how the type of question affects the distributional preferences.

Finland is a country in which centralized wage bargaining is the norm, and therefore the question was also framed with this situation in mind. For $e = 1$, the question was as follows:

Let us imagine that in wage negotiations two different alternatives are considered. Which of the following do you prefer?

1. If all employees are ordered from the lowest-income earner to the highest-income earner, someone belonging to the lowest decile earns €1570 in a month, a person with average income earns €2340 and a person belonging to the highest decile earns €3480.
2. Income differences rise and the average income is increased, so that the low-income earner gets €1280 per month, the person with average income gets €2580 and the high-income earner €5190.
3. Cannot say.

Table 2 contains information about the log-normal estimate of the Finnish wage distribution and alternative distributions used with different values of inequality aversion.

TABLE 2
WAGE DISTRIBUTIONS FOR THE WAGE LEVEL QUESTION

Income level	Log-normal estimate of actual distrib.	Alternative distribution with $e = 0.5$	Alternative distribution with $e = 1$	Alternative distribution with $e = 2$	Alternative distribution with $e = 3$
1st decile	1570	1045	1280	1460	1540
Median	2340	2580	2580	2580	2580
10th decile	3480	6371	5190	4560	4340

II. RESULTS

The responses to the 'leaky bucket' question, for different values of the inequality aversion parameter, are tabulated in Table 3. The responses are consistent in the sense that, when the share of leakage (and e) goes up, the support for the transfer diminishes. The differences are also statistically significant according to the Kendall's rank correlation measure.[7] Note also that a larger proportion of respondents is against than in favour of the transfer for any values of e. This suggests that the median inequality aversion of the respondents lies below 0.5. The result is well in line with the findings by Amiel *et al.* (1999) for a similar 'leaky bucket' question in an experimental setting.

This result is in sharp contrast with the responses to the wage distribution question, reported in Table 4. For all values of e, the majority of the respondents prefer the more equal distribution to the alternative with higher mean and larger dispersion. Thus, on the basis of this question, the median inequality aversion of the respondents is larger than 3. Answers to the wage distribution question are also consistent, in the sense that the support for more equal distribution decreases with e. And again, this evidence is compatible with earlier work that has presented similar questions in an experimental setting (Carlsson *et al.* 2005).

The fraction of respondents who answered 'Cannot say' is quite high in both questions, although in the 'leaky bucket' question (33%) it was somewhat higher than in the wage distribution question (24%). On the other hand, the share of non-respondents was higher in the wage level question (8.5%) than in the 'leaky bucket' question (2.6%).[8] The exact reasons why so many find it difficult to answer these questions remain, of course, unclear, but one of the most important reasons must be that they deal with difficult choices. We tend to get a similar share of 'Cannot say's in other difficult questions in the survey instrument. The other explanation is that people may be genuinely indifferent between the options presented. This is the interpretation we mostly follow in our analysis of the factors that predict the choices for these questions (Section III).

Table 5 presents a cross-tabulation of responses to the two questions. The correlation between the two measures of inequality aversion is positive and highly significant. However, rank correlation between the two measures is not very high. This is caused mainly by the fact that many respondents support the compressed wage distribution but oppose transfers.

Several reasons why the two different inequality questions provide different results come to mind. One obvious possibility is that people simply have different attitudes towards the efficiency–equity tradeoff in different situations. In the 'leaky bucket' question tax and transfer policy is used in redistribution, whereas the change in wage distribution is a bargaining result. Furthermore, in the 'leaky bucket' question a reason for the efficiency loss is included in the survey instrument (i.e. that people may work less), whereas this is not the case in the wage-setting question.

TABLE 3

SUPPORT FOR THE TRANSFER IN A 'LEAKY BUCKET' QUESTION FOR DIFFERENT VALUES OF e (%)

e	Yes	Cannot say	No
0.5	29.6	34.1	36.3
1	28.6	34.9	36.5
2	23.1	31.4	45.5
3	23.5	32.4	44.1
Total	26.2	33.2	40.6

Pearson χ^2 (6) = 9.05 ($p = 0.17$); Kendall's tau-b = 0.062 ($p = 0.009$).

TABLE 4

SUPPORT FOR MORE EQUAL WAGE DISTRIBUTION FOR DIFFERENT VALUES OF e (%)

e	Yes	Cannot say	No
0.5	71.7	20.1	8.2
1	66.0	25.0	8.9
2	60.7	26.8	12.5
3	58.2	23.1	18.7
Total	63.8	23.9	12.4

Pearson χ^2 (6) = 27.7 ($p = 0.00$); Kendall's tau-b = 0.12 ($p = 0.00$).

TABLE 5

CROSS-TABULATION OF THE TWO INEQUALITY AVERSION QUESTIONS

		Supports more equal wage distribution			
		No	Cannot say	Yes	Total
Support transfer from rich to poor	No	98	87	320	505
		19.4%	17.2%	63.4%	100.0%
	Cannot say	26	144	216	386
		6.7%	37.3%	56.0%	100.0%
	Yes	22	68	229	319
		6.9%	21.3%	71.8%	100.0%
	Total	146	299	765	1210
		12.1%	24.7%	63.2%	100.0%

Pearson χ^2 (4) = 83.3 ($p = 0.000$); Kendall's tau-b = 0.079 ($p = 0.003$).
Notes: the alternatives for each respondent are calculated using the same value for e.

One could also try to find an explanation for the different answers from the recent work on responsibility-sensitive egalitarianism; see e.g. Roemer (1998) and Fleurbaey and Maniquet (2008). The idea there is that people should be compensated for income differences that arise from factors outside their control (luck, innate ability), whereas they should be held responsible for differences that are due to their own effort.[9] In our

case, people can support a 'fair' wage policy but do not support unconditional transfers to those who are not working. On the other hand, if the wage rate is regarded as conveying information about effort, responsibility sensitivity could also lead to less support for small wage differences.

The two questions may also measure the same phenomenon but with a different scale. When an underlying latent preference for equality increases, one is first willing to support equal wage distribution; but the latent inequality preference must increase much more to trigger the person to support costly transfers.

In addition, the assumption of the constant relative inequality aversion may be a straightjacket that distorts the inference. Indeed, Beckman *et al.* (2006) find that subjects are inequality-averse at low-income levels, but neutral towards distribution at high-income levels. This can have different consequences for the two questions, for example because the 'leaky bucket' question deals with extremes of distribution.

Finally, the leakage, or the efficiency loss, is very explicitly visible in the 'leaky bucket' question, whereas in the wage distribution question the respondent must calculate the loss behind the forgone wage increases. Thus, a majority of respondents may have had efficiency concerns in mind in the 'leaky bucket' question, and preferences for efficiency might explain part of the unwillingness to support the transfer.

In sum, the discussion above suggests that inequality aversion can be consistently measured using either question on the basis of survey data, with results that are in line with earlier experimental evidence; but the two approaches yield completely different results. All this suggests that the extent of inequality aversion is not a universal parameter: it is different in different circumstances.

III. How is Inequality Aversion Affected by the Individuals' Own Position?

Since the respondents are not set behind a veil of ignorance, their position in society—in particular, their income level—is likely to affect their attitudes towards inequality aversion. We examine this in two ways. First, the answers are tabulated according to whether the respondents themselves are winners or losers in the choice offered, given the information we have about their own income. Second, we estimate the relative importance of the impact of one's own income and the impact on the distribution of income for the revealed choices of inequality aversion.

Consider first the 'leaky bucket' question. If the transfer is carried out, those in the lowest decile win and those in the tenth decile lose. The income of all the others (that is, the income of middle 80% of the respondents) will remain the same. The persons in the tenth decile always lose €100 per month, whereas the gain in the lowest decile depends on the extent of the leakage.

The left-hand side of Table 6 reports the answers to the 'leaky bucket' question, depending on whether the person loses or wins if the transfer is made. The deciles are calculated on the basis of net income in the respondents' households. The modified OECD scale is used as an equivalence scale.

As expected, support for carrying out the transfer is the highest among those who would benefit from it. In fact, the majority of the winners would like to make the transfer (with 40% in favour, 36% inconclusive and 24% against). This holds for the smaller values of e (0.5–1), whereas for the higher values of e a small majority of even those who would win rejects the transfer. In the top income group (the would-be losers), only 10% of the respondents support the transfer. While the impact of one's own income for the

TABLE 6

RESULTS BY THE RESPONDENT'S OWN POSITION, AVERAGED OVER DIFFERENT VALUES OF e

	'Leaky bucket'; supports the transfer	Wage distribution; supports more equal wage distribution
Winners	($n = 113$)	($n = 843$)
Yes	39.5	55.6
Cannot say	24.1	7.1
No	36.4	37.3
No change	($n = 902$)	
Yes	25.4	–
Cannot say	35.0	–
No	39.6	–
Losers	($n = 114$)	($n = 491$)
Yes	10.0	61.7
Cannot say	14.7	17.7
No	75.6	20.6

opinions of the 'leaky bucket' question is strong, there are still many low-income persons who are against the transfer and some high-income persons who support it. This suggests that concerns other than one's own position also matter.

In a similar way, we calculated the change in the wage level the individuals would get in the more equal wage distribution as opposed to the less equal wage distribution. For all wage-earners, the wage level changes when the wage distribution becomes more compressed; so for all respondents for whom we have wage information, the change is either positive or negative. The answers to the wage distribution question are then reported on the right-hand side of Table 6. The support for the lower wage distribution is quite wide. The main difference is that the 'cannot say' category is much larger among the losers than among the winners. Overall, attitudes about the wage level questions seem to be more dependent on other concerns than attitudes about the transfer question.

Let us now consider in more detail the relative importance of the respondent's own position and the distributional consequences for the choice revealed in the two questions. Instead of presenting the trade-off between mean income and income inequality, we now examine the trade-off between own income and income inequality. Consider the case where the individual can have a utility function

$$(3) \qquad u = u(x^i, \sigma),$$

where x^i refers to his or her own income, and σ is some measure of the income dispersion. The individuals can therefore care not only about their own income, but also about the distribution of income, reflected by σ. Individuals can also value efficiency reflected in mean income, but in the questionnaire the change in mean income and income differences are tied together for each value of e, and we cannot separately identify their effects without invoking further functional assumptions. Given the individual's own income, we can calculate the difference in their income between the two choices. Similarly, we can calculate the change in income distribution in the two societies. We can

then estimate the choice probabilities using the Random Utility Model, made famous by McFadden (1974). In our case, the probability of choosing society 1 over society 2, i.e.

$$(4) \qquad P(choice_1/choice_2) = f(\mathrm{d}x^i, \mathrm{d}\sigma, Z),$$

is a function of the change in the respondent's own income $(\mathrm{d}x^i)$, the change in the distribution $(\mathrm{d}\sigma)$ and some other (control) factors, Z.

We assumed that the 'Cannot say' category implies indifference between the options[10] and so used an ordered-logit model, where the support for the transfer and the support for a more equal wage distribution were explained by the change in the respondent's own position and in the income distribution, respectively. We used a simple measure of dispersion, i.e. the standard deviation of log-disposable income, in the 'leaky bucket' question and the standard deviation of log wages in the wage level question. This measure takes only four different values, depending on which of the four different values of e was used in calculating the alternatives in the version of questionnaire that the individual received.

In addition to the basic models, we also ran specifications with control variables. As additional explanatory variables, we included sex, age, education, income, main activity and whether the respondent had a spouse and had children at home. The explanatory variables also include a measure of political inclination, where respondents could depict their political views with a 10-point scale from left to right. We also included responses to two opinion questions. First, we asked (with a scale from 1 to 5) whether poverty was the fault of the poor and, second, whether they thought income differences arose to a large extent from differences in how hard-working a person was.

The results are reported in Table 7. Consider first the first two columns that refer to the 'leaky bucket' question. If the person gains in terms of income from carrying out the transfer, his or her support of the transfer is increased. This finding confirms the role of 'egoistic' concerns in answering the question. But the persons are also willing to support the transfer more if it leads to a bigger reduction in income inequality (based on the second right-hand-side term)—in particular, if other control variables are included. In addition to the selfish considerations, income differences therefore also affect the choice. Another way to interpret this finding is that when the leakage is smaller the willingness to carry out the transfer is larger.

Things are quite different in the answers to the wage level question. There, what happens to the person's own wage is not significant in explaining their opinions about the wage structure. The distributional concerns are, however, significant—again, in particular when control variables are included.

Results concerning the other variables can reveal information on what determines the opinions about redistribution when the individual's own position and the efficacy of the policy to reduce income differences are already being controlled for. Not many of these other explanatory variables are significant, but those that are have reasonable signs. Having more education reduces the support for the transfer; students probably anticipate enjoying a better position in society, and therefore their support for redistribution is smaller.

The opinion variables turn out to be important determinants. Plausibly, the more right-wing the respondent is, the smaller is his or her support for the income transfer or for low wage inequality. When one believes that the plight of the poor is their own fault, the willingness to support transfers decreases. Similarly, when hard work is seen as a strong determinant of income differences, the willingness to curb wage differences is reduced. It is interesting that the view of poverty is significant only for the opinion about

TABLE 7
ORDERED LOGIT ESTIMATION RESULTS

	(1)	(2)	(3)	(4)
	Supports transfer	Supports transfer	Supports smaller wage differences	Supports smaller wage differences
Change in own log income	8.722	6.956	0.219	0.363
	(2.63)**	(2.43)*	(1.08)	(1.38)
Reduction in income	1.440	2.156	0.187	1.864
differences	(1.87)	(2.34)*	(0.29)	(2.51)*
Male		0.085		0.049
		(0.62)		(0.28)
Age		− 0.038		− 0.053
		(0.85)		(1.07)
Age-squared		0.001		0.001
		(0.98)		(1.00)
Has spouse		0.027		− 0.407
		(0.15)		(1.67)
Has children		0.016		0.189
		(0.10)		(0.98)
Occupational status (ref. employed):				
Student		− 0.732		− 1.455
		(1.92)		(2.16)*
Unemployed		0.191		− 0.395
		(0.54)		(0.65)
Retired		0.223		− 0.590
		(0.58)		(1.84)
Education (ref. basic education)				
Secondary education		− 0.416		0.089
		(2.24)		(0.37)
Academic education		− 1.086		− 0.374
		(4.58)**		(1.28)
'Poverty is the poor's own fault'		− 0.179		− 0.143
		(3.05)**		(1.88)
'Income differences are due to hard work'		− 0.021		− 0.146
		(0.45)		(2.35)**
Right-wing (scale 0–10)		− 0.113		− 0.135
		(3.40)**		(2.93)**
Observations	1322	1089	904	789

Robust z-statistics in parenteses. *Significant at 5% level; **significant at 1% level.

the transfer, while the view of the causes of income differences is significant only for the view of wage differences.

   To sum up the analysis of this section, it is evident that the respondent's own position is indeed important for part of our analysis. But the respondent's own position is not the sole determinant of the answers: other concerns also matter, in particular the efficiency in reducing income differences. Finally, political tastes and views about the source of income differences can explain the 'residual' support for equality.

IV. OTHER VIEWS ABOUT THE WELFARE STATE

The purpose of this section is to assess the extent to which inequality aversion is related to respondents' views of the welfare state as expressed when they answered other questions in the survey. These relationships can be interpreted as a test of the external relevance of inequality aversion questions. A similar approach has been used to evaluate whether risk aversion measured from survey data predicts risky behaviour (Barsky *et al.* 1997).

We explained opinions on taxation and social benefits using both measures of inequality aversion. Even though our questions reveal only whether inequality aversion is higher or lower than the threshold value of e, we can evaluate their effect by using the yes/no answers on the inequality aversion question as explanatory variables and including the values of e that were used to calculate choice options in each questionnaire as explanatory variables. The first question was:

> If your home municipality has financial difficulties, should it rather increase taxes or cut public services?

For ordered logit models we coded responses 'Cut services' as -1, 'Cannot say' as 0 and 'Increase taxes' as 1.

Similarly, we tried to explain attitudes to increased tax progression, increased unemployment insurance (UI) and unemployment assistance (UA) benefits and increased income support, always coding the respondents that preferred better benefits or higher progression as 1, respondents who would like to keep the benefits at the current level as 0 and respondents who would like to cut benefits or reduce progression as -1. All these questions were price-tagged, so that improved benefits required increasing taxes. We also provided information on current benefits and calculated the costs of changing benefits as accurately as possible. For example, on unemployment insurance we first told the respondents that

> Currently earnings-related unemployment insurance benefit for a median earner earning €2300 per month is 52% of previous earnings (€1200 per month). Unemployment insurance is financed by income taxes and unemployment insurance payments collected from both employees and employers.

We then asked:

> *Should the earnings-related benefit system be changed and, if so, in which direction?*

> 1. Increase the benefit for the median earner by 10% and finance that by increasing income taxes. For median earners, tax payments would increase by about €5 per month.
> 2. Lower the benefit for the median earner by 10%. This would allow reducing tax payment of the median earner by about €5 per month.
> 3. No, the current level is OK.
> 4. Cannot say.

The questions on unemployment assistance for those not eligible for unemployment insurance and on income support was framed in the same way, adjusting the change in the tax rates so that the reform would be revenue-neutral, assuming no effects on behaviour. Similarly, the question on tax progression involved explicit trade-

TABLE 8
IMPACT OF INEQUALITY AVERSION ON OPINIONS ON TAXATION AND BENEFITS, ORDERED LOGIT ESTIMATES

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	Increase taxes rather than cut services		Increase tax progression		Increase UI benefits		Increase UA benefits		Increase income support	
Supports	0.130	0.095	1.051	0.943	0.201	0.173	0.365	0.358	0.403	0.260
transfers	(1.61)	(0.98)	(10.00)**	(7.97)**	(2.22)*	(1.58)	(3.90)**	(3.18)**	(4.65)**	(2.54)*
$e = 2$	− 0.313	− 0.314	− 0.295	− 0.158	0.228	0.086	0.219	0.032	− 0.113	− 0.160
	(1.71)	(1.57)	(1.30)	(0.67)	(0.97)	(0.36)	(1.07)	(0.14)	(0.62)	(0.76)
$e = 3$	− 0.102	− 0.111	0.223	0.107	0.135	− 0.150	0.333	0.263	0.236	0.132
	(0.58)	(0.55)	(0.99)	(0.44)	(0.67)	(0.66)	(1.61)	(1.19)	(1.20)	(0.60)
$e = 4$	− 0.166	− 0.138	0.086	0.281	0.131	− 0.177	− 0.016	0.018	0.061	0.083
	(0.95)	(0.68)	(0.38)	(1.14)	(0.66)	(0.86)	(0.08)	(0.08)	(0.31)	(0.39)
Male		− 0.181		− 0.547		− 0.155		− 0.040		0.138
		(1.20)		(2.98)**		(0.92)		(0.24)		(0.88)
Age 25–34		0.146		0.900		0.073		0.495		− 0.178
		(0.47)		(2.40)*		(0.19)		(1.18)		(0.51)
Age 35–44		− 0.007		0.986		0.251		0.462		0.320
		(0.02)		(2.75)**		(0.75)		(1.13)		(0.92)
Age 45–54		− 0.067		1.039		0.073		0.963		0.263
		(0.22)		(2.74)**		(0.20)		(2.27)*		(0.73)
Age 55–64		0.157		1.240		− 0.098		0.705		0.533
		(0.48)		(3.19)**		(0.27)		(1.59)		(1.41)
Age $\geqslant$ 65		0.231		1.138		− 0.439		0.559		0.006
		(0.51)		(2.15)*		(0.94)		(0.97)		(0.01)
Log (income)		0.098		− 0.576		− 0.152		− 0.133		− 0.029
		(0.65)		(2.56)*		(0.79)		(0.85)		(0.20)
Unemployed		− 0.022		1.403		0.140		0.721		0.903
		(0.05)		(1.92)		(0.23)		(1.68)		(2.34)*
Pension		0.033		− 0.038		− 0.080		− 0.438		0.252
		(0.10)		(0.11)		(0.27)		(1.22)		(0.68)
Student		0.179		− 1.176		− 0.145		− 0.213		0.629
		(0.46)		(2.48)*		(0.36)		(0.43)		(1.34)
Other		− 0.724		− 0.436		0.850		0.702		0.136
		(1.63)		(1.03)		(1.37)		(1.13)		(0.37)
Secondary		− 0.146		− 0.033		− 0.313		− 0.090		− 0.129
education		(0.75)		(0.14)		(1.38)		(0.38)		(0.59)
Acdemic		− 0.076		− 0.772		− 0.326		− 0.118		− 0.155
education		(0.31)		(2.87)**		(1.15)		(0.45)		(0.58)
Right-wing,		− 0.205		− 0.110		− 0.131		− 0.187		− 0.202
scale 0–10		(5.45)**		(2.33)*		(3.31)**		(4.58)**		(4.93)**
Observations	1263	995	1022	817	944	784	966	785	1023	843

Robust z-statistics in parentheses. *Significant at 5%; **significant at 1%.

offs between tax rates of high and low income-earners, keeping the total tax revenue constant.

The results are presented in Tables 8 and 9. We used inequality aversion as implied by the 'leaky bucket' question in Table 8, and as implied by the wage compression question in Table 9. For each such question (taxes v. services, tax progression, unemployment insurance, unemployment assistance, income support), we explained the possible answers

TABLE 9

IMPACT OF INEQUALITY AVERSION ON OPINIONS ON TAXATION AND BENEFITS, ORDERED LOGIT ESTIMATES

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	Increase taxes rather than cut services		Increase tax progression		Increase UI benefits		Increase UA benefits		Increase income support	
Supports wage compression	0.507	0.462	0.759	0.726	0.263	0.245	0.350	0.249	0.445	0.300
	(5.07)**	(4.13)**	(6.57)**	(5.44)**	(2.46)*	(2.14)*	(3.33)**	(1.94)	(4.01)**	(2.51)*
$e = 2$	−0.237	−0.293	−0.103	−0.080	0.234	0.132	0.234	0.102	−0.093	−0.230
	(1.22)	(1.39)	(0.46)	(0.33)	(0.98)	(0.55)	(1.11)	(0.45)	(0.49)	(1.04)
$e = 3$	0.042	−0.034	0.161	0.072	0.147	−0.104	0.287	0.252	0.220	0.039
	(0.22)	(0.16)	(0.74)	(0.30)	(0.72)	(0.45)	(1.36)	(1.12)	(1.11)	(0.17)
$e = 4$	−0.007	−0.038	0.212	0.245	0.181	−0.140	0.022	0.050	0.109	0.014
	(0.04)	(0.18)	(0.96)	(1.02)	(0.91)	(0.67)	(0.10)	(0.21)	(0.52)	(0.06)
Male		−0.184		−0.505		−0.127		−0.017		0.157
		(1.19)		(2.71)**		(0.75)		(0.10)		(0.98)
Age 25–34		0.224		0.819		0.040		0.466		−0.244
		(0.70)		(2.03)*		(0.11)		(1.11)		(0.68)
Age 35–44		0.150		0.880		0.201		0.489		0.200
		(0.51)		(2.29)*		(0.59)		(1.18)		(0.55)
Age 45–54		0.089		0.983		0.042		0.986		0.183
		(0.29)		(2.42)*		(0.11)		(2.30)*		(0.48)
Age 55–64		0.177		1.302		−0.146		0.680		0.447
		(0.54)		(3.10)**		(0.41)		(1.52)		(1.14)
Age ⩾ 65		0.278		1.060		−0.759		0.284		−0.031
		(0.58)		(1.81)		(1.61)		(0.47)		(0.06)
Log (income)		0.043		−0.748		−0.164		−0.154		−0.091
		(0.28)		(3.58)**		(0.84)		(0.95)		(0.58)
Unemployed		−0.013		1.128		0.149		0.791		0.962
		(0.03)		(1.63)		(0.24)		(1.70)		(2.50)*
Pension		0.215		0.033		0.045		−0.267		0.296
		(0.59)		(0.09)		(0.15)		(0.69)		(0.74)
Student		0.273		−1.318		−0.143		−0.235		0.432
		(0.70)		(2.96)**		(0.37)		(0.47)		(0.92)
Other		−0.591		−0.396		0.859		0.748		0.039
		(1.17)		(0.82)		(1.46)		(1.32)		(0.10)
Secondary education		−0.137		−0.200		−0.337		−0.183		−0.159
		(0.70)		(0.82)		(1.46)		(0.74)		(0.67)
Academic education		−0.001		−0.986		−0.328		−0.205		−0.199
		(0.00)		(3.58)**		(1.15)		(0.75)		(0.71)
Right-wing, scale 0–10		−0.195		−0.105		−0.115		−0.188		−0.199
		(5.10)**		(2.31)*		(2.95)**		(4.58)**		(4.79)**
Observations	1193	947	960	777	933	779	954	781	978	808

Robust z-statistics in parentheses. *Significant at 5%; **significant at 1%.

first using only measures of inequality aversion as explanatory variables, and then by adding a set of demographic variables to the equation.

The results indicate that measures of inequality aversion are strongly correlated with opinions on the tax and benefit question. The coefficient for the answer in the 'leaky bucket' question is statistically significant in 7 out of 10 cases and the answer on the wage compression question is significant in 9 out of 10 cases. Adding control variables

typically reduces coefficients, but the effect is not very large. This is rather remarkable, given that the set of additional covariates includes a number of variables strongly correlated with inequality aversion. One could argue that, for example, the left–right dimension of political views is itself a measure of inequality aversion. Therefore, the two questions on inequality aversion appear to convey meaningful additional information about issues relevant for the design of the welfare state.

V. Conclusion

Assessing the views on the efficiency–equity trade-off is important for deriving policy recommendations at the societal level; and, as new research on the inherent human preference for fairness suggests, inequality aversion can also be instrumental in explaining individual choices. Existing evidence on the extent of inequality aversion is solely based on 'classroom' experiments. Yet, it is by now well known that the background of the experiments' subjects matters for the results. Therefore it is also worth asking to what extent the experiments' results are a reliable prediction of the behaviour of the whole population.

The purpose of this paper was to examine the extent of inequality aversion using representative survey data. The questions for assessing views on inequality were related to real economic circumstances that the respondents faced in Finland in 2006. We applied two different approaches to quantify the extent of inequality aversion also used by the earlier literature: the 'leaky bucket' and wage inequality. Each respondent was asked two questions about inequality aversion, and the level of inequality aversion was set as the same for both questions.

Our results reveal that inequality aversion can be estimated in a reliable way using survey data for both specific questions. For the 'leaky bucket' type of question we estimated that the median inequality aversion parameter lies below 0.5 (e in Atkinson's social welfare function). This is well in line with earlier evidence, such as results by Amiel *et al.* (1999), despite the fact that in our survey the respondents were not set behind a veil of ignorance. The results from the wage inequality type of question gave a completely contradictory view of the magnitude of inequality aversion, with e being greater than 3. But also this result is in line with earlier evidence in Carlsson *et al.* (2005). In this sense, our results suggest that the inequality aversion parameter values obtained from experiments can also be applicable for society as a whole.

Individuals' answers to the two inequality aversion questions were correlated in a statistically significant way, but the rank correlation coefficient was not very large. There are a large number of respondents who were willing to support narrow wage differences (at the expense of mean wage), but the same persons were not willing to carry out costly transfers from the top to the bottom of income distribution. Exactly why this was the case remains unclear, but at the very least the results suggest that the exact extent of inequality aversion is specific to the way the question is posed. Obtaining universal measures to inequality aversion therefore appears unlikely.

Finally, both measures of inequality aversion were shown to predict the respondents' opinions on the proper role of the welfare state, such as the level of taxation, tax progressivity and the scope of unemployment benefits, even after controlling for the background of respondents, including their political views. However, the revealed preference for inequality that was derived from the wage inequality question was a more robust determinant of opinions on the welfare state than the one based on the 'leaky bucket' question. Even if the exact scale of the inequality aversion the two questions

propose is different, they both appear to measure something meaningful for choices about economic policy. Society probably needs to apply different parameter values for inequality aversion in different situations.

It would be interesting to study some issues in more detail in future research. Additional experiments could be designed to shed light on why the answers on wage inequality and 'leaky bucket' questions are so different. Another topic could be to examine how the distributional tastes revealed here are correlated with, say, charitable giving at the individual level. Finally, conducting similar surveys in other countries could improve our understanding of the extent to which the preferences that people state in surveys are aligned with the distributional policies their countries conduct.

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NOTES

1. Monkeys too have been found to prefer equal distributions (Brosnan and de Waal 2003). The preference for equality may thus have an early evolutionary origin.
2. What exactly the scale means will be explained in Section II. It is derived from the concept of relative risk aversion, applied to the situation of income dispersion.
3. An alternative approach estimates implicit social welfare functions that could give rise to observed policy choices, such as tax structure; see e.g. Ahmad and Stern (1984) or Christiansen and Jansen (1978). On the other hand, the questionnaire approach has provided useful evidence on how people interpret the notions of inequality and poverty (Amiel and Cowell 1999).
4. This line of research has also attempted to separate risk aversion and inequality aversion. Kroll and Davidovitz (2003) found that, in a chocolate bar game, schoolchildren preferred an uncertain, but equal, outcome for a peer group as a whole as opposed to an uncertain individual-specific outcome, thereby revealing a preference for equality.
5. However, the experiments they consider are unrelated to the circumstances in the actual society.
6. The willingness to carry out the transfer could be different depending on what is behind the leak. This was not, however, tested in this study.
7. Since the answers are ordered, the rank correlation test is probably more appropriate than the standard chi-squared test.
8. This may be due partly to the fact that the wage level question was presented later in the questionnaire, and the respondents might have become tired of answering complicated questions.
9. For implications of this idea for cross-country differences, see Alesina and Angelotos (2005). Cappelen et al. (2006) gather experimental evidence supporting the responsibility-sensitive view.
10. The qualitative results stay the same even if the 'Cannot say' category is dropped and the model is estimated with a standard logit model.

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