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# Leaky Bucket in the Real World: Estimating Inequality Aversion Using Survey Data*

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# Abstract

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 the magnitude of inequality aversion can be measured in a meaningful way using survey data, but the estimates depend dramatically on the framing of the question. 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.

# 1. Introduction

The conflict between efficiency and equality is 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. For a review of this work, see Camerer and Fehr (2006).[1]

But a mere qualitative statement – that equality matters – is not very helpful in designing the appropriate extent of distortions the government ought to impose. For this purpose, one must measure what is the magnitude of inequality aversion of the people whose welfare the social planner wishes to maximise. The issue has been studied extensively in work on optimal income taxation (eg. Tuomala, 1990 and 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 one on the

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[1] Monkeys have also been found to prefer equal distributions (Brosnan and de Waal 2003). The preference for equality may thus have an early evolutionary origin.

Atkinson (1970) scale[2]. Dasgupta (2006) criticises 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 utilised a questionnaire approach for quantifying the level of inequality aversion.[3] Perhaps the most well-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 is, the more society averts inequality. Following this method, Amiel, Creedy and Hurn (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 formalising the efficiency-equity trade-off is to present the respondents 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, Daruvala and Johansson-Stenman (2005) found that the median inequality aversion lies between 1 and 2. Their estimate was 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 run among university students. As in other experimental work, it is not clear how well this evidence can be generalised for real populations. Even within experimental studies it has been shown that the composition of the participants (for example economics students vs. 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 hypothetical situations, where the sums of money are unrelated to any real-world situation the respondents are familiar with.

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[2] What the scale exactly means will be explained in Section 2. 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, for instance, Ahmad and Stern (1984) or Christiansen and Jansen (1978).
[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, thus revealing a preference for equality.

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 the respondents face. In our survey the leaky bucket question asks about the willingness to adjust the tax schedule so that those in the highest income decile pay 100 EUR more and only part of the money reaches the lowest decile. The wage distribution question asks the respondents to compare the existing Finnish wage distribution (without telling the respondents this) and alternative distributions with a higher mean and a larger dispersion of income.

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 then use this measure in explaining the choices in inequality aversion questions. One is therefore able to compare the relative importance of the direct effect on the respondents themselves and a general preference for equity. In this sense, our paper is most closely related to the work by Beckman et al. (2003) who examine how the actual position of respondents affect the answers in a leaky bucket experiment.[5]

We present the same individuals with questions on both leaky bucket and 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 a change in the framing of a question 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. We evaluate whether the revealed extent of inequality aversion predicts attitudes towards the desirability of income transfers and tax progression. 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).

While our 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. Similarly to them, we also explain the determinants of the aversion parameter and test its validity in predicting other opinions

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[5] However, the experiments they consider are unrelated to the circumstances in the actual society.

or deeds – health behaviour in the case of risk aversion and support for the welfare state in the case of inequality aversion – that are related to the same economic sphere.

The paper proceeds as follows. Section 2 describes the survey and the key questions used. Section 3 presents the results, while Section 4 examines how the individuals' background affects their choices. Section 5 looks at the role of inequality aversion as an explanatory variable for opinions on the welfare state. Section 6 concludes.


## 2. Data and methodology

The data is based on a random sample of 3,000 Finnish people between 18 and 75 years of age. These individuals received a detailed questionnaire on their opinions of 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 non-random attrition in our survey, we re-weighted the data using information from the annual tables of the latest available Labour Force Survey 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 similar cross-classification table based on estimated population frequencies in the Labour Force Survey. 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 re-weighting the data, the gender, age, education and main activity distributions in the survey correspond exactly to those in the Labour Force Survey. Re-weighting therefore removes any systematic bias in the responses that is due to different response rates across these categories. All tables and estimation results are based on the weighted data.

*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 function is given by

$$U = a + b\frac{x_i^{1-e}}{1-e}, \qquad \text{for } e \neq 1$$

$$\tag{1}$$

$$U = a + b\ln x_i, \qquad \text{for } e = 1,$$

where $x$ denotes income of person $i$, $e$ refers to the extent of inequality aversion, and $a$ ja $b$ are other parameters. 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 values answered by the respondents as parameters of this social welfare function. We can therefore compare the survey respondents' answers to those derived in experiments in earlier literature. In Section 4, 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 is 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:

$$l = \frac{dx_{10} - dx_1}{dx_{10}} = 1 - \left(\frac{x_1}{x_{10}}\right)^e, \tag{2}$$

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 set-up are of key importance, we decided to ask each respondent only one question, where the loss parameter had been calculated based on 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 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 EUR per month, is increased. The money is spent for the benefit of those low-income earners whose disposable income is less than 800 EUR 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 EUR paid by the high-income earners, only 25 EUR can be spent for the benefit of low-income earners.*

*Are you still in favour of this proposal?*
*1.	Yes*
*2.	No*
*3.	I do not know*

Table 1 below depicts the loss percentage and the EUR value the low-income earner gets for the different values of $e$.

*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 |

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[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 paper.

Once we have a large number of respondents, the distribution of the inequality aversion parameter can be estimated, even though each individual only answers a question calculated based on a single value for $e$. For example, if the majority of respondents rejects the transfer when the loss is calculated according to $e = 3$, but accepts 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.

*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 pre-tax wages is used, since we believe that the public has a better understanding of gross rather than 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. Based on this distribution, we calculated three wage levels, corresponding to the median and the upper threshold of the 1$^{\text{st}}$ and the 9$^{\text{th}}$ decile. We then increased the mean income level by 10 percent, 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. With log-normal wage distribution, it can be shown that society is indifferent between the original distribution with mean $m$ and variance $s^2$ with an alternative less equal distribution $(\hat{m}, \hat{s}^2)$ if

$$\hat{s}^2 = s^2 + 2\big[\log(\hat{m}) - \log(m)\big]/e \qquad (3)$$

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 where centralised wage bargaining is the norm, and therefore the question was also framed with this situation in mind. For $e = 1$, the question was the following:

*'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 EUR in a month, a person with average income earns 2340 EUR and a person belonging to the highest decile earns 3480 EUR.*
2. *Income differences rise and the average income is increased so that the low-income earner gets 1280 EUR per month, the person with average income gets 2580 EUR and the high-income earner 5190 EUR.*
3. *Cannot say.*

Table 2 below 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 $e = .5$ | 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 |

## 3. 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 a sense that when the share of leakage (and $e$) goes up, the support for the transfer diminishes. Note also that the majority of the respondents do not support 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.

*Table 3: Support for the transfer in a leaky bucket question for different values of e, %.*

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

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, based on 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).[7]

*Table 4: Support for more equal wage distribution for different values of e, %.*

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

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[7] The fraction of respondents who could not answer the leaky bucket question (33%) was 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%). This may be partly due to the fact that the wage level question was presented later in the questionnaire, and the respondents may have become tired in answering complicated questions.

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 mainly caused by the fact that many respondents support the compressed wage distribution but oppose transfers.

*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 |
|  |  | 19.41 | 17.23 | 63.37 | 100.00 |
|  | Cannot say | 26 | 144 | 216 | 386 |
|  |  | 6.74 | 37.31 | 55.96 | 100.00 |
|  | Yes | 22 | 68 | 229 | 319 |
|  |  | 6.90 | 21.32 | 71.79 | 100.00 |
|  | Total | 146 | 299 | 765 | 1,210 |
|  |  | 12.07 | 24.71 | 63.22 | 100.00 |

Pearson chi2(4) = 83.3363   Pr = 0.000 Spearman's rho =     0.0840 Kendall's tau-b =     0.0788
Notes: the alternatives for each respondent are calculated using the same value for *e*.

Several reasons for 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 trade-off in different situations. In our case, it is plausible that people support a 'fair' wage policy but do not support unconditional transfers to those who are not working. Preferences according to which social transfers should be linked to the obligation to work are not captured in the leaky bucket question.[8]

Second, the two questions may 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.

Third, it may well be the case that the assumption of the constant elasticity of inequality aversion is 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

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[8] This reasoning can be linked to the idea in Alesina and Angelotos (2005), who study how redistribution is shaped by society's belief in to what extent income differences are fair (related to people's talent and effort) or not (owing to luck). Perhaps some of our respondents thought that income transfers to those outside the labour force would not be fair.

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 foregone wage increases. Thus 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 exists, but it is different in different circumstances.

# 4. 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 will 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. All others' income will remain the same. The persons in the tenth decile always lose 100 euros 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' household. The modified OECD scale is used as an equivalence scale.

*Table 6: Results by the respondent's own position, averaged over different values of e.*

|  |  | Supports the transfer | Supports more equal wage distribution |
|---|---|---|---|
| **Winners** |  |  |  |
|  | yes | 39.5 | 55.6 |
|  | no | 36.4 | 37.3 |
|  | cannot say | 24.1 | 7.1 |
| **No change** |  |  |  |
|  | yes | 25.4 | - |
|  | no | 39.6 | - |
|  | cannot say | 35.0 | - |
| **Losers** |  |  |  |
|  | yes | 10.0 | 61.7 |
|  | no | 75.6 | 20.6 |
|  | cannot say | 14.7 | 17.7 |

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 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 the transfer. This suggests that other concerns than one's own position also matter for the opinions.

In a similar way, we calculated the change in the wage level the persons 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 among the losers, the 'cannot say' category is much larger 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. Consider the case where the individual can have a utility function

$$u = u(x^i, \boldsymbol{m}, \boldsymbol{s}), \tag{4}$$

where $x^i$ refers to his or her own income, $\boldsymbol{m}$ is the mean income in society and $\boldsymbol{s}$ is some measure of the income dispersion. The individuals can therefore care not only about their own income, but also what happens to others in society. Individuals may value efficiency, reflected by the mean income, or the distribution of income, reflected by $\boldsymbol{s}$.

In our case we offer each individual a choice between two different societies. Since the mean income and income differences are tied together for each value of $e$, we cannot separately identify their effects. Given the individual's own income, we can calculate the difference in their income between the two choices. Likewise, we can calculate the change in income distribution in the two societies. We can then estimate the choice probabilities using Random Utility Model, made famous by McFadden (1974). In our case, the probability of choosing society 1 over choosing society 2, i.e.

$$P(choice_1 / choice_2) = f(dx^i, d\boldsymbol{s}, Z), \tag{5}$$

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

We assumed that the "cannot say" -category implies indifference between the options and used an ordered-logit model, where the support for the transfer and the support for a more equal wage distribution, respectively, were explained by the change in the respondent's own position and in income distribution. We used a simple measure of dispersion, 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 that depend on the four different values of $e$.

In addition to the basic models, we also run specifications with control variables. As additional explanatory variables we include sex, age, education, income, main activity and whether the respondent has a spouse and whether she/he has 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 income differences arose to a large extent from differences in how hard-working the 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 matter for 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 the opinions about the wage structure. The distributional concerns are, however, significant, again in particular when control variables are included.

The results concerning the other variables can reveal information on what determines the opinions about redistribution when one already controls for the individual's own position and the efficacy of the policy to reduce income differences. Not many of these other explanatory variables are significant, but those which are have reasonable signs. Having high education reduces the support for the transfer. Students probably look forward to 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 thinks 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 only significant for the opinion about the transfer, whereas the view of the causes of income differences is significant only for the view of wage differences.

**Table 7: Ordered logit estimation results.**

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

Robust z-statistics in parentheses
* significant at 5%; ** significant at 1%
The number of observations is smaller in the latter two columns, since it is
only run among respondents who have wage income

To sum up the analysis of this section, one notices that the respondent's own position is indeed important for part of our analysis. But the respondents' 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.

## 5. Relation to other views about the welfare state

The purpose of this section is to assess to what extent inequality aversion is related to the respondents' views of the welfare state that they expressed when answering 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 previously 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 only reveal 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 euros per month is 52 per cent of previous earnings (1200 euros/month). Unemployment insurance is*

*financed by income taxes and unemployment insurance payments collected from both employees and employers*

and then asked:

*Should the earnings-related benefit system be changed and, if so, to which direction?*
1. *Increase the benefit for the median earner by ten per cent and finance that by increasing income taxes. For median earners tax payments would increase by about 5 euros per month.*
2. *Lower the benefit for the median earner by ten per cent. This would allow reducing tax payment of the median earner by about 5 euros 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-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. In Table 8 we use inequality aversion implied by the leaky-bucket question and in Table 9 wage compression question. For each opinion question (taxes vs. services, tax progression, unemployment insurance, unemployment assistance, income support) we first explained the answers 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 the opinions on the tax and benefit question. The coefficient for the answer in the leaky bucket question is statistically significant in seven out of ten cases and the answer on the wage compression question is significant in nine out of ten 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.

**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 >= 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%

*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 | 0.507 | 0.462 | 0.759 | 0.726 | 0.263 | 0.245 | 0.350 | 0.249 | 0.445 | 0.300 |
| wage compression | (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 | | -0.137 | | -0.200 | | -0.337 | | -0.183 | | -0.159 |
| education | | (0.70) | | (0.82) | | (1.46) | | (0.74) | | (0.67) |
| Academic | | -0.001 | | -0.986 | | -0.328 | | -0.205 | | -0.199 |
| education | | (0.00) | | (3.58)** | | (1.15) | | (0.75) | | (0.71) |
| Right-wing | | -0.195 | | -0.105 | | -0.115 | | -0.188 | | -0.199 |
| scale 0-10 | | (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%

# 6. 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 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 could be estimated in a reliable way using survey data for both specific questions. For the leaky bucket type of questions, we estimated the median inequality aversion parameter to lie below 0.5 ($e$ in Atkinson's social welfare function). This is well in line with earlier evidence, such as results by Amiel at 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 opposite view about 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.

The 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 persons who are willing to support narrow wage differences (at the expense of mean wage), but the same persons are 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 framed. 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. One topic could also be to examine how the distributional tastes revealed here are correlated with, for instance, charitable giving at the individual level. Finally, conducting similar surveys in other countries can improve our understanding of the extent to which the preferences people state in surveys are aligned with the distributional policies that countries conduct.

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