



**TURUN  
YLIOPISTO**  
UNIVERSITY  
OF TURKU

# ESSAYS ON BEHAVIORAL PUBLIC ECONOMICS

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Satu Metsälampi





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## ABSTRACT

This compilation thesis studies empirically questions related to public and behavioral economics using lab and field experimental methods. Two of the essays integrate survey and individual level administrative data. The essays explore image and positional concerns and provide new insights into the nature of social preferences.

The first essay investigates the effects of tax reporting institutions on market outcomes and tax evasion using a lab experimental double auction market and finds that third-party-reporting effectively deter evasion. However, when sellers can unilaterally evade taxes, prices are higher than expected with the tax burden falling more heavily on buyers. A model incorporating lying aversion, or lying aversion and image concerns best explains our results.

The other three essays explore causes and consequences of income comparisons using a survey experiment on a general population sample of Finnish adults. Respondents are randomized into receiving information about their income rank in age, occupational, educational, municipality or national distribution. The second essay studies the effects on individual welfare and find that new information about income rank affects income satisfaction and perceived fairness, with varying effects across reference groups. Information about national rank has no discernible impact.

The third essay asks whom do people compare themselves to, and why, using data from an experimental condition that allowed respondents to choose which rank was revealed to them. Nearly half of the respondents preferred learning their rank within their occupation, while only six percent showed interest in national rank. No differences in welfare were found between assigned and chosen rank information.

The fourth essay investigates the effect of rank information on risk-taking. We show that both perceived and actual income rank predicts risk-taking, but find no effects of providing rank information.

**KEYWORDS:** Relative position, individual welfare, fairness, comparison group, information provision experiment, tax evasion, image concern

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## TIIVISTELMÄ

Tämä kokoelmaväitöskirja tutkii empiirisesti käyttäytymis- ja julkistaloustieteeseen liittyviä kysymyksiä hyödyntäen kokeellisia menetelmiä. Kaksi esseistä yhdistää kyselyn ja yksilötason rekisteritiedot. Esseet käsittelevät imagoon ja suhteelliseen asemaan liittyviä huolia ja tarjoavat uusia näkökulmia sosiaalisten preferenssien luonteesta.

Ensimmäinen essee tutkii veroraportointi-instituutioiden vaikutuksia markkinatulemiin ja veronkiertoon laboratorionkokeellisilla double auction -markkinoilla ja osoittaa, että kolmannen osapuolen raportointi estää tehokkaasti veronkiertoa. Myyjien voidessa yksipuolisesti kiertää veroja, hinnat ovat odotettua korkeammat ja verotaakka lankeaa pääosin ostajille. Valehteluaversion, tai valehteluaversion ja imagohuolet käsittävä malli selittää parhaiten tuloksiamme.

Kolmessa muussa esseessä tarkastellaan tulovertailujen syitä ja seurauksia suomalaiselle aikuisväestölle kohdennetun kokeellisen kyselyn avulla. Kyselyssä satunnaistetaan vastaajat saamaan tietoa sijoituksestaan ikä-, ammatti-, koulutus- taso-, asuinkunta- tai kansallisessa tulojakaumassa. Toisessa esseessä tutkitaan vaikutuksia yksilön hyvinvointiin ja todetaan, että uusi tieto tulossijoituksesta vaikuttaa tulotyytyväisyyteen ja koettuun oikeudenmukaisuuteen, ja vaikutukset vaihtelevat vertailuryhmien välillä. Tiedolla kansallisesta sijoituksesta ei ole havaittavissa olevaa vaikutusta.

Kolmas essee kysyy, keneen ihmiset vertaavat itseään ja miksi he vertaavat, kun vastaajilla on mahdollisuus valita, mikä tulopistesijoitus heille paljastetaan. Valtaosa halusi tietää sijoituksensa ammattiryhmässään, ja vain kuusi prosenttia oli kiinnostunut kansallisesta sijoituksesta. Eksogeenisesti määrättyjen ja itse valittujen tulopistetietojen vaikutuksissa hyvinvointiin ei havaittu eroja.

Neljäs essee tutkii sijoitustiedon vaikutusta riskinottoon. Esseessä osoitetaan, että sekä koettu että todellinen tuloasema ennustaa riskinottoa, mutta tuloasemaa koskevien käsitysten oikaisemisen ei havaittu vaikuttavan riskinottoon.

ASIASANAT: Suhteellinen tuloasema, hyvinvointi, oikeudenmukaisuus, vertailuryhmä, informaatiokokeet, veronkierto, imagohuolet

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5.4.2025

*Satu Metsälampi*

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# List of Original Publications

This dissertation is based on the following original publications, which are referred to in the text by their Roman numerals:

- I Kotakorpi<sup>Ⓘ</sup>, Kaisa; Tuomas Nurminen; Topi Miettinen; Satu Metsälampi. Bearing the Burden — Implications of Tax Reporting Institutions on Evasion and Incidence. *Journal of Economic Behavior & Organization*; 2024; 220: 81–134.
- II Xu, Xiaogeng; Satu Metsälampi; Michael Kirchler; Kaisa Kotakorpi; Peter Hans Matthews; Topi Miettinen. Which Reference Groups Matter and How? A Relative Income Information Experiment with Administrative Data.
- III Metsälampi, Satu; Xiaogeng Xu; Michael Kirchler; Kaisa Kotakorpi; Peter Hans Matthews; Topi Miettinen. Which Ponds Do We Choose, And Why? Choices of Income Reference Group and Its Consequences.
- IV Metsälampi, Satu; Xiaogeng Xu; Michael Kirchler; Kaisa Kotakorpi; Peter Hans Matthews; Topi Miettinen. Effect of income rank information rank on risk taking.

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# 1 Introduction

This dissertation contains four essays in the fields of behavioral and public economics. All the essays in this dissertation use experimental research methodology. Essay I studies the causal effects of tax reporting institutions and how these institutions interact with non-pecuniary motivations such as preferences for truth-telling. Essays II-IV explore the causes and consequences of income comparisons. In essays II and III we ask: Who do we compare ourselves to, and why do we compare? What are the consequences of these comparison on subjective well-being? Essay IV investigates how income comparisons influence a key determinant in economic decision-making—risk-taking. Sections 1.1 and 1.2 provide an overview of the themes addressed in these essays.

Given the centrality of the design of data collection in experimental and survey research, the second half of this introductory chapter is dedicated to discussing these methods in relation to the studies included in this dissertation. I conclude the chapter by discussing ways to improve the reliability, transparency and reproducibility of (experimental) social science.

## 1.1 Tax evasion, reporting and incidence

Tax evasion is a central issue in public economics as it affects the distribution of the tax burden and takes up a large share of the costs of raising taxes (Slemrod et al., 2016). Tax evasion results in horizontal inequity when equally well-off individuals end up with different tax burdens; individuals differ in their attitudes towards taxation and risk, for instance, and have different opportunities and rewards for evasion, and therefore individuals with the same tax liability do not evade taxes in equal amounts. Vertical inequity concerns may rise when, for example, enforcement efforts concentrate on the income sources and reporting of lower income individuals. The efficiency costs of evasion relate to tax payers efforts in disguising non-compliant activities, and the costs that third-parties bear for information reporting and with-holding. Moreover, tax evasion provides incentives to engage in activities in which it is relatively easy to evade taxes, distorting the allocation of resources. (Slemrod et al., 2016)

Early models and empirical work in public finance approached tax evasion as a decision with risk (Allingham & Sandmo, 1972; Yitzhaki, 1974): The individual chooses the extent of tax to be evaded, subject to probability of being caught and punished, to maximize expected utility. Subsequent empirical work has shown, however, that the expected utility maximization framework is unable to explain many empirically observed features of tax evasion (Myles, 2004). This has led to the incorporation of non-pecuniary motivations and factors not included in the expected utility framework in the study of tax evasion. Surveying the evidence from lab, field and natural experiments, (Luttmer & Singhal, 2014) conclude that “tax morale”, defined in this broad sense, is an important component of tax compliance.

In the “tax-systems” framework proposed by (Slemrod & Gillitzer, 2014) economic agents’ reactions to taxation depend on all the design features of a tax-system. A tax-system is a set of rules, regulations and procedures, which define tax liability (i.e. tax bases and rates), remittance rules (who remits the taxes) and the enforcement rules. Enforcement rules relate to the procedures designed to increase compliance, including audits and penalties. They also include the third-party information reporting requirements, which have been shown to be key in deterring evasion (e.g. Kleven et al., 2011; Dina Pomeranz, 2015), undermining the explanations based on moral motivations in tax evasion. However, as we argue in Essay I, understanding how intrinsic motivations interact with the incentives generated by the tax-system may be important in understanding how economic agents react to taxation.

In Essay I, “Bearing the Burden — Implications of Tax Reporting Institutions on Evasion and Incidence”, we study the effects of tax reporting institutions on tax evasion, pricing, quantities sold and tax incidence in the context of commodity taxation. We design a lab experiment in which the decision environment mimics some features of tax-reporting institutions encountered in many countries. The design allows us to investigate the effects of tax reporting institutions on both real responses, i.e. responses related to market behavior, and compliance, which are difficult to disentangle with field data. In our experiment we impose exogenous variation also in the incentives of providing third-party information which also allows us to investigate whether reporting costs facilitate tacit collusion among market participants and how this might affect market outcomes.

The outcomes in the benchmark treatments correspond to theoretical predictions of competitive equilibrium. Moreover, we find that reporting responds to the intensity of deterrence, broadly in line with the standard, self-interested theory (Allingham and Sandmo) and literature on third-party information reporting (Kleven et al., 2011), but the results also suggest that reporting is also affected by intrinsic costs related to lying. Moreover, when sellers can unilaterally evade taxes, prices do not fully reflect the lower taxes of the evaders which causes results in a heavier tax burden on the buyers.

In other words, the comparative statics of reporting behavior seem to be consistent with the standard self-interested model, while market behavior does not.

We discuss various mechanisms that may explain why incidence is heavily distorted towards buyers when sellers can unilaterally evade. First, we argue that our findings are not explained by risk aversion—an explanation explored in Doerrenberg & Duncan (2019)—or behavioral explanations including intrinsic generosity towards the state. We show that our results can be reconciled in a framework building on Gneezy et al. (2018) and Abeler et al. (2019) with moral motivations in the form of lying costs and image concerns: Sellers can privately (under-)report their trades, but the desire to appear honest prevents them from offering “too low” prices at the market stage. Hence even while market competition leads to lower prices in the presence of evasion, prices do not fully reflect the lower monetary costs of evaders. The mechanism we propose is also in line with more recent work by Lane et al. (2023) concerning the expressive function of the law. They show with a large-scale experiment that laws can causally affect social norms, consistently with a model with image concerns; individuals care about the inferences others make about their underlying, unobservable characteristic, i.e. pro-sociality.

In our experiment, if buyers take into account the potential indirect effect of tax evasion on prices, they should not provide reports that enable stricter tax enforcement. Nevertheless, we find that introducing buyer reporting has a very strong disciplining effect on evasion. Buyers and sellers are thus unable to tacitly collude on an outcome with a lower level of reporting, even though it would be in their joint monetary interest. We show in our theoretical model, that also this finding can be explained by moral motivation: even very little (some) intrinsic motivation to report honestly is sufficient to destabilize the collusive equilibrium when buyer reporting is costless (costly).

## 1.2 Causes and consequences of social comparisons

Essays II-IV of this compilation thesis explore some of the determinants and consequences of social comparisons. These essays use data collected for our project “Causal Study of the Effects of Personal Relative Income Information” funded by the Research Council of Finland. The project is a collaboration with Statistics Finland (SF) and uses individual level administrative data linked to survey data to investigate how relative concerns impact individual welfare, preferences, political attitudes and beliefs, as well as actual decisions such as educational choices and job changes. More precisely, we focus on the effects of relative standing in the distribution of *disposable income*, in line with research emphasizing the view that positional concerns are often rooted in relative private consumption (e.g. Veblen (1899), Frank (1985), Corneo & Jeanne (1997)).

For this project we invited 20,000 35–45 years old Finnish adults to take part in an online survey experiment. The survey is personalized to each respondent using income rank and reference group information from SF’s administrative records. The identification relies on an information provision protocol (discussed in more detail in section 1.3.2), in which we randomize respondents to receive information concerning their relative income among (Finnish) individuals born in the same year, who have the same level of education, who have the same occupational group, who reside in the same municipality, or among all adult Finns. Participants in the control group do not receive any information, while individuals in exogenous information treatments are randomly assigned to receive information about their rank in one distribution, e.g. among individuals who live in the same municipality. In addition, we have a so-called endogenous information treatment in which participants get to choose which reference distribution information they receive. I discuss the themes of the essays in more detail in the following two subsections.

### 1.2.1 Social comparisons

That “men do not desire to be richer, but richer than other men” (Luttmer, 2005; [John Stuart Mill])—the idea that we compare ourselves to others, and that these comparisons influence our behaviour—has been acknowledged in social sciences, and studied systematically in sociology, psychology and economics. The modern literature on comparisons, reviewed in Clark & D’Ambrosio (2015), can be attributed to Festinger’s (1954) social comparison theory in psychology, and Duesenberry (1949) in economics. In his book *Income, Saving and the Theory of Consumer Behavior* Duesenberry (1949) proposes what has become known as the relative income hypothesis, which asserts that an individual’s relative standing affects, in addition to subjective well-being, her saving and consumption behavior. A prominent example of a study exploring the relative income hypothesis is Kuhn et al. (2011) showing that as individuals won luxury cars in a lottery, purchases of luxury cars in their whole neighborhoods increased as well. Some studies even suggest that relative income matters more to reported SWB than absolute income (e.g. Boyce et al. (2010; Clark et al. (2008)). By now, the relationship between relative income and subjective well-being has been well-established, but the question “relative to whom?”, i.e. how reference groups (Hyman, 1942; Merton, 1968) are determined, remains unanswered (Ferrer-i-Carbonell, 2013).

To whom we compare ourselves is inevitably linked to the question of *why* we engage in comparisons. Page (2022) argues that there are, broadly speaking, two reasons for social comparisons. First, comparison information helps set aspirations by identifying the range of outcomes that are within an individual’s reach and informs about current and past choices by showing what could be or could have been; it helps

make better decisions (Kubitz & Page, 2024). Second, comparisons relate to competition for status: status is valuable in itself as it reflects the social value that others assign to an individual and thereby impacts access to resources and partnerships.

According to Kubitz & Page (2024), both of these motivations shape the selection of peer groups via the effects they have on subjective well-being. On the one hand, the positive effect on satisfaction that arises from doing better than one's peers may motivate to choose a peer group so that it enhances well-being (see also e.g. Frank (1985)). On the other hand, choosing an “inconvenient” peer group helps in setting goals and adjusting aspirations to a higher level. In other words, people compare to peers whose success aligns with their beliefs about their own potential. Even if comparison information is unfavourable and can therefore negatively impact happiness, it can enhance well-being if it shapes expectations about future outcomes. (Kubitz & Page, 2024)

In Essay III “Which Ponds Do We Choose, And Why? Choices of Income Reference Group and Its Consequences” we study the relationship between subjective well-being and income comparisons. First, we describe the comparisons people engage in when given a choice between several reference groups —compatriots, educational or occupational peers, age cohort, or residents in the same municipality— and the stated motivations behind these comparisons. Second, we investigate the associations with subjective well-being. Our results indicate that the choices and the reported motivations for that choice align with comparisons that are actionable: Almost half of the participants choose occupational peers as a reference group, and fewer than 10% choose residents of the same municipality or all their compatriots. An often indicated motivation for choosing occupation is the intent to use the information, and the most commonly cited reason, not only for choosing occupation, but overall, is a desire to confirm an expected low rank. We interpret this reason as consistent with actionable (un)fairness motives (see also Almås et al. (2020)).

## 1.2.2 Effects of social comparisons on happiness

In Kubitz & Page's (2024) framework, happiness is reward system shaped by evolution that works as a guide to action.<sup>1</sup> In hedonic psychology, “happiness”, or

<sup>1</sup> More precisely, (Kubitz & Page, 2024) formulate a model about utility as a reward system that motivates individuals to make the best possible decisions. In their framework, an optimal system consists of a reference dependent utility function that adapts to expectations. The model reconciles two empirically established behavioral patterns: anticipatory utility, i.e. satisfaction associated with having high aspirations, and loss aversion relative to a reference point by encouraging calibrating the reference point to a “correct” level of expected potential, encouraging high aspirations while decreasing both over-pessimism and over-optimism.

“subjective well-being” (SWB), is defined as the overall goodness or badness of an individual’s felt experience at any given time, and as such it is distinct from (decision) utility, which has typically been the focus of modern economics (Kimball & Willis, 2023). By contrast, an older tradition (Dhami, 2016b; [Bentham, 1798]) did emphasize the hedonic experience associated with an outcome. SWB cannot be directly observed and inferred from choices, but requires relying on “expressed preferences”, and while there is some skepticism among economists concerning self-reported, non-incentivized measures, empirical evidence indicates a plausible link between these measures and important economic choices (Dhami, 2016b), such as job quits (Clark, 2001). Oswald et al. (2015) show that an exogenous increase in positive affect causally increases productivity.

Kimball & Willis (2023) posit that utility is the extent to which people get what they want, while happiness, or *affect*, is how they feel, and that these two are systematically linked. In their framework, affect consists of two components: 1) a short-lived sensation, *elation*, which depends on recent news about lifetime utility, and 2) *baseline mood*. Baseline mood is a “valuable commodity” akin to health, i.e. an output of a household production function that cannot be purchased directly. (Kimball & Willis, 2023) It is a long-run response to circumstances, and not directly linked to utility. By contrast, elation relates to an individual’s reaction to recent news about lifetime utility and thus provides information about preferences. Kimball & Willis (2023, p.36) argue that elation is important despite its short duration; in fact, it can be “extremely important as a signal of important utility-relevant news related to the long-term welfare of the individual”.

Essay II “The Welfare Consequences of Learning Where One Stands: Evidence From A Large Field Experiment” builds on the observation that income comparisons are ubiquitous and systematically related to subjective well-being (e.g. Clark & Senik (2010)), yet there is little empirical work studying whether the relationship is causal, and if so, which income comparisons are most consequential. In this essay we study how receiving personal relative income information about a given reference group causally impacts SWB, and compare the causal effects across reference groups. The reference groups are compatriots, educational or occupational peers, age cohort, or residents in the same municipality. The post-treatment questions concerning subjective well-being (discussed in Essays II and III) measure different dimensions of affect, and the elation component of affect, in particular.

We find a robust causal effect of relative income information on income related satisfaction measures, and the effects are stronger for information concerning educational level and occupational peer groups, and weakest for the national reference group. These effects are in general consistent with the choices concerning reference distribution information reported in Essay III. Moreover, comparisons in

Essay III show that the effects of chosen and randomly assigned relative income information on subjective well-being are broadly similar.

### 1.2.3 Effects of social comparisons on risk-taking

Most economically meaningful decisions involve uncertain outcomes, and therefore risk preferences have far-reaching implications for the individuals themselves, and societies, more broadly. Moreover, there is mounting evidence that risk-taking is linked to inequality and positional concerns. For example Pickard et al. (2024) show a robust, positive, correlation between income inequality and propensity for risk-taking using large-scale, globally representative survey data. They propose that the relationship is causal: Falling behind relative to one's reference group increases willingness to take risks. This argument is in line with a rich literature studying how social reference points, i.e. reference points stemming from social comparisons such as peer outcomes, affect risk-taking. These are grounded in Prospect Theory (PT, introduced in Kahneman and Tversky (1979), which is one of the most influential accounts of decision making under risk (Dhimi, 2016a). In PT, the decision maker evaluates losses and gains against a reference point which partitions the domain of outcomes to losses and gains. There are differences in behavior in gains and losses; decision makers exhibit loss aversion, i.e. individuals dislike losses more than like equally sized gains. (Kahneman & Tversky, 1979)

The determination of reference points remains an open question, however. Often studied reference points can be based on the prevailing circumstances, e.g. the given endowment, or as the decision maker's expectations (Kőszegi & Rabin, 2007). In Kubitz & Page's (2024) framework (also discussed in section 1.2.1) reference points are expectations about the best possible achievement available to the decision maker, and social comparisons offer a way to calibrate these beliefs. Multiple lab studies (e.g. Rohde & Rohde, 2011; Linde & Sonnemans, 2012; Fafchamps et al., 2015; Gamba et al., 2017; Schwerter, 2024) have investigated the impact of different social reference points. These studies find that social reference points may affect risk-taking as predicted by PT. Schwerter (2024) shows that relative concerns may matter independently of public recognition (see also Dijk et al. (2014)).

Essay IV "Effect of income rank information on risk taking", explores the relationship between positional concerns and several dimensions of risk-taking. As the title suggests, we investigate the causal effects of receiving information about one's income rank relative to a reference group on risk taking as measured in our survey experiment: self-reported willingness to take risks, self-reported intentions to invest or gamble and actual decisions to purchase lottery tickets. We find that relative income, and *perceived* relative income in particular, predicts risk-taking. However,

treating individuals with information concerning their actual rank does not meaningfully impact risk-taking.

## 1.3 Methods

In economics, choices are typically viewed as a combination of preferences, beliefs, and constraints. In experimental research, the experimenter alters some feature of the choice environment to study what and how choices are made. In the lab experiment reported in Essay I, the experimental variation concerns the *constraints* of the choice environment, i.e. the tax reporting institutions, faced by the study participants. As I argue in section 1.3.1, the lab experimental method is particularly well suited for this type of research. Information provision experiments, on the other hand, vary the information set available to the individual and thus affect *beliefs* or *perceived constraints* (Haaland et al., 2023). The studies reported in Essays II-IV of this dissertation rely on this type of identification; causing exogenous variation in *beliefs*. I discuss the methodological aspects of information provision experiments in section 1.3.2. I close this section by describing and motivating the adoption of practices aiming at improving the quality of experimental social scientific research.

### 1.3.1 Controlled variation using the established procedures of an economics lab environment

Essay I, “Bearing the Burden — Implications of Tax Reporting Institutions on Evasion and Incidence”, reports on the results of a lab experiment. In our study we set-up induced cost and value double auction markets (Smith, 1962) in which we generate controlled variation in taxation and tax reporting across subjects to study the effects on reporting, market prices, quantities and tax incidence. The experimental continuous double auction market provides a good foundation to study tax incidence because careful experimentation has shown that it generates Walrasian competitive equilibrium outcomes when the market has converged (Friedman, 2018), and it has been used in the context of taxation (e.g. Borck et al., 2002; Cox et al., 2013; Doerrenberg & Duncan, 2019).

Much of the empirical work on deterrence, reviewed in (Antinyan & Asatryan, 2019; D. Pomeranz & Vila-Belda, 2019) has focused on reporting responses, and in general they reporting and other behavioral responses are difficult to disentangle using field data. The precise control over the decision environment and the implied high degree of internal validity of lab experiments (e.g. Dhimi, 2016c) allows us to provide insights that are complementary to other field evidence. In particular, the lab setting allows us to isolate the variables of interest to identify causal effects of different reporting institutions on both compliance and pricing behavior. In addition,

as we argue in Essay I, it allows us to study the behavior of agents when they have had the opportunity to learn about others' behavior and the implied audits and effective taxes. This permits studying causal effects when markets have settled to an equilibrium.

We designed the experiment and conducted the data collection following closely the established protocols and using the standard tools of experimental economics, which have been developed to guarantee a high degree of internal validity. These include e.g. piloting and testing the clarity of experimental instructions, randomizing participants into treatments and participant roles, and credibly ensuring participants' anonymity. The experiment was programmed using zTree (Fischbacher, 2007), and the recruitment of study participants was carried out with ORSEE software (Greiner, 2015).

The experimental sessions were conducted on-site at the University of Turku's PCRClab. The experiment is quite complex, with lengthy instructions, and required sustained high-speed, real-time interaction between participants. The physical lab environment and accompanying procedures serve this type of research particularly well (Charness et al., 2023). By design, it increases social engagement, and seeing other participants confirms that the interactions are with other real individuals. Reading instructions out loud establishes common knowledge, and the physical, observable, procedures increase the credibility of randomization and salience of incentives with the immediate provision of cash payments on-site (Charness et al., 2023). The physical lab also offers strict control over the information environment by preventing access to external information, and, importantly, controlling access to information from other participants. In our experiment, credibly preventing explicit collusion among subjects is crucial.

A commonly voiced criticism of lab experiments concerns the use of convenience samples, i.e. university students as subjects, and relates to worries about external validity (e.g. Dhimi, (2016c); see e.g. Camerer (2015) for a discussion and evaluation of generalizability of experimental economics). Using students as subjects as we do in this experiment, has several advantages, however. Students are on average better posed to understand complicated instructions, and ask clarifying questions if they don't understand something. Snowberg & Yariv (2021) show that even as results are qualitatively similar in student and general population samples, the level of noise is lower in student subjects than general population samples. Relatedly, Rigotti et al., n.d.) find that noise levels are lower in on-site than in online experiments. These results speak in favor of a lab experiment with a student sample despite the possible reductions in external validity. To improve external validity in our experiment, we paid out the tax revenue collected in the experimental sessions to the state tax authority, and this was known to the participants.

### 1.3.2 Information provision survey experiments

The provision of cleanly identified evidence by only varying a particular feature of the choice set has led to a growing literature using information provision experiments in public economics, political economy, health, labor and education economics and household finance, among others (surveyed in Haaland et al. (2023)).

In our project “Causal Study of the Effects of Personal Relative Income Information” (Essays II-IV) we conduct an information provision survey experiment. In the experiment we generate variation in an individual’s beliefs about their own income rank by providing accurate and reliable information about actual income rank in a given reference distribution. For example, the negative relationship between relative income and subjective well-being has been well-established (e.g. Clark & Senik (2010)). Controlled exogenous variation in perceived income rank allows the exploration of the *causal relationship* between relative income and individual welfare, preferences and behavior, even if the income rank itself is not affected. Formally, let equation (1) denote the estimating equation:<sup>2</sup>

$$Y_i^k = \beta_0 + \beta_1(ER_i^j - R_i^j) + \beta_3 * T_i^j(ER_i^j - R_i^j) + \gamma X_i + u_i \quad 1)$$

Here  $Y_i^k$  is the value of outcome k for individual i (e.g. reported life satisfaction as in Essay II).  $ER_i^j$  is the individual i’s belief about their rank in income distribution of reference group j, and  $R_i^j$  is the actual rank in said distribution.  $ER_i^j - R_i^j$  therefore defines the extent and direction of individual i’s misperception about their rank in distribution j.  $T_i^j$  is an indicator for individual i being treated with information about actual rank in ditribution j ( $R_i^j$ ). Participants in the control group do not receive any rank information, while individuals in exogenous information treatments are randomly assigned to receive information about their rank in one distribution. Participants in the endogenous treatment get to choose the distribution.

In our survey experiment, we first elicit all respondents’, including control group respondents’, beliefs about their income ranks ( $ER$ ) in all the five reference group distributions included in our design, in random order, using a vertical slider bar without an explicit default option. We incentivize the belief elicitation, even though evidence on the benefits of incentives in belief measurement is mixed. Incentivization can improve the precision of measurement by rewarding the reporting of *correct* instead of *expressive* beliefs, especially in the political domain (e.g. Peterson & Iyengar, 2021; Settele, 2022), while their importance in the non-political, non-partisan, domains are less pronounced (Armantier et al., 2015; Hoffman & Burks, 2020; Roth & Wohlfart, 2020). Furthermore, incentives may also be counterproductive if the incentivization is

<sup>2</sup> Equation 1 is the pre-registered main estimating equation of “Causal Study of the Effects of Personal Relative Income Information” presented in the pre-analysis plan.

difficult to understand (Danz et al., 2020). In our design we elicit quantitative point beliefs using the frequentistic incentivization method proposed by Schlag & Tremewan (2021): the respondent is rewarded if the answer hits the correct five-percentage point interval. The advantage of this method is that it is transparent, relatively easy to understand and robust to bias arising from risk aversion, thus mitigating the potential disadvantages of incentivization.<sup>3</sup>

We use the elicited beliefs to calculate individuals' misperceptions  $ER_i^j - R_i^j$  concerning all reference distributions  $j$ . Randomization into treatments ensures, and statistical testing confirms, that respondents' misperceptions are on average the same in all treatments and the control condition. After the belief elicitation, participants in exogenous (endogenous) information treatments receive information about their actual income rank  $R$  in one randomly assigned (chosen) reference distribution  $j$ . The control group participants do not receive any information about their actual rank in any distribution, forming a so-called passive control group.<sup>4</sup>

The quantitative rank information is presented graphically alongside the corresponding belief elicited in the previous survey section, with accompanying explanatory text. The treatment also makes clear the source of the rank information, i.e. administrative records compiled by Statistics Finland, which in general is a trusted source of information among Finns. The objective of the design is to cause participants to update their beliefs while highlighting the difference between their (prior) belief and actual rank. The information treatment is complemented with a comprehension question to strengthen the first stage effect on beliefs.<sup>5</sup>

<sup>3</sup> Our survey sample also included a treatment without incentives, allowing the investigation of the effect of incentivization on accuracy of reported beliefs. The results of this analysis will be reported in future work.

<sup>4</sup> The advantage of active control groups is that it reduces the possible "side effects" of receiving information, especially if the treatment is about correcting beliefs, and generates variation in the relevant belief also among those with more accurate prior beliefs (Haaland et al., 2023). Our design does not include an active control group, i.e. a group of respondents that receive differential information, but we argue that the different active treatment groups in which the reference distribution  $j$  is randomly varied, serve this purpose to some extent.

<sup>5</sup> Measuring belief updating after information provision, i.e. the posterior beliefs, is recommended to better understand how information updating works, complemented with measures of trust in the information (Haaland et al., 2023). A challenge is numerical anchoring, which can be mitigated by providing a different answer scale, provision of another (irrelevant) numerical anchor (see e.g. Cavallo et al. (2017)) for an empirical test of their effects), or conducting follow-up surveys with a time lag. We will measure the effect of information on beliefs about own rank in one reference distribution (age cohort) in a follow-up survey, which will be conducted in the December 2024. The time from the initial information is unusually long (cf. Fehr et al. (2022), who conduct a follow-up after one year).

Providing information about rank ( $R$ ) in a particular reference distribution  $j$  is likely to cause the individual to update their beliefs about their rank in other distributions as well. Cross-learning can complicate the interpretation of the effects of the information intervention, and in particular through the channel of updated beliefs (Haaland et al., 2023). For example, learning about one's rank among residents of the same municipality may cause the respondent to make inferences about their rank in other reference distributions, or about the inequality within that reference distribution. As we argue in Essay II, our design allows us to cleanly identify the causal effect of *information* about rank in a given distribution, even if not the effect of a *change in belief* about rank. Furthermore, the differential treatment effects suggest that information spill-overs are modest: information about ranks in reference groups that are highly correlated, *municipality* and *national*, for example, should have a similar effect on a given outcome if beliefs are updated similarly for both distributions.

In our design, the intervention is followed by survey questions concerning individual welfare, preferences and attitudes, with which we measure outcomes  $Y$ . We also include so-called real stakes questions; we offer respondents the possibility to donate some or all of their participation payoff as a voluntary tax or to a charity, or purchase lottery tickets (discussed in Essay IV). This allows the comparison of self-reported behavior and actual behavior, and overcomes some of the criticism related to self-reports (Stantcheva, 2023). A challenge remains if respondents seek to give internally consistent answers, and another relates to experimenter demand effects and social desirability bias, especially given that survey responses are linked to individual level register data. Arguably, the online mode of our survey experiment helps reduce experimenter demand effects (e.g. de Quidt et al. (2018)), and social desirability is unlikely to differentially impact responses in different treatments. In addition to outcomes measured with survey instruments, in future work we will study the effects of the information provision on field outcomes (job changes or changes in incomes, for example) using administrative records, in which instance the aforementioned sources of bias are less likely to have an impact.

Essays II and III study the implications of the information treatments on subjective well-being. There is an extensive literature in psychology (surveyed in e.g. Schwarz & Strack (1999)) that studies the measurement of SWB and how these judgments relate to underlying cognitive processes (see also Benjamin et al. (2023) for an assessment concerning the relationship of these measures and different utility notions). SWB measures are shown to be sensitive to contextual factors (Schwarz & Strack, 1999). In our experiment, we impose controlled variation in context by treating random subsets of our respondents with a different piece of information, allowing us to compare the effects on SWB across different contexts. However, in Essay II we argue that the measured effects do reflect more than just

differences in what information is received, or “priming”, and are consistent with updated beliefs.

We designed our survey questions so that they measure many dimensions of subjective well-being. We ask domain specific questions about satisfaction (with wage and job), views concerning the fairness of one’s income, the perceived meaningfulness of one’s job, and a more standard general evaluative question about life satisfaction “overall”, used in many prominent surveys such as the European Social Survey. We also elicit the respondent’s reaction to the news about income rank with a question measuring how they feel about their disposable income on a continuous scale from “disappointed” to “pleased”. We complement these measures with a type of “get-me-out-of-here action” question concerning job search intentions (see e.g. Kaiser & Oswald (2022) on their relation to happiness measures), and in future work also data on actual decisions concerning job quits, for example, using SF’d register data.

We measure risk taking (Essay IV) with four different survey items: self-reported general willingness to take risks, self-reported intentions engage in in (legal) gambling activities and buying or selling financial assets, and a real stakes question allowing the respondent to purchase lottery tickets instead of receiving the participation payoff as gift card.

### 1.3.3 Methods to improve reproducibility and transparency of experimental social science

The same dataset can be analyzed in countless ways: researchers decide how to define variables, clean data, treat outliers and calculate standard errors, which control covariates to include, and what functional form to estimate (Gelman & Loken, 2013). These decisions lead to different specifications and varying results. This “dual problem of methodological abundance and model uncertainty” is addressed by multiverse analysis, which aims to improve transparency of research by recognizing the ‘many worlds’ of modeling assumptions and reveal the range of estimates the data can support (Young & Stewart, n.d., p. 2). In our study on the effects of relative income information on individual welfare (Essay II), we conduct a particular form of multiverse analysis, the specification curve analysis (Simonsohn et al., 2020), to increase transparency of our research.<sup>6</sup>

The traditional approach in economics in demonstrating robustness has been report regression results of different specifications, often side by side. Specification curve analysis (SCA), is not dramatically different. Rather, as Simonsohn et al.

<sup>6</sup> For another approach, see for example (Muñoz & Young, 2018) on computational model robustness analysis.

(2020) suggest, it can be considered as an extension and formalization of this approach. It consists of 1) identifying and estimating all the plausible, theoretically justified, empirical specifications, 2) graphically displaying the results, and 3) conducting joint inference across all the specifications.

Formally, following the notation of Simonsohn et al. (2020), assume that the relationship of interest is between  $x$  and  $y$  (for example perceived income rank and subjective well-being), and there are confounders and moderators  $Z$  which may affect the relationship. The challenges of learning about the relationship  $y=F(x,Z) + e$ , where  $e$  consists of orthogonal predictors, concern the fact that both  $x$  and  $y$  are typically imprecisely defined latent variables, the set of moderators and confounders in  $Z$  are often not fully known ex-ante, and  $Z$  also contains imprecisely defined latent variables. In addition, the functional form  $F()$  is not known. (Simonsohn et al., 2020)

In our research design the controlled, exogenous, variation in the provision of income rank information ensures that confounders and moderators do not challenge the findings of the estimation. However, determining which proxies to use to measure the underlying constructs  $\Theta$ , such as subjective well-being and perceived relative income, entails decisions that are arbitrary. For instance, a key variable in many of the analyses in Essays II-IV, (mis)perception about own income rank denoted as  $(ER_i^j - R_i^j)$  in Equation (1), could be operationalized in countless, valid, ways: as percentiles (Perez-Truglia, 2020) and in Essays II-IV of this dissertation), quintiles (Hoy & Mager, 2021), categorized as positive, negative, and no bias (Karadja et al., 2017) or positive and non-positive (Hvidberg et al., 2023), among others. In addition, there are analytical decisions concerning what to do with extreme observations.

Following Simonsohn et al. (2020), denote the operationalization of a theoretical construct  $\Theta$  with  $\vec{\Theta}$ .<sup>7</sup> Researchers approximate  $y=F(x,Z)$  with a specification which is a set of operationalizations  $\vec{y}_{k_y} = \vec{F}_{k_F}(\vec{x}_{k_x}; \vec{Z}_{k_Z})$  where  $k_y$ ,  $k_F$ ,  $k_x$  and  $k_Z$  are indices for single operationalizations. For each construct, there are multiple “statistically valid, theoretically justified, non-redundant operationalizations”, and their combination leads to a *set of the reasonable specifications* (Simonsohn et al., 2020). The total number of valid specifications to study the relationship  $y=F(x,Z)$  is therefore is  $N \leq n_y \times n_F \times n_x \times n_Z$ . Let  $\Pi$  the

<sup>7</sup> “Operationalization” here refers to defining the measurement of a phenomenon that is not directly observable. Many of the phenomena of interest in economics are directly observable, but empirical work nevertheless often entails some defining in order to make the phenomena measurable. For example, human capital could be approximated by education, health, which in turn may be operationalized as years of schooling, training programs or attainment of post-secondary degrees.

set of these  $N$  specifications and  $\pi$  the set of valid, theoretically justified, specifications reported by the researcher(s), i.e. a *sample* of  $\Pi$ . By definition, the specifications are valid proxies for  $y=F(x,Z)$ , but the set of reported specifications  $\pi$  is not a i) large, ii) random, iii) independently drawn sample of  $\Pi$ , and therefore the reported specifications do not lead to a non-biased, reasonable estimate of the relationship of interest. (Simonsohn et al., 2020)

Specification curve analysis addresses the abovementioned problems by i) generating a larger  $\pi$ , thus reducing specification noise, ii) generating a  $\pi$  with less arbitrariness in the inclusion decisions, and by making possible statistical inference that takes into account the statistical dependence of the specifications. Simonsohn et al. (2020) propose a three step analysis procedure: 1) identify the set of reasonable specifications  $\Pi$ , 2) display the results, or a random subset of them, graphically, and 3) conduct joint inference across all specifications. The inference in step 3 consists of three statistics (see Simonsohn et al. (2020) for details, and Table 8 in Essay II for an application to our study).<sup>8</sup>

Specification curve analysis can be viewed as a complement to non-statistical remedies to possibly motivated curation of research results, such as pre-registering analysis plans, and making data and code publicly available. We pre-registered analysis plans for the project “Causal Study of the Effects of Personal Relative Income Information” (available at <https://osf.io/42z6d/>) and the study reported in Essay I (available at <https://osf.io/bkeca/>). The pre-analysis plans contain the empirical main specification reported in the papers, and other analyses are indicated as exploratory. In addition to pre-registering, the code used for the analyses, as well as the code for the experimental program, will be published online and made publicly available. The survey data collected in collaboration with Statistics Finland will be made publicly available at the Finnish Social Science Data Archives (<https://www.fsd.tuni.fi/en/data/>). However, Essays II and IV also use data from administrative records that are not publicly available. Moreover, as is evident based on the exposition above, pre-committing to a pre-registered analysis plan and a given set of specifications  $\pi$  implies pre-committing to a given conclusion, if different specifications yield different results (Simonsohn et al., 2020).

For these reasons, and the added benefit of being able to systematically explore the impact of specifications used in studies using a similar methodology, we

<sup>8</sup> In short, the three test statistics proposed by Simonsohn et al. (2020) are i) the median effect across all estimated specifications, ii) the share of specifications that show a statistically significant effect in the hypothesized direction, and iii) aggregating the obtained p-values by averaging the Z-values. These are tested against a distribution obtained by re-sampling under the null: the observed data is modified so that the null-hypothesis is known to be true. In our study it is constructed by shuffling the exogenous, randomly assigned, income rank information.

incorporate (non-pre-registered) specification curve analysis for the main results concerning the effect of relative income information on subjective well-being as a robustness check in Essay II.

## 2 Summary of the essays

This section provides summaries of the essays of this compilation thesis.

### 2.1 Essay I: Bearing the Burden — Implications of Tax Reporting Institutions on Evasion and Incidence

This is a summary of essay I, “Bearing the Burden — Implications of Tax Reporting Institutions on Evasion and Incidence”. In this paper we study the effects of tax reporting institutions on tax evasion and market outcomes using an experimental continuous double auction market, which is known to generate competitive equilibrium outcomes after convergence has taken place, and for which tax-side liability equivalence and incidence is robust. We have five treatments that differ in whether a per-unit sales tax is imposed on the sellers, and how the tax reporting institution is organized. In the two benchmark treatments taxes are i) automatically collected or ii) there are no taxes. We have three treatments with tax reporting: (iii) only sellers report taxes and (iv) costless and (v) costly buyer-reporting. Traders post bids to buy and offers to sell and they are publicly observable. In the reporting treatments, tax reporting is done privately after the trading stage.

We find that reporting responds to the intensity of deterrence, broadly in line with the standard, self-interested theory and literature on third-party information reporting. However, our results suggest that intrinsic costs related to lying may also affect reporting decisions. Moreover, when sellers can unilaterally evade taxes, prices do not fully reflect the lower taxes of the evaders and the tax burden falls more heavily on the buyers. In other words, the comparative statics of reporting behavior appear consistent with the self-interested model, while market behavior does not. We discuss various mechanisms that may explain why incidence is heavily distorted towards buyers when sellers can unilaterally evade. We argue that our findings are not explained by risk aversion, but that a model of intrinsic lying costs, or lying costs and image concerns best explain the observed reporting and trading behavior.

## 2.2 Essay II: Which Reference Groups Matter and How? A Relative Income Information Experiment with Administrative Data

Essay II studies how knowledge about own income relative to compatriots, neighbors, colleagues, age cohort, or educational peers affects subjective well-being (SWB). To this end, a general population sample of mid-career Finns was invited to participate in a pre-registered income provision survey experiment, in which participants were randomly assigned to receive information about their income rank within a specific reference group, while others received no such information. We report estimates of the causal effects of rank information on self-reported life, job, and wage satisfaction, perceived fairness of one's own income, and meaningfulness of one's job.

As a major finding, we report significant causal effects on income related well-being measures —positive surprises about rank lead to increased satisfaction, while negative surprises decrease satisfaction— and weaker or non-existent effects on satisfaction specific to other domains or life “overall”. In addition, we show that the effects are stronger for educational level and occupation, for instance, but small for the national reference group. Specification curve analysis supports the main findings.

## 2.3 Essay III: Which Ponds Do We Choose, And Why? Choices of Income Reference Group and Its Consequences

Essay III uses an incentivized information provision experiment to study how individuals select reference groups for income comparisons and how the information individuals receive about their relative income affects their subjective well-being (SWB). The exogenous and endogenous variation in beliefs about reference group income ranks generated by the experimental design allows comparing the welfare consequences of chosen and randomly assigned comparison information. In addition, the study explores the motivations behind the choice of comparison information.

We find that almost half of the individuals, and twice as many as the second most popular reference groups, educational level and age cohort, are most interested in rank in the occupational distribution. The usefulness of information stands out as an unusually popular motive behind that choice. Moreover, the choice of both “occupation” and “educational level” are most often motivated by willingness to confirm an expectation of a low rank – consistent with (actionable meritocratic) (un)fairness motives. These insights contribute to the broader understanding of how income comparisons and income reference group selection influence subjective well-being.

## 2.4 Essay IV: Effect of income rank information rank on risk taking

Economic decisions often involve uncertain outcomes, and the preferences driving these choices significantly influence personal and societal outcomes. This study aims to understand how social reference points and societal factors influence risk preferences. The study provides causal evidence on the effect of social comparisons on risk-taking by conducting a large-scale survey experiment in which participants' income rank beliefs were elicited, and some were randomly informed of their actual rank within a reference group.

The study examines how changes in perceived rank affected participants' willingness to take risks, intentions to gamble and invest, and actual lottery ticket purchases. Additionally, it explores links between these intentions and real investment behavior using administrative data from Statistics Finland. While perceived and actual income rank are shown to predict risk attitudes, no substantial or statistically significant effect is found from receiving information concerning actual income rank.

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