Compulsory and Voluntary Contributions to Public Goods: Three Essays on Higher Education, Charitable Donations and Volunteering

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To my family

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Chapter 1

Introduction

The three essays that form this thesis concern contributions made by private individuals to various types of public goods. The nature of the contributions ranges from enforceable taxes and fees to purely voluntary donations of time and money. The methods employed include microeconomic theory, an economics laboratory experiment and an econometric analysis of time-use diary data.

Public goods were first formally described by Paul Samuelson as "collective consumption" goods that can be consumed by anyone and everyone, at the expense of no one else's consumption. Traditional economic theory anticipates free-riding in the production of such goods (Samuelson, 1954, pp. 388-389):

> [With private goods, t]he servant of the ethical observer would not have to make explicit decisions about each person's detailed consumption and work[, ... whereas with public goods,] *no decentralized pricing system can serve to determine optimally these levels of collective consumption.* [...] By departing from his indoctrinated rules, any one person can hope to snatch some benefit in a way not possible under the self-policing competitive pricing of private goods[.]

In other words, with a public good, ensuring that supply satisfies demand is doubly challenging because total demand for the good is unknown and must

first be estimated; and once this is set, something is required that will compel individuals to pay for the supply.

In practice, various mechanisms exist to facilitate the provision of public goods. The classic examples of street lighting and national military services tend to be financed through general taxation imposed on citizens by their governments. Demand for other public goods is revealed by people forming associations that then appeal for funding from both public and private sources. Examples of such public goods include the preservation of wildlife and the countryside, the upkeep of public libraries and museums, and research to improve knowledge in the prevention of diseases.

One question of particular importance to governments is the extent to which the financing of a public good through compulsory taxation crowds out voluntary contributions, that is, people who would otherwise have provided the good decide not to contribute because it is already being funded through other means (see, for example, Bergstrom et al., 1986). There is an economic argument for tax breaks on voluntary contributions wherever such crowding out is incomplete, i.e. where increasing public funding by €1 results in a reduction of voluntary contributions of less than €1. This is because it would then be cheaper for a government to offer the tax break and have private individuals pay for the good than it would be to fund the good directly through the public finances. If, on the other hand, crowding out is complete, it should make no difference on aggregate whether a public good is financed through general taxation or through voluntary contributions. Any change in the level of compulsory contributions would be offset by a change in voluntary contributions of equal magnitude.

The first essay in chapter 2 is about the provision of higher education, with a focus on compulsory contributions to this good. It is assumed that government is prepared to fund education to a certain extent through general taxation but that the remaining portion is to be financed either through fees at the beginning of studies or through a graduate tax on completion of studies, both of which are to be paid by the students who benefit directly from the education. In the model, there is therefore also a private component to higher education that serves to improve the welfare of the student being

educated, through a higher expected wage on graduation. However, the main point of the model is to investigate and compare the effects of the different types of contributions (tuition fees or graduate tax) on universities' incentives to enhance the quality of education, and graduates' incentives to work hard later in life, which have implications for society as a whole. In this respect, higher education is essentially a public good, as has been argued previously by Tilak (2008, p. 452):

> [Higher] education satisfies both the essential features: the spread of benefits from an educated citizenry cannot be restricted to a small population, nor is the quantum of benefits received by some affected by the level of benefits others receive.

Indeed, without higher education, total economic production in the model in chapter 2 would be lower. A graduate tax is more public-spirited than tuition fees in that through such a tax, the more successful graduates effectively subsidize the education of their less successful counterparts.

The analysis reveals a trade-off: compared to tuition fees, a graduate tax reduces work incentives because a graduate's marginal revenue from work is lower. At the same time, such a tax induces universities to improve their teaching quality as they stand to gain from increased tax revenue.

Another typical trait of a public good is exposed when it is demonstrated that if revenues are distributed evenly among universities, the universities free-ride on others' efforts to increase education quality and so they settle for a lower quality of education. This problem is then solved in a straightforward way, by allocating each university the tax revenue from its own alumni.

The question of which system leads to more education overall is also addressed. It is shown how a budget-balancing graduate tax encourages higher university participation than the equivalent tuition fee. This is due both to the tax transferring the volatility in future income from risk-averse students to the risk-neutral state and to its exacting price discrimination on students of differing ability, since students of higher ability are prepared to pay more for their studies.

Chapter 2 concludes with the observation that universities are becoming increasingly reliant on alumni to top up their finances through voluntary contributions, which include both lifetime gifts and bequests upon death.

Whether people are presented with the opportunity to add to the public good through free will, or commanded to do so by law, can affect whatever motivations underlie their contributions and ultimately how much of the good is produced. This is the subject of the second essay (chapter 3). Continuing the theme of taxation, the essay reports results from a laboratory experiment that tests the effect of forcing contributions, through a charity tax, on people's voluntary donations to charitable organizations.

In order for organizations to register as charities and be eligible to receive donations, there must be demonstrable public benefit.[1] Traditionally, economists modeled charity as a pure public good, where the individual donor derives utility from total supply of the good, but not from his or her personal contribution to it. Andreoni (1988, p. 57) argues that this approach does not stand up to empirical testing, noting that "guilt, sympathy, an ethic for duty, a taste for fairness, or a desire for recognition" can all play a role in a person's charitable giving.

Insofar as people are intrinsically motivated, exerting extrinsic pressure to generate action can have consequences that standard economic theory would not normally predict (Frey and Jegen, 2001).

The experiment presented in chapter 3 seeks to investigate the effects of imposing a small, a medium and a large income tax on donor behavior, where the tax revenue and donations both go to the same good cause. Contrary to economic reasoning, it is found that the small charity tax crowds out donations from male participants to the extent that total contributions to the cause are reduced. This result cannot be explained by the theory of warm glow (Andreoni, 1990), which predicts only partial crowding out. However, an explanation for the observed behavior is provided by psychological reactance theory (Brehm, 1966): male participants in the experiment were willing to

[1] For example, in England and Wales, this is laid out in the Charities Act 2011 §4 *The public benefit requirement.* In Germany it is defined in Abgabenordnung §52 *Gemeinnützige Zwecke.*

donate generously to the cause without any interference from a tax, but when forced to make a small contribution through a small tax, they reacted adversely by reducing total contributions to below their "natural" level.

Somewhat surprisingly, the charity tax is found to crowd in donations from female participants. While the experimental evidence is insufficient to provide a conclusive explanation for this gender difference (the experiment was not designed to focus on gender), men and women have previously been shown to differ in their psychological reactions in other contexts (Regan and Brehm, 1972; Brehm and Brehm, 1981).

Having studied different forms of compulsory contributions and how these interact with people's voluntary contributions of money, the final part of this thesis is about voluntary contributions of time to public goods. Chapter 4 presents an empirical analysis that compares contributions of time to formal charitable organizations with contributions of time to help others in informal settings. This chapter sets out to examine the differences between men and women in their volunteering behavior.

The data stem from detailed diaries of how people spend their time that were recorded in the German Time Use Survey 2001/02. A bivariate probit model is used to estimate simultaneously the probability of volunteering formally and the probability of volunteering informally. This approach controls for endogeneity in the decisions to perform both activities. The effects of observable factors such as gender, age and education are thus calculated for each type of volunteering and then an estimate for the residual correlation between formal and informal volunteering is produced. Any further, unobservable, factors that impact on the decisions to participate in formal and informal volunteering are captured in this correlation parameter.

The residual correlation estimate for the female sample is positive: the women are more likely to volunteer formally if they also volunteer informally, which suggests that the decisions are complementary. However, for men, the decisions to volunteer formally and informally are not found to be significantly related.

A potential explanation for the observed participation of women in both formal and informal volunteering is that in Germany, many more women

than men do not work, or work only part-time, so they might have more time available for volunteering activities. However, further analysis of the subsample of full-time workers in fact accentuates the result: the positive correlation becomes even stronger among women who work full-time.

It is concluded that simple gender differences in labor-force participation cannot explain the complementary voluntary contributions of women to public goods through formal and informal gifts of time. The behavior may be due to women's particular social networks that become amplified through paid employment; whether or not this is the case is left for investigation in future research.

The diverse collection of results presented in this thesis underlines the complexity inherent to people's contributions to public goods. Much depends on context. Combining economics and psychology to study behavior in more detail can help Samuelson's "ethical observer" to steer society closer to its optimal levels of supply and demand.

Chapter 2

Universities as Stakeholders in their Students' Careers – On the Benefits of Graduate Taxes to Finance Higher Education[1]

2.1 Introduction

The funding of public university education is the subject of current debate across Europe.[2] Courses have traditionally been funded entirely by the state in several countries, including Germany, where some federal states introduced tuition fees only recently and subject to controversial discussion, leading some of the states to abandon them again. In the United Kingdom, universities have been charging students tuition fees for the past decade, but at levels that are not sufficient to cover the costs of education, and the government has introduced legislation to triple the maximum chargeable fee. We acknowledge the pressing need to have students participate in the financing of their studies. However, there is significant risk involved in completing a university course

[1] This chapter is based on McKenzie and Sliwka (2011).

[2] For a survey of developments in higher education and an international overview of funding models see for instance *The Economist*'s survey of higher education (Wooldridge, 2005). For an introduction to the various forms of university funding, see Barr (1993).

successfully and securing future employment. We therefore question whether up-front tuition fees represent an efficient funding model. The idea of a tax following graduation from university has been proposed as an alternative to tuition fees and was embraced by the leader of the opposition in the UK (Rigby, 2010). In this chapter we consider these two different means of financing higher education from both the students' and the universities' perspectives.

There is some previous economic literature on the issue of graduate taxes. Eaton and Rosen (1980) demonstrate in their analysis that a linear income tax can increase incentives for risk-averse individuals to invest in human capital. When the returns to such investments are uncertain, the state effectively takes on a part of the risk via the tax. García-Peñalosa and Wälde (2000) build on this result, relating it to the funding of higher education. They compare a graduate tax with loan schemes. The graduate tax is preferred to student loans due to such insurance effects. It is also superior to general taxation when equity in the economy as a whole is considered. Gary-Bobo and Trannoy (2008) assume that wages are a function of learnable skill and innate ability. The authors focus on tuition fees and analyze the decision to study and student selection on the part of universities under this regime.

In our model, we compare a system of tuition fees with a proportional graduate tax on future income. The state continues to fund the universities up to a certain point. Beyond this point, the students are responsible for financing their education. When there is no moral-hazard problem, we too obtain the general result that risk-averse students prefer the graduate tax, as future income is volatile, and the risk-neutral state assumes part of this risk via the tax. However, since students differ in their abilities, highly able students are likelier to prefer an up-front fee, as they expect to pay more tax than their less able counterparts later on. But due to the insurance effect, a student with an ability at the median prefers the graduate tax.

We then introduce two levels of moral hazard into the model. First, we allow future income to depend on costly, unobservable effort on the part of graduates. Subsequently, we incorporate moral hazard with regard to teaching quality provided by universities. We hence end up with a double moral-

hazard problem, such as has been analyzed in various contexts, for instance by Cooper and Ross (1985), Demski and Sappington (1991), Romano (1994) and Bhattacharyya and Lafontaine (1995). We find that while a graduate tax reduces the incentives for graduates to work hard, it also leads to higher teaching quality if the revenues are destined for the universities. The reason is that universities stand to profit from the higher future income of their former students (which they can affect by raising teaching quality). However, if revenues from the tax are distributed evenly among universities, a free-rider problem exists. This problem can be solved if each university is allowed to receive the revenues raised from the tax paid by its own former students. In such a system, universities become stakeholders in their students' future careers. Each university has high incentives to improve teaching quality, as this increases its students' human capital, in turn leading to higher future wages and thus higher tax revenue, which benefits the university directly.

Finally, we endogenize enrolment and show that a budget-balancing graduate tax encourages more students to attend university than would an equivalent up-front tuition fee.

The chapter is structured as follows. In the next section, we introduce the basic model. In section 2.3, we consider a reference case where teaching quality is an exogenous variable. In section 2.4 we endogenize both graduate effort at the workplace and the quality of teaching at university. In section 2.5, we determine whether a graduate tax or tuition fees would lead to a higher number of school-leavers applying for a university degree course. Section 2.6 concludes.

2.2 Basic Model

We consider a country in which there are n equally sized publicly owned universities and first assume that the population of students is of fixed size (in section 2.5 we endogenize the decision to study at university and consider which form of funding would lead to more applications). Let there be a continuum of students $I = [0, 1]$. Each student $i \in I$ has constant absolute risk aversion $r > 0$ and utility function $u(w) = -e^{-rw}$ where w is

the individual's lifetime income. Students vary in their ability, captured by the variable a_i. Following the career-concerns literature (Holmström, 1999; Dewatripont et al., 1999), abilities are normally distributed across the population of students $a_i \sim N(m_a, \sigma_a^2)$.[3] There are two periods in the model. In the first period, the students attend university. In the second period, each student (now a graduate) earns income that depends on his human capital and some random component. The human capital of a graduate is a function of his ability and the quality of the university education q which we first treat as exogenously given.[4] We assume that abler students benefit more from a higher quality of education. This is well in line with results from personnel psychology showing that in nearly all jobs people with higher cognitive abilities build up more knowlege and skills than others and do so faster. See, for instance, the discussion in Schmidt and Hunter (1998). Hence, the second-period wage of individual i is

$$W_i = qa_i + \varepsilon_i$$

where $\varepsilon_i \sim N(0, \sigma_\varepsilon^2)$. We assume that ε_i and a_i are uncorrelated. The total cost of education is K. Our risk-neutral state provides $B < K$ from an education budget to cover part of this cost. To finance the rest, the state now faces a choice between an up-front tuition fee per student α and a proportional graduate tax on future income β. We allow for a case where the state chooses not to pay for any of the cost but the state cannot turn a profit from the private financing of education $B \geq 0$. We make the reasonable assumption that the future income of university graduates is sufficient to cover the cost of their education:

$$qm_a > K - B. \tag{2.1}$$

[3]Note that a_i can become negative with positive probability. However the parameters m_a and σ_a^2 may be chosen such that the probability that this is the case is made arbitrarily small (i.e., $\Pr\{a_i < 0\} \to 0$ for $m_a \to \infty$ or $\sigma_a^2 \to 0$).

[4]In addition to building human capital, a university education can act as a signal of high ability to the job market. Ismail and Myles (2010) analyze the effects of a graduate tax within a signaling context.

2.3 A Reference Case

We first consider the case where teaching quality is an exogenous variable. The state's budget constraint with a fixed fee α is

$$\int_0^1 \alpha di = K - B.$$

Hence, the budget-balancing fixed fee is given by $\alpha = K - B$. When a graduate tax is imposed, the budget constraint is

$$\beta \int_0^1 q a_i di = K - B.$$

The graduate tax rate covering the budget deficit is hence

$$\beta = \frac{K - B}{q m_a}.$$

We now compare the utility of an individual student i with ability a_i under the two systems. Given our assumption that students are risk averse with constant absolute risk aversion, the certainty equivalent of student i with a fixed fee is[5]

$$E\left[q a_i + \varepsilon_i - \alpha\right] - \frac{1}{2} r \cdot \operatorname{var}\left[q a_i + \varepsilon_i - \alpha\right], \tag{2.2}$$

and with a graduate tax it is

$$E\left[(1-\beta)\left(q a_i + \varepsilon_i\right)\right] - \frac{1}{2} r \cdot \operatorname{var}\left[(1-\beta)\left(q a_i + \varepsilon_i\right)\right]. \tag{2.3}$$

First, suppose that the state, having a utilitarian welfare function, selects the system that maximizes the expected utility of students, taking into account the distribution of abilities. Note that this corresponds to the choice of an individual student acting under a *veil of ignorance*, i.e., not yet knowing his own individual ability. We obtain the following result:

[5] See, for instance, Wolfstetter (1999, p. 342).

Proposition 1 *The expected utility of students who do not know their ability ex ante is maximized when the state implements the graduate tax.*

Proof. The graduate tax is preferred if (2.3) exceeds (2.2), taking into account that abilities are normally distributed. Let $\sigma_W^2 = \text{var}[qa_i + \varepsilon_i] = q^2\sigma_a^2 + \sigma_\varepsilon^2$. The graduate tax is preferred iff

$$\begin{aligned}(1-\beta)\,qm_a - \frac{1}{2}r\,(1-\beta)^2\,\sigma_W^2 &\geq qm_a - \alpha - \frac{1}{2}r\sigma_W^2 \\ \Leftrightarrow \frac{1}{2}r\sigma_W^2\left[1-(1-\beta)^2\right] &\geq \beta q m_a - \alpha.\end{aligned}$$

Substituting the (binding) budget constraints for α and β, we obtain

$$\begin{aligned}\frac{1}{2}r\sigma_W^2\left[1-\left(1-\frac{K-B}{qm_a}\right)^2\right] &\geq \frac{K-B}{qm_a}qm_a - (K-B) \\ \Leftrightarrow \frac{1}{2}r\sigma_W^2\left[1-\left(1-\frac{K-B}{qm_a}\right)^2\right] &\geq 0.\end{aligned}$$

From the viability condition (2.1) we have that $qm_a > K - B$. Hence, the inequality always holds. *Q.E.D.*

Note that the state here decides as an individual student would, were he oblivious to his own ability. The reason that the graduate tax is preferred to an up-front tuition fee is that through the tax, the risk-neutral state insures the risk-averse students against uncertainty in their future incomes.

However, individual students typically will have information regarding their abilities and may differ in their preferences about the system. We therefore investigate individual students' preferences for one of the systems when the state is only interested in balancing the budget. We find:

Proposition 2 *When students are aware of their personal ability, those up to a threshold ability level $\widehat{a}_i$ prefer a proportional graduate tax on future income. Beyond this cutoff value, students of high ability $a_i > \widehat{a}_i$ prefer the up-front fee. The threshold $\widehat{a}_i$ is greater than the median (mean) ability m_a.*

Proof. Student i will prefer the graduate tax if and only if (2.3) $\geq$ (2.2). This inequality is equivalent to

$$\begin{aligned}(1-\beta)\,qa_i - \frac{1}{2}r\,(1-\beta)^2\,\sigma_\varepsilon^2 &\geq qa_i - \alpha - \frac{1}{2}r\sigma_\varepsilon^2 \\ \Leftrightarrow \frac{1}{2}r\sigma_\varepsilon^2\left[1-(1-\beta)^2\right] &\geq \beta q a_i - \alpha.\end{aligned}$$

Substituting the (binding) budget constraints for α and β, we obtain

$$\begin{aligned}\frac{1}{2}r\sigma_\varepsilon^2\frac{K-B}{qm_a}\left(2-\frac{K-B}{qm_a}\right) &\geq \frac{K-B}{qm_a}qa_i - (K-B) \\ \Leftrightarrow \frac{1}{2}r\sigma_\varepsilon^2\frac{1}{qm_a}\left(2-\frac{K-B}{qm_a}\right) &\geq \frac{a_i}{m_a} - 1 \\ \Leftrightarrow a_i \leq m_a + \frac{1}{2}r\sigma_\varepsilon^2\frac{1}{q}\left(2-\frac{K-B}{qm_a}\right) &=: \widehat{a_i}.\end{aligned}$$

From the viability condition (2.1) we have that $qm_a > K - B$. It follows that the median student will also prefer the graduate tax $m_a < \widehat{a_i}$. *Q.E.D.*

The graduate tax still has an insurance effect from the perspective of an individual student. But when abilities are known, this insurance effect only covers the unsystematic fluctuations ε_i. In addition, the tax redistributes income from the abler to the less able students. Students of low ability benefit more from the graduate tax. They will earn less in the future and therefore have to pay less. However, very able students anticipate their relatively high expected future incomes and would thus prefer to pay the standard fee today in return for not having to subsidize the education of others through their earnings later. Hence, if a_i is large enough, the costs from redistribution outweigh individual risk concerns.

Nevertheless, a student of median ability always prefers the graduate tax. The reason for this is that the median student pays the same under both systems in expected terms, but still profits from the insurance effect of the graduate tax. Hence, a median-voter model would predict that majority voting between the two systems would lead to the choice of a graduate tax.

2.4 Moral Hazard

In this section we compare the incentive effects of the graduate tax and fixed tuition fee on graduate effort at the workplace and on university provision of teaching quality. We start by analyzing the moral-hazard problems separately and then consider an integrated model.

2.4.1 Graduate Moral Hazard

In reality, income depends not only on the quality of a university education. It also depends on a graduate's effort once he or she is in employment. We now modify our wage function to include the effects of graduate effort e_i, with convex cost of effort $C(e_i) = (c/2)(e_i - \overline{e})^2$, where $\overline{e}$ is the basic level of effort provided by a graduate, regardless of incentives. We assume that the effects of higher ability and higher effort complement each other:

$$W_i(q, e_i, a_i, \varepsilon_i) = (q + e_i) a_i + \varepsilon_i.$$

We obtain the following result:

Proposition 3 *The fixed tuition fee provides higher work incentives for graduates.*

Proof. The certainty equivalent with the tuition fee (2.2) now becomes

$$(q + e_i) a_i - \alpha - \frac{c}{2}(e_i - \overline{e})^2 - \frac{1}{2} r \sigma_\varepsilon^2.$$

The student chooses the effort level that maximizes the above expression. The first-order condition is

$$\begin{aligned} a_i - c(e_i - \overline{e}) &= 0 \\ \Leftrightarrow e_i &= \overline{e} + \frac{a_i}{c}. \end{aligned}$$

The certainty equivalent under the graduate tax (2.3) becomes

$$(1 - \beta)(q + e_i) a_i - \frac{c}{2}(e_i - \overline{e})^2 - \frac{1}{2} r (1 - \beta)^2 \sigma_\varepsilon^2.$$

The student maximizes the above expression with respect to e_i for a given tax β. The first-order condition is

$$\begin{aligned}(1-\beta)\,a_i - c\,(e_i - \overline{e}) &= 0\\ \Leftrightarrow e_i &= \overline{e} + (1-\beta)\,\frac{a_i}{c}.\end{aligned}$$

This is $\beta a_i/c$ less than the effort exerted under the tuition fee. *Q.E.D.*

Under the tax, graduates effectively only see $1-\beta$ of the income they generate. With the fixed fee they remain residual claimants on their income. They thus choose to work less hard than in the situation with a fixed tuition fee.

2.4.2 University Moral Hazard

So far we have assumed that teaching quality is exogenous. However, it is quite likely that universities' efforts to improve teaching quality are also affected by the mode of financing higher education. We model this by assuming that revenues from the up-front tuition fee and graduate tax are to be shared equally among the n universities and that each university can affect the teaching quality provided.

Each university $j \in \{1, 2, ..., n\}$ can expend effort to increase its teaching quality q_j, investing more in the human-capital formation of its students. The (nonmonetary) cost of effort of the university staff is $\Gamma(q_j, s_j) = (\gamma/2)\,s_j\,(q_j - \overline{q})^2$, where s_j denotes the mass of students educated by university j and $\overline{q}$ represents the basic teaching quality provided voluntarily by the university, regardless of any external incentives.[6] We assume that the teaching cost parameter γ is greater than the workplace cost parameter c, since γ is a per capita measure.[7] Universities are risk-neutral. Furthermore,

[6] For simplicity, we have assumed that the cost of effort in teaching quality is linear in the number of students. In reality these costs may be concave due to economies of scale. Note that since we have a continuum of students $I = [0, 1]$ and n universities with an equal number of students, $s_j = 1/n \;\; \forall j$.

[7] It should not be the case that it costs an individual more to generate a wage increase through higher direct workplace effort than it costs his university to achieve the same increase indirectly through improved teaching quality.

we assume for simplicity that the distribution of student abilities is the same at each university and that universities are of equal size. Finally, we assume that each university is interested in maximizing its budget, taking into account the effort costs of raising teaching quality.

With a centrally determined up-front fee, the universities have no influence on revenues through teaching quality. Thus, a university simply seeks to minimize its cost of effort. It hence chooses $q_j = \overline{q}$, and the system provides no additional incentives to raise quality. Under the graduate tax, the universities choose effort so as to maximize their revenue, net of the cost of effort. The total revenue from the graduate tax is

$$\beta \int_0^1 W_i di = \beta \left[\sum_{l=1}^{n} s_l q_l m_a + \int_0^1 \left[\overline{e} + (1-\beta) \frac{a_i}{c} \right] a_i di \right].$$

The optimization problem of university j is

$$\max_{q_j} \ \frac{1}{n} \beta \left[\sum_{l=1}^{n} s_l q_l m_a + \int_0^1 \left[\overline{e} + (1-\beta) \frac{a_i}{c} \right] a_i di \right] - \frac{\gamma}{2} s_j \left(q_j - \overline{q} \right)^2.$$

The first-order condition yields

$$\begin{aligned} \frac{1}{n} \beta s_j m_a - \gamma s_j \left(q_j - \overline{q} \right) &= 0 \\ \Leftrightarrow q_j &= \overline{q} + \beta \frac{m_a}{n\gamma}. \end{aligned}$$

The universities have a stake in providing a better quality of teaching under the graduate tax, as they will benefit from the surplus revenues generated through increasing the future wages of their students.

Note the classic free-rider problem among universities. As each university is allocated an equal share of total tax revenue, the marginal revenue from improved teaching quality is lower, the more universities there are (the higher is n).

Yet there is a straightforward solution to this problem: universities should be allowed to collect tax directly from their own alumni. To analyze this

formally, note that in this case the optimization problem of university j is

$$\max_{q_j} \; s_j \beta q_j m_a + s_j \beta \int_0^1 \left[\overline{e} + (1-\beta) \frac{a_i}{c} \right] a_i di - \frac{\gamma}{2} s_j \left(q_j - \overline{q} \right)^2,$$

with first-order condition

$$\begin{aligned} & s_j \beta m_a - \gamma s_j \left(q_j - \overline{q} \right) = 0 \\ \Leftrightarrow \; & q_j = q = \overline{q} + \beta \frac{m_a}{\gamma} \quad \forall j. \end{aligned}$$

Clearly, the quality provided is higher under the direct collection system than when the graduate tax is shared equally among the public universities. Hence, we can conclude:

Proposition 4 *When universities set their teaching quality endogenously, graduate taxes provide better incentives for universities to invest in their students' human capital than do fixed tuition fees. These incentives are even stronger when each university receives the tax revenues directly from its own former students.*

Thus, such a system would make universities stakeholders in the career success of their students. Universities that find effective new ways to increase their students' human capital are able to share the gains.

2.4.3 The Trade-Off between Incentives

We see from Propositions 3 and 4 that there is a trade-off when moving from fixed tuition fees to a graduate tax. On the one hand, graduates are less inclined to expend effort on work as the marginal revenue from effort decreases while marginal costs remain unchanged. On the other hand, the prospect of increased future tax revenues induces universities to invest in the quality of their teaching (which they do not do under the fixed tuition fee). We now analyze the state's funding policy, assuming that the state's objective function is to maximize the utility of the median (mean) student, which is equivalent to the maximization of aggregate utility. We allow for a combination of both a tuition fee and a graduate tax.

We again impose a viability condition, ensuring that even without incentives, university graduates are sufficiently productive to cover the education budget deficit:

$$(\overline{q} + \overline{e})\, m_a > K - B.$$

The time structure of the game is as follows: First the state sets the funding policy, consisting of a possible combination of fixed up-front fees and a graduate tax rate. The tuition fee is paid, and then universities choose the teaching quality. Finally, the graduates choose their effort at work, and universities collect the revenues from the graduate tax.

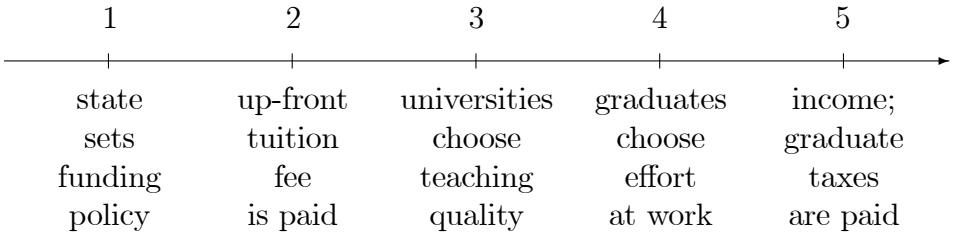

Figure 2.1: Timeline

Let e_m be the equilibrium effort exerted by the median student. Note that the state chooses fee and tax such that universities earn as much as needed to balance the budget in equilibrium, anticipating the students' and universities' reaction to the funding policy. In the subgame-perfect equilibrium α and β are chosen so as to maximize the certainty equivalent of the median student:

$$(1-\beta)\,(q + e_m)\, m_a - \alpha - \frac{1}{2} c\,(e_m - \overline{e})^2 - \frac{1}{2} r\,(1-\beta)^2\, \sigma_\varepsilon^2$$

subject to the incentive constraints

$$e_i = \overline{e} + (1-\beta)\,\frac{a_i}{c} \text{ for } i \in [0,1]\,,$$
$$q = \overline{q} + \beta \frac{m_a}{\gamma},$$

and the budget-balancing condition, which now becomes

$$\alpha + \beta \int_0^1 (q + e_i)\, a_i d_i = K - B.$$

We obtain the following result:

Proposition 5 *With both university and graduate moral hazard, the state chooses a strictly positive graduate tax*

$$\beta^* = \frac{\frac{cm_a^2}{\gamma} + \sigma_a^2 + cr\sigma_\varepsilon^2}{m_a^2 + 2\sigma_a^2 + cr\sigma_\varepsilon^2}.$$

This tax is decreasing in the universities' cost parameter γ and increasing in the graduates' cost parameter c. The state will impose an additional tuition fee α if and only if the budget deficit $K-B$ is sufficiently large, and otherwise pay a subsidy.

Proof. The state solves

$$\max_{\alpha,\beta,e,q} (1-\beta)(q + e_m) m_a - \alpha - \frac{1}{2} c (e_m - \overline{e})^2 - \frac{1}{2} r (1-\beta)^2 \sigma_\varepsilon^2.$$

Subsituting the students' optimal effort levels, the budget-balancing condition becomes

$$\begin{aligned}
\alpha &= K - B - \beta \int_0^1 \left[\overline{q} + \beta \frac{m_a}{\gamma} + \overline{e} + (1-\beta) \frac{a_i}{c} \right] a_i di \\
&= K - B - \beta \left[\left(\overline{q} + \beta \frac{m_a}{\gamma} + \overline{e} \right) m_a + (1-\beta) \int_0^1 \frac{a_i^2}{c} di \right] \\
&= K - B - \beta \left[\overline{q} m_a + \beta \frac{m_a^2}{\gamma} + \overline{e} m_a + (1-\beta) \frac{1}{c} E\left[a_i^2\right] \right] \\
&= K - B - \beta \left[\overline{q} m_a + \beta \frac{m_a^2}{\gamma} + \overline{e} m_a + (1-\beta) \frac{1}{c} \left(\sigma_a^2 + m_a^2 \right) \right]. \qquad (2.4)
\end{aligned}$$

Substituting α, e_i, and q into the objective function and simplifying, we

obtain

$$\begin{aligned}
&\max_{\beta} (1-\beta)\,\overline{q}m_a + \left(\beta-\beta^2\right)\frac{m_a^2}{\gamma} + (1-\beta)\,\overline{e}m_a \\
&+ (1-\beta)^2\,\frac{m_a^2}{c} - K + B + \beta\overline{q}m_a + \beta^2\frac{m_a^2}{\gamma} + \beta\overline{e}m_a \\
&+ \left(\beta-\beta^2\right)\frac{1}{c}\left(\sigma_a^2+m_a^2\right) - \frac{1}{2}(1-\beta)^2\,\frac{m_a^2}{c} - \frac{1}{2}r\,(1-\beta)^2\,\sigma_\varepsilon^2,
\end{aligned}$$

which is strictly concave in β. The first-order condition is

$$\begin{aligned}
&-\overline{q}m_a + (1-2\beta)\,\frac{m_a^2}{\gamma} - \overline{e}m_a - 2\,(1-\beta)\,\frac{m_a^2}{c} + \overline{q}m_a + 2\beta\frac{m_a^2}{\gamma} \\
&\quad + \overline{e}m_a + (1-2\beta)\,\frac{1}{c}\left(\sigma_a^2+m_a^2\right) + (1-\beta)\,\frac{m_a^2}{c} + r\,(1-\beta)\,\sigma_\varepsilon^2 = 0.
\end{aligned}$$

By solving for β we obtain β^*. Given the budget-balancing condition, the tuition fee can be computed by inserting β^* into (2.4). *Q.E.D.*

Note that $\beta^* \in (0,1)$, since $c < \gamma$. The optimal policy is driven by several effects. First, the budget deficit has to be financed. In addition, the two incentive problems have to be taken into account as well as the insurance effects of the finance policy. The double moral-hazard problem is reflected in the fact that the tax rate is increasing in graduate effort costs c and decreasing in the university teaching costs γ. Indeed, in the case where $\sigma_a^2 = \sigma_\varepsilon^2 = 0$ the graduate tax represents a direct trade-off between the costs of graduate effort and university teaching as $\beta^* = c/\gamma$. The more costly teaching effort is relative to graduate work effort the lower is the tax rate (as the provision of incentives for universities has lower returns), and vice versa.

The tax represents insurance for students regarding the unsystematic fluctuations in future wages, in that income is redistributed. The higher σ_ε^2 and the higher the students' degree of risk aversion r, the higher is the tax rate, as the state takes on this risk to a larger extent. Note that α may well become negative when these insurance considerations outweigh other aspects, and hence the fee α may become a subsidy.[8]

[8] This is for example the case when future income is extremely volatile: $\sigma_\varepsilon^2 \to \infty \Rightarrow$

Finally, it is interesting to consider the comparative statics with respect to the mean m_a and variance σ_a^2 of the ability distribution, which are less obvious than the previous considerations. First, when all abilities are equal (i.e., $\sigma_a^2 = 0$), the tax rate is strictly decreasing in m_a. The higher the average ability in the population, the higher the revenues of the graduate tax, thus the lower the tax rate required to finance the education budget deficit.

However, the effects of a change in the variance of talent in the population, σ_a^2, are much less straightforward. Such a change has no direct impact on the median student's utility, but it has an indirect one. Note that there is a basic complementarity between ability and effort in production. Recall that a graduate's wage is $(q + e_i)\, a_i + \varepsilon_i$ and the incentive-compatible effort is $e_i = \overline{e} + (1 - \beta)\, a_i / c$. Students of higher ability have a higher marginal return to effort and exert higher levels of effort. Due to this complementarity the talent-wage relation is convex. By Jensen's inequality, for a given m_a a larger variance in the distribution of talents, σ_a^2, leads to higher expected wages and therefore higher tax revenues for a given β. But this does not necessarily lead to lower graduate taxes. To see this, note that the optimal tax rate is strictly decreasing in σ_a^2 if and only if

$$\begin{aligned} & m_a^2 \left(1 - 2\frac{c}{\gamma}\right) - cr\sigma_\varepsilon^2 < 0 \\ \Leftrightarrow\ & \frac{m_a^2}{2\frac{m_a^2}{\gamma} + r\sigma_\varepsilon^2} < c, \end{aligned}$$

i.e., when c is sufficiently large. For such high graduate effort costs, the optimal tax rate is rather large. At this level, the disincentive effect of an increase in the tax is relatively high, leading to a decrease in tax revenue (we are beyond the highest point of the so-called Laffer curve). Should σ_a^2 increase, more income is generated on account of Jensen's inequality. The tax rate should however be lowered in order to generate higher revenues and hence lower tuition fees. The reverse is true when graduate effort costs are low $c < m_a^2 / \left(2m_a^2/\gamma + r\sigma_\varepsilon^2\right)$. In this case, the optimal tax rate is small and

$\beta \to 1 \Rightarrow \alpha < 0$. Educational subsidies as a means for redistribution are discussed by Dur et al. (2004).

the disincentive effect of an increase in the tax is relatively small. A rise in the spread of abilities may be met with an increase in the tax rate, as tax revenues will then be driven up by the highly able. The median student then benefits from lower tuition fees.

2.5 Decision to Study at University

In the previous sections students account for the whole population. In this section we relax this assumption, allowing for only a subset of the population to study and focusing on the decision of a school-leaver to apply for a place at university. We compare the graduate tax with up-front tuition fees and determine which system leads to a higher number of applications, focusing on the selection problem.

Let there be a continuum of school-leavers $I = [0, 1]$ contemplating whether or not to take a degree course at university. School-leaver i is aware of his or her ability a_i, and abilities are normally distributed: $a_i \sim N(m_a, \sigma_a^2)$. For simplicity, all school-leavers who decide against a university degree will attain a certainty equivalent of w_0, irrespective of their abilities. But if school-leaver i decides to study, the second-period graduate wage is

$$W_i = qa_i + \varepsilon_i,$$

where q again stands for the quality of education and $\varepsilon_i \sim N(0, \sigma_\varepsilon^2)$ represents a random component of future income of a university graduate unbeknown to the school-leaver at the time of applying for a place at university.[9] We again assume that ε_i and a_i are uncorrelated. Suppose now that the per capita costs of education are equal to κ. Furthermore, we assume that the state can screen the applicants and can set a minimum ability level $a_{\min}$ as a precondition for admission.

[9] To reduce the complexity of analysis, we revert to exogenous teaching quality and the basic-model wage that is independent of workplace effort.

With a tuition fee α, a school-leaver will apply for university if

$$\begin{aligned} E\left[qa_i + \varepsilon_i - \alpha\right] - \frac{1}{2} r \cdot \operatorname{var}\left[qa_i + \varepsilon_i - \alpha\right] &> w_0 \\ \Leftrightarrow qa_i - \alpha - \frac{1}{2} r\sigma_\varepsilon^2 &> w_0 \\ \Leftrightarrow a_i &> \frac{w_0 + \frac{1}{2} r\sigma_\varepsilon^2 + \alpha}{q}. \end{aligned}$$

With a graduate tax β, a university education is chosen if

$$\begin{aligned} E\left[(1-\beta)\left(qa_i + \varepsilon_i\right)\right] - \frac{1}{2} r \cdot \operatorname{var}\left[(1-\beta)\left(qa_i + \varepsilon_i\right)\right] &> w_0 \\ \Leftrightarrow (1-\beta)\, qa_i - \frac{1}{2} r\left(1-\beta\right)^2 \sigma_\varepsilon^2 &> w_0 \\ \Leftrightarrow a_i &> \frac{w_0 + \frac{1}{2} r\left(1-\beta\right)^2 \sigma_\varepsilon^2}{(1-\beta)\, q}. \end{aligned} \tag{2.5}$$

In the case of a fixed tuition fee, the state can cover its costs by setting $\alpha = \kappa$, regardless of the number of students. With the tax rate, however, voluntary enrolment will not necessarily lead to a balanced budget when the tax rate is small. But the state can always limit enrolment by imposing an appropriate minimum ability requirement.

We now show that more school-leavers will apply for university if the state implements a budget-balancing graduate tax. To see this, we first consider a situation in which the state imposes a fixed fee $\alpha = \kappa$ on all students. In this case, the marginal student, i.e., the one whose ability is just sufficient to warrant a university education rather than employment directly on finishing school, is characterized by ability

$$a_\kappa = \frac{w_0 + \frac{1}{2} r\sigma_\varepsilon^2 + \kappa}{q}.$$

Now suppose instead that the state sets a graduate tax rate β' leading to exactly the same expected payment by the marginal student as the budget

balacing fee, i.e.,

$$\beta' q a_\kappa = \kappa \quad \Leftrightarrow \quad \beta' = \frac{\kappa}{q a_\kappa} = \frac{\kappa}{w_0 + \frac{1}{2} r \sigma_\varepsilon^2 + \kappa}.$$

By substituting this tax level into (2.5) we see that a school-leaver will choose to enrol if

$$a_i > \frac{w_0 + \frac{1}{2} r \left(1 - \frac{\kappa}{w_0 + \frac{1}{2} r \sigma_\varepsilon^2 + \kappa}\right)^2 \sigma_\varepsilon^2}{\left(1 - \frac{\kappa}{w_0 + \frac{1}{2} r \sigma_\varepsilon^2 + \kappa}\right) q} =: a_\beta.$$

Note that a_β is always smaller than a_κ, as

$$\begin{aligned} \frac{w_0 + \frac{1}{2} r \left(1 - \frac{\kappa}{w_0 + \frac{1}{2} r \sigma_\varepsilon^2 + \kappa}\right)^2 \sigma_\varepsilon^2}{\left(1 - \frac{\kappa}{w_0 + \frac{1}{2} r \sigma_\varepsilon^2 + \kappa}\right) q} &< \frac{w_0 + \frac{1}{2} r \sigma_\varepsilon^2 + \kappa}{q} \\ \Leftrightarrow \left(1 - \frac{\kappa}{w_0 + \frac{1}{2} r \sigma_\varepsilon^2 + \kappa}\right)^2 &< 1, \end{aligned}$$

which is always true. Hence, the number of applicants will increase when moving to a graduate tax and imposing this tax rate.

Now we consider the effect of the tax on the state's finances. Recall that by definition, the state always breaks even with the budget-balancing fixed fee. With the tax, the state earns less when students of lower ability choose to enrol. However, costs can be controlled by limiting enrolment and choosing a threshold ability for admission $a_{\min} \in [a_\beta, a_\kappa]$. The expected surplus from the tax is then

$$\begin{aligned} &\int_{a_{\min}}^{\infty} \left(\beta' q a_i - \kappa\right) f\left(a_i\right) da_i \\ &= \int_{a_{\min}}^{\infty} \kappa \left(\frac{a_i}{a_\kappa} - 1\right) f\left(a_i\right) da_i \\ = \int_{a_\kappa}^{\infty} \kappa \left(\frac{a_i}{a_\kappa} - 1\right) f\left(a_i\right) da_i &+ \int_{a_{\min}}^{a_\kappa} \kappa \left(\frac{a_i}{a_\kappa} - 1\right) f\left(a_i\right) da_i. \end{aligned} \tag{2.6}$$

Note that the first term of expression (2.6) is strictly positive. This is due to the fact that with the tax the state collects more money than it spends

from all the students who would rather enrol with the fee; although these students would prefer the fee, they continue to enrol with the tax. On the other hand, at the tax rate β', the state subsidizes those students with ability levels below a_κ. Still, it is always possible to finance such a subsidy out of the additional revenues collected from the more able students. The state simply sets a minimum ability requirement $a_{\min}$ that guarantees that it does not lose money from implementing the graduate tax. The budget-balancing threshold $\underline{a}_{\min}$ is strictly smaller than a_κ. To see this, note that the budget surplus (2.6) is strictly positive at $a_{\min} = a_\kappa$ and decreases as the admission threshold $a_{\min}$ is lowered.

Hence, we conclude:

Proposition 6 *By replacing a budget-balancing tuition fee with a graduate tax, enrolment can be increased without violating the budget constraint.*

There are two reasons for this property of the graduate tax. The first is risk aversion; the tax reduces the risk of uncertain returns from studying and in turn increases the school-leaver's willingness to study. This can be seen by comparing the certainty equivalent of the marginal student paying the tax with the alternative certainty equivalent when paying the fee; the former is always higher than the latter:

$$\begin{aligned} & E\left[(1-\beta)\left(qa_\kappa+\varepsilon_\kappa\right)\right]-\frac{1}{2}r\cdot\operatorname{var}\left[(1-\beta)\left(qa_\kappa+\varepsilon_\kappa\right)\right] \\ & \quad > E\left[qa_\kappa+\varepsilon_\kappa-\alpha\right]-\frac{1}{2}r\cdot\operatorname{var}\left[qa_\kappa+\varepsilon_\kappa-\alpha\right] \\ \Leftrightarrow & \left(1-\frac{\kappa}{qa_\kappa}\right)qa_\kappa-\frac{1}{2}r\left(1-\frac{\kappa}{qa_\kappa}\right)^2\sigma_\varepsilon^2>qa_\kappa-\kappa-\frac{1}{2}r\sigma_\varepsilon^2 \\ & \quad \Leftrightarrow \left(1-\frac{\kappa}{w_0+\frac{1}{2}r\sigma_\varepsilon^2+\kappa}\right)^2<1. \end{aligned}$$

The second reason for more school-leavers applying with the graduate tax than the fixed tuition fee is price discrimination. The tax results in higher prices for those students with a higher willingness to pay, due to their higher abilities, and lower prices for others, who are less able with a lower willingness to pay.

Of course, it is important to stress that increasing enrolment may not be an appropriate goal in its own right, as this could result in overprovision of university education. It is therefore instructive to compare enrolment under both systems with a first-best benchmark. Note that if the risk-neutral state could absorb all the risk, in the first-best solution any individual for which $qa_i > w_0 + \kappa$ should enrol. Hence, there is a cutoff

$$a^{FB} = \frac{w_0 + \kappa}{q}$$

characterizing the ability of the marginal student who should study at university in a world with perfect insurance against income fluctuations. Note that $a_\kappa > a^{FB}$, so in fact a budget-balancing fee leads to underprovision of university education relative to this criterion.[10] This is because the risk-averse individuals dislike uncertainty about future income. But as we have shown in the above, a graduate tax can always increase enrolment without violating the budget constraint and, hence, it follows directly that setting an appropriate tax rate rather than charging a budget-balancing fee would bring enrolment closer to the first-best benchmark.

Finally, note that the state's financial contribution to education is assumed to be constant in the model. In reality, the state's budget is a function of revenues from other sources including general income tax, which also depends on productivity and is affected by education levels.[11] In our model, the graduate tax attracts a greater number of students without deterring high-ability students from enrolling. Since all graduates are more productive than they would have been without a university education, we conjecture that a graduate tax would provide a greater return on investment to the state's part-financing of education, in terms of general income tax revenues, than would fixed tuition fees.

[10]Note too that the higher the quality of teaching q, the higher the optimal level of enrolment (the lower is a^{FB}).

[11]Note that this may be a rationale for the state to choose a strictly positive B to subsidize university education from the general budget.

2.6 Conclusion and Outlook

We have compared fixed tuition fees with a graduate tax as a means to fund higher education, from the perspective of students of differing ability. Applying a utility function with constant absolute risk aversion, we were able to show that for risk-averse students, a graduate tax is generally preferable, as it insures against fluctuations in future income. We then allowed for universities to invest in teaching quality and for income to depend not only on this quality but also on graduate effort at the workplace. We showed that while the tax is a disincentive for workers to generate income themselves, it acts as an incentive for the universities to improve the quality of education. A key finding is that the tax is most effective when paid directly by graduates to their former universities. In this way, it is possible to overcome the free-rider problem which exists when the state shares tax revenue equally among universities.

One may ask what the effect would be of having tuition fees collected directly by universities. In our model, there are only two periods and the fee is paid only once; thus there would be no direct incentive for universities to increase teaching quality. Were the model extended to more periods or an overlapping-generations setup, long-term reputation considerations would become relevant and implicit incentives would be created. However, reputation would always be built on past teaching quality; the incentives would not be as immediate as those created by the graduate tax scheme.

Although our students differ in their innate abilities, we do not differentiate between rich and poor students and do not look into grants and loans. Hence, the issue of equity based on initial endowments of wealth does not arise in the model. This might be incorporated via an interest rate that varies between students with respect to their ability to borrow money to pay the up-front fee. Note that if we did distinguish between rich and poor, the level of risk aversion could be lower among wealthier individuals, and an assumption of decreasing rather than constant risk aversion might be more appropriate. The advantage of the tax in reducing the risk in future income would then be greater for potential students from poorer backgrounds. Tu-

ition fees would represent a stronger deterrent to poorer individuals in the decision to enrol at university. Despite not considering different levels of wealth, when we endogenize the decision by school-leavers whether or not to apply for university, our analysis does demonstrate that a graduate tax would allow a larger proportion of the population to study than the equivalent up-front tuition fee. This is due to the tax exacting price discrimination on the market for higher education in addition to its insurance properties. Individual risk concerns under a system of tuition fees lead to underprovision of university education, and a graduate tax could be used to bring enrolment closer to the optimal level.

Barr (2004) advocates a system of loans with income-contingent repayments, which has similar properties to the graduate tax but is beyond the scope of our analysis. Such systems operate in Australia and Sweden.[12] They have the attraction of allowing students to reap more of the returns from education and mitigate disincentive effects on effort at the workplace relative to a graduate tax. However there is no direct cross-subsidy from high-ability students to finance the education of those with lower abilities, and there is less transfer of risk where the principal of a loan remains payable, so participation in higher education is likely to be lower with income-contingent repayments than with a graduate tax. The problem of moral hazard with regard to university investments in teaching quality may also persist with income-contingent loans, as revenues from graduates are limited to covering the cost of their education, as is the case with the fixed tuition fees in our model.

Finally, alumni donations seem to play an increasingly significant role in financing higher education.[13] A graduate tax might be expected to crowd out donations more than would up-front tuition fees. Yet Rothstein and Rouse (2011) find that students who financed their studies through loans were no

[12]Using data on graduate income profiles, Chapman and Sinning (2012) demonstrate how a system of income-contingent loans could be introduced to compensate for a significant rise in tuition fees at universities in Germany.

[13]This is especially true in the USA. From a nationwide sample of 415 institutions of higher education, Cunningham and Cochi-Ficano (2002) calculate an average annual donation of U.S. $149 per alumnus.

less likely to pledge a gift to their institution than those who studied on a free grant. Alumni bearing debt from their studies were, however, more likely to default on such pledges, an effect that the authors attribute to credit constraints. Voluntary contributions to one's alma mater presumably arise through graduate preferences for fairness and reciprocity. An interesting extension to our model may thus be to consider the effect of universities anticipating such preferences on their incentives to improve teaching quality.

Chapter 3

Tax or Beg? Mandatory Payments to Charity and their Effects on Donor Behavior

3.1 Introduction

Charitable organizations' income derives from various sources. On the one hand, individuals and private foundations provide voluntary donations. On the other hand, funds are provided indirectly through state grants. It is perhaps natural to wonder why the state is required to finance these organizations when it is people who vote for government in the first place and pay for its spending via their taxes. To what extent do charities benefit from such government intermediation? In several European countries, a small charity tax forms an integral part of standard fiscal policy.[1] The purpose of the present study is to ask whether such mandatory payments to charity lead to higher contributions than would do a system of purely voluntary donations. Put shortly, should we let government tax or charities beg?

In practice, we observe further fiscal intervention related to donations. In Germany, for example, donors may reclaim tax paid on the income they

[1] In Germany, Finland and Sweden, the state levies additional tax from church members. In Italy and Spain, there exist similar regimes but taxpayers can opt for their money to be spent on nonreligious causes. Charity tax rates range from 0.8% to 2.5% of income.

have donated to registered charities. In the United Kingdom, the "Gift Aid" scheme allows charities themselves to reclaim tax paid on the income donated to them by taxpayers.[2] Andreoni (1990) offers a rational explanation for the existence of such fiscal incentives for donors. Assuming people derive additional utility from the act of donating voluntarily (they experience the "warm glow" of giving), charity revenues will be higher through subsidies to voluntary donations than via the equivalent compulsory charity tax.

Our study involves a laboratory experiment that compares a system of voluntary donations with a compulsory charity tax at various rates. We set no explicit incentives to donate. Indeed, in the absence of subsidies, Andreoni (1990) would not predict any difference in total contributions (voluntary donations plus charity-tax revenue) between the systems for pure altruists as long as the tax does not exceed their desired level of contributions. The tax would merely crowd out the voluntary part of contributions. For impure altruists who experience warm glow, the introduction of a tax should only increase total contributions as they are unwilling to substitute all of their voluntary donations with the tax. They would continue to donate on top of the tax in order to continue experiencing warm glow.

We are not the first to investigate the effects of different fiscal systems on the propensity to donate within an experimental setting. Andreoni (1993) himself found that taxing contributions to the public good crowded out voluntary contributions incompletely, by less than three quarters. Bolton and Katok (1998) used a dictator game to elicit donor preferences which also turned out to be in accordance with warm glow theory. However, their study focused on altruism between experiment participants rather than on donations to charitable organizations. Researchers in the field of neuroscience have been concerned with motives for charitable giving. Harbaugh et al. (2007) report "larger activation in reward-related areas [of the brain] when executing a charitable transfer, over and above what occurs in an analogous mandatory transfer, even after controlling for the payoffs associated with

[2]Higher-rate taxpayers can reclaim the difference between the higher and basic rates of tax. See Heinzel (2004) for some further examples of European tax-relief systems with regard to charitable spending.

subject choices." Although our results gain some plausibility in light of this study, it is based on observations of just nineteen subjects.[3]

Our experiment is most closely related to Eckel et al. (2005). They compare donations when donors are taxed at two different, positive tax rates, across two frames, one where the tax is called as such, and the other where it is masked as a contribution to the charity from the experimenter, as a model of fiscal illusion. Subjects' voluntary donations are crowded out by the higher tax in the transparent setting but not when the frame is opaque – hence the subjects are successfully illuded. Our design sets itself aside from Eckel et al. (2005) in three key ways. First and foremost, it is not about fiscal illusion. Our no-tax treatment is just that; there really is no tax. In the tax treatments, the charity tax is always labeled as such in order to preclude framing effects. Second, we make our subjects work for the money from which they can donate rather than simply paying them for turning up.[4] Indeed, 12.5% of our subjects fail to complete a sufficient number of tasks satisfactorily and are consequently unable to donate. Third, we choose different tax rates, setting them to 2%, 8% and 30%, rather than replicating the rates of 10% and 25% in the above-mentioned experiments. The aim here is to see if particularly small or large tax rates make a difference. In their experiment on work incentives, Gneezy and Rustichini (2000) report that while effort is positively related to the level of the reward, the very introduction of monetary compensation has a negative effect on performance. Similarly, we hypothesize that introducing a small charity tax actually decreases total charity revenue as people react adversely to being constrained to contribute a minimum amount to the charity. Indeed, on average, voluntary donations under our small tax are crowded out by more than one hundred percent.[5] Only higher tax rates, while also crowding out voluntary donations, guarantee charity revenues to reach those achieved under the tax-free system.

[3] A potential weakness in the design by Harbaugh et al. (2007) is that they did not implement separate tax/no-tax treatments. Subjects switched between mandatory and voluntary transfers, which presumably made the aim of the experimenters quite obvious to them. In addition, there was no free choice on the actual amount to be donated.

[4] This represents a more general departure from typical designs of experiments on charitable giving.

[5] This result holds exclusively for male participants.

The chapter is structured as follows. We begin with a simple model to analyze the economic-theoretical impact of changes in the tax rate on contributions to the cause. We next distinguish between high and low taxes, deriving a counter-hypothesis from psychology. We then consider gender effects based on previous findings in the literature. In section 3.3 we introduce our experimental design and in section 3.4 we present and discuss our results, before concluding and proposing an extension to our experimental design in section 3.5.

3.2 Theoretical Basis

3.2.1 A Simple Economic Model

We first present a simple economic model and show that a donor who cares about a good cause is indifferent between whether money destined for the cause is transferred via a tax on income or through a voluntary donation.[6] We assume that an exogenously determined level of income $w > 0$ is earned and that a lump-sum tax $t \in [0, w]$ is levied on this income. The tax revenue goes to a good cause. On top of this, the donor may make a voluntary donation v to the same good cause. The total contribution to the cause is thus $c = v + t$. The donor derives positive utility from personal consumption of net income x and from her total contribution to the cause c. The donor's utility function is concave in both parameters: $U(x, c)$, $U_x \geq 0$, $U_{xx} < 0$ and $U_c \geq 0$, $U_{cc} < 0$. In addition, her marginal utility from personal consumption is positive at the point of no consumption $U_x(0, \cdot) > 0$.

Under the charity tax, the donor decides on the voluntary donation that

[6] The model is similar to Andreoni (1990) where individuals are considered to derive extra utility from the act of giving voluntarily. He refers to "warm glow" and labels such donors "impure altruists". However, in our model we only allow for pure altruism. It is also different in that utility is based simply on contributions from a donor to her chosen good cause. We assume that she has no information about transfers from other donors to this cause and that their contributions to the public good do not affect her utility.

maximizes utility subject to her budget constraint,

$$\begin{aligned} &\max_{v} U(x, c) \\ \text{s.t.} \quad &v \geq 0 \\ &x + c = w. \end{aligned}$$

Substituting $c = v + t$, we have

$$\begin{aligned} &\max_{v} U(w - v - t, v + t) \\ \text{s.t.} \quad &v \geq 0. \end{aligned}$$

We now distinguish between two cases. In the first case, marginal utility from voluntary donations at the point of zero voluntary donations is less than or equal to marginal utility from personal consumption. This could be either because the donor is selfish in not wanting to contribute anything to the cause or because the charity tax at this point is already equal to or above the amount the donor would optimally allocate to the cause. We then obtain the corner solution with an optimal voluntary donation of zero $v^* = 0$. In the second case, where marginal utility from voluntary donations at the point of zero voluntary donations is positive, we have an interior solution $v^* > 0$ characterized by the first-order condition[7]

$$\begin{aligned} &\frac{dU}{dv} = 0 \\ \Leftrightarrow &-U_x + U_c = 0. \end{aligned} \tag{3.1}$$

We thus state our first theoretical result.

[7] See subsection 3.6.1 for the proof.

Proposition 1 *For $U_x(w-t,t) < U_c(w-t,t)$, donors give $v^* > 0$ voluntarily at the point where marginal utility from consumption equals marginal utility from total charitable contributions $U_x = U_c$. Otherwise they donate nothing $v^* = 0$.*

Applying the implicit function theorem, we obtain

$$\frac{dv}{dt} = -1. \tag{3.2}$$

Voluntary donations and mandatory tax contributions are thus perfect substitutes for each other. We now examine what happens when the tax level is changed,

$$\begin{aligned} c &= v(t) + t \\ \Rightarrow \frac{dc}{dt} &= -1 + 1 = 0. \end{aligned}$$

Our second theoretical result is summarized as follows.

Proposition 2 *Given a positive optimal voluntary donation $v^* > 0$, any small change in the charity tax will be offset by an adjustment in the voluntary donation such that total contributions remain unaffected $\frac{dc}{dt} = 0$.*

Changing the tax level will not influence total revenue to the good cause as the donor adjusts her voluntary donation accordingly. At the point where the voluntary donation has been totally crowded out by the tax we again obtain the corner solution $v^* = 0$ and any further increase in the tax will enforce a level of contributions which is suboptimal for the donor. None of these shall then be voluntary. Based on the assumptions of this economic model, it may be inferred that a charity-tax system would be superior to a system of purely voluntary donations, in terms of total contributions. We hence present our first hypothesis to be tested in the experiment.

Hypothesis 1 (economics)

A compulsory charity tax generates total contributions from donors equal to or above those generated by a system of voluntary donations.

3.2.2 Psychological Reactance Theory

In this subsection, we adopt an alternative approach from psychology to argue that our first hypothesis should only hold for a sufficiently large charity tax. In his theory of "psychological reactance," Brehm (1966) supposes that individuals enjoy specific freedoms regarding how to behave and suggests that if such a freedom comes under threat, a desire to reinstate the freedom is experienced. Examples of observed behavior in line with this theory range from children who refuse to eat vegetables when forced but readily do so when vegetables are presented to them as a delicacy available only to adults, to politicians who deliberately change their course of action solely to demonstrate that they are fully capable of making their own decisions.[8] Applying psychological reactance theory to our comparison of a compulsory charity tax with a system of voluntary donations, we derive predictions that conflict with the economic reasoning in subsection 3.2.1. Given the choice, individuals would prefer not to be forced to support a cause through a tax. Where voluntary donations are still possible in combination with the charity tax, donors may use these to demonstrate their frustration with the tax. Deeming themselves capable of deciding how to allocate their own income, they will react adversely to the tax by reducing the total contributions made to the cause through lower voluntary donations. When the tax rate is sufficiently low, i.e. the forced contribution is less than what the individual would contribute within a purely voluntary system, the introduction of this tax may hence lead to lower total contributions. We therefore hypothesize that small charity taxes crowd out voluntary donations by more than one hundred percent. Only when the charity tax is sufficiently large does it generate higher total contributions than a system of purely voluntary donations.

Hypothesis 2 (psychology)

(a) A small compulsory charity tax generates lower total contributions from donors than a system of voluntary donations.

[8] See Brehm and Brehm (1981) for further examples.

(b) A large compulsory charity tax generates higher total contributions from donors than a system of voluntary donations.

3.2.3 Gender Aspects

Previous research on charitable giving has shown that men and women often differ in their generosity. There is mixed evidence in the economics literature on giving regarding differences between the sexes.[9] In the context of dictator games such as in our experiment, Bolton and Katok (1995) find no gender difference whereas Eckel and Grossman (1998) report giving by female subjects to be double that of their male counterparts. Andreoni and Vesterlund (2001) obtain a more complex result whereby whether male or female donors are more generous depends on the price of giving (men are more responsive to changes in price). Kamas et al. (2008) find that in anonymous individual giving to charity, women donate more than men, but when women are able to negotiate the amount to be donated with men, the latter increase their donations.[10] We base our third hypothesis on the sum of these findings, i.e. if there is a general trend, it is that women tend to be more generous than men.

Hypothesis 3 (gender)

On average, female participants donate more than male participants.

Having established our hypotheses, we next present the design of the experiment.

3.3 Experimental Design

The experiment was programmed and implemented using z-Tree (Fischbacher, 2007) version 3.2.6 and is subdivided into four treatments. The first of these

[9] See Cox and Deck (2006) for a comprehensive overview.

[10] Negotiation may not always lead to increased charitable giving. Using US survey data on the donor behavior of married couples, Andreoni et al. (2003) find that those who bargain give significantly less compared to situations in which decisions are made by a single spouse.

is the no-tax treatment while in the remaining three a charity tax on income is levied at 2%, 8% and 30%, respectively.

120 individuals, mostly students on various courses at the University of Cologne, Germany, were recruited to four experimental sessions, two in June 2007 and two in October 2007 at the Cologne Laboratory[11] using ORSEE (Greiner, 2004).[12] Each participant was allocated a computer booth randomly upon arrival at the laboratory. Once all the participants were seated, the experimenter thanked them for coming and informed them that they would be working for money and that they would be able to donate a part of their earnings to a good cause. They were also told not to communicate with fellow participants. The rest of the instructions appeared on the computer screens as they varied by treatment and all four treatments took place simultaneously in each session in order to control for any session effects that might arise.[13]

In each treatment, subjects were provided with the descriptions of six charities in print form and were first instructed to read them.[14] They were then required to select one of the charities to which they would be able to

[11]The Cologne Laboratory for Economic Research. For more information, see http://www.lab.uni-koeln.de/rs/public/index.php?language=en.

[12]This system provides for the selection of potential participants according to various criteria such as age, gender, university course, etc. The only two restrictions imposed on the invitations to this experiment were (a) that the invitees had not previously applied for participation in other experiments and then not shown up and (b) that they had not previously participated in experiments with the same real-effort task. There was no mention of charity or the opportunity to donate in the invitations. In all, 140 individuals were invited (35 per session); those turning up first were allowed to participate and the remainder (up to 5 people per session) were denied participation and paid €2.50 for showing up. This is standard procedure in Cologne in order to ensure punctuality and avoid empty seats for no-shows. The demographics of those who actually participated are presented in subsection 3.6.2.

[13]Translations of the instructions can be found in subsection 3.6.3. Since there were thirty participants per session and thirty is not divisible by four, sessions alternated between treatment formations of 8-8-7-7 and 7-7-8-8. That is, in two sessions, eight participants were allocated to the no-tax treatment, eight to the 2% treatment and seven to each of the 8% and 30% treatments. In the other two sessions, this pattern was reversed.

[14]Eckel et al. (2005) also had their subjects pick a charity from a list. Our charities were preselected from participating organizations at the Cologne Volunteer Day ("Kölner Ehrenamtstag") held on 24 September 2006. They range in scope from local to international, covering areas from health to the environment (see figure 3.1). None of them has an overtly religious background.

donate any money they earned in the experiment. After having selected a charity, they were informed of the tasks they should perform in order to earn the fixed amount of €10 on top of the show-up fee of €2.50. These tasks involved adding or subtracting the sums of the digits in two twelve-figure numbers, depending on their relative size. A minimum of five correct answers over a period of fifteen minutes was required to earn the €10. Two simple examples were displayed on the screen and the subjects were provided with pens and paper to assist them in their calculations.[15] Before the fifteen-minute period of work began, subjects were informed of their respective fiscal settings and the possibility to donate from their after-tax income. Those in the no-tax treatment were simply told that they would earn €10 upon fulfilling the minimum requirement and that they would be able to donate any amount from this to their designated charity at the end of the fifteen-minute period. Those in the treatments with 2%, 8% and 30% tax rates were informed that they would earn €10 upon fulfilling the minimum requirement and that €0.20, €0.80 and €3, respectively, would be levied as a tax from this income and paid to the charity of their choice.[16] In addition, they would then be able to donate any amount from the remainder (€9.80, €9.20 and €7, respectively) to their designated charity at the end of the fifteen-minute period.[17] Once all the participants had clicked a button to acknowledge that they had understood the instructions, the fifteen-minute period started simultaneously for all treatments.

At the end of the fifteen minutes, the subjects were informed of their earnings. Unsuccessful participants were told that they had unfortunately failed to achieve the minimum number of five correct answers, informed that they would be paid €2.50 and asked to remain seated to fill in a questionnaire at the computer. Successful subjects were told that they had achieved the minimum of five correct answers and informed of their gross earnings and

[15] The use of calculators was not permitted.

[16] The designated charities were named at this stage to reassure the subjects that their choice of organization had been registered.

[17] In compliance with laboratory regulations, all subjects were informed that they would be paid an additional €2.50 for showing up to the experiment, regardless of their performance in the fifteen-minute period, but that they would not be able to donate from this amount within the framework of the experiment.

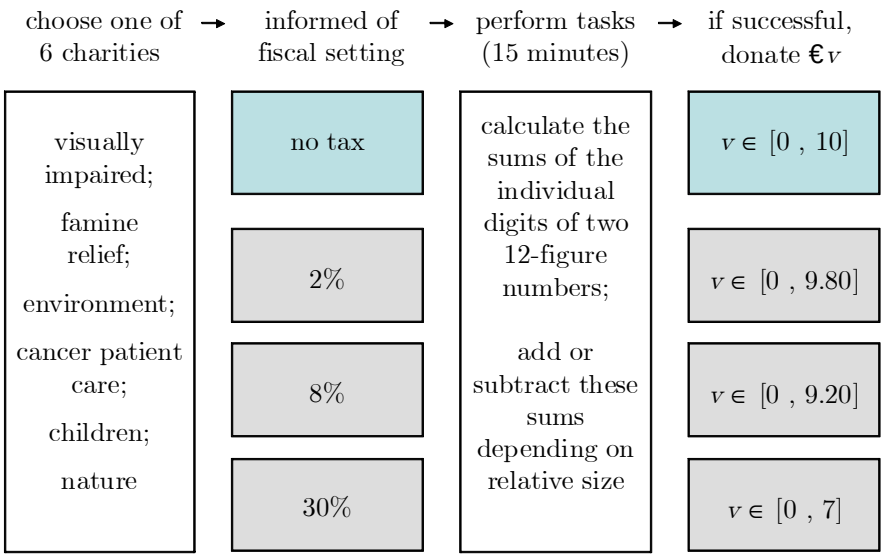

Figure 3.1: Experimental Design

any charity-tax deduction. They were then asked to choose how much to donate on top of this by entering an amount between €0 and their post-tax income. After having made their choice, they were presented with a table outlining their earnings, tax contribution and voluntary donation as well as the show-up fee of €2.50 and the amount they would be paid in cash. They were also asked to remain seated to fill in a questionnaire.

The questionnaire appeared on the screens once all successful subjects had decided how much to donate. It contained both general questions on personal characteristics as well as specific questions tailored to the actual performance of and decisions made by the individual participants over the course of the experiment. Once this had been completed, subjects were called up individually by booth number to collect their cash and, insofar as tax had been levied and/or money had been donated, a form signed by the experimenter confirming the name of the charity and the amount (tax plus donation) to be donated to the charity. Donations were then pooled by charity and paid by bank transfer to the respective charities in two payment stages, one after the two sessions in June and the other after the two sessions

in October.

3.4 Experimental Results

3.4.1 General Results

Of the 120 participants, 105 managed to achieve the minimum number of five correct answers and earn the €10 from which to donate. While this leaves us with a reduced total number of observations of (potential) donors, it is also an indication that subjects actually had to work for their money. However, imposing a charity tax did not affect their effort.[18] Figure 3.2 shows the

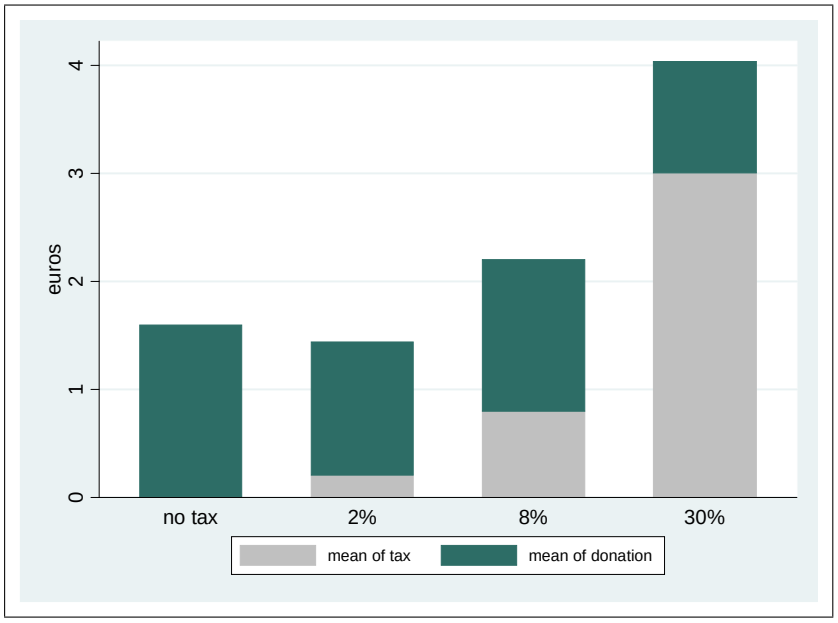

Figure 3.2: Mean Contribution by Tax Rate

mean average contributions.

[18] Taxes can act both as incentives and disincentives to work through income and substitution effects, see e.g. Break (1957). No single effect prevailed in our case of a charity tax where revenue is destined for a cause of one's choosing. Neither the number of actual failures nor the task success rate (number of correct answers divided by number of tasks attempted) differed significantly between the treatments, see subsection 3.6.7 for details.

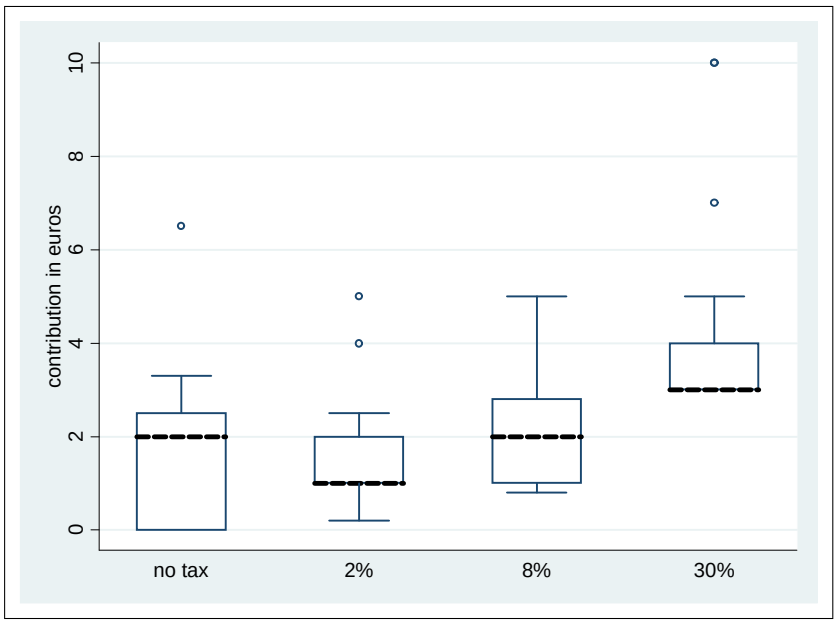

Figure 3.3: Box Plot of Contribution by Tax Rate

At first glance, it would seem that the economic model does not do too badly in predicting total contributions across the no-tax and low-tax (2% and 8% tax) treatments as mean contributions are comparable.[19] It does not predict the donations on top of the 30% tax, although there is at least some crowding out of donations here.[20] The 30% tax does generate significantly higher total contributions than the no-tax treatment.[21] Overall, we may be tempted to accept hypothesis 1, and we can certainly provide evidence to support hypothesis 2(b).

However, these aggregated data do mask existing differences between the treatments that appear on closer inspection of the respective distributions of donations in the data. Figure 3.3 displays the range of contributions by treatment. The dotted lines represent the median contributions while the

[19] Nonparametric comparisons of total contributions in the 2% and 8% tax treatments with those in the no-tax treatment reveal no significant difference. See subsection 3.6.4 for details of the nonparametric tests.

[20] Note that the fact that we still find positive donations with the 30% tax is in line with warm glow theory (Andreoni, 1990).

[21] A Fligner-Policello test comparison of both treatments results in a probability of error of less than 0.1%.

boxes include all values between the 25th and 75th percentiles. Whiskers mark the 5th and 95th percentiles, respectively, and the small circles depict outliers. First, note that the distributions of contributions in the tax treatments are compressed relative to the distribution in the no-tax treatment. Indeed, we would expect this from the economic theory in subsection 3.2.1 as total contributions are limited at the bottom by the tax itself while crowding out pulls the distribution downwards. Yet in relative terms, there are more cases of zero voluntary donations in the no-tax treatment, which contains 24 observations, than in either of the 2% or 8% tax treatments, which contain 26 and 27 observations, respectively. There, the 25th percentile is at the higher level of €1 rather than the lower bounds of €0.20 and €0.80. This is in part due to preferences for round numbers among those toward the lower end of the distribution.[22]

Note that the median contribution in the 2% tax treatment at €1 is a whole euro lower than in the no-tax treatment. Although this difference is not statistically significant,[23] it is still worthy of mention. Neither the economic model presented in subsection 3.2.1 nor warm glow theory (Andreoni, 1990) can explain it. Rather, it represents support for hypothesis 2(a) derived from the psychological theory in subsection 3.2.2.[24] Given that we have drawn participants from the same distribution (they were recruited from the same subject pool and allocated randomly to the treatments), what we observe is crowding out of voluntary donations by the 2% compulsory tax of well over 100%. In the following subsections we stratify the data by gender to reveal a significant difference between male and female donor behavior by tax treatment and analyze this over-crowding out in some more detail.

[22] Reasons for the actual amounts donated were solicited from participants donating positive amounts via an open question in the questionnaire. If anything related to round numbers formed part of the answer, a dummy variable *roundnum* was set to one. While there were no reports from those donating amounts less than or equal to €1 in the no-tax treatment, between 35% and 45% of those donating similar small amounts in the 2% and 8% tax treatments did report such preferences.

[23] A test for a higher median contribution in the no-tax treatment relative to the 2% tax treatment reveals a probability of error of 13% (one-tailed test).

[24] See subsection 3.6.5 for comments made by participants that are in line with this theory.

3.4.2 Results by Gender

In our experiment, similarly to some of those discussed in subsection 3.2.3, we find no significant difference between male and female giving at the aggregate level, meaning we cannot reject the null of hypothesis 3. Mean voluntary donations are €1.34 and €1.26, respectively, with female subjects displaying higher variance in their donor behavior. However when we look at the figures by tax treatment, the story changes somewhat. Figure 3.4 shows the mean

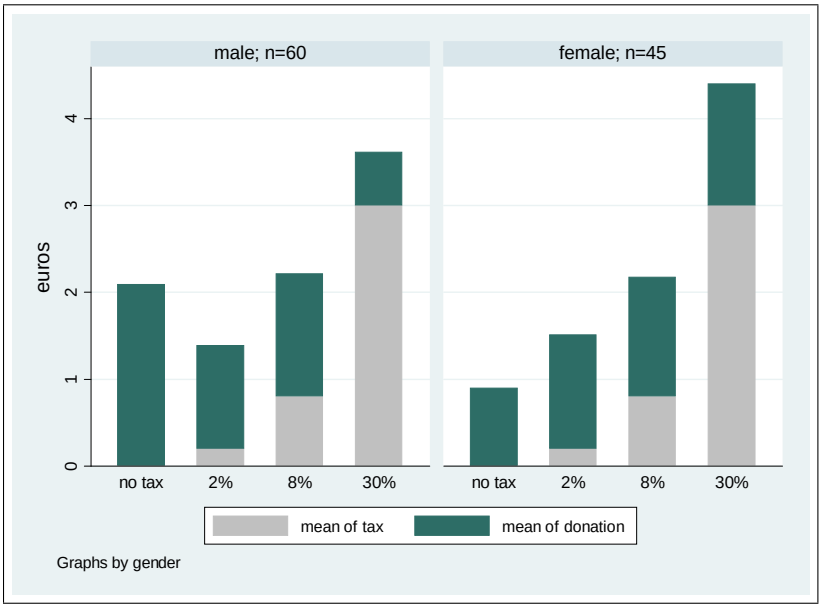

Figure 3.4: Mean Contribution by Tax Rate and Gender

average contributions by gender. While donations in the 2% and 8% tax treatments do not differ much between the sexes, differences are apparent in the no-tax and 30% tax treatments. Indeed, it would appear that a charity tax even tends to crowd *in* donations by female participants. As may be seen in the box plot in figure 3.5, the higher mean donation by female subjects in the 30% tax treatment shown in figure 3.4 is driven mainly by outliers (two generous undergraduate female participants donated fully €7 on top of their €3 tax).

The most important gender difference is found in the no-tax treatment. Male participants here donate an average of €2.09, which is more than double

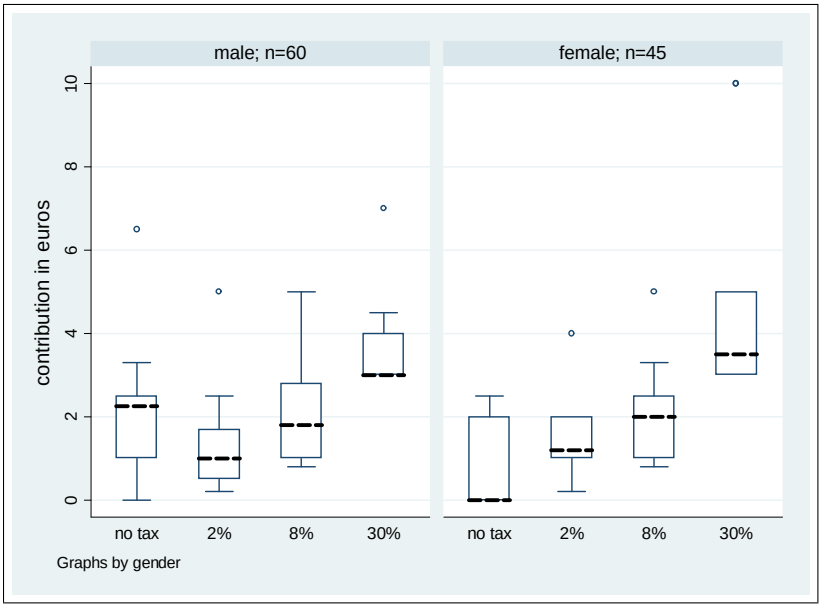

Figure 3.5: Box Plot of Contribution by Tax Rate and Gender

the mean female donation of €0.90. This difference contradicts hypothesis 3 and is statistically significant at the 5% level.[25] Why should we observe this stark contrast between the sexes?

We return to the psychological theory presented in subsection 3.2.2, which already explains why there can be more than 100% crowding out of voluntary donations when comparing the no-tax to the 2% tax treatment. In further work on psychological reactance, Regan and Brehm (1972) report differences between male and female reactance in an experiment on shopping for bread. They found that while men were susceptible to persuasive messages to buy a particular brand, women reacted to such messages by deliberately buying the other brand, despite being shown to be indifferent between the brands in the control group. It is proposed that when people differ in the perception of their competence to exercise a particular freedom, they react differently to threats to this freedom. The blunt conclusion from the shopping experiment is that the women there felt more competent than the men in choosing which

[25]See table 3.15 in subsection 3.6.4 for a Fligner-Policello test of higher contributions from males than from females in the no-tax treatment. The null hypothesis of equal contributions from males is rejected ($p = 0.013$).

bread to buy. Applying psychological reactance theory in an attempt to explain our experimental results, it could be that gender affects reactions to the constraint of having to give at least some money to the charity and not being free to decide how to spend all of one's money oneself. If women are more resolved or perceive more of a duty to donate to charity than men, they are perhaps less likely to be put off by the constraint. They may however react more than men to anything that appears to demean the value of their voluntary gift. In an experiment on blood donations, Mellström and Johannesson (2008) investigated the effect of introducing a monetary incentive on the intention to donate. While the payment had no effect on male intentions, female participants were significantly less inclined to make a blood donation for money. When offered the choice between taking the money for themselves and transferring it to a charity, female intentions were reinstated to the levels of those female participants not receiving any monetary incentive. It would seem that gender effects depend very much on context and that it is difficult to generalize our results to anything other than forced versus voluntary contributions of money to charity.

3.4.3 Regression Analysis

In the previous subsections we have tested each of our hypotheses in isolation using nonparametric methods, simply considering whether there is any difference in total contributions between the treatments and by gender. Here, we investigate the effects of the charity tax on crowding in/out voluntary donations in greater detail, testing all our hypotheses simultaneously, with particular attention to gender differences.[26] The variable that we now seek to explain in the analysis is the voluntary donation rather than the total contribution.

Using linear regression, we wish to calculate an overall rate of crowding out and predict what might happen to donor behavior for all feasible tax rates within the range of 0% to 30%, based on our data for 0%, 2%, 8% and 30% tax rates. We are particularly interested in estimating the level of tax at which donations would hit zero, so that total contributions at and beyond this tax level would simply consist of the tax. We might think of this tax level as the amount that the average (male) participant is willing to pay for charitable causes. We first perform ordinary least squares regression (OLS) on the data. However, this method underestimates crowding out as it does not take into account the fact that donations cannot be negative. To overcome this problem, we run a Tobit regression that censors the observations at both maximum and minimum donations. In doing so, we obtain a more realistic estimate of crowding out, effectively allowing for the fact that some participants would have preferred to give less than the €3.00 charity tax imposed on them. The results from these regressions are presented in table 3.1. Note that when we do not control for gender, we find no significant effect of tax on donations between the tax and no-tax treatments, underlining our results from the nonparametric tests discussed in subsection 3.4.1.[27] The *tax* coefficients in table 3.1 represent estimates for $\frac{dv}{dt}$ from our economic model, equation (3.2). Both the OLS and the Tobit estimates with absolute values

[26] We also control for any effects that the choice of a particular charity had on the amount donated.

[27] We present robust standard errors here on account of the observed heteroscedasticity in figure 3.5.

of less than one indicate that overall the tax only incompletely crowds out male donations.

Table 3.1: Donations as a Function of the Charity Tax

	OLS				Tobit[(3)]	
	donation		*donation*		*donation*	
tax (euros)	−0.12	(0.14)	**−0.33****	(0.14)	**−0.64****	(0.25)
female			−0.54	(0.36)	−0.76	(0.50)
tax·female			0.42	(0.27)	0.67	(0.44)
constant	**1.51*****	(0.26)	**1.78*****	(0.32)	**1.64*****	(0.44)
R^2	0.06		0.08		0.03	
observations	105		105		105	

Notes:

(1) Robust standard errors in parentheses.

(2) All regressions include binary control variables for the individual charities.

(3) Tobit: 31 left-censored, 2 right-censored observations; R^2 is pseudo R^2.

(4) *, ** & *** denote statistically significant difference from zero at the 10%, 5% & 1% levels.

The Tobit regression is also presented graphically alongside the actual donations in figure 3.6.[28] As can be seen here, based on the Tobit estimates, donations would become zero at a tax level of roughly €2.37. In other words, the average male participant in our experiment was ready to give about one quarter of the money he earned to the charity.

While the regressions in table 3.1 are informative in the sense that we can attempt predictions of what participants may donate under charity tax rates other than those tested in the experiment, they are also flawed because our data are concentrated toward the lower end of the range (€0.00 to €0.80 tax). We therefore turn to binary controls for each of the treatments and then interact each of these with gender. This enables us to quantify crowding in/out of donations by the specific charity tax rates more accurately. The results from these Tobit regressions are presented in table 3.2. Again, when

[28]The dots representing actual donations have been jittered in the graphs so as to disclose multiple cases of the same donation. Predicted donations have been evaluated at the mean values of the charity binary variables for each gender.

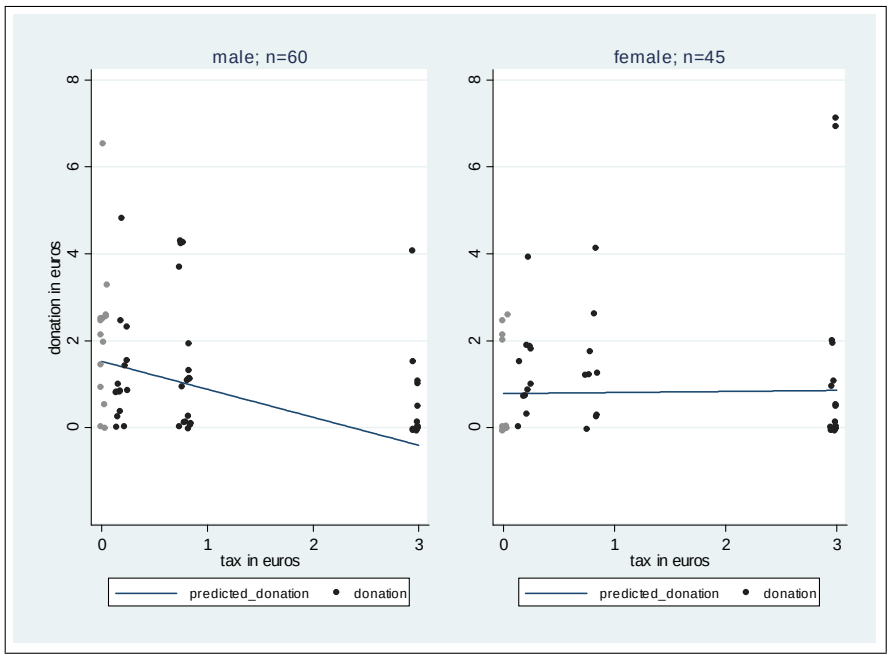

Figure 3.6: Tobit Donation Predictions by Tax and Gender

we do not control for gender, we find no significant difference in donations between the tax and no-tax treatments. However, when the sample is stratified by gender, a clearer picture emerges. The magnitude of the coefficient estimate for *2% tax* relative to the level of tax points to significant crowding out of donations by the 2% charity tax. Indeed, the model predicts a donation of €1.85 for an average male in the no-tax treatment and a donation of €1.05 for his counterpart in the 2% tax treatment. In other words, the €0.20 tax crowds out voluntary donations from male participants by 400%. Females who are subject to the 2% tax behave in a completely different way, increasing their donations by an estimated €1.35 with respect to female participants without the tax, representing crowding in of over 600%. While the coefficient for the 8% tax on male participants is not statistically significant, it points in the same direction as the one for the smaller 2% tax.

The results for the 30% tax are statistically significant. As already mentioned in subsection 3.4.2, the positive coefficient for the variable *30% tax·female* is driven mainly by two outliers. For male participants, we ob-

Table 3.2: Donations by Tax Treatment

	Tobit			
	donation		*donation*	
2% tax	−0.22	(0.53)	**−1.15***	(0.62)
8% tax	0.02	(0.58)	−0.74	(0.68)
30% tax	−0.98	(0.68)	**−2.35*****	(0.81)
female			**−2.01****	(0.92)
2% tax·female			**2.38****	(1.07)
8% tax·female			**2.02***	(1.16)
30% tax·female			**3.12****	(1.51)
constant	**1.24****	(0.55)	**2.08*****	(0.57)
pseudo R^2	0.03		0.04	
observations	105		105	

Notes:

(1) Base group: *no tax* *no tax & male*

(2) Robust standard errors in parentheses.

(3) All regressions include binary control variables for the individual charities.

(4) 31 left-censored, 2 right-censored observations.

(5) *, ** & *** denote statistically significant difference from zero at the 10%, 5% & 1% levels.

serve incomplete crowding out of voluntary donations. The actual average donation by men in the no-tax treatment is €2.09, less than the tax of €3.00, so it would not be possible to witness 100% crowding out when comparing both treatments. Yet our Tobit estimate predicts that the average male participant paying a charity tax of €3.00 would actually prefer a rebate of €0.49 on his payment. There is still 78% crowding out of male voluntary donations by the large tax.

We designed the experiment specifically to investigate the effect of a small, a medium and a large charity tax on donor behavior. We have established for male participants that the small 2% tax crowds out donations by more than the value of the tax revenue, thus doing more harm than good in terms of total contributions. Although the 30% tax only partially crowds out (male) donations, it has a stronger absolute negative effect on donations compared to the smaller taxes.

We now consider briefly the impact of the charity tax at the various rates on the decision to donate, running probit regressions and again stratifying the data by gender.

Table 3.3: Probit Regressions

	$\Pr\{donation > 0\}$			
	male sample		female sample	
2% tax	0.02	(0.19)	**0.44*****	(0.11)
8% tax	−0.06	(0.17)	0.31	(0.12)
30% tax	**−0.47****	(0.19)	0.03	(0.18)
observed probability	0.73		0.67	
predicted probability	0.76		0.72	
pseudo R^2	0.18		0.32	
observations	60		45	

Notes:

(1) Figures reported are estimated marginal effects relative to *no tax*.

(2) Robust standard errors for the underlying coefficients in parentheses.

(3) All regressions include binary control variables for the individual charities.

(4) ** & *** denote statistically significant difference from zero at the 5% and 1% levels.

The estimates in table 3.3 show that a small tax does not deter the male participants from voluntarily donating money altogether in the same way that the large tax does. A male participant paying the 2% charity tax is just as likely to make a positive voluntary donation as his counterpart in the treatment without tax (84% probability), whereas a male participant in the 30% tax treatment is only likely to donate on top of the tax with 39% probability. Yet as the Tobit results show, the 2% tax does reduce the size of male donations, to the extent that total contributions are smaller relative to a system of purely voluntary donations. Regarding female participants' decision to donate voluntarily, the story is in line with the previous regressions. The predicted probability for a positive donation without a charity tax is a mere 39%, but this increases significantly with the 2% tax rate. In other words, the small tax would seem to encourage female participants to donate.

3.5 Conclusion and Outlook

Having set out to see if a charity tax generates higher contributions than a system of purely voluntary donations, we have found mixed evidence. At the aggregate level, tax crowds out donations by less than the one hundred per cent predicted by our economic model. This suggests that a model with warm glow (Andreoni, 1990) would better describe donor behavior. The high tax of 30% certainly serves to increase charity revenue. Yet our small tax of 2%, which is in fact more comparable to charity tax rates that exist in the real world, actually lowered total contributions to the charities, doing more harm than good and providing support for the notion of psychological reactance among the male participants. Of course our results are only based on incomes of €10 so they should not be interpreted in terms of charity-tax incidence for the whole economy. Nevertheless, the participants in the experiment did have to earn their money and from their comments in the questionnaire it would seem that they took their decisions on the amount to donate seriously and with care. If the results did hold for larger incomes, the message from this study regarding charity taxes might be in the spirit of

Gneezy and Rustichini (2000), "tax enough or don't tax at all."

Our findings regarding gender are complex and harder to explain. We are not able to reject the null hypothesis of no significant difference between male and female donations overall, and in contrast to other experimental studies on giving, we have found that male participants actually donate significantly more than their female counterparts in a setting without tax. We are not the first to witness the crowding in of donations by government intervention, indeed a strand of the literature on charity is devoted to "matching donations," see e.g. Karlan and List (2007). Yet why this should only be the case for women remains curious and perhaps deserves more attention in future research.[29]

Finally, one question that our experimental design does not tackle is what happens when the existing fiscal regime is changed. Participants in our experiment were only subject to one fiscal setting. A follow-up experiment might entail three working periods, with the opportunity to donate earnings at the end of each period. Allowing participants to choose the amount freely in the first period, constraining them to a minimum contribution in the second and then withdrawing this constraint in the final period would provide the possibility to gauge the consequences of reducing state intervention in charitable giving.

[29] See Alesina et al. (2011) for an interesting discussion of why it may be legitimate to differentiate fiscal policy according to gender.

3.6 Appendix

3.6.1 Two Solutions to the Donor's Maximization Problem

Here, we distinguish between two cases for solving the donor's maximization problem and demonstrate that we either obtain the corner solution with a zero voluntary donation $v^* = 0$ or an interior solution with a voluntary donation $v^* > 0$.

Corner Solution $v^* = 0$ if $\frac{dU(x,c)}{dv}\Big|_{v=0} \leq 0$

We first show what happens if at the point of zero voluntary donations, marginal utility from donating is less than or equal to zero $\frac{dU(x,c)}{dv}\Big|_{v=0} \leq 0$.

The donor decides on the voluntary donation that maximizes utility subject to her budget constraint,

$$\begin{aligned} &\max_{v} U(x,c) \\ \text{s.t.} \quad &v \geq 0 \\ &x + c = w. \end{aligned}$$

Substituting $c = v + t$, we have

$$\begin{aligned} &\max_{v} U(w - v - t, v + t) \\ \text{s.t.} \quad &v \geq 0. \end{aligned}$$

In this case,

$$\frac{dU(x,c)}{dv}\Big|_{v=0} \leq 0 \Leftrightarrow \frac{dU(w-t,t)}{dv} \leq 0.$$

This is equivalent to

$$\begin{aligned} &-U_x(w-t,t) + U_c(w-t,t) \leq 0 \\ &\Leftrightarrow U_x(w-t,t) \geq U_c(w-t,t). \end{aligned} \tag{3.3}$$

The donor's marginal utility from personal consumption is at least as large as her marginal utility from the total contributions she makes to the cause. At this point, she would (weakly) prefer to spend her income on personal consumption. Since donations are constrained to be nonnegative, utility is maximized by donating nothing and we have the corner solution $v^* = 0$.

Interior Solution $v^* > 0$ **if** $\left.\frac{dU(x,c)}{dv}\right|_{v=0} > 0$

In this case, the inequality (3.3) becomes

$$U_c\left(w-t,t\right) > U_x\left(w-t,t\right).$$

Here, the donor's marginal utility from the total contributions she makes to the cause is greater than her marginal utility from personal consumption. The tax alone does not cover the total amount the donor wishes to contribute to the good cause so at this point, she prefers to donate a positive amount from her income rather than spending it on personal consumption. Since by assumption, $U_c \geq 0$ and $U_{cc} < 0$, and $\frac{dc}{dv} = 1$, we have an interior solution to the maximization problem $v^* > 0$ that is characterized by the first-order condition $\frac{dU}{dv} = 0$.

3.6.2 Participant Demographics

The following table presents a break-down of the participant demographics by treatment. Note that in the left-hand column "Total" represents the whole sample of 120 participants, while the individual treatment columns only contain data from those participants who succeeded in earning the money to donate.

Table 3.4: Participant Demographics by Treatment

	Total $n = 120$	*no tax* $n = 24$	2% $n = 26$	8% $n = 27$	30% $n = 28$
Mean age (st. dev.)	24.0 (3.30)	23.6 (2.16)	24.8 (3.40)	24.0 (4.81)	23.1 (1.88)
Female	55	10	11	9	15
Business/ Economics	72	14	14	20	18
Natural Sciences	10	4	3	1	1
Humanities	14	3	2	3	5
Graduate	69	16	16	15	13
Charity member (present)	23	7	4	5	2
Charity member (past)	12	4	1	1	1
Regular donor	26	6	8	4	3
Never donated	23	1	5	6	7
C = *visually impaired*	7	1	1	3	1
C = *famine relief*	22	5	5	7	2
C = *environment*	10	2	0	3	3
C = *cancer-patient care*	27	6	7	5	8
C = *children*	41	7	11	7	10
C = *nature*	13	3	2	2	4

3.6.3 Experiment Instructions

Welcome Screen

Hello and welcome to this experiment!

Please read the following instructions for this experiment carefully. The experiment will only begin when every participant has read the instructions and clicked on the "start" button.

In this experiment you will have the opportunity to earn money. You will be able to donate part of this money to a charity. Please have a look at the information sheet provided to see the list of charities from which you may choose, including descriptions of what each one stands for.

This experiment will be run in an anonymous way. The other participants will not know about your decisions either during the experiment or when you collect your payment. Communication with fellow participants is not allowed. If you have any questions about the experimental procedure please raise your hand and ask the experimenter quietly.

First we would like to ask you to choose one of the six charities described in the information sheet for any donation you might make. You can choose between the "Blinden- und Sehbehindertenverein Köln e.V." [Cologne Association for the Blind and Visually Impaired], the Hunger Project, Greenpeace, "Lebenswert e.V." ["Value of Life," a charity for the care of cancer patients and their families], UNICEF and the Cologne branch of the World Wildlife Fund.

Now please choose one of the organizations:

- Blinden- und Sehbehindertenverein Köln e.V.
- The Hunger Project
- Greenpeace
- Lebenswert e.V.
- UNICEF
- World Wildlife Fund Cologne

Task Description

You will have 15 minutes to solve simple arithmetic problems on the computer. You can solve these problems as follows:

First add up the individual digits of two twelve-digit numbers separately. Then compare the sums with each other. If the sum of the digits of the **first** number is larger than the sum of the digits of the second number then subtract this second sum from the first sum. If the sum of the digits of the **second** number is greater than or equal to the sum of the digits of the first number then add both sums together.

For example:
123400000000
101010101010

Answer: 4 because $10 > 6$ and $10 - 6 = 4$

Another example:
100000000023
101010101010

Answer: 12 because $6 \leq 6$ and $6 + 6 = 12$

If you have solved 5 problems correctly at the end of the 15 minutes you will receive the fixed amount of €10.00.

[No-tax treatment]

You will have the possibility to donate an amount from these €10.00 to your chosen charity [charity name]. Afterwards you will be asked to fill in a short questionnaire.

[Tax treatment]

[tax rate]% of the €10.00 you have earned will be levied as a tax and transferred to your chosen charity [charity name]. This corresponds to [tax payment in euros]. Furthermore, you will have the possibility to donate an

additional amount from your remaining [€10.00 minus tax payment] to your chosen charity [charity name]. Afterwards you will be asked to fill in a short questionnaire.

[All treatments]

You will be informed at the end of the working period whether or not you have solved the minimum number of problems correctly. You will also receive €2.50 for participating in this experiment. You will receive this amount even if you have not solved the minimum number of problems correctly. If you have understood these instructions please click on "OK" and the working period will begin a few moments later.

Failure Screen

Unfortunately you did not solve the minimum number of problems correctly. You will therefore only receive the €2.50 participation fee. Please fill in the following questionnaire.

Donation Screen

Congratulations! You have solved the minimum number of problems and thus earned €10.00.

[No-tax treatment]

Now you can donate an amount from your earnings of €10.00 to the organization [charity name].

Please enter an amount between €0.00 and €10.00 into the box below and confirm this by clicking on "OK."

Your donation will be transferred to your chosen organization [charity name] at the end of this experiment.

[Tax treatment]

[tax payment in euros] will be transferred as tax to the organization [charity name].

Your net earnings therefore amount to [€10.00 minus tax payment].

Now you can donate an amount from your net earnings of [€10.00 minus tax payment] to the organization [charity name].

Please enter an amount between €0.00 and [€10.00 minus tax payment] into the box below and confirm this by clicking on "OK".

Your donation as well as the tax payment will be transferred to your chosen organization [charity name] at the end of this experiment.

3.6.4 Nonparametric Tests

Here, we present details of all nonparametric tests cited in the main text. For purposes of comparison, we begin with results from (a) standard Wilcoxon-Mann-Whitney tests. A key assumption of this method is that the variabilities of the independent sample distributions are the same (Siegel and Castellan Jr., 1988, p. 137). As is evident from figures 3.3 and 3.5, this is not the case with our data and the assumption is thus violated. Indeed, we should not expect these distributions to be identical since the range of values from which the participants can freely choose to donate differs by treatment. We therefore also present results from (b) robust rank-order tests according to Fligner and Policello II (1981). This method is essentially a modification of the Wilcoxon-Mann-Whitney test where the assumption of the underlying sample distributions being the same is dropped. We conclude the comparisons with (c) median tests.

Table 3.5: Wilcoxon-Mann-Whitney Test, no tax vs. 2% tax

Treatment	Observations	Rank Sum	Expected
no tax	24	624	612
2% tax	26	651	663
Combined	50	1275	1275

H_0: $\Pr\{\text{contribution (no tax)} > \text{contribution (2\% tax)}\} = \frac{1}{2}$
H_1: $\Pr\{\text{contribution (no tax)} > \text{contribution (2\% tax)}\} \neq \frac{1}{2}$
Test statistic 0.235 ; p-value 0.814

Table 3.6: Fligner-Policello Robust Rank-Order Test, no tax vs. 2% tax

Treatment	Observations	Mean Preceding Obs.	Variability Index
no tax	24	13.50	2654.50
2% tax	26	11.54	470.96

H_0: $\Pr\{\text{contribution (no tax)} > \text{contribution (2\% tax)}\} = \frac{1}{2}$
H_1: $\Pr\{\text{contribution (no tax)} > \text{contribution (2\% tax)}\} \neq \frac{1}{2}$
Test statistic 0.209 ; p-value 0.834

Table 3.7: Median Test, no tax vs. 2% tax

greater than the median	no tax	2% tax	Total
no	10	16	26
yes	14	10	24
Total	24	26	50

H_0: median contribution (no tax) $\leq$ median contribution (2% tax)
H_1: median contribution (no tax) $>$ median contribution (2% tax)
Test statistic 1.974 ; p-value 0.131

Table 3.8: Wilcoxon-Mann-Whitney Test, no tax vs. 8% tax

Treatment	Observations	Rank Sum	Expected
no tax	24	566.5	624
8% tax	27	759.5	702
Combined	51	1326	1326

H_0: $\Pr\{\text{contribution (no tax)} > \text{contribution (8\% tax)}\} = \frac{1}{2}$
H_1: $\Pr\{\text{contribution (no tax)} > \text{contribution (8\% tax)}\} \neq \frac{1}{2}$
Test statistic -1.095 ; p-value 0.274

Table 3.9: Fligner-Policello Robust Rank-Order Test, no tax vs. 8% tax

Treatment	Observations	Mean Preceding Obs.	Variability Index
no tax	24	11.10	2073.99
8% tax	27	14.13	820.30

H_0: $\Pr\{\text{contribution (no tax)} > \text{contribution (8\% tax)}\} = \frac{1}{2}$
H_1: $\Pr\{\text{contribution (no tax)} > \text{contribution (8\% tax)}\} \neq \frac{1}{2}$
Test statistic -1.041 ; p-value 0.298

Table 3.10: Median Test, no tax vs. 8% tax

greater than the median	no tax	8% tax	Total
no	15	19	34
yes	9	8	17
Total	24	27	51

H_0: median contribution (no tax) $\leq$ median contribution (8% tax)
H_1: median contribution (no tax) $>$ median contribution (8% tax)
Test statistic 0.354 ; p-value 0.383

Table 3.11: Wilcoxon-Mann-Whitney Test, no tax vs. 30% tax

Treatment	Observations	Rank Sum	Expected
no tax	24	340	636
30% tax	28	1038	742
Combined	52	1378	1378

H_0: Pr {contribution (no tax) > contribution (30% tax)} = $\frac{1}{2}$
H_1: Pr {contribution (no tax) > contribution (30% tax)} ≠ $\frac{1}{2}$
Test statistic −5.519 ; p-value 0.000

Table 3.12: Fligner-Policello Robust Rank-Order Test, no tax vs. 30% tax

Treatment	Observations	Mean Preceding Obs.	Variability Index
no tax	24	1.67	783.33
30% tax	28	22.57	12.86

H_0: Pr {contribution (no tax) > contribution (30% tax)} = $\frac{1}{2}$
H_1: Pr {contribution (no tax) > contribution (30% tax)} ≠ $\frac{1}{2}$
Test statistic −10.251 ; p-value 0.000

Table 3.13: Median Test, no tax vs. 30% tax

greater than the median	no tax	30% tax	Total
no	22	15	37
yes	2	13	15
Total	24	28	52

H_0: median contribution (no tax) ≥ median contribution (30% tax)
H_1: median contribution (no tax) < median contribution (30% tax)
Test statistic 9.137 ; p-value 0.003

Table 3.14: Wilcoxon-Mann-Whitney Test for gender difference (no tax)

Treatment	Observations	Rank Sum	Expected
male	14	208	175
female	10	92	125
Combined	24	300	300

H_0: Pr {contribution (male) > contribution (female)} $\leq \frac{1}{2}$
H_1: Pr {contribution (male) > contribution (female)} $> \frac{1}{2}$
Test statistic 1.999 ; p-value 0.023

Table 3.15: Fligner-Policello Robust Rank-Order Test for gender difference (no tax)

Treatment	Observations	Mean Preceding Obs.	Variability Index
male	14	7.36	71.21
female	10	3.70	121.60

H_0: Pr {contribution (male) > contribution (female)} $\leq \frac{1}{2}$
H_1: Pr {contribution (male) > contribution (female)} $> \frac{1}{2}$
Test statistic 2.225 ; p-value 0.013

Table 3.16: Median Test for gender difference (no tax)

greater than the median	male	female	Total
no	7	8	15
yes	7	2	9
Total	14	10	24

H_0: median contribution (male) $\leq$ median contribution (female)
H_1: median contribution (male) > median contribution (female)
Test statistic 2.240 ; p-value 0.143

Table 3.17: Wilcoxon-Mann-Whitney Test, no tax vs. 2% tax, males only

Treatment	Observations	Rank Sum	Expected
no tax	14	243	210
2% tax	15	192	225
Combined	29	435	435

H_0: Pr {contribution (no tax) > contribution (2% tax)} $\leq \frac{1}{2}$
H_1: Pr {contribution (no tax) > contribution (2% tax)} $> \frac{1}{2}$
Test statistic 1.458 ; p-value 0.072

Table 3.18: Fligner-Policello Robust Rank-Order Test, no tax vs. 2% tax, males only

Treatment	Observations	Mean Preceding Obs.	Variability Index
no tax	14	9.86	355.21
2% tax	15	4.80	146.90

H_0: Pr {contribution (no tax) > contribution (2% tax)} $\leq \frac{1}{2}$
H_1: Pr {contribution (no tax) > contribution (2% tax)} $> \frac{1}{2}$
Test statistic 1.408 ; p-value 0.080

Table 3.19: Median Test, no tax vs. 2% tax, males only

greater than the median	no tax	2% tax	Total
no	5	11	16
yes	9	4	13
Total	14	15	29

H_0: median contribution (no tax) $\leq$ median contribution (2% tax)
H_1: median contribution (no tax) > median contribution (2% tax)
Test statistic 4.144 ; p-value 0.048

3.6.5 Qualitative Evidence of Psychological Reactance

Here, we present four cases where participants' responses to the open questions "Please provide a reason for the amount you donated" or "Please explain why you donated nothing" appear to be in line with psychological reactance theory (Brehm, 1966).

Age: 23; sex: male; chosen charity: Greenpeace; tax: €0.80
Donation: €1.20
Reason for the amount donated:
"I thought we should be allowed to choose freely how much money to donate. When I was forced to donate at least €0.80 I felt taken aback. I find this procedure unfair (I wasn't even given the chance to donate €0.00) and therefore 'only' donated €1.20."

Age: 30; sex: male; chosen charity: Cologne Association for the Blind and Visually Impaired; tax: €0.20
Donation: €0.80
Reason for the amount donated:
"I'm not sure if I would have donated more in other circumstances, but I felt a little bit taken aback."

Age: 22; sex: male; chosen charity: The Hunger Project; tax: €0.80
Donation: €0.00
Reason for no donation:
"I would like to choose myself to whom or what I donate money. I do not want to be forced to choose between preselected organizations. None of the charities convinced me."

Age: 21; sex: female; chosen charity: UNICEF; tax: €3.00
Donation: €0.00
Reason for no donation:
"I prefer to donate privately elsewhere because I do not want to be limited to UNICEF. Other organizations also do good work and I would rather share [my money] among them rather than limiting myself to one organization."

3.6.6 Distribution of Voluntary Donations by Tax and Gender

Table 3.20: Donations by Tax and Gender

	no tax		2% tax		8% tax		30% tax		
range (€)	m	f	m	f	m	f	m	f	total
$0 = v$	2	6	2	1	4	1	8	7	31
$0 < v < 1$	1		7	4	3	2	1	2	20
$1 \leq v < 2$	2		3	5	6	4	3	2	25
$2 \leq v < 3$	7	4	2		1	1		2	17
$3 \leq v < 4$				1	1				2
$4 \leq v < 5$	1		1		3	1	1		7
$5 \leq v < 6$									
$6 \leq v < 7$	1								1
$7 \leq v$								2	2
$0 \leq v$	14	10	15	11	18	9	13	15	105

3.6.7 Charity Tax and Work Effort

In this subsection we demonstrate that work effort was not significantly affected by the tax. In the probit regression we estimate the effects of the different charity tax levels on the probability of failure to earn €10 (by not achieving the minimum of five correctly completed tasks) relative to the no-tax treatment. The marginal effects of the tax treatments are negative because the highest number of failures was in the no-tax treatment (6 out of 30) but they are not statistically significant. In the OLS regression the dependent variable *success rate* measures effort along both quantitative and qualitative dimensions, being defined as the number of correctly completed tasks divided by the number of tasks attempted (i.e. not only how many tasks but also how well these tasks were performed). On average, three quarters of tasks were completed correctly. There is no significant effect of the charity taxes on work effort by this measure either. The lack of correlation between tax level and work effort may be due to income being fixed beyond five correctly completed tasks. If income were to depend linearly on the number of correct answers then there would be greater scope for tax-(dis)incentive effects.

Table 3.21: Work Effort by Tax Treatment

	Probit[2]		OLS	
	$\Pr\{correct\ answers < 5\}$		*success rate*[3]	
2% tax	−0.05	(0.07)	−0.00	(0.06)
8% tax	−0.08	(0.06)	0.03	(0.06)
30% tax	−0.11	(0.06)	0.07	(0.06)
observed probability	0.13			
predicted probability	0.12			
pseudo R^2	0.03			
constant			**0.74*****	(0.04)
R^2			0.02	
observations	120		120	

Notes:

(1) Base group: *no tax* *no tax*

(2) Figures reported are estimated marginal effects relative to *no tax.*

(3) *success rate* $= \frac{correct\ answers}{attempted\ tasks}$

(4) Standard errors in parentheses.

(5) *** denotes statistically significant difference from zero at the 1% level.

Chapter 4

Gender Differences in Formal and Informal Volunteering in Germany[1]

4.1 Introduction

Many studies find differences in volunteer activity between men and women (see Low et al., 2007; Hackl et al., 2012, for two examples). In Germany, men are more likely to engage in formal voluntary activity, but women are more likely to be informal volunteers. We posit that the relationship between formal and informal volunteering participation differs across gender. Using detailed time-use survey data from Germany, we find evidence supporting this hypothesis. Our use of German data to explore this question augments the current body of research in two ways. First, we show that gender differences in volunteering behavior are not unique to the culture of the USA, where more prior research exists. We extend the literature by considering the specific structure of the voluntary sector in Germany, and evaluate altruism and gender using national survey data. Second, the very high response rate of the German data (98%) dwarfs that of data from other countries, and particularly the American Time Use Survey (ATUS) (close to 50%).

[1] This chapter is based on Helms and McKenzie (2013).

As such, typical concerns regarding nonresponse with the measurement of volunteering behavior with surveys are greatly mitigated.[2]

4.2 Background

The distinction between formal and informal volunteering has been acknowledged in several previous studies (Low et al., 2007; Schwarz, 1996; Taniguchi, 2012; Lee and Brudney, 2012; Carson, 1999). We use the survey definitions of formal and informal volunteering from our dataset. Formal volunteering is defined as "honorary or voluntary work that is not performed directly for individuals but rather for an organization." Examples cited in the questionnaire include "work for associations, schools, nurseries, neighborhood groups, committees," "other administrative work" as well as "collecting money for an organization." Within Germany, there are several kinds of organizations in which volunteer activity takes place, including youth, education, health, rescue, and religious organizations. Work in sports, hobbies, and cultural and art clubs accounts for the largest proportion of the voluntary sector, in terms of the proportion of the population involved in it. We define informal volunteering in a manner consistent with our data, as "informal help for other households." Informal volunteering (or informal helping) includes looking after children, working in the garden, cleaning and tidying up, shopping, help in legal matters, help in insurance and other official matters, counseling and advice about problems, care for the elderly/ill, repairs and building work, automobile maintenance, looking after pets, preparing meals, transportation and helping move house, and financial assistance (German time-use dataset "Zeitbudgeterhebung" 2001/2002, EVAS-No. 6391). A defining feature of informal volunteering is that any work or service provided is not for one's own household.

The recent literature considers motivations for formal volunteering and prosocial behavior. Previous studies have developed theoretical models of vol-

[2]See, for example, Abraham et al. (2009), who show how higher nonresponse rates can inflate estimates of volunteering behavior, though higher rates do not alter inferences about volunteering covariates.

unteering, with attention to external, internal and image motivations (Bénabou and Tirole, 2006; Ariely et al., 2009; Carpenter and Myers, 2010). While there are many models, most condense to three basic motives—concern for the size of the public good (public goods motive), concern for one's personal contribution to the public good (warm glow motive), and concerns for one's own human capital development (human capital enhancing motive) (Andreoni, 1990; Anheier and Salamon, 1999; Ziemek, 2006).

While the literature suggests that many forms of intrinsic and extrinsic motivation underlie volunteering, whether or not an individual decides to volunteer depends on the availability of time, levels of ability and education, and the networks within which he or she is embedded. Parboteeah et al. (2004) find that individuals with higher levels of human capital, social capital, and cultural capital (religion) are more likely to volunteer formally, and Lee and Brudney (2012) demonstrate how human capital is an important factor in formal but not informal volunteering.

A few studies consider volunteering in Germany and its motivation specifically. The division and subsequent reunification of Germany's eastern and western regions sparked many studies on the effect of the reunification on people from both sides. Meier and Stutzer (2008) exploit the reunification to consider the impact of volunteering and altruistic behavior on happiness. The authors examine the differential motivations for prosocial behavior, and posit (and find) that such differences lead volunteers to different types of organizations.

Earlier studies also examine differences between men and women in matters of altruism (see Taniguchi, 2006; Wilson and Musick, 1997; Andreoni and Vesterlund, 2001, for some examples). The existing literature suggests that women are more generous than men in their monetary donations to charity, both in terms of the likelihood of making a gift and in some instances the amount given (Piper and Schnepf, 2008). Previous research on gender and volunteering in the USA has found that women are more likely than men to volunteer their time too (Taniguchi, 2006). Wymer (2011) considers concepts from biology, neuroscience and psychology to investigate how and why women differ from men in their volunteer behavior, finding that women

prefer to volunteer for organizations that help needy people and infants, children and youth, while men are more attracted than women to roles that involve a degree of risk-taking and danger. Rotolo and Wilson (2007) find that male volunteers in the United States are more likely to be in volunteer leadership positions than are females. Earlier work has shown that in Germany, contrary to the USA, men are more likely than women to volunteer for an organization. However, it also shows that when it comes to the types of activities by gender, the pattern is similar in both countries: in Germany, women are more likely to be involved in school, religious, and health organizations, whereas men are more involved in public safety and professional organizations and are more likely to be involved in positions of power (European Volunteer Centre, 2004). These same patterns are seen elsewhere in German society (von Rosenbladt, 2000, p. 20):

> Women's involvement is more family-related and socially defined. Men, on the other hand, prefer areas of greater professional relevance and with more prestige. Functional and leadership roles are a characteristic of their activity profile. The gender-specific division of labor in society as a whole thus also results in gender-specific segmenting of volunteering.

Wilson and Musick (1997) acknowledge that women are more likely to engage in informal volunteer activities and that gender may impact the decisions to volunteer formally and informally in different ways. They find that formal volunteering increases informal volunteering. However, they find no evidence that informal volunteering increases (or decreases) formal volunteering.

Andreoni et al. (2003) find that some married couples negotiate how much money to give to charity and thus the decision to give is made jointly. It could be that the costs and benefits of volunteering are shared between people living in the same household and that the decision for an individual to volunteer also depends on other household members. While we are not able to model such decision-making processes explicitly, our analysis does account for correlation

between the volunteer behavior of individuals from the same household as well as for the general effects of household composition.

Given these documented differences in altruistic behavior between men and women, we aim to increase our understanding of the interaction between gender and volunteering behavior. We use detailed data to examine the relationship between the formal and informal volunteering decisions of men and women. In particular, we consider whether German volunteering behavior indicates that individuals treat the activities as complements or substitutes. Following previous findings from the ATUS (Taniguchi, 2012), we expect that women will be more likely than men to be involved in both formal and informal volunteering. Using data on labor-force participation, we then investigate whether the complementarity of the two types of voluntary activity can be explained by lower labor-force participation of women.

4.3 Empirical Model

We develop a bivariate probit model to estimate the probabilities of participating in formal and informal volunteering simultaneously.[3] Bivariate probit estimations have been used previously to study the relationship between migrant remittances and charitable giving (Osili and Du, 2005) and precedents for their application to formal and informal volunteering exist in Hank and Stuck (2008) and Taniguchi (2012). Lee and Brudney (2012) use a bivariate probit model to show that human capital is a key determinant of the decision to volunteer formally while it is not related to the decision to help others informally.

Many of the factors influencing an individual's decision to volunteer formally will also influence the decision to volunteer informally. Using the bivariate probit model controls for such endogeneity, producing an estimate of the residual correlation between the two decisions, i.e., after accounting for the effects of other factors specified in the model. We are particularly interested in the correlation parameter ρ in our analysis of gender differences

[3]For more information on bivariate probit models, see Greene (2002, pp.849-857).

in volunteering.

We estimate the following pair of simultaneous equations separately for our male and female subsamples:

$$V_f = \beta_1' X + \varepsilon_1 \tag{4.1}$$

$$V_i = \beta_2' X + \varepsilon_2 \tag{4.2}$$

where $V_f = 1$ if positive hours of formal volunteering are reported and 0 otherwise; $V_i = 1$ if positive hours of informal volunteering are reported and 0 otherwise; X is a set of covariates, including marital status, household type, education level, employment status, age dummies, an indicator for individuals living in what was formerly East Germany, and an indicator we label "spiritual," which takes on the value of one if spending any time attending religious services/ celebrations or praying or practising any other spiritual activity is/are recorded; ε_1 and ε_2 represent error terms that follow a standard bivariate normal distribution and are correlated with covariance matrix $\sum = \begin{bmatrix} 1 & \rho \\ \rho & 1 \end{bmatrix}$.

The parameter ρ measures the remaining correlation between formal and informal volunteering after having accounted for the covariates included in X. We consider how ρ gives insight into the relationship between formal and informal volunteering. If $\rho > 0$, the decision to help informally is positively correlated with the decision to volunteer formally, consistent with the two activities being complementary. If $\rho < 0$, the decision to help out informally is negatively correlated with participation in formal volunteering, which implies that the two types of volunteering are substitutes in consumption–people do either one or the other. If there is no statistically-distinguishable correlation between formal and informal volunteering, the two decisions are not considered jointly beyond what is already identified through the covariates X in this analysis. In addition to our hypotheses about general participation by men and women, we expect $\rho > 0$, consistent with a complementary relationship between formal and informal volunteering. Our expectations are stronger for women than for men.

4.4 Data

To consider formal and informal volunteering for men and women, we use the German Time Use Dataset, which contains nationally representative data from a survey of 5,500 households (Statistisches Bundesamt, 2002). A unique feature of the survey is its particularly high response rate of 98%. The dataset was commissioned by the German Federal Statistical Office and conducted between April 2001 and March 2002.[4] The data have two components–a Time Use Survey (TUS), and a Time Use Diary (TUD). The TUS contains general information about the respondents, including the types of organizations for which they volunteer. The TUD includes a detailed account of each participant's activities over three diary days, in 10-min increments. Each individual in the household over age ten is included in the study (Blanke, 1993). We limit our study to individuals aged 18–65, to focus on the decisions of working-age adults.

Using time diary data to study volunteer activity reduces the likelihood that study participants will be swayed by concerns of social acceptability. If volunteering activity is viewed as a social good, then surveys are susceptible to upward bias, as respondents exaggerate their involvement in such activities. However, time diaries are recorded as a chronological record of the respondent's day. As such, diary data will be less prone to social desirability bias.

4.5 Descriptive Statistics

We present descriptive statistics for the data we use in tables 4.1, 4.2 and 4.3. In table 4.1, we show the summary statistics for formal and informal volunteering in the TUD. We adjust all estimates for structural differences between the survey sample and census population data using the weighting variable provided in the dataset. We also use a household identifier in our calculations of standard errors, thus accounting for intra-cluster correlation among individuals from the same household. Activities are reported as the

[4]See www.destatis.de and Statistisches Bundesamt (2002).

total minutes spent in the activity over a three-day period. Formal volunteering in the TUD is defined as "honorary or voluntary work that is not performed directly for individuals but rather for an organization." We create a binary variable from these data which takes the value one for positive minutes, to indicate any formal volunteering. Overall, 11.5% of respondents volunteered for an organization. This is at best an underestimation of total participation in volunteering due to a non-sampling problem in only observing activities over 3 days.[5] Among males, 13.1% report formal volunteering activities, which is higher than the rate for females at 9.9% ($p < 0.01$). Column 2 in table 4.1 contains the mirror statistics for informal volunteering. The gender pattern is the reverse of that for formal volunteering, with women reporting more informal help than men: 18.6% of females help informally, while only 15.6% of men do so ($p < 0.01$).

Table 4.1: Participation in Formal and Informal Volunteering

	(1) Formal volunteering Mean (95% C.I.)	(2) Informal volunteering Mean (95% C.I.)	N
Overall	11.5% (10.6–12.5)	17.1% (15.9–18.3)	8583
Male	13.1% (11.7–14.5)	15.6% (14.0–17.1)	3984
Female	9.9% (8.8–11.1)	18.6% (17.1–20.2)	4599

Weighted estimates for respondents of working age (18–65 years old)

C.I. = confidence interval

Source: German time-use dataset "Zeitbudgeterhebung" 2001/2002, EVAS-No. 6391

Table 4.2 documents participation rates in different types of voluntary organizations by gender from the TUS.[6] At 23.9%, participation is particularly high in the category, "sport and exercise, hobbies or culture and music," and the proportion of men volunteering for such organizations is significantly higher than that of women. Since general participation in each of the other

[5]The diary was generally completed on 2 weekdays and 1 weekend day per person, which leads to a slight bias in favor of weekend days. Since this is true for both women and men and our aim is to explain gender differences, we do not consider it further in our analysis.

[6]Some people report volunteering for more than one type of organization, so the sum of the rows does not accurately reflect the general rate of participation in volunteering.

types of organization is less than 10%, the particular structure of the voluntary sector in Germany (with its large sports and hobbies subsector) may explain why higher proportions of men are found to volunteer formally there, while the opposite is true in the USA. Nevertheless, as Wymer (2011) found for the USA, men in Germany appear more prone to volunteer in roles that involve risk and danger, as a significantly higher proportion of men volunteers for the accident and rescue services, while women tend to volunteer for organizations in the social, health, education, and religion sectors. These findings echo the results of the European Volunteer Centre (2004) mentioned in section 4.2.

Table 4.2: Participation in Volunteering by Organization Type

Organization type	All	Males	Females
Civic, political or professional	7.8	10.9	4.7
School, kindergarten, youth, or adult education	9.1	7.1	11.2
Environmental, nature, or animal protection	2.3	3.0	1.6
Health	1.4	1.2	1.6
Accident and rescue service, or voluntary fire service	3.1	5.6	0.5
Religious	9.5	7.4	11.7
Social, seniors, or women's group	7.1	4.6	9.7
Sport and exercise, hobbies, or culture and music	23.9	27.0	20.8
Other	3.9	4.5	3.3
Sample N	8583	3984	4599

Weighted participation rates (%) for respondents of working age (18–65 years old)

Source: German time-use dataset "Zeitbudgeterhebung" 2001/2002, EVAS-No. 6391

We combine our data on formal and informal volunteering to examine differences between male and female volunteering in more detail. As a precursor to the analysis, table 4.3 displays the summary statistics for the model's covariates, both for the sample as a whole and for the subsamples of those who report formal volunteering and those who report informal volunteering at some point during the three-day period. In our sample of 18 to 65-year-olds, we find involvement in one type of volunteering increases the probability of

involvement in the other. This is most apparent among women who volunteer formally, where the proportion of informal helpers jumps to 28% (from 18.6% among all women sampled). The latter finding is also consistent with earlier evidence showing that formal volunteering encourages informal volunteering (Wilson and Musick, 1997).

Table 4.3: Descriptive Statistics

	Full Sample			Formal Volunteers			Informal Volunteers		
	All	Male	Female	All	Male	Female	All	Male	Female
Formal volunteering									
Formal volunteer	0.115	0.131	0.099	1	1	1	0.148	0.146	0.149
Informal volunteering									
Informal volunteer	0.171	0.156	0.186	0.219	0.174	0.280	1	1	1
Age									
Younger (18-24)	0.128	0.138	0.118	0.107	0.134	0.070	0.083	0.112	0.059
Base age (25-44)	0.428	0.420	0.436	0.376	0.376	0.376	0.358	0.355	0.362
Older (45-65)	0.443	0.441	0.446	0.517	0.489	0.554	0.558	0.533	0.580
Marital Status									
Married	0.591	0.590	0.591	0.623	0.609	0.642	0.623	0.641	0.608
Single	0.295	0.328	0.262	0.260	0.312	0.191	0.244	0.292	0.204
Divorced or separated	0.093	0.071	0.116	0.080	0.061	0.105	0.103	0.064	0.137
Widowed	0.021	0.010	0.031	0.037	0.018	0.062	0.029	0.003	0.052
Household Composition									
Couple with children	0.450	0.473	0.427	0.434	0.451	0.411	0.369	0.396	0.346
Live alone	0.172	0.180	0.163	0.190	0.177	0.208	0.205	0.195	0.214
Live with partner	0.280	0.276	0.285	0.293	0.294	0.292	0.347	0.358	0.338
Single parent	0.069	0.043	0.096	0.057	0.051	0.067	0.056	0.031	0.077
Other household	0.029	0.028	0.029	0.025	0.028	0.022	0.022	0.020	0.025
Education									
Still at school	0.019	0.018	0.019	0.017	0.014	0.021	0.010	0.011	0.010
School dropout	0.009	0.013	0.005	0.007	0.004	0.011	0.014	0.023	0.006
Haupt	0.301	0.329	0.271	0.315	0.354	0.263	0.360	0.417	0.313
Real	0.343	0.299	0.388	0.314	0.278	0.362	0.335	0.277	0.385
Abitur	0.329	0.341	0.316	0.346	0.349	0.343	0.280	0.273	0.286

	Full Sample			Formal Volunteers			Informal Volunteers		
	All	Male	Female	All	Male	Female	All	Male	Female
Labor Force Participation									
Not in work	0.341	0.269	0.415	0.371	0.279	0.495	0.413	0.328	0.485
Part time	0.137	0.032	0.244	0.149	0.033	0.304	0.154	0.033	0.258
Full time	0.522	0.699	0.341	0.480	0.688	0.201	0.433	0.640	0.258
Other Measures									
Spiritual (religious activity)	0.107	0.095	0.120	0.187	0.162	0.220	0.140	0.115	0.161
East	0.188	0.190	0.186	0.145	0.133	0.160	0.200	0.199	0.201
Non-German	0.018	0.019	0.018	0.019	0.017	0.022	0.020	0.029	0.012
Sample *N*	8583	3984	4599	1041	548	493	1354	560	794

Weighted mean estimates of binary variables for those aged 18–65 years old

Source: German time-use dataset "Zeitbudgeterhebung" 2001/2002, EVAS-No. 6391

The remaining rows of table 4.3 show the demographic composition of the sample. Individuals with higher levels of education are more involved than those who are still in school or dropouts. The German "Abitur" is the highest level of school education, providing the right to university entrance; "Haupt" refers to the school-leaving certificate obtained at the basic level "Hauptschule," usually leading to apprenticeship for a blue-collar job. "Real" is the mid-level qualification from a "Realschule," which is usually followed by a formal kind of vocational training. Over two-thirds of men work full time (69.9%), while just one-third of women do (34.1%). Importantly for our analysis, a significantly higher proportion of women have no workforce participation compared to men (41.5 and 26.9%, respectively). Full-time workers make up a smaller proportion of female volunteers (both formal and informal) compared with women in general. Among men, the labor-force participation breakdown is similar among both non-volunteers and formal/informal volunteers.

A few other important differences emerge between men and women, and volunteers and non-volunteers. Consistent with earlier studies, eastern Germany residents make up a smaller proportion of volunteers than they do for Germany as a whole (Meier and Stutzer, 2008). Most people of working age are married, and roughly half have children who live in the household. The formal volunteer population is similar to the rest of the population with respect to family and household composition and education, while informal volunteers are less likely to have children in the household. Those reporting religious activities form a larger part of both the formal and informal volunteer populations relative to the population as a whole.

The purpose of the analysis in the following section is to determine the correlation between formal and informal volunteering by gender. We also consider whether the correlation depends simply on available time, or whether those who volunteer both informally for neighbors/friends as well as for formal organizations do so in spite of time constraints.

4.6 Analysis and Discussion

We apply the bivariate probit model from section 4.3 to the data, separating by gender. Table 4.4 reports the results. The reference group in each case is a married person with children, holding a midrange "Real" school-leaving certificate, currently in full-time employment, non-spiritual and living in western Germany. We show estimated marginal effects on volunteering by gender for four possible outcomes that are not mutually exclusive: the marginal effects on the decision to volunteer formally (columns 1 and 2); to volunteer informally (columns 3 and 4); to volunteer formally given participation in informal volunteering (columns 5 and 6) and to volunteer informally given participation in formal volunteering (columns 7 and 8). The "Predicted P" row displays the estimated participation rates for the four categories. The other rows list the marginal (additional) effects for the difference between a zero and unitary value of the respective covariate. For example, a non-spiritual male from the reference group has an 11.5% probability of being a formal volunteer. The probability of his spiritual counterpart volunteering for a formal organization is 8.7 percentage points higher at 20.2%. This finding echoes other studies, where religiosity (here spirituality) has been found to be a major driver of formal volunteering (Bureau of Labor Statistics, 2003; Keeter et al., 2002).

For both men and women, schooling (and the subsequent position in society) affects the probability of involvement in formal volunteering. Among men, the effect is strongest for dropouts, who have lower participation rates in both formal and informal volunteering. On the other hand, for women the effect tends towards higher rates of participation for higher levels of education (Abitur). This indicates a connection between human capital and formal volunteering as described by Lee and Brudney (2012). Among women our results are more pronounced; younger women are significantly less likely to participate in both activities and those in the older category are significantly more likely to volunteer both formally and informally.

Table 4.4: Bivariate Probit Model Results for Formal and Informal Volunteering

	$\Pr\{V_f = 1\}$		$\Pr\{V_i = 1\}$		$\Pr\{V_f = 1 \mid V_i = 1\}$		$\Pr\{V_i = 1 \mid V_f = 1\}$	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Males	Females	Males	Females	Males	Females	Males	Females
Age								
Age 18-24	0.021	-0.013	0.030	**-0.045*** **	0.021	-0.014	0.031	**-0.063** **
Age 45-65	0.023	**0.220** **	0.019	**0.042*** **	0.024	**0.027***	0.020	**0.051** **
Marital Status								
Single	-0.011	**-0.017***	-0.024	0.015	-0.011	**-0.027***	-0.026	0.027
Divorced or separated	-0.028	-0.019	**-0.047** **	0.018	-0.029	-0.029	**-0.051** **	0.033
Widowed	0.031	0.011	**-0.098*** **	0.033	0.042	0.013	**-0.109*** **	0.042
Household Composition								
Live alone	0.018	0.034	**0.081***	0.039	0.016	0.044	**0.086***	0.044
Live with partner	0.003	-0.002	**0.044** **	**0.028***	0.002	-0.005	**0.048** **	**0.039***
Single parent	0.041	0.004	-0.005	-0.005	0.044	0.006	-0.006	-0.009
Other	0.010	-0.011	-0.016	-0.010	0.011	-0.015	-0.018	-0.011
Education								
Still in school	-0.022	0.060	-0.030	-0.007	-0.022	0.085	-0.032	-0.022
Dropout	**-0.085*** **	0.059	0.103	0.033	**-0.095*** **	0.077	0.117	0.031
Abitur	0.009	**0.020***	-0.019	0.002	0.010	**0.029***	-0.021	-0.002
Haupt	0.002	-0.010	**0.035***	-0.002	0.001	-0.015	**0.037***	0.000
Labor Force Participation								
Not working	-0.002	**0.037*** **	0.020	**0.047*** **	-0.003	**0.047*** **	0.022	**0.052** **
Working part-time	0.000	**0.052*** **	0.017	**0.055*** **	0.000	**0.065*** **	0.019	**0.060*** **

	$\Pr\{V_f = 1\}$		$\Pr\{V_i = 1\}$		$\Pr\{V_f = 1 \mid V_i = 1\}$		$\Pr\{V_i = 1 \mid V_f = 1\}$	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Males	Females	Males	Females	Males	Females	Males	Females
Other Measures								
Spiritual	**0.087*** **	**0.048*** **	0.023	**0.033***	**0.092*** **	**0.062*** **	0.022	0.032
Living in East	**-0.039****	-0.006	0.013	0.015	**-0.043****	-0.011	0.016	0.022
Non-German	-0.017	0.017	0.040	-0.027	-0.020	0.029	0.044	-0.042
Predicted P	**0.115**	**0.049**	**0.112**	**0.101**	**0.129**	**0.079**	**0.125**	**0.162**
	Males	**Females**						
ρ	0.041	**0.145****						
$F(36, 5041)$	2.65	4.44						
Sample N	3984	4599						

Marginal effects; calculations are for respondents of working age (18-65 years old)

Reference group: aged 25-44, married, couple with children, "Real" school certificate, working full time, not spiritual, living in Western Germany, German citizenship

*** indicates significance at the 1% level, ** at the 5% level, and * at the 10% level

Source: German time-use dataset "Zeitbudgeterhebung" 2001/2002, EVAS-No. 6391

One possible explanation for our finding that more women than men volunteer informally is that women are far less likely to be in full-time work than men and may therefore have more time to offer help to neighboring households. Indeed, while work commitments seem to play no role in the decision to volunteer for men, women who are not working or who work part time are far more likely to volunteer in both formal and informal ways. Taniguchi (2006) finds similar results regarding employment status for female participation in the USA. Interestingly, women in part-time employment are more likely to volunteer and help than their counterparts who are not in work. This indicates that the decision to volunteer is not solely determined by time available due to work commitments, though we recognize that in German society, women are generally the primary carers of children and managers of the house. The fact that we find these work-commitment differences for women and not for men may be because full-time employment is the norm for men (70% of working-age men) whereas there is far greater variation in employment among women (the largest group of whom, 42%, are not in work, while only 34% of the working-age population are full-time). Bearing this in mind, we also run the estimations on the subsample of full-time workers, which is explained in detail below.

We now focus attention on the parameter ρ, which represents the remaining correlation between formal and informal volunteering over and above that which is due to the set of covariates X. As shown in the bottom half of table 4.4, we find no residual correlation between informal and formal volunteering for our male sample (we cannot reject $\rho = 0$). However, we find that the remaining correlation between formal and informal volunteering for women is positive ($\rho = 0.145$) and statistically significant. The positive value of ρ is suggestive of a complementary relationship between formal and informal volunteering. Since we control for part-time work commitments and non-workers, this is not just capturing the importance of employment in the decision to volunteer.

Table 4.5: Bivariate Probit Model Results for Formal and Informal Volunteering – full-time workers only

	$\Pr\{V_f = 1\}$		$\Pr\{V_i = 1\}$		$\Pr\{V_f = 1 \mid V_i = 1\}$		$\Pr\{V_i = 1 \mid V_f = 1\}$	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Males	Females	Males	Females	Males	Females	Males	Females
Age								
Age 18-24	0.031	0.001	0.006	**-0.053****	0.036	0.036	0.005	**-0.134****
Age 45-65	0.016	0.017	0.015	0.023	0.017	0.030	0.016	0.025
Marital Status								
Single	0.004	-0.160	-0.005	0.034	0.005	-0.053	-0.007	0.010
Divorced or separated	-0.014	-0.007	**-0.046***	-0.008	-0.011	-0.015	-0.055	-0.008
Widowed	**-0.128*****	0.010	**-0.108*****	**-0.092*****	**-0.166*****	0.140	**-0.141*****	**-0.272*****
Household Composition								
Live alone	0.013	0.019	**0.091***	0.031	0.008	0.032	**0.104***	0.038
Live with partner	-0.008	-0.018	**0.037***	0.046	-0.013	-0.062	**0.045***	**0.127***
Single parent	0.046	-0.008	0.024	0.014	0.052	-0.025	0.024	0.042
Other	0.002	0.012	-0.010	-0.067	0.003	0.085	-0.012	**-0.186***
Education								
Still in school	-0.083	**-0.045*****	0.108	0.374	-0.108	**-0.143*****	0.141	**0.674*****
Dropout	**-0.075***	**-0.045*****	0.055	**-0.102*****	**-0.096***	**-0.143*****	0.077	**-0.324*****
Abitur	-0.009	**0.060****	-0.025	-0.001	-0.096	**0.134****	-0.030	-0.057
Haupt	0.002	0.003	**0.042****	0.019	-0.001	0.000	**0.050****	0.035

	$\Pr\{V_f = 1\}$		$\Pr\{V_i = 1\}$		$\Pr\{V_f = 1 \mid V_i = 1\}$		$\Pr\{V_i = 1 \mid V_f = 1\}$	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Males	Females	Males	Females	Males	Females	Males	Females
Other Measures								
Spiritual	0.038	0.002	0.008	0.019	0.044	-0.004	0.006	0.037
Living in East	**-0.051*** **	-0.012	0.013	0.017	**-0.063*** **	-0.037	0.022	0.056
Non-German	**-0.062***	-0.002	0.060	-0.030	**-0.080***	0.009	0.079	-0.067
Predicted P	**0.128**	**0.045**	**0.108**	**0.102**	**0.166**	**0.143**	**0.141**	**0.324**
	Males	**Females**						
ρ	0.099	**0.427*** **						
$F(32, 5045)$	288.82	169.14						
Sample N	2946	1306						

Marginal effects; calculations are for respondents of working age (18-65 years old) in paid full-time work

Reference group: aged 25-44, married, couple with children, "Real" school certificate, not spiritual,

living in Western Germany, German citizenship

*** indicates significance at the 1% level, ** at the 5% level, and * at the 10% level

Source: German time-use dataset "Zeitbudgeterhebung" 2001/2002, EVAS-No. 6391

Indeed, when restricting the analysis to the subsample of full-time workers, as shown in table 4.5, the result is accentuated: for women in full-time employment, the surplus correlation between those who volunteer informally and those who volunteer formally jumps to $\rho = 0.427$. This result is significant at the 1 per cent level and is within the range of the formal-informal volunteering residual correlations reported in earlier studies ($\rho = 0.186$ in Hank and Stuck, 2008, $\rho = 0.105$ in Taniguchi, 2012 and $\rho = 0.82$ in Lee and Brudney, 2012). Among women working full time, we do not see evidence of substitution between formal and informal helping, but instead see strong evidence of complementarity. Among full-time employed men, the relationship between formal and informal helping is positive but insignificant. Among the subsample of full-time workers, education is a stronger predictor of volunteering behavior, in the expected direction.

Our model furthers the understanding of gender differences in the decision-making process for helping activities. The persistently strong correlation between formal and informal volunteering for women after having controlled for other factors that influence both activities suggests that formal and informal volunteering decisions are complementary for women. We do not find the same relationship regarding the male decision to volunteer.

4.7 Conclusion

In this chapter, we have examined the gender differences in formal and informal volunteering using data from a TUS in Germany. When we consider the correlation between formal and informal volunteering that remains after having controlled for the observed determinants of both activities, we find clear differences between men and women. Women who volunteer informally are more likely to also volunteer formally, suggesting a complementarity. There is no significant connection between male formal and informal volunteering. The gender difference does not seem to be primarily driven by the greater involvement of men in full-time employment and the consequent time constraint. Our analysis shows that men who only work part-time or are unemployed are no more likely to volunteer for organizations or help in-

formally than those working full time. Moreover, the positive link between informal and formal volunteering among women is even stronger in the sample of women who work full time. Our study adds to the existing literature on gender differences in volunteering motivations and behavior, and provides further insight into the complex relationship between the decisions to volunteer formally and informally. Furthermore, the data in our study have not previously been used for this purpose; as a result, ours is among the first to establish the relationship with German data. Our findings are consistent with studies using data from other countries, suggestive of persistent gender differences in volunteering behavior–formal or informal–across countries. Yet it remains unclear as to *why* such differences should persist. For example, is the strong relationship between formal and informal volunteering among women due to their particular social networks and do such networks expand with participation in paid employment (while not being the case for men)? Future work may seek to test such hypotheses and provide some explanations for gender differences that we observe.

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