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## The efficiency of public support to private charity: An econometric analysis of the income tax treatment of charitable

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# Kieler Arbeitspapiere

# Kiel Working Papers

Working Paper No. 151

The Efficiency of Public Support to Private Charity.

An Econometric Analysis of the  
Income Tax Treatment of Charitable Contributions in  
the Federal Republic of Germany

by  
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## 1. Some Aspects of the Theory of Charity Market Failure<sup>+</sup>

Economists like to justify public redistributive activity with standard externality arguments. While not denying the existence of a private charity market based on altruism, feelings of social responsibility, pure taste for giving or even egoistic speculation on future rewards to charity, they seriously doubt the efficiency of the market outcome. The prime reason for the presumed market failure lies in a peculiar feature of the charity market, namely the inherent division of consumption into a "material" component enjoyed by the donee and a "spiritual" component enjoyed by the donor precisely by making somebody else better off. For other potential donors this creates the chance for a free ride: as long as their preferences for giving at least partially depend on the well-being of the recipients - pure private good cases are excluded -, they adjust for others' transfers to the poor by reducing their own contributions to an "independent adjustment equilibrium level"<sup>1</sup> with marginal social utility greater than marginal cost of the transfers. Thus the overall level of charitable giving will remain below Samuelson's optimal public goods supply, and a case for public redistribution in the broadest sense (including the provision of welfare services) seems to be established.

This string of reasoning which has found its most elegant analytical shape in the work on the pareto optimal redistribution<sup>2</sup>, correctly identifies the most compelling reason for a charity market failure<sup>3</sup>. Its policy conclusion, however, goes too far:

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<sup>+</sup>The author is grateful to Ludwig Gutberlet, Klaus-Werner Schatz and Roland Vaubel for valuable comments on an earlier draft of the paper. Thanks are also due to Rolf Knudsen who mastered the computer work with a lot of patience and imagination.

<sup>1</sup>This term is due to Buchanan (5), p. 11 ff.

<sup>2</sup>See Hochman & Rodgers (16), Fürstenberg & Mueller (13) et.al.

<sup>3</sup>Brennan (3) reveals another rationale for government intervention based on positive externalities between donors and donees. Paqué (19), in turn, doubts the validity of Brennan's argument.

from a neoclassical viewpoint, the internalization of externalities should always proceed by means of a policy which best preserves the desirable qualities of a decentralized market system. In this respect, a "socialization" of redistribution is inferior to a policy of subsidizing private charitable giving to extend the level of redistribution to the socially optimal level where the sum of all individual marginal utilities of the transfers equals their marginal cost<sup>1</sup>. Such a policy preserves the individual freedom of choice inherent in any market activity; in contrast the compulsory public redistribution must resort to some complex public choice processes which frequently involve distinct violations of the basic Pareto efficiency criterion.

Of course, a policy of subsidization has to face serious information problems since both the amount and the incidence of the consumption externalities among different individuals are unknown. A subsidy scheme will thus most likely remain suboptimal, but so will a socialization of redistribution: as long as the state honestly pursues the aim of achieving an optimal provision of a public good he cannot escape the duty of somehow estimating the amount and incidence of the externalities involved. The informational requirement with respect to external effects is the same for both policies; hence no a priori argument in favour of socialisation can be derived on informational efficiency grounds<sup>2</sup>.

Other efficiency arguments clearly favour some subsidy scheme over outright socialization. The deadweight loss of a governmental bureaucracy may well be cut back if individuals prefer to address their charitable giving to competing private welfare organisations with more efficient management and better knowledge of peculiar market conditions. This in turn may reduce the moral

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<sup>1</sup>This assumption is implicitly made in all studies on the optimal level and structure of tax subsidies to charity (Atkinson (2), Dean (8), Brennan (4), Hochman & Rodgers (17)).

<sup>2</sup>In fact the total informational requirement is larger for socialization as it requires estimates of the internal effects as well.

hazard problems which tend to cumulate in highly centralized anonymous redistribution systems<sup>1</sup>. Finally the enlarged range of individual choice may stimulate overall economic activity just as particular tax or tariff cuts induce substitution and income effects that are likely to be conducive to economic growth. This gain in dynamic efficiency may be particularly important if an income progressive subsidy scheme is adopted (e.g. tax deductability in an income progressive tax structure) since this allows economic agents with growing income to avoid high marginal and average tax rates<sup>2</sup>.

Without further discussion of these theoretical aspects going beyond the scope of this paper, it remains to be concluded that there are a number of most plausible economic rationales for subsidizing private charity instead of socializing redistribution. German tax authorities have cautiously adopted this view in § 10b of the Income Tax Law which reads: "Private giving to the advancement of charitable as well as ecclesiastical, religious, scientific and selected political purposes ... are deductible up to a limit of 5 per cent of gross income"<sup>3</sup>.

The main purpose of this paper is to test econometrically whether the deductability rule of German tax law can be called efficient in any meaningful economic sense. Section 2 of the paper develops a formal concept of "quantitative efficiency" which appears to be the appropriate framework for econometric modelling. Section 3 discusses some problems concerning the computation of the main variables and the estimation procedure. Section 4 presents the most

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<sup>1</sup>As Buchanan (6, pp. 364 ff.) puts it, decentralization through competition reduces the divergence between "the extent of morals" and the "extent of markets".

<sup>2</sup>This is not to say that an income progressive scheme is preferable to a flat-rate subsidy. From a static welfare viewpoint just the reverse is most likely true (see Hochman & Rodgers (17, pp. 7 ff.), Paqué (19, pp. 22 ff.)).

<sup>3</sup>See NWB-Textausgabe: Wichtige Steuergesetze, 27. Auflage, Berlin 1980, S. 35/36 (translation with minor changes: K.-H. P.).

reliable empirical results of alternative model specifications; these are compared to some estimates obtained by Feldstein in his econometric work on taxation and charity in the U.S. Section 5 develops some scenarios for promising reform proposals based on the previously derived econometric model. Section 6 concludes the paper with some final remarks on specific "German" problems of studying the impact of tax subsidies to charity.

## 2. The Concept of "Quantitative Efficiency"

In a broad welfare theoretic sense, the concept of efficiency lies far beyond any approach of empirical testing: it is simply not possible to know to any reliable degree either the amount or the incidence of all pareto relevant spill-over-effects due to bilateral charity transfers.

In a less ambitious framework, however, we may well be able to derive meaningful propositions about the state of efficiency of the charity market. Assuming

- that the given level of redistribution is optimal in the broad sense of externality internalization, and
- that private transfers are not inferior to an equal amount of public redistribution,

an unambiguous quantitative efficiency gain can be secured by a substitution of private giving for public expenditure at any given (optimal) level of overall redistribution (public + private transfers = const.!) if the cost (= tax spending) of subsidizing private charity is lower than the cost of financing a corresponding public expenditure program.

Of course, this concept of quantitative efficiency may be criticized on the basis of the realism of its assumptions.



First, the level of actual redistribution is certainly not optimal at any given point in time. A change of the level, however, should not in any way affect the efficiency of a substitution between public and private charity within a given amount of overall redistribution. The optimality assumption thus serves as an auxiliary device to allow unambiguous welfare judgements about structural shifts independent of moves towards or away from optimality in the level of redistribution. The weaker assumption of a constant level of redistribution would do as well provided that potential pareto improvements through shifts in the transfer level are explicitly excluded as parts of the welfare judgement.

Second, the private allocation of charity funds will most likely differ from prior public redistributive pattern. From a neo-classical viewpoint this allocative change may be welcome as a genuine welfare gain due to a dismantling of distorted public choice processes. Even if this staunch theoretical view is not taken, there is good reason to believe that the state has ample opportunity for reestablishing the prior overall redistributive pattern via simple internal adjustment at lower levels of total social costs. Despite the striking variety of potential charity recipients named in § 10b of the German Income Tax Law - including political parties -, many recipients of private charity are also somehow financially supported by the state, frequently through budgetary items not summed under the label of welfare expenditure<sup>1</sup>. Furthermore the actual level of private charitable giving - in 1974 around 660 Mio. DM - still amounts to a tiny part of total public expenditure, and it seems not at all unrealistic to assume that the "capacity limit" for indirect substitution via internal adjustment has not yet been reached. Hence private giving should be, at last in present day Germany, a close to perfect and in no way inferior substitute for public redistribution.

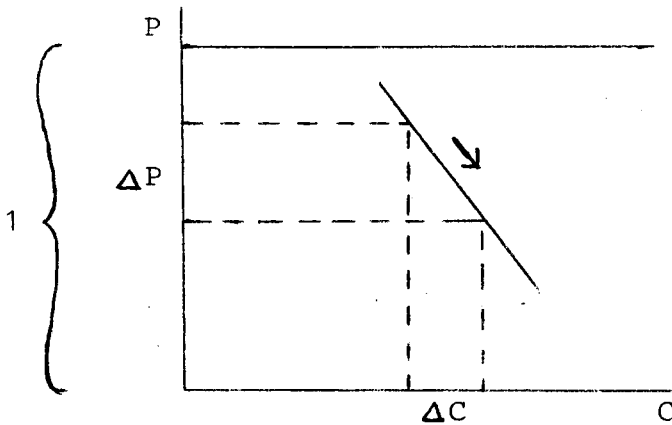
Backed up by reasonably realistic assumptions we are ready to derive optimality conditions for quantitative efficiency: A pareto

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<sup>1</sup>Political parties may be a good case in point.

improvement will be achieved by additional subsidies to private charity if the induced increase in private giving (and hence the induced reduction in public welfare expenditure) surpasses the additional amount of public subsidies so that the state can secure a (net) gain to be passed over to the citizens through reduced overall tax rates at an unchanged level of transfers.

Standard microeconomic monopoly theory is the appropriate tool to formalize this idea (fig. 1):



The state can vary the price  $p$  per unit of giving by varying the subsidy fraction  $(1-p)$ ; just like a private monopolist he faces a more or less downward sloping demand curve which allows him to maximize social gain ( $G$ ) defined as the difference between the sum of private charitable giving ( $C$ ) and the sum of public subsidies.

Hence:

Max  $G!$

$$G = C(p) - [1 - p] C(p) \\ = p \cdot C(p)$$

$$\frac{dG}{dp} = C(p) + p \cdot \frac{dC(p)}{dp} \\ = C(p) \left[ 1 + \frac{dC(p)}{C(p)} \cdot \frac{p}{dp} \right] \\ = C(p) \left[ 1 + \eta_c \right]^1 \quad \text{with } \eta_c < 0$$

<sup>1</sup>The formal analogy to the Amoroso-Robinson-Condition is obvious (see H. Varian (20), p. 53 f.).

G is maximized if  $\frac{dG}{dp} = C(p) (1 + \eta_c) = 0$

$$\eta_c = -1.$$

If  $\eta_c < -1 = \frac{dG}{dp} < 0.$

If  $\eta_c > -1 = \frac{dG}{dp} > 0.$

Again analogous to private monopoly theory the optimal price/quantity-mix depends on the price elasticity of demand for charitable giving.

- If  $\eta_c = -1$ , the subsidy per unit of giving  $(1-p)$  is just sufficient to maximize social gain;
- if  $\eta_c < -1$ , there is a positive marginal gain of exploiting the giving potential by raising the subsidy to some level above  $(1-p)$ ;
- if  $\eta_c > -1$ , the subsidy should be lowered to exploit the inelasticity of the demand for giving<sup>1</sup>.

Derived in a partial equilibrium framework these criteria neglect income effects that may arise from decreasing/increasing subsidies to private giving. As the ratio of private giving to gross income is extremely low in the F.R.G. - on average around 0.2 % in 1974 - the relevant income effects will be negligibly small except in cases of dramatic subsidy changes.

The primary purpose of the following empirical inquiry must be the estimation of price elasticities for the Federal Republic of Germany. Depending on the magnitude of these elasticities proposals for reform will be advanced. Methodologically the work comes close to prior econometric studies done by Feldstein & associates (2, 8, 9, 10, 11)

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<sup>1</sup>For an ingenious interpretation of the price elasticity of demand for charitable giving in terms of externalities between donors and donees, see Brennan (4). A critical review of Brennan's argument is given by Paqué (19, pp. 11 ff.).

and Clotfelter (6) for the U.S.<sup>1</sup>.

### 3. The Econometric Model

The estimates are based on German income tax data for private giving pursuant to § 10b income tax law, disaggregated by fourteen gross income classes<sup>2</sup>. These statistics tend to be published in three years intervals; the series starts in 1961 and for the time being ends in 1974<sup>3</sup>. Hence it is possible to estimate the average level of charitable giving per gross income class as a function of the average disposable income and the average "price of charity" in this class.

The various specification problems of this model will be described briefly.

#### 3.1. Private Charitable Giving (C)

The specification of C appears to be straightforward: it is defined as the sum of private giving of the *i*-th gross income class divided by the number of tax returns in the class. Hence for each of the five years (1961, 65, 68, 71, 74) there are fourteen observations of the endogeneous variable.

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<sup>1</sup>The value of the seemingly trivial concept of the price elasticity of demand - obviously the theoretical core of all empirical studies on tax subsidies to charity - has been thoroughly questioned by Hochman & Rodgers (17, pp. 10 ff.). They argue that the concept is entirely worthless as a guide to policy makers since it does not yield any information on the amount of externalities to be internalized via public subsidies to charity. Correct as Hochman & Rodgers' judgement may be in a world without prior public intervention where government has first to solve the problem of finding an optimal transfer level, it is certainly too destructive in a world where public transfers already exist so that the prior transfer level can be taken as a starting-point for pareto improvements along the lines described above thereby assuming that both private and public redistribution are backed up by externality arguments. In my view, this is the approach adopted, albeit implicitly, by the above mentioned empirical studies.

<sup>2</sup>The term "gross income" is used synonymously to the German legal term "Gesamtbetrag der Einkünfte".

<sup>3</sup>See Statistisches Bundesamt, Fachserie L, Reihe 6I: Einkommens- und Körperschaftssteuer for 1961, 1965 and 1968; Statistisches Bundesamt, Fachserie 14, Reihe 7.1.: Einkommenssteuer for 1971 and 1974.

### 3.2. Disposable Income (Y and YT)

Specifying an appropriate income variable is far more troublesome. We need a comprehensive measure of the resources available to an individual for personal consumption or saving in a given year of taxation. Hence two basic questions stand out:

- What should be the gross income measure to arrive at the broadest feasible concept of a personal budget? (i)
- What should be the amount of taxes and other charges to be deducted from gross income to arrive at an appropriate disposable income measure? (ii).

(i) The use of an ideal permanent income measure is obviously not feasible in a world of tax data exclusively limited to current income concepts. As Feldstein has aptly pointed out, there is no bias from this specification error if the estimates are based on grouped data of current income, with the grouping correctly classifying taxpayers according to their current and permanent income<sup>1</sup>. In the case of the grouped German income tax data, this will most likely be a realistic assumption since the inter-grouped variance of permanent income over the whole population of taxpayers is certainly large relative to its intragroup variance. Hence the bias should be negligably small. We are left with the broad concept gross income (GI) defined as the sum of all current income streams from all possible sources, and the narrow concept of taxable income (TI), loosely speaking defined as gross income minus the sum of all tax deductible items like tax exemptions for children, voluntary church taxes and compulsory property taxes, expenditure on vocational training and tax consulting, charitable giving etc.<sup>2</sup>. Which of the two concepts is preferable for the purpose of computing the income variable in our model has to be decided on purely theoretical grounds. The choice crucially depends on the understanding of the term "disposable income":

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<sup>1</sup>Feldstein (9), p. 84.

<sup>2</sup>Precise legal definitions of both concepts are to be found in Statistisches Bundesamt, op.cit. (1974), p. 12.

- If we consider all tax deductible items as burdens taking away part of the taxpayer's income without being part of his consumption, we are bound to prefer the narrow concept of taxable income with its restricted consumption choice set.
- If, in turn, we consider the factual conditions underlying tax deductible items as the outcome of a voluntary, rational consumption choice, we must resort to the broad budget concept of gross income with all tax deductible items included.

I am strongly inclined to take the latter approach since in my view, nearly all tax deductible items are in the domain of individual decisionmaking on lifetime allocation of permanent income. Nevertheless, as there might be arguments in favour of either concept, the most important estimates of the empirical part of the paper will be carried out for both income variables<sup>1</sup>.

To avoid spurious interdependencies between exogenous and endogenous variables, taxable income must be adjusted by adding the amount of deductible charitable giving. Of course, this need not be done with gross income which contains all tax deductible items including charitable giving.

(ii) A measure of disposable income can be obtained by subtracting the income tax liability (TL) from GI and (TI + C) respectively. Three problems complicate the analysis:

- Once again, to avoid spurious interdependencies between exogenous and endogenous variables, we must not subtract the tax actually paid but rather a "fictitious" tax that would have been paid if the individual had not contributed to charity.

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<sup>1</sup>German tax law defines a third concept simply called "income" which is somehow a midway between the polar concepts of gross income and taxable income excluding "Sonderausgaben" (special expenses) but including "Außergewöhnliche Belastungen" (extraordinary burdens). As no clearcut view on consumption underlies the concept of "income", I have omitted it completely.

- In the F.R.G. two distinct tax schedules are commonly used to compute individual tax liabilities, namely the "basic schedule", primarily applied to singles, and the "splitting schedule", exclusively applied to couples if they itemize their income in one single tax return. As the two schedules mostly differ in average and marginal tax rates at any given taxable income, it is not possible to derive "fictitious" tax liabilities from aggregate data of taxable income. Instead we must resort to tax liability data<sup>1</sup>.
- From 1968 to 1974, the German income tax was technically supplemented by a tax surcharge ("Ergänzungsabgabe") amounting to 3.p.c. of the income tax liability for taxpayers with yearly gross income above 16 000 DM. Although legally separated from the income tax, this compulsory surcharge may well have figured as an effective rise of income tax liability in the economic calculus of the individual taxpayer. To have a check on the sensitivity of the parameter estimates with respect to this redefinition of disposable income (and also price of charity!), the main calculations were carried out for both tax liability concepts, excluding and including the tax surcharge.

To solve these problems simultaneously the following tedious computation procedure was applied to each gross income class: The average actual tax liability TL was computed from income tax liability statistics. TL is a mean of all taxpayers in the class, regardless of how these individual tax liabilities have been computed. The basic tax schedule renders the marginal tax rate (MTR) at the actual tax liability TL corresponding to some "fictitious" taxable income  $TI_f$ . To compute the amount of taxes saved through charitable giving, the marginal tax rate was applied to the actual amount of contributions. The saved amount, in turn, was added to

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<sup>1</sup>Of course, there is a more general argument in favour of using tax liability instead of taxable income data: if the degree of progression changes within a given income class, the average tax liability of the class will reveal this fact while the tax liability of the average taxable income will not.

TL to arrive at the "fictitious" tax liability  $TL_f$  reflecting both the "splitting-effect" - via the actual tax liability - and the "fiction effect" - via the added amount of charity induced tax saving<sup>1</sup>.  $TL_f$  is the appropriate variable to be subtracted from GI and  $(TI + C)$  respectively.

In summary the whole procedure of computing the disposable income variable looks as follows:

1. step: computation of GI and  $(TI + C)$  respectively
2. step: computation of TL
3. step: computation of MTR at TL (corresponding to  $TL_f$ )
4. step: computation of  $S = MTR \cdot C$
5. step: computation of  $TL_f = TL + S$
6. step: computation of  $Y = GI - TL_f$  and  
 $YT = (TI + C) - TL_f$  respectively.

In the calculations with income tax surcharge SU, a fictitious surcharge  $SU_f$  was computed by multiplying SU by the ratio of fictitious to actual tax liability. This procedure entails no perceptible bias since the ratio of SU to TL is almost constant over the relevant income range.  $SU_f$  was added to  $TL_f$ , and the sum of both replaced  $TL_f$  in the formula of Y and YT.

### 3.3. Price of Charity (P)

With the previous discussion in mind the specification of an appropriate price variable is fairly straightforward. Due to tax deductibility the price of private monetary transfers equals one minus the marginal tax rate ( $p = 1-m$ ).

As the price of charity enters the economic calculus of the average taxpayer per gross income class at the level of the taxable

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<sup>1</sup>Due to the "discrete jumps" of tax liability in the tax schedule, C could not just be added to  $TI_f$  to read  $TL_f$  off the tax schedule. The direct application of the marginal tax rate to C promised more accuracy.



income he would attain if he did not contribute to charity, the marginal tax rate must be computed at the relevant fictitious taxable income ( $TI_f + C$ ). This procedure is invariant to the choice of the exogenous income variable ( $Y$  or  $YT$ ) in the econometric model since the individual economic calculus does obviously not depend on the broadness of the income concept.

To avoid some "technical" irregularities of the basic tax schedule that defy any meaningful economic interpretation<sup>1</sup>, the marginal tax rate for discrete changes of 600 DM in the first ten gross income classes and 1 200 DM in the last four classes were used to calculate the price variable. For very small taxable incomes falling below 600 DM, the remaining tax liability was also divided by 600 resulting in correspondingly lower marginal tax rates.

In the econometric model including the tax surcharge  $SU_f$ , the effect of the surcharge on the marginal tax rate was taken into account by computing at  $(TI_f + C)$  not the marginal change in  $TL_f$ , but the marginal change in  $(TL_f + SU_f)$ . As expected the tax surcharge slightly raised the marginal tax rate (i.d. lowered the price of charity) for all taxpayers with yearly gross income above 16 000 DM.

Two statistical complications could not be accounted for:

- The German income tax law sets an upper limit to deductibility of charitable giving at 5 % of gross income, for giving to political parties even an absolute ceiling of 1 800 DM. These limitations do effectively raise the price of charity for taxpayers approaching one of the ceilings. Fortunately, the average

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<sup>1</sup> So the marginal tax rate between two discrete current numbers (60 DM) fluctuates between 16,67 % and 20 % in some ranges of the tax schedule in use for the years 1965 to 1974; the "average marginal tax rate" (between ten current numbers in these ranges) is constant at 19 %. It would be absurd to interpret these kind of irregularities - hardly noticed by any taxpayer - as genuine realizations of the exogenous price variable in the econometric model.

ratio C/GI is extremely low in the F.R.G. (on average around 0,21 %, in the highest income class 0,57 %) so that the bias from this source is presumably very small.

- According to § 10b income tax law, the value of charitable donations in kind is deductible from taxable income<sup>1</sup>. Thus realized capital gains may escape the taxes that would be levied in case of a sale of the asset in the current year. This in turn may lower the opportunity cost of donations in kind thus leading to a fall of the price of charity below the price of pure monetary transfers. Unfortunately, the lack of data prohibits any attempt of quantifying this effect in the case of Germany. It may be comforting, however, that Feldstein's attempt to incorporate a rudimentary measure of appreciated assets into his price variable did not significantly change his basic parameter estimates<sup>2</sup>.

### 3.4. The Data

As noted above the German income tax statistics provide cross-section data for fourteen income classes and five years (1961, 65, 68, 71, 74) thus allowing the computation of 70 observations of the three variables. In the subsequent time-series-cross-section analysis, however, the observations of the first gross income class ( $GI > 1\,500$  DM) will be omitted as the computation error is suspected to be prohibitively high relative to the negligibly low level of private giving in this class. Both private giving and disposable income are measured in constant 1970 DM by deflating with the consumer price index.

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<sup>1</sup>§ 10b (2) German Income Tax Law.

<sup>2</sup>Feldstein (9), pp. 93 f. He also discusses the theoretical problem at length (9, p. 84 f.).

### 3.5. Functional Form and Estimation Procedure

For the basic estimates a log-linear, constant elasticity specification of the form

$$(1) \ln C = \beta_0 + \beta_1 \ln Y + \beta_2 \ln P + \mathcal{E} \quad \text{resp.}$$

$$(2) \ln C = \beta_0 + \beta_1 \ln YT + \beta_2 \ln P + \mathcal{E}$$

was chosen, with  $\mathcal{E}$  being a random error term. In alternative specifications the restrictive assumptions were relaxed to allow for variable elasticities over some income ranges.

Equations (1) and (2) were first estimated by ordinary least squares (OLSQ); a weighted least squares procedure (WLSQ), described in section 4, was later introduced to improve the efficiency of the estimates.

## 4. Empirical Results

### 4.1. Estimates with "Gross Disposable Income" (Y)

The basic ordinary least squares estimate of (1) is given in table 1 as equation I. Despite the high adjusted  $R^2$  - not unusual in regressions with grouped data - the estimate suffers from serious deficiencies: the test statistics indicate heteroscedasticity in both pooling characteristics (GI-class and time), intertemporal parameter changes and first order autocorrelation with respect to income. Furthermore, the power of the insignificant F-statistic on parameter constancy in class is strongly impaired by the high level of heteroscedasticity in GI-classes and time<sup>1</sup>. Heuristic examination of the residual structure indicated that

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<sup>1</sup>This is the well-known problem of testing homoscedasticity and parameter constancy simultaneously; the use of either F-statistic (FS, FH) involves the implicit assumption that the non-tested property of the regression holds. If it does not, the F-statistics will be biased. See Maddala (18) p. 199.

Table 1 : Estimates with Y (Excl. Tax Surcharge)

No.	Estim. Procedure	Sample	Const.	Y	P	Y <sub>L</sub>	Time	adR <sup>2</sup>	SSR	SE	DW <sub>Y</sub>	FH <sub>CL</sub>	FH <sub>T1</sub>	FS <sub>CL</sub>	FS <sub>T1</sub>	FS <sub>T2</sub>
I	OLSQ	n = 65 CL: 2-14 T: 61-74	-9,127	1,216 (0,060)	-1,903 (0,418)	-	-	0,991	4,122	0,258	2,79**	15,69**	4,42**	2,32	10,49**	5,54**
II	OLSQ	n = 40 CL: 7-14 T: 61-74	-9,176	1,230 (0,024)	-1,729 (0,169)	-	-	0,998	0,357	0,098	1,79	1,65	4,12**	1,85	9,52**	3,55**
III	OLSQ	n = 40 CL: 7-14 T: 61-74	-9,426	1,249 (0,020)	-1,622 (0,140)	-	0,013 (0,003)	0,998	0,231	0,080	1,73	3,32**	4,75**	1,24	1,83	1,71
IV	OLSQ	n = 40 CL: 7-14 T: 61-74	-11,628	1,248 (0,021)	-1,622 (0,143)	0,236 (0,058)	-	0,998	0,243	0,082	1,77	3,24**	4,79**	0,96	2,23	1,91
V	WLSQ	n = 40 CL: 7-14 T: 61-74	-12,481	1,274 (0,018)	-1,378 (0,128)	0,308 (0,044)	-	-	0,215	0,077	1,78	1,09	2,16	1,45	4,75**	2,35*
VI	OLSQ	n = 24 CL: 7-14 T: 68-74	-8,904	1,213 (0,029)	-1,825 (0,198)	-0,009 <sup>o</sup> (0,146)	-	0,998	0,169	0,092	1,34 <sup>++</sup>	-	-	-	-	1,53
VII	WLSQ	n = 24 CL: 7-14 T: 68-74	-9,386	1,224 (0,024)	-1,682 (0,172)	0,036 <sup>o</sup> (0,107)	-	-	0,106	0,073	1,11 <sup>++</sup>	-	-	-	-	1,11
VIII	WLSQ	n = 65 CL: 2-14 T: 61-74	-12,877	1,254 (0,020)	-1,544 (0,158)	0,359 (0,069)	-	-	1,810	0,172	2,50 <sup>++</sup>	1,66	1,79	12,67**	3,98**	3,25**
IX	WLSQ	n = 39 CL: 2-14 T: 68-74	-11,364	1,235 (0,018)	-1,535 (0,140)	0,231 (0,106)	-	-	0,665	0,138	1,26 <sup>++</sup>	-	-	-	-	3,80**

No.	Estim. Procedure	Sample	Const.	Y	Y <sub>L</sub>	Y <sub>H</sub>	P <sub>L</sub>	P <sub>H</sub>	Y <sub>L</sub>	adR <sup>2</sup>	SSR	SE	DW <sub>Y</sub>
X	OLSQ	n = 40 CL: 7-14 T: 61-74	-11,927	1,262 (0,021)	-	-	-1,777 (0,160)	-1,634 (0,138)	0,247 (0,056)	0,998	0,220	0,079	2,15
XI	WLSQ	n = 40 CL: 7-14 T: 61-74	-12,624	1,278 (0,017)	-	-	-1,617 (0,171)	-1,491 (0,135)	0,309 (0,042)	-	0,192	0,074	2,26
XII	OLSQ	n = 40 CL: 7-14 T: 61-74	-11,754	-	1,244 (0,039)	1,271 (0,026)	-1,855 (0,209)	-1,262 (0,656)	0,246 (0,056)	0,998	0,218	0,080	2,17
XIII	WLSQ	n = 40 CL: 7-14 T: 61-74	-12,489	-	1,256 (0,024)	1,292 (0,020)	-1,756 (0,198)	-1,023 (0,376)	0,312 (0,041)	-	0,183	0,073	2,31
XIV	WLSQ	n = 65 CL: 2-14 T: 61-74	-12,801	1,255 (0,020)	-	-	-0,774 (0,453)	-1,422 (0,169)	0,360 (0,067)	-	1,716	0,169	2,75**
XV	WLSQ	n = 65 CL: 2-14 T: 61-74	-12,806	-	1,260 (0,028)	1,255 (0,021)	-0,618 (0,762)	-1,441 (0,185)	0,359 (0,068)	-	1,714	0,170	2,76**

(Abbreviations, see appendix)

taxpayers with nominal gross income below 16 000 DM (gross income classes 2 to 6) should be omitted to improve the homogeneity of the sample. This restriction does not seriously narrow the policy scope of the predictions derived from the regression results since only 3,49 % of total private giving in 1974 stemmed from these lower classes.

Equation II shows the results for the restricted sample: while probably homogeneous in class, the estimate is still plagued by heteroscedasticity and parameter changes in time.

Intertemporal parameter constancy can easily be established by introducing an exponential time trend as is done in equation III. Although quite satisfactory on statistical grounds, III suffers from a theoretical drawback: the time trend cannot simply be interpreted as the net effect of all non-specified variables moving in trend since the use of grouped data with nominal gross income classes unchanged over time mostly eliminates any intertemporal increase of the income level itself. In the extreme, each individual taxpayer may have experienced dramatic increases in income while the average income of each class remains virtually constant as the intra- and intergroup movement of the taxpayers leaves the distribution in each class unchanged.

To account for this specific effect a variable for the income level has to be introduced. Unfortunately, the average disposable income of all sample tax returns will not do the job since its trend itself is biased downward due to the disproportionally growing number of low income earners moving from the excluded gross income classes (below 16 000 DM) into the included ones and, even more importantly, from wage taxation - not included in the statistics - into income taxation<sup>1</sup>. Instead national income per employee (in

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<sup>1</sup>During the sample period, income taxation has been compulsory for wage incomes above 24 000 DM for singles, 48 000 DM for couples itemizing one single tax return. As these limits fall into the first two sample classes whose share in the total number of income tax returns has increased from 24,28 % in 1961 to 67,33 % in 1974, the quantitative importance of the downward bias should be obvious.

constant 1970 DM) appears to be a more reliable proxy for the overall level of income (YL) at any given point in time.

As can be seen from the sum of squared residuals of equation IV YL explains the intertemporal shifts almost as well as the time trend does<sup>1</sup>; the insignificant F-statistic on intertemporal parameter constancy suggests that there is no further need for resorting to a "theoretically empty" time trend.

Equation IV will serve as a starting-point for further analysis. It yields income and price elasticities in absolute amount significantly greater than one thus indicating broad scope for a liberalized tax treatment of charitable contributions. Due to some heteroscedasticity in time and class, equation IV is not yet the most efficient of all linear unbiased estimates. To reduce the variance to a global minimum an iterative weighted least squares procedure (WLSQ) was adopted. In a first step the absolute values of the OLSQ-residuals of IV were regressed on all exogeneous variables to identify the causes of the heteroscedasticity<sup>2</sup>. Drawing on the estimated coefficients of this auxiliary regression fitted residuals were computed and normalized; the reciprocals of these fitted (and normalized) residuals were used as weights to the original data. On basis of the weighted data a new regression was run, and the whole procedure was repeated until no further increase in efficiency could be achieved. In fact, two iterations were sufficient to eliminate all traces of heteroscedasticity.

Equation V presents the result of the WLSQ-procedure: while the efficiency gain is remarkable - the sum of squared residuals is

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<sup>1</sup>On purely statistical grounds, of course, any other variable with a pronounced trend component would do the job as well. On theoretical grounds, however, no other variable has a comparable degree of a priori plausibility.

<sup>2</sup>This procedure is known as the Glejser-test for heteroscedasticity. See Maddala (18), p. 262; Glejser (14).

reduced from 0.245 to 0.215 -, the test statistics identify an intertemporal parameter change, particularly pronounced between the periods 1961-65 and 1968-74. To check on the magnitude of this parameter change which may be present but undetected due to heteroscedasticity in III and IV as well, the equations were reestimated for the homogeneous period beginning in 1968. These estimates (equations VI and VII) yield higher absolute price elasticities thus casting some doubt on the accuracy of the relatively low absolute price parameter of the WLSQ-equation<sup>1</sup>.

To obtain some more reliable information on the magnitude of the coefficients the restrictive assumption of constant elasticities over the income range has to be relaxed. Unfortunately, the high collinearity between Y and P and the moderate sample size do not allow any unconstrained parameter estimation for any distinct gross income or price range. Similarly, the common procedure of specifying the variability of the elasticities by hypothesizing elasticity changes somehow functionally related to the level of income and price is not applicable as, again, the high collinearity between Y and P at a moderate sample size prohibits the introduction of any further collinear variable<sup>2</sup>. Instead, we must resort to the less elegant procedure of defining distinct price and income variables for separate gross income ranges, namely  $Y_L$  and  $P_L$  for GI-classes of 16 000 - 100 000 DM and  $Y_H$  and  $P_H$  for GI-classes above 100 000 DM.

Equations X and XI, allowing for varying price elasticities at a constant income elasticity, yield useful insights: the absolute price elasticity turns out to be slightly (but not significantly)

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<sup>1</sup>Estimates of the earlier period yield a correspondingly lower absolute price elasticity (around 1,30); as these estimates are based on a very small sample (16 observations), their value should not be rated high.

<sup>2</sup>With the somewhat richer U.S. data, Feldstein (9, pp. 88 f.) is able to specify a model along these lines; the variance of his parameter estimates, however, is also pushed up by the high collinearity.

higher in the lower than in the upper gross income ranges. If we further relax the assumption of a constant income elasticity as is done in XII and XIII, the gap widens, but the parameter estimates lose a good deal of their statistical accuracy due to the "separate" collinearity within both ranges.

The results are in line with common prejudice asserting that high income earners are less receptive to price incentives since their charitable giving is primarily motivated by a price inelastic desire for social power and prestige. As the parameter shifts are hardly secured on statistical grounds, however, no far reaching conclusions can be drawn without additional evidence from some richer data source.

Incidentally, the slight parameter change may well explain the relatively low absolute price elasticity indicated by the WLSQ-equation V: as the estimation error in IV declines with the level of income, the weighting procedure attaches greater weight to the observations of the high income classes thus pulling down the overall price elasticity toward some lower absolute level. The specifications with variable elasticities (X - XIII) clearly point to a higher absolute price elasticity of the middle income classes somewhere between 1,60 and 1,80. This should be kept in mind when resorting to the estimates to make predictions of the quantitative effects of various reform proposals<sup>1</sup>.

Finally, the WLSQ procedure was applied to the sample of all thirteen income classes. The results in VIII - for the full sample - and IX - for 1968-1974 - show parameters not much different from previous estimations using the restricted sample. As the test statistics indicate distinct parameter changes in class and time, the estimates should not be taken too seriously. The specifications with variable elasticities (XIV, XV) between the gross income classes 1 500 - 16 000 DM and above 16 000 DM indi-

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<sup>1</sup>We will return to this issue in Section 5.



cate marked parameter changes at fairly large estimation errors; no reliable conclusions can be drawn from these results.

The whole set of regressions in table 1 was reestimated for gross disposable income and price variables including the impact of the tax surcharge introduced in 1968<sup>1</sup>.

The main results are presented in table 2. As could be expected the parameter estimates and the test statistics barely deviate from previous results of corresponding specifications in table 1. The only remarkable differences appear to be the slightly lower absolute price elasticities and the slightly lower estimation errors in almost all specifications: both facts are easily explained by the increased price variation due to higher marginal tax rates in the upper income classes.

On theoretical grounds the results of table 1 are somewhat inferior to the results of table 2 as those are computed on a more complete basis of all factors relevant to the economic calculus of individual taxpayers.

#### 4.2. Estimates with "taxable income" (YT)

An alternative set of specifications using taxable income YT instead of gross income Y yield the results presented in table 3 (excluding the tax surcharge effects) and table 4 (including the tax surcharge effects).

In general, the estimates have slightly inferior statistical qualities compared to the estimates with the gross income variable. While the income elasticities hardly change, the absolute price elasticities are markedly reduced to levels around 1,3;

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<sup>1</sup>See pp. 12 ff. of this paper for the discussion of this specification problem.

Table 2 : Estimates with Y (Incl. Tax Surcharge)

No.	Estim. Procedure	Sample	Const.	Y	P	YL	Time	adR <sup>2</sup>	SSR	SE	DW <sub>Y</sub>	FH <sub>CL</sub>	FH <sub>T1</sub>	FS <sub>CL</sub>	FS <sub>T1</sub>	FS <sub>T2</sub>
I	OLSQ	n = 40 CL: 7-14 T: 61-74	-11,295	1,249 (0,020)	-1,589 (0,133)	0,201 (0,058)	-	0,998	0,232	0,080	1,76	3,22*	4,73**	0,97	1,87	1,75
II	WLSQ	n = 40 CL: 7-14 T: 61-74	-12,130	1,266 (0,019)	-1,413 (0,123)	0,278 (0,044)	-	-	0,208	0,076	1,74	1,13	1,96	1,45	3,48*	2,09
III	OLSQ	n = 24 CL: 7-14 T: 68-74	-8,976	1,217 (0,029)	-1,747 (0,184)	-0,003 <sup>0</sup> (0,145)	-	0,998	0,166	0,091	1,36 <sup>++</sup>	-	-	-	-	1,49
IV	WLSQ	n = 24 CL: 7-14 T: 68-74	-9,529	1,228 (0,026)	-1,599 (0,164)	0,049 (0,102)	-	-	0,114	0,075	1,08 <sup>++</sup>	-	-	-	-	1,39
V	WLSQ	n = 65 CL: 2-14 T: 61-74	-12,748	1,257 (0,021)	-1,482 (0,150)	0,345 (0,075)	-	-	1,850	0,174	2,52 <sup>++</sup>	1,69	1,73	13,24 <sup>**</sup>	4,04 <sup>**</sup>	3,33 <sup>**</sup>
VI	WLSQ	n = 39 CL: 2-14 T: 61-74	-11,536	1,239 (0,018)	-1,469 (0,131)	0,246 (0,107)	-	-	0,691	0,140	1,28 <sup>++</sup>	-	-	-	-	3,82 <sup>**</sup>

No.	Estim. Procedure	Sample	Const.	Y	Y <sub>L</sub>	Y <sub>H</sub>	P <sub>L</sub>	P <sub>H</sub>	YL	adR <sup>2</sup>	SSR	SE	DW <sub>Y</sub>
VII	OLSQ	n = 40 CL: 7-14 T: 61-74	-11,575	1,263 (0,021)	-	-	-1,734 (0,149)	-1,597 (0,129)	0,211 (0,056)	0,999	0,209	0,077	2,15
VIII	WLSQ	n = 40 CL: 7-14 T: 61-74	-12,216	1,270 (0,018)	-	-	-1,643 (0,156)	-1,520 (0,126)	0,273 (0,041)	-	0,182	0,072	2,24
IX	OLSQ	n = 40 CL: 7-14 T: 61-74	-11,511	-	1,248 (0,034)	1,269 (0,024)	-1,795 (0,185)	-1,314 (0,521)	0,218 (0,058)	0,999	0,207	0,078	2,14
X	WLSQ	n = 40 CL: 7-14 T: 61-74	-12,272	-	1,259 (0,022)	1,280 (0,020)	-1,719 (0,177)	-1,254 (0,318)	0,287 (0,044)	-	0,178	0,072	2,29
XI	WLSQ	n = 65 CL: 2-14 T: 61-74	-12,716	1,258 (0,020)	-	-	-0,740 (0,447)	-1,370 (0,161)	0,350 (0,735)	-	1,759	0,171	2,75 <sup>**</sup>
XII	WLSQ	n = 65 CL: 2-14 T: 61-74	-12,715	-	1,261 (0,028)	1,258 (0,021)	-0,631 (0,754)	-1,382 (0,175)	0,349 (0,074)	-	1,758	0,173	2,76 <sup>**</sup>

(Abbreviations, see appendix)

Table 3 : Estimates with YT (Excl. Tax Surcharge)

No.	Estim. Procedure	Sample	Const.	YT	P	YL	Time	adR <sup>2</sup>	SSR	SE	DW <sub>Y</sub>	FH <sub>CL</sub>	FH <sub>T1</sub>	FS <sub>CL</sub>	FS <sub>T1</sub>	FS <sub>T2</sub>
I	OLSQ	n = 40 CL: 7-14 T: 61-74	-11,138	1,242 (0,023)	-1,288 (0,165)	0,239 (0,064)	-	0,988	0,301	0,091	1,78	3,24*	5,96**	0,36	2,61	1,87
II	WLSQ	n = 40 CL: 7-14 T: 61-74	-12,315	1,272 (0,020)	-1,031 (0,144)	0,340 (0,047)	-	-	0,263	0,085	1,87	1,21	1,62	0,87	6,18**	2,85
III	OLSQ	n = 24 CL: 7-14 T: 68-74	-7,734	1,204 (0,032)	-1,502 (0,227)	-0,071 (0,161)	-	0,997	0,206	0,102	1,37 <sup>++</sup>	-	-	-	-	1,26
IV	WLSQ	n = 24 CL: 7-14 T: 68-74	-7,776	1,210 (0,028)	-1,405 (0,194)	-0,069 <sup>o</sup> (0,116)	-	-	0,111	0,075	1,29 <sup>++</sup>	-	-	-	-	1,11
V	WLSQ	n = 65 CL: 2-14 T: 61-74	-12,860	1,250 (0,024)	-0,819 (0,210)	0,308 (0,070)	-	-	3,487	0,239	1,53 <sup>++</sup>	1,40	1,07	29,26**	6,32**	3,47
VI	WLSQ	n = 39 CL: 2-14 T: 68-74	-8,486	-1,214 (0,026)	-0,783 (0,229)	0,043 <sup>o</sup> (0,133)	-	-	1,522	0,209	0,60**	-	-	-	-	1,40

No.	Estim. Procedure	Sample	Const.	YT	YT <sub>L</sub>	YT <sub>H</sub>	P <sub>L</sub>	P <sub>H</sub>	YL	adR <sup>2</sup>	SSR	SE	DW <sub>Y</sub>
VII	OLSQ	n = 40 CL: 7-14 T: 61-74	-11,337	1,251 (0,024)	-	-	-1,394 (0,188)	-1,296 (0,165)	0,247 (0,064)	0,998	0,290	0,091	1,92
VIII	WLSQ	n = 40 CL: 7-14 T: 61-74	-12,415	1,275 (0,020)	-	-	-1,217 (0,187)	-1,120 (0,153)	0,340 (0,046)	-	0,246	0,084	2,11
IX	OLSQ	n = 40 CL: 7-14 T: 61-74	-11,174	-	1,233 (0,046)	1,259 (0,030)	-1,473 (0,258)	-0,963 (0,755)	0,245 (0,065)	0,998	0,288	0,092	1,94
X	WLSQ	n = 40 CL: 7-14 T: 61-74	-12,329	-	1,257 (0,025)	1,289 (0,024)	-1,343 (0,217)	-0,708 (0,398)	0,344 (0,046)	-	0,237	0,084	2,16
XI	WLSQ	n = 65 CL: 2-14 T: 61-74	-11,519	1,250 (0,024)	-	-	-0,217 (0,722)	-0,728 (0,235)	0,308 (0,070)	-	3,444	0,240	1,56 <sup>+</sup>
XII	WLSQ	n = 65 CL: 2-14 T: 61-74	-11,818	-	1,395 (0,038)	1,253 (0,021)	4,504 (1,228)	-1,075 (0,219)	0,310 (0,061)	-	2,570	0,209	2,45 <sup>+</sup>

(Abbreviations, see appendix)

Table 4 : Estimates with YT (Incl. Tax Surcharge)

No.	Estim. Procedure	Sample	Const.	YT	P	YL	Time	adR <sup>2</sup>	SSR	SE	DW <sub>Y</sub>	FH <sub>CL</sub>	FH <sub>T1</sub>	FS <sub>CL</sub>	FS <sub>T1</sub>	FS <sub>T2</sub>
I	OLSQ	n = 40 CL: 7-14 T: 61-74	-10,988	1,243 (0,023)	-1,275 (0,155)	0,223 (0,065)	-	0,998	0,294	0,090	1,77	3,22	5,93**	0,46	2,41	1,80
II	WLSQ	n = 40 CL: 7-14 T: 61-74	-12,114	1,265 (0,021)	-1,098 (0,140)	0,324 (0,050)	-	-	0,265	0,086	1,84	1,30	1,81	0,83	5,59**	2,62
III	OLSQ	n = 24 CL: 7-14 T: 68-74	-7,783	1,207 (0,032)	-1,448 (0,211)	-0,069 <sup>0</sup> (0,160)	-	0,997	0,205	0,101	1,33 <sup>++</sup>	-	-	-	-	1,27
IV	WLSQ	n = 24 CL: 7-14 T: 68-74	-7,766	1,215 (0,028)	-1,355 (0,182)	-0,073 <sup>0</sup> (0,117)	-	-	0,117	0,077	1,18 <sup>++</sup>	-	-	-	-	1,13
V	WLSQ	n = 65 CL: 2-14 T: 61-74	-11,424	1,245 (0,023)	-0,880 (0,198)	0,295 (0,075)	-	-	3,607	0,234	1,56 <sup>+</sup>	1,47	1,11	28,48**	6,20**	3,52
VI	WLSQ	n = 39 CL: 2-14 T: 68-74	-8,314	1,219 (0,024)	-0,777 (0,208)	0,021 (0,122)	-	-	1,603	0,214	0,57**	-	-	-	-	1,52

No.	Estim. Procedure	Sample	Const.	YT	YT <sub>L</sub>	YT <sub>H</sub>	P <sub>L</sub>	P <sub>H</sub>	YL	adR <sup>2</sup>	SSR	SE	DW <sub>Y</sub>
VII	OLSQ	n = 40 CL: 7-14 T: 61-74	-11,176	1,252 (0,024)	-	-	-1,374 (0,177)	-1,280 (0,155)	0,229 (0,065)	0,998	0,283	0,090	1,95
VIII	WLSQ	n = 40 CL: 7-14 T: 61-74	-12,200	1,269 (0,020)	-	-	-1,278 (0,172)	-1,176 (0,144)	0,321 (0,048)	-	0,245	0,084	2,16
IX	OLSQ	n = 40 CL: 7-14 T: 61-74	-11,120	-	1,240 (0,041)	1,257 (0,028)	-1,428 (0,229)	-1,060 (0,605)	0,234 (0,067)	0,998	0,282	0,091	1,96
X	WLSQ	n = 40 CL: 7-14 T: 61-74	-12,231	-	1,261 (0,025)	1,276 (0,024)	-1,332 (0,200)	-0,985 (0,374)	0,331 (0,052)	-	0,242	0,084	2,20
XI	WLSQ	n = 65 CL: 2-14 T: 61-74	-11,411	1,245 (0,023)	-	-	-0,273 (0,723)	-0,792 (0,223)	0,299 (0,076)	-	3,562	0,244	1,59 <sup>+</sup>
XII	WLSQ	n = 65 CL: 2-14 T: 61-74	-11,523	-	1,391 (0,039)	1,249 (0,020)	4,488 (1,248)	-1,115 (0,208)	0,282 (0,066)	-	2,676	0,213	2,46 <sup>+</sup>

(Abbreviations, see appendix)

in the WLSQ-equation II it is even pushed down to a level around 1,1. The variable elasticity specifications reveal the same pattern as in tables 1 and 2, with the absolute price elasticity being somewhat lower in the high income ranges. The differences between the corresponding equations of tables 3 and 4 are of a minor magnitude.

The results show quite clearly that a change in the definition of income may have substantial effects on the estimated parameters. Hence a priori arguments favouring the broad or the narrow concept of income cannot be neglected when making policy recommendations.

#### 4.3. Comparison with Feldstein's Estimates

Table 5 contrasts the results with the main constant elasticity estimates obtained by M. Feldstein in a time-series-cross-section analysis of U.S. income tax data which methodologically comes very close to the present study. The table reveals some striking features which will be sketched out briefly:

- The specification with gross disposable income indicates higher absolute income and price elasticities for the case of Germany. There is a plausible explanation for these peculiar differences: About 65 % of all charitable giving in the U.S. is destined for religious organizations; the corresponding ratio for the F.R.G. is most probably far lower<sup>1</sup> because, on behalf of the churches, the government collects a so-called "church tax" from church members. As Feldstein has shown for the U.S.<sup>2</sup>, lower income earners concentrate their giving almost exclusively on religious organizations, whereas high income earners prefer giving to other charitable purposes like higher education, research, health services etc.; thus religious giving figures as a kind of income- and price inelastic base which is obviously present in the U.S.<sup>3</sup>, but lacking in the

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<sup>1</sup>Unfortunately, no disaggregated data on this issue is published in Germany.

<sup>2</sup>See Feldstein (10), p. 213 (table 1).

<sup>3</sup>Feldstein's elasticity estimates for various kinds of charitable giving point in this direction (10, p. 217, table 3).

Table 5 : Comparison Between USA and FRG

	estimation procedure	specification	estimated coefficients of log-linear model (standard error in parenthesis)						no. of cases	SE	
			const.	Y	YT	P	Time	YL			
USA (Feldstein (8))	1)	OLSQ	Y,without Time	-1,922	0,822 (0,032)	-	-1,238 (0,101)	-	-	117	0,125
	2)	OLSQ	Y,with Time	-1,649	0,806 (0,023)	-	-1,272 (0,071)	-0,014 (0,001)	-	117	0,088
	3)	OLSQ	YT,without Time	1,690	-	0,445 (0,031)	-2,044 (0,128)	-	-	117	0,195
FRG	4)	OLSQ	Y,with YL	-11,295	1,249 (0,020)	-	-1,589 (0,133)	-	0,201 (0,058)	40	0,080
	5)	WLSQ	Y,with YL	-12,130	1,266 (0,019)	-	-1,413 (0,123)	-	0,278 (0,044)	40	0,076
	6)	OLSQ	YT,with YL	-10,988	-	1,243 (0,023)	-1,275 (0,155)	-	0,223 (0,065)	40	0,090
	7)	WLSQ	YT,with YL	-12,114	-	1,265 (0,021)	-1,098 (0,140)	-	0,324 (0,050)	40	0,086

(Abbreviations, see appendix)

F.R.G. The validity of this explanation seems to be strengthened by the fact that the ratio of average German to average American charitable giving at equal income levels rises from 1/27th for taxpayers with net income of about 18 000 DM (1968) to 1/7th for income levels about 200 000 DM (1968). Hence it is not surprising that the German regression curve turns out to be somewhat steeper than the American one.

- In both studies taxable income has a lower explanatory power than gross disposable income. In the case of the U.S., the results for taxable income cast serious doubt on the validity of the specification: the extraordinary low income elasticity, the extremely high absolute price elasticity and, most of all, the high standard error of the regression are apparently no good basis for any comparison with the results for Germany.
- Feldstein's estimates indicate a negative time trend which - he argues - may be due to a decline of the relative income of the taxpayers in the restricted sample<sup>1</sup>. To me, the negative sign remains an unexplained puzzle since precisely the grouping and averaging of the data should tend to "neutralize" any absolute change in disposable income. If at all, a positive time trend should emerge<sup>2</sup>.
- Finally, Feldstein's estimates yield a constant term clearly above the one estimated for Germany. This fact can mostly be explained by differing average propensities to spend on charity independent of income and price: in the U.S., the ratio of contributions to disposable income varies between 25,9 % (!) in the highest GI-class down to 2,8 % in some middle income ranges<sup>3</sup> whereas in Germany it never surpasses 1,1 %. Due to some non-specified socioeconomic or political reasons, the Americans are far more generous than the Germans.

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<sup>1</sup>Feldstein (9), p. 88, footnote 27.

<sup>2</sup>See the argument outlined in part 4.1. of this paper. Abrams & Schmitz (1) believe that an increase in public welfare expenditure has caused this downward trend in private giving.

<sup>3</sup>Feldstein (9), p. 87, table 1.

## 5. Proposals for Reform

Almost all price elasticities estimated in Section IV indicate broad scope for efficiency gains through a more liberal income tax treatment of charitable giving in the Federal Republic of Germany.

To forecast the quantitative effects of various reform schemes we must take one of the specifications in table 2 and 4 as the basis for predictions. Although the WLSQ-equation II may have the most attractive statistical properties, it will not be chosen as it probably underestimates the price elasticity in the important middle income ranges (16 000 DM - 100 000 DM) which, in 1974, included 96,28 % of all tax returns in the sample. On these grounds the simple OLSQ-equation I is clearly preferable; as its restrictive constant elasticity assumption is not falsified by the homogenous sample estimates of equations III and IV or the variable elasticity specifications of equations VII to X, there is no reason to be particularly sceptical about the accuracy of the estimate.

On the basis of equations I in table 2 and 4, ex-post predictions for 1974 are made by retaining the 1974 observations of YL and Y resp. YT but replacing the factual values of P by the designed reform prices.

Two basic ways of subsidizing charity must be considered, namely the tax deduction and the tax credit.

- In a system of tax deductions, the taxpayer is allowed to reduce his taxable income by the amount of his charitable giving. Thus his per unit tax saving is a positive function of the marginal tax rate he faces. Hence, in a progressive income tax scheme, the subsidy per unit of giving rises with income.



- In a system of flat-rate tax credits, the taxpayer is allowed to reduce his tax liability by a fixed percentage of his charitable giving. Hence his tax saving is independent of the income tax scheme provided that his tax liability is not yet close to zero which is the unusual limiting case<sup>1</sup>.

As the present German system is a pure deduction scheme with the price of private monetary transfers just equaling one minus the marginal tax rate, there are two distinct changes any reform may bring about, namely

- a replacement of the tax deduction by a tax credit yielding the same amount of gross charitable giving, and
- a genuine liberalization by increasing subsidies to charitable giving either in a tax deduction or in a tax credit framework.

Both aspects are analyzed in tables 6 and 7:

- Columns 1 and 2 put the present deduction system against a tax credit scheme yielding an equal amount of gross giving (about 660 Mio DM in current 1974 prices) by fixing the per unit tax subsidy at 0.3784 (in table 6) and 0.3683 (in table 7). The structural differences deserve some comments: only the lowest two income classes enjoy a higher subsidy rate in the tax credit system but as they alone account for 82,38 % of all tax returns in the sample the quantitative impact of the subsidy shift is tremendous. As can be seen from the lower bounds of the prediction intervalls, the increase of private giving in the lower income ranges is well secured on statistical grounds, with the possible exception of the first GI-class in the elasticity-pessimistic prediction of table 7. The social gain as defined in Section 2<sup>2</sup> of the current tax deduction system is slightly

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<sup>1</sup>A third way of subsidizing charity is the flat-rate matching grant: in this system a fixed proportion of the taxpayer's charitable giving is added to the donation. As long as an increase in the recipient's welfare is the prevalent charity motive, the economic effects of the matching grant are analogous to the effects of a flat-rate tax credit.

<sup>2</sup>See pp. 6 f.

Table 6 : Predictions Based on Equation I in Table 2

CL (1000 DM)	actual (1) values	(2) $m = 0.3784$ $P = 0.6216$	(3) $p = \frac{m}{\bar{p}} - (1 - \bar{p}) \cdot 0.5$	(4) $m = 0.6649$ $p = 0.3351$	(5) $m = 0.8$ $p = 0.2$
$c_1$	16	30.56	28.00	86.11	177.37
	25	51.06	73.37	157.43	324.85
	50	133.84	108.90	206.34	507.05
	75	243.29	160.42	405.46	842.17
	100	452.13	277.25	1122.34	1474.05
	250	1232.80	656.69	4099.91	3570.64
	500	2656.19	1457.34	9315.65	8108.56
	1000	5312.37	2914.68	18631.30	16217.12
	$\Sigma$	10624.74	5829.36	21346.60	17561.40
	$\Sigma c_1$	10624.74	5829.36	21346.60	17561.40
$\Sigma \Sigma c_1$	16	46 297 667	48 923 125	162 511 476	368 959 222
	25	221 544 540	368 276 017	841 183 706	1 909 776 216
	50	107 057 679	195 594 952	267 476 220	607 252 944
	75	45 586 220	91 963 765	92 279 821	209 506 755
	100	104 163 744	300 618 331	180 354 634	409 465 803
	250	46 884 617	204 897 656	77 134 474	175 120 315
	500	27 032 513	122 848 794	46 246 813	104 595 364
	1000	61 846 162	252 868 518	95 193 280	216 119 862
	$\Sigma$	660 463 142	1 585 991 156	1 762 380 424	4 001 196 481
	$\Sigma c_1(1-p_1)$	16	8 844 489	14 016 475	108 053 880
25	64 453 792	160 697 240	559 303 046	1 527 820 973	
50	42 247 171	115 772 652	177 844 939	485 802 355	
75	20 184 790	61 082 333	61 356 853	167 605 404	
100	52 571 873	227 583 108	119 917 796	327 572 643	
250	25 593 506	167 780 446	51 286 712	140 096 252	
500	14 783 879	100 594 735	30 749 506	83 996 291	
1000	33 760 757	207 061 386	63 294 012	172 895 889	
$\Sigma$	262 440 257	1 054 588 375	1 171 806 744	3 200 957 185	
$\Sigma c_1 p_1$	16	37 453 178	34 906 650	54 457 596	73 751 844
25	157 090 749	207 578 777	281 880 660	381 955 243	
50	64 810 508	79 822 300	89 631 281	121 450 589	
75	25 401 430	30 881 432	30 922 968	41 501 351	
100	51 591 871	73 035 224	60 436 838	81 893 161	
250	21 291 140	37 117 210	25 847 762	35 024 063	
500	12 298 635	22 254 059	15 497 307	20 599 073	
1000	28 085 405	45 807 132	31 899 268	43 223 972	
$\Sigma$	398 022 885	531 402 784	590 573 680	800 239 296	

(Abbreviations, see appendix)

Table 7 : Predictions Based on Equation I in Table 4

	CL (1000 DM)	(1) factual values	(2) $m = 0.3683$ $p = 0.6317$	(3) $m = 1.5 \bar{m}$ $p = (\bar{p} - (1-\bar{p}) * 0.5)$	(4) $m = 0.6482$ $p = 0.3518$	(5) $m = 0.8$ $p = 0.2$
$C_i$	16	30.56	28.67 < 33.78 < 39.80	24.63 < 28.92 < 33.97	55.70 < 71.22 < 91.07	101.01 < 146.29 < 211.88
	25	51.06	60.87 < 71.39 < 83.72	70.04 < 82.56 < 97.30	119.68 < 150.53 < 189.33	217.62 < 309.19 < 439.28
	50	133.84	110.65 < 129.58 < 151.75	186.55 < 226.16 < 274.18	219.91 < 273.24 < 339.50	400.98 < 561.23 < 785.53
	75	243.29	163.05 < 190.99 < 223.70	343.64 < 427.29 < 531.31	326.56 < 402.72 < 496.65	596.67 < 827.19 < 1146.76
	100	492.13	287.33 < 337.20 < 395.72	869.97 < 1139.79 < 1493.30	582.46 < 711.04 < 868.00	1068.02 < 1460.47 < 1997.13
	250	1232.80	697.00 < 823.48 < 972.91	2954.31 < 4045.52 < 5539.77	1442.14 < 1736.44 < 2090.79	2662.80 < 3566.63 < 4777.26
	500	2656.19	1548.89 < 1847.60 < 2203.92	6751.01 < 9076.71 < 12203.60	3267.04 < 3895.95 < 4645.92	6081.13 < 8002.27 < 10530.30
	1000	13263.17	6769.37 < 8278.28 < 10123.59	31205.40 < 40668.80 < 53002.10	14775.40 < 17456.10 < 20623.10	28063.70 < 35854.70 < 45808.60
$\sum C_i$	16	46 297 667	51 175 889	43 813 106	107 896 591	221 625 839
	25	221 544 540	309 754 499	358 220 079	653 135 520	1 341 546 346
	50	107 057 679	103 650 135	180 903 801	218 562 763	448 923 948
	75	45 586 220	35 786 560	80 063 036	75 459 257	154 993 899
	100	104 163 744	71 371 415	241 246 812	150 498 015	309 121 620
	250	46 884 617	31 317 768	153 855 171	66 038 550	135 642 506
	500	27 082 513	18 838 130	92 546 135	39 723 106	81 591 145
	1000	61 846 162	38 601 620	189 638 614	81 397 794	167 190 466
$\sum \sum C_i$	$\sum$ 660 463 142	660 496 016	1 340 286 754	1 392 711 596	2 860 635 769	
$\sum C_i(1-p_i)$	16	8 844 489	18 848 080	12 552 455	69 938 570	177 300 671
	25	64 453 792	114 082 582	156 309 332	423 362 444	1 073 237 077
	50	42 247 171	38 174 345	107 076 960	141 672 383	359 139 159
	75	20 184 790	13 180 190	53 177 869	48 912 690	123 995 119
	100	52 571 873	26 286 092	182 635 899	97 552 813	247 297 296
	250	25 593 506	11 534 334	125 984 307	42 806 188	108 514 004
	500	14 783 879	6 938 083	75 781 403	25 748 517	65 272 916
	1000	33 760 757	14 216 977	155 285 579	52 762 050	133 752 373
$\sum \sum C_i(1-p_i)$	$\sum$ 262 440 257	243 260 683	868 803 804	902 755 657	2 288 508 615	
$\sum C_i p_i$	16	37 453 178	32 327 809	31 260 651	37 458 021	44 325 168
	25	157 090 749	195 671 917	201 910 748	229 773 076	268 309 269
	50	64 810 508	65 475 790	73 826 841	76 890 380	89 784 789
	75	25 401 430	22 606 370	26 885 167	26 546 567	30 998 780
	100	51 591 871	45 085 323	58 610 913	52 945 202	61 824 324
	250	21 291 110	19 783 434	27 870 864	23 232 362	27 128 502
	500	12 298 635	11 900 047	16 764 752	13 974 589	16 318 229
	1000	28 085 405	24 384 643	34 353 035	28 635 744	33 438 093
$\sum \sum C_i p_i$	$\sum$ 398 022 885	417 235 333	471 482 950	489 955 940	572 127 154	

(Abbreviations, see appendix)

lower than the social gain of the equal revenue tax credit system which indicates some shift from intramarginal to marginal subsidization.

- Columns 3 and 4 put the quantitative effects of a 50 %-increase of subsidy rates in the present deduction system<sup>1</sup> against the effects of a tax credit with the same average per unit subsidy of 0.6649 for all taxpayers. Both reform schemes induce remarkable increases in gross giving and social gain, but once again, the tax credit wins the race on quantitative efficiency grounds, independently of the prediction equation used. Again, the statistical properties of the forecasts are quite satisfactory. It should be kept in mind, however, that the absolute price elasticity estimate for the upper classes may well entail an upward bias; as the tax deduction scheme relies more heavily on the quantitative increase of private giving in these classes, the efficiency gap between the two schemes may even be larger than indicated.
- Column 5 shows the forecast for a generous reform introducing a flat-rate per unit tax credit of 0.8. The wide gap between the "optimistic" predictions of table 6 and the "pessimistic" predictions of table 7 is particularly striking for this dramatic subsidy increase. In both cases, however, the induced increases in gross giving and social gain are remarkable. Although the forecast may be biased due to neglected income effects occurring through the drastic change in the price of charity, the overall magnitude of the predicted level of private giving is certainly no statistical illusion. Before dismissing such generous proposals for reform as utterly unrealistic, we should recognize that the ratio of charitable giving to disposable income - in this reform scheme in the range of 1,33 % to 3,78 % for the elasticity optimistic predictions of table 6 - would merely be approaching American dimensions from below.

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<sup>1</sup>Strictly speaking, the new scheme is not a deduction system anymore since the marginal tax rate does no more equal the per unit subsidy rate. To avoid semantic confusion, we retain the previous terminology throughout the paper.

In summary we can conclude that there is in fact a very broad scope for liberalizing the tax treatment of charitable contributions. On purely quantitative efficiency grounds, this scope could best be exploited if the present tax deduction scheme were replaced by a flat-rate-tax-credit which allowed the state to tap the broad giving potential of the middle classes<sup>1</sup>.

## 6. Final Remarks

The econometric model developed in this paper shows quite clearly what kind of information can be drawn from German income tax statistics. The estimates of income and price elasticities are fairly reliable on statistical grounds and the policy conclusions derived from these estimates are firmly rooted in standard microeconomic theory.

Nevertheless the limitations of an analysis based on a single set of data should not be overlooked: no doubt, it would be desirable to check on the magnitude of the coefficients by using some entirely independent data sources as has been done for the U.S. by Feldstein & associates (3, 11, 12) and Clotfelter (7).

Unfortunately, this way of corroborating the results does not seem to be feasible for Germany since there has never been a "national survey of philanthropy". The regionally disaggregated tax data for the German states may be a precious source for estimating the impact of other variables on charitable giving; they are, however, of little help for checking on the parameter estimates in this paper.

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<sup>1</sup>This is not to say that other externality arguments may not point in different directions. In my view, however, a thorough welfare theoretic analysis will support the superiority of the tax credit system (see Hochman & Rodgers (17, pp. 7 ff.), Paqué (19, pp. 22 ff.)).

Appendix

Abbreviations in tables 1 - 5:

OLSQ	= ordinary least squares;
WLSQ	= weighted least squares (weighting procedure described in section 4);
n	= total number of observations in the sample;
Cl.	= GI-classes in the sample;
T	= years in the sample;
const.	= parameter estimate of constant resp. weighted constant in log-linear specifications;
$Y, Y_T, P, Y_L, Y_L, Y_H, Y_T, Y_T, Y_T$	= parameter estimates - standard estimation error in paranthesis - of Y, Y <sub>T</sub> etc. (as defined in section 3 and 4) in log-linear specification;
Time	= parameter estimate of exponential time trend;
ad R <sup>2</sup>	= adjusted square of multiple regression coefficient (only given for OLSQ-estimates);
SSR	= sum of squared residuals;
SE	= standard error of the regression;
DW <sub>Y</sub>	= Durbin-Watson-statistic for the estimate with observations ordered according to the magnitude of the income variable (Y resp. Y <sub>T</sub> ) in the equation;
FH <sub>CL</sub>	= F-statistic of homoscedasticity according to Goldfeld & Quandt (14): the sample is divided into two distinct ranges of the grouping characteristics (classes: 7-10 and 11-14 for n = 40, 2-6 and 7-14 for n = 65; time 1961-1965 and 1968-1974); the F-statistic is given as the ratio of the SSR - corrected for the corresponding ratio of degrees of freedom - of the separate estimates for the two ranges;
FH <sub>T1</sub>	
FS <sub>CL</sub>	= F-statistic of parameter constancy as described by Maddala (17, pp. 198 ff.): the sample is splitted into two or more distinct ranges of the grouping characteristics (classes: 7-10 and 11-14 for n = 40, 2-6 and 7-14 for n = 65; time (T <sub>1</sub> ): 1961-65 and 1968-74; time (T <sub>2</sub> ): 1961,65,68,71 and 74); for these ranges separate regressions are run and the SSR of these unrestricted estimates are summed up; the F-statistic is obtained by computing the difference of the restricted estimates' SSRs and the summed unrestricted estimates' SSRs as a fraction of the unrestricted estimates' SSRs, both numerator and denominator corrected for the relevant degrees of freedom;
FS <sub>T1</sub>	
FS <sub>T2</sub>	

significance levels

- of the F- and DW-statistics:

- \* = significant at the 5 % level;
- \*\* = significant at the 1 % level;
- ++ = DW-statistic in the indifference range at the 1 % and the 5 % level;
- \*+ = DW-statistic in the indifference range at the 1 % level, but significant at the 5 % level;

- of the parameter estimates:

all significant at least at the 1 % level if not denoted by "o"  
(= not significant);

explanation of tables 6 and 7

- row 1 ( $C_i$ ): charitable giving per average tax return in class i
  - column 1: factual values;
  - column 2-5: point forecasts and prediction intervals for various prices of charity (10 %-significance-interval as only lower prediction bound, i.d. one-sided test at 5 %-significance level is policy relevant);
- row 2 ( $\sum C_i$ ): sum of all gross charitable giving in GI-class i;
- row 3 ( $\sum C_i(1-p_i)$ ): sum of all subsidies in GI-class i;
- row 4 ( $\sum C_i p_i$ ): social gain per GI-class i, defined as sum of all charitables giving minus sum of all subsidies in GI-class i.

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