Universität Potsdam

Hans-Georg Petersen

Taxes, Transfers, Economic Efficiency and Social Justice

Essays on Public Economics 1979 – 2009

Chapter 5: Group- and Microsimulation

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Preface

This volume contains the articles and papers which predominately have been published in international journals or edited volumes in the period from 1979 to 2009. The single articles reflect the main research areas of the editor and his co-authors who were engaged at the Kiel Institute of World Economics, the Johannes-Kepler-University Linz/Austria, the Justus-Liebig-University Giessen, the University of Potsdam, and the German Institute for Economic Research (DIW Berlin). The editor would like to thank all the copy right holders for their content; if any have been inadvertently overlooked the editor will be pleased to make the necessary arrangement at the first opportunity.

The editor would also like to thank Doris Gericke and Christina Bennewitz for all their effort they have invested in the creation of this volume. As a matter of course the editor is deeply indebted to all his co-authors and collaborators and last but not least to all the foundations, which have supported the research projects by generous grants.

Potsdam, September 2010

Hans-Georg Petersen

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Introduction

HANS-GEORG PETERSEN AND JOHANN KURT BRUNNER

I

For a long time there has been an intense discussion among economists about the question "What are the appropriate methods to derive knowledge about the real world?" If economics is to be regarded as a positive science at all, some way of applying theoretical economic reasoning to the understanding of real-world phenomena must exist. No doubt, the most ambitious task in this context is, besides the explanation of historical events, to forecast (part of) the economic development in the future and to assess the consequences of political measures aimed at influencing this development.

One can formulate profound explanations why accurate forecasts are necessarily beyond the scope of scientific work (as an example from physics, think of the impossibility of describing precisely the course a sheet of paper follows when it is sailing down to the floor); there are phenomena which can be explained in principle but cannot be described (precisely) ex ante. Nevertheless, the wish of politicians and the will of applied economists to assess the effects of intended political actions remain. In order to satisfy this demand as accurately as possible various methods have been developped depending on the measures which are to be evaluated as well as on the mathematical and statistical tools which are available.

The natural sciences can in many important cases rely on a method which proves particularly useful for the derivation of knowledge about real-world phenomena: They can perform experiments. This means that they try to study the behavior of an object of interest in a strictly controlled environment, which enables the researchers to separate essential influences from incidental ones. Simulation methods in the social sciences can be viewed as an attempt to develop something similar to the experimental approach. Necessarily, this attempt leads only to a surrogate which is imperfect in many respects, but it certainly provides a further source of knowledge in addition to other research methods.

In this simulation approach the part of nature being kept under strict control is played by a computer model being developped by a (or a group of) researcher(s). Obviously, the control over this model is perfect, no incidental forces must be feared to influence the results, and hence the situation could be regarded even superior to that

one in which experiments in the natural sciences take place. However, the artificial nature of the model also constitutes its apparent drawback: There is no guarantee that the description of real-world processes, as formulated in the model, is sufficiently close to reality itself and, consequently, that the results of the simulations are reliable, accurate and detailed enough.

It is clear that the possibility of building large models, which hopefully represent real-world features to a large extent, has only been opened up by the construction of powerful computers. In spite of the enormous computer capacities which are now available rather easily, one should still keep in mind that the pictures generated by them remain artificial, like any pictures. Specific knowledge of how the models are built is necessary in order to assess the value of simulation results correctly.

II

As mentioned above, simulation methods in the social sciences play a role similar to experiments in the natural sciences: With the help of simulation models economists try to test hypotheses, instruments and political measures under given conditions. The main object described in this book is how to get information about the possible effects of changes within the tax and transfer system, before these changes are implemented in reality. The simulations of different tax and transfer schemes deliver standard values which are independent of exogenous disturbances; the comparison of these standard values allows economists and politicians to evaluate different policy measures. The significance of this kind of knowledge is apparent, and hence substantial efforts are made to attain a satisfactory degree of reliability and accuracy of the results. Still, in practice the investigation of the expected effects of changes in tax and transfer law is often limited to the revenue effect. A thorough analysis of allocative and distributive consequences, which entails considerable costs, is rarely accomplished, at best some typical illustrative examples are provided.

As already said before, the actual effects of reforms within the tax and transfer system are strongly influenced by exogenous shocks (e.g., employment effects due to the business cycle), which implies that after the implementation of reform measures their pure consequences cannot be detected easily. Therefore a great uncertainty about the realization of the targets at which the measures are aimed, will exist. In this respect, results derived from a simulation model which reflects indeed the essential relations relevant for the measures in question, may prove important for assessing the rationality of tax and transfer policy.

Due to the development of macroeconomic theory in the post-war period, a lot of macroeconometric models were constructed and used as instruments for the diagnosis

and forecast of the economic process. (For a bibliography of macroeconometric models see UEBE, HUBER, and FISCHER 1985.) Their main purpose is to analyze the development of macroeconomic variables under different fiscal and monetary policies, especially the effects on allocation and stabilization. Obviously, these models are not designed to deal with the effects of taxation and transfer policy on the personal income distribution and on the economic behavior of the individuals (e.g., supply of labor). As state activities in this field gained increasing importance, micro-oriented models had to be developped (see ORCUTT, MERZ, and QUINKE 1986, among others), which can reflect the influence on the level of single households or on groups of households. Very frequently ideas arose to combine macro- and microeconomic models; but many unsolved problems with respect to the macro-micro link must lead to the confession that this is beyond the current "state of the art". In the last decade a third type of model, in addition to the standard macro- and micro-oriented models, was put forward and used for the simulation of tax and transfer policy: The applied general equilibrium model (see, e.g., SHOVEN and WHALLY 1984, AUERBACH and KOTLIKOFF 1987). Its intention is to describe a real economy by a static or dynamic general equilibrium model with numerically fixed parameters, and to apply the model to policy analysis.

These three different types of models are discussed in this volume, but the stress is upon the second one, which aims to provide information on the microeconomic level. Under the notation "microeconomic simulation model" we summarize models whose data bases rest on grouped data for different categories (population, taxpayers, pensioneers, employees, etc.) which are relevant for the purpose of the investigation, or on data referring directly to single individuals or households. Consequently we distinguish between "group-simulation models" and "microanalytic-simulation-models" (GALLER and GROHMANN 1981). Since the first proposals of ORCUTT (1957), it took nearly two decades to prove the efficiency of the microeconomic simulation method (see KRUPP and WAGNER 1982). Nowadays such models are used successfully in many universities, research institutes and - in a rapidly increasing number - in the public administration (ministries of finance, of social affairs, of economic policy etc.).

Often these models are constructed under the assumption that no behavioral responses of the individuals take place ("static microsimulation models"). This is a considerable simplification, of course, whose justification depends on the purpose for which the model is used. Changes of behavior may indeed be negligible, especially for short-run analysis or when reactions of different individuals cancel out. In many cases, however, changes in tax and transfer policy will cause relevant modifications of the economic behavior of individuals (changes in labor supply, in saving and investment behavior, ...). Therefore, especially if long-run effects are to be analyzed, "dynamic microsimulation models" must be used which include behavioral responses. For instance, a system of social security will in the long run have effects on the demographic behavior (fertility), thus influencing the size and the structure of the population. The

problem with the incorporation of behavioral reactions is, not surprisingly, that the complexity of the simulation model increases substantially and that additional data are necessary. Moreover, it is often difficult to select reliable hypotheses describing realistically the economic behavior of individuals or households. This problem can partly be overcome if the sensitivity of the results with respect to parameter variations is analyzed. In any case, as with any wish to get more detailed information, additional costs arise for the attempt to allow for changes in economic behavior. Given this restriction, expectations should not be directed to the construction of a total model which explains everything, but to more precise models designed for the analysis of specific fields of policy measures.

III

We have separated the contributions to this volume into six parts, though the assignment is not always straightforward.

1. The first part gives an overview over some tax simulation models which are currently used in the Federal Republic of Germany and in Austria:

The model presented by BOSS is designed to simulate the revenue of the wage income tax in the Federal Republic of Germany under varying tax regimes. The taxpayers are divided into groups, differentiated according to their marital status and the number of children as well as to gross income. Extrapolations are made by applying macroeconomic growth rates to compute future values of average income in any group.

GYÁRFÁS and QUINKE, after describing the data situation and different tax models in the Federal Republic of Germany, introduce a more elaborate procedure of how to ameliorate tax data in order that disaggregated simulations can be performed. They construct a "synthetic microdata base" which is consistent with a large amount of tabular information from tax statistics.

The contribution by RAINER and LEITNER describes a (micro-based) model which portrays in detail the schedules for tax payments and social security contributions in Austria. It is applied for the simulation of the distributional as well as (by aggregation) the revenue effects of different proposals for a reform of these schedules.

A more theoretical approach is chosen in KITTERER's paper. It discusses the effect of consumption or income taxation on savings and on capital formation in the context of an overlapping generations model. The theoretical considerations are supplemented by a survey from the literature on numerical simulations of the long-run solutions of this problem.

2. The second part contains three papers on indices of tax burden and on methods to compare income distributions:

LAMBERT and PFÄHLER give a survey over the recent theoretical literature on the effects of changes in the income tax schedule on income distribution and social welfare. They work out various cases where income distributions (with differing total income) can be compared without ambiguity, by concentrating on the value of any representative out of an appropriate class of individualistic social welfare functions.

The paper of HINTERBERGER is addressed to a related topic, namely to the comparison of income distributions if the corresponding LORENZ curves intersect. As is known, no straightforward ranking of the LORENZ curves can be performed in this case, nevertheless, qualifications of subgroups as winners or losers can be given.

ROSE and FARKEN deal with measures of the excess burden caused by a tax system or a tax reform, respectively. They analyze the reliability of these measures in indicating the direction of the welfare effect of a tax reform and in ranking different reform proposals. Furthermore, they illustrate the theoretical considerations by calculations of deadweight loss measures, using an applied general equilibrium model for the Federal Republic of Germany.

3. The models in the third section are of the macroeconometric type, designed for the forecast of tax or social-security revenue, as well as of the applied general-equilibrium type:

HUJER, HANSEN, and KLEIN, in the first part of their contribution, present an overview of the characteristics of the most important macroeconometric models which at present serve for the simulation of economic and tax policies in the Federal Republic of Germany. In the second part, the main general difficulties related to the application of such models are demonstrated, using the *Frankfurt model* as an example.

JAHNKE describes the *model of the German Bundesbank* which is a quarterly and interdependent model of the macroeconometric type, like the Frankfurt model. It is applied for the simulation of the effects of changes in tax and social-security schedules, computing short- and long-run effects on revenue and on various macroeconomic variables.

GOTTFRIED, STÖSS, and WIEGARD offer a critical introduction into applied general equilibrium analysis. They describe the basic structure of these models and discuss their strengths and weaknesses. As a special issue, they analyze the differences between exemptions and zero-rating of some goods in a value-added-tax regime, in the framework of an applied general-equilibrium model for a fictive economy.

The construction of a dynamic general-equilibrium model is demonstrated in the first part of KEUSCHNIGG's contribution. He then uses this model to simulate the long-run effects on capital accumulation and production of various proposals for a reform of

the corporate income tax, such as a change in the tax rate or the introduction of a pure profits tax or a cash-flow tax.

4. In the fourth section papers on the simulation of tax and transfer systems in various countries are collected:

Using the *Frankfurt Microsimulation Model* as an example, GALLER discusses the essential advantages and problems of the microsimulation approach. Attention is given to the incorporation of behavioral equations, which makes the model more realistic, but also more costly and more complicated. Interdependencies in the behavior of different units and the micro-macro link still represent major problems.

The paper of SUTHERLAND describes a micro-model for the simulation of the UK tax-benefit system. It is designed to enable an interested user to compute the effects of changes in the tax-benefit system (the UK tax reform of 1988 is taken as an example) on his own PC. By this, it provides a valuable tool so that the public discussion of reform proposals can be conducted on a more rational basis.

DE KAM offers a critical overview of microanalytic models and datasets for the Netherlands. He discusses the merits and problems of different types of models and stresses that microsimulation represents certainly a rather expensive technique. He also investigates the reasons why politicians ask for continuously more comprehensive information concerning the effects of tax and transfer systems.

A model based on a microdata set and designed in order to run PC-simulations of tax and transfer programs in Canada is presented by WOLFSON. He sketches the main features of Canada's current tax and transfer system and applies the model to an illustration of how this complex system of various single measures could be substituted by an integrated one which combines a guaranteed income (i.e., a refundable tax credit) with a flat rate tax.

VAN'T EIND, EINERHAND, and SONNEMANS deal with the development of simulation models for the unemployment insurance in the Netherlands. As a current step beyond microsimulation models they describe the construction of an expert system. This new type of models contains a knowledge base (legal regulations) which can be used for various purposes, e.g. for checks of the constistency of proposed reforms, or for the simulation of the decision-making of the employees of insurance institutions.

A more specific problem is addressed in OELLERICH's paper, namely the distributional impacts of the private child support system. This system is presently established in the USA, in order to transfer income from a non-custodial parent (normally a father who does not live in the same household) to his/her dependent child. Applying a set of hypotheses on the relation between custodial and non-custodial families the limited effectiveness of this system is shown.

5. The fifth part concentrates on behavioral simulation models:

BETSON deals with the question of how reliable conclusions derived from microsimulation models are. He works out the main sources for the defectiveness of the results and gives an overview of various attempts that have been made to verify the sensitivity of these models. Furthermore he presents a method of examining the statistical porperties of simulation results, given the variability of parameters describing economic behavior.

The estimation of behavioral reactions due to a change in tax policy is the concern of SLEMROD's and SHOBE's contribution. They demonstrate the potential advantage of the use of panel data over the more popular use of cross-sectional or aggregate time-series data and discuss some recent research on the tax elasticity of charitable contributions, based on a new panel data set for the USA.

NAKAMURA and NAKAMURA focus on the modeling of behavioral response as well. In their paper they consider the range of tax and transfer programs that might be incorporated into a microsimulation model, and investigate the potential direct and indirect impacts of such programs. They give special attention to selecting the most appropriate behavioral relation out of a set of competing alternatives and indicate how output space analysis can profitably be used for this task.

HAGENAAR's paper is devoted to a specific field of behavioral reactions which is presently gaining in importance, namely to female labor supply. She offers an overview of various theoretical models, which expand the traditional neoclassical model of labor-leisure choice by the incorporation of additional influencing factors, such as home-production, child benefits or household income. Furthermore, some empirical results from the literature on this topic are presented.

Working time is also the essential behavioral variable, on which the contribution of MERZ concentrates. He describes a microeconomic time allocation model, where special attention is given to the substitution possibility between the formal and the informal economy. Having estimated the parameters of this model on the basis of sample data on primary and secondary occupation, he computes the expected effects of the German tax reform of 1990 on time allocation.

6. An Applied Model for the FRG: First Results

In the last section applied micro-oriented models for the Federal Republic of Germany are presented together with some first simulation results. This study is part of the project "Simulation of Alternative Tax and Transfer Systems for the Federal Republic of Germany", which is sponsored by the VOLKSWAGEN-STIFTUNG. Besides different expenditure tax proposals, alternative family equalization systems and integrated tax and transfer schemes are analyzed, stressing upon the revenue and distributive consequences of such proposals in the FRG.

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Microsimulation of Alternative Tax and Transfer Systems for the Federal Republic of Germany*

MICHAEL HÜTHER, MATTHIAS MÜLLER,
HANS-GEORG PETERSEN, AND BERND SCHÄFER

I. Description of the Project

1.1. The Objective of the Overall Project

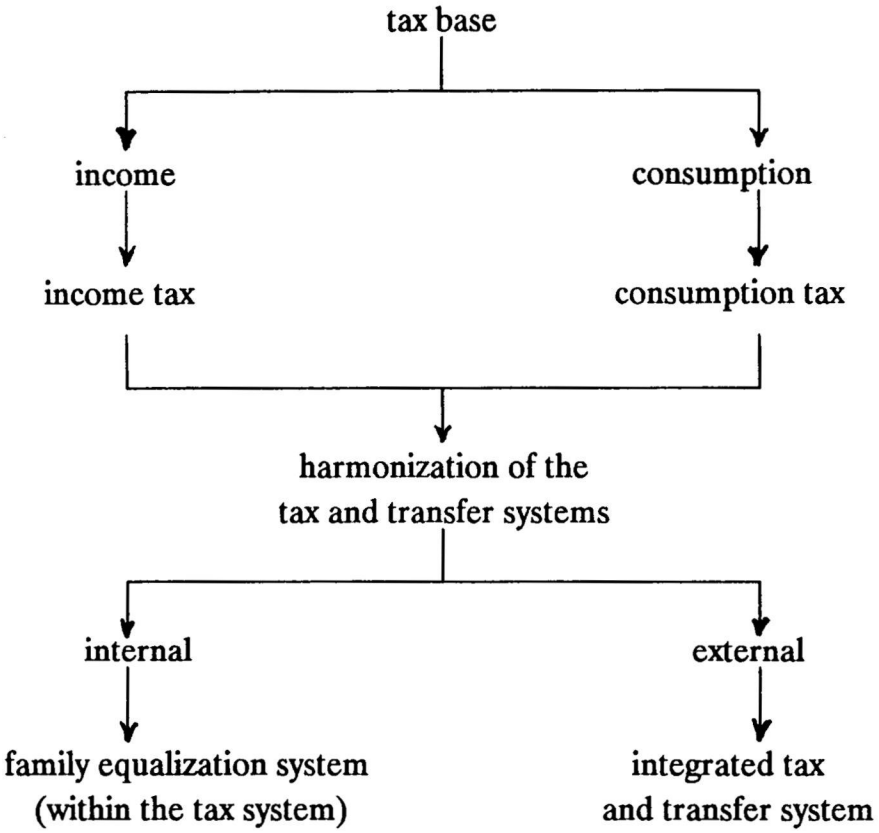
In the framework of a project which is named "simulation of alternative tax and transfer systems for the Federal Republic of Germany" we try to evaluate a broad spectrum of reform proposals using microeconomic simulation models for grouped data. Our aim is to come to a more rational foundation of tax and transfer policy; we therefore present analysis of revenue and distributive effects which go far beyond conventional theoretical reasoning, plausibility considerations, and partial modeling (KARRENBERG, KITTERER 1979, and NIERHAUS 1988). Only in this framework it is possible to reconsider the normative claim of different reform ideas.

Two problems are in the focus of the current discussions about tax and social policy: on the one hand, in the close political context of taxation, the *problem of the tax base* - income versus consumption - ; on the other hand *the problem of a harmonization of tax and transfer policy.*

The discussions about alternative tax bases simultaneously influence the design of the second complex of problems because the decision for a certain tax base also has different consequences for the harmonization of the tax and transfer system as well as for the single elements within that system. The problem of harmonization arises from the fact that the existing, almost totally uncoordinated rules and regulations in tax and social policy are connected with effects which are interdependent. This holds true for the subsystems of social security which were formerly organized in accordance with the *principle of causality* (PETERSEN 1989) as well as for the transfer and the tax system in

* This study is part of the project "Simulation of Alternative Tax and Transfer Systems for the Federal Republic of Germany", which is sponsored by STIFTUNG VOLKSWAGENWERK; the financial support is gratefully acknowledged.

Current Questions in German Tax and Transfer Policy



total. The approaches to the reformation of the existing systems range from very limited proposals for partial reforms (e.g., within the family equalization system) up to comprehensive concepts for integration (integrated tax and transfer system).

The empirical analysis of the single reform proposals concentrate on *revenue effects* as well as *distributive effects*. The underlying *notion of incidence* is a decisive factor for the concrete concepts of investigation: our analyses are limited to the direct effects of institutional changes ("first order effects"), behavioral adaptations are not taken into consideration.

This has to be kept in mind and the results should therefore be interpreted carefully; but the exclusion of indirect effects[1] is justified, considering the current development level of behavioral simulation models and the "dictatorial rule" of

1 The indirect effects are divided into (a) second order effects (effects on labor supply), (b) higher order personal effects (family formation, divorce, fertility, formation of human capital), and (c) macro feedback effects; for more details see NAKAMURA, NAKAMURA (1990).

availability of data.[2] But pure analysis of formal incidence does make sense because it is the precondition for the analysis of effective incidence, the former producing the "input" for the latter. The empirical investigations within the first phase of our current project are closely bound to revenue and distributive effects; effective incidence will be partially analysed within the second phase.

1.2. The Single Projects

The basic ideas for our simulations stem from quite a range of conceptual reasonings. It is not the aim of this article to present all reform models theoretically possible but to give a selection of some typical solutions. The income concept as tax base itself is not discussed; it serves as yardstick for the evaluation of different concepts concerning reforms and is only used for the comparison with the results of our simulation studies.

1.2.1. Expenditure Tax

There are many different proposals to substitute the existing personal income tax by a personal expenditure tax system (MITSCHKE 1985). According to our notion of incidence, we assume a substitution *under the condition of equal yield* using a comparable tax base.[3] Within our models the tax base is overwhelmingly determined by our data base; in the following, we will use a comprehensive tax base which deviates more or less from the theoretical ideal because of the limitations due to our data base. Another serious problem in connection with the expenditure tax base is the treatment of durable consumer goods, the costs of which we have spread over their useful lives (especially if progressive tax schedules are used).

Anyway we do not want to lay the stress upon the tax base but the tax schedules: (1) a *flat-rate-schedule*, (2) a *schedule which corresponds to the German income tax schedule of 1990*, and (3) an *expenditure tax schedule which, at a given expenditure function, leads to an equal tax yield within the single income brackets as the income tax schedule* (HINTERBERGER, MÜLLER, PETERSEN 1989). According to our concept of incidence, the condition of equal tax revenue is fulfilled in the first two cases, the condition of distributive neutrality is additionally fulfilled in the third case (with regard

2 An actual german data base for behavioral simulation is not available; the analysis of behavioral responses will be possible within two or three years because by then data out of the German socio-economic Panel for several inquiry waves will be disposable. For the concept of the panel see HANEFELD (1984 and 1987).

3 One compares either the income and expenditure tax under the condition of a comprehensive tax base or the actual (eroded) income tax base with a corresponding (hypothetical) expenditure tax base.

to the distribution of tax yield as well as of residual income).[4] It is quite obvious that such a postulation only makes sense for the total distribution of tax payers because, in practice, tax policy also uses this distribution as a basis for decision. This constraint is not valid if distributions for different socio-economic characteristics are used. But the analysis of these redistributive effects of such a tax reform program is beyond the scope of our paper.

1.2.2. Family Equalization System (FES)

In our definition the family equalization systems (FES) comprehends, besides *the child benefit system*, all *tax concessions which are connected with the family* (marriage, number of children) *within the existing income tax system*. The FES has to pursue social aims (recognition of the social value of families) to contribute to the aspect of tax justice (influence of expenses for children on the ability to pay).[5] The current FES in the FRG is a combination of the splitting for spouses[6], household exemptions for singles with children, child exemptions within the income tax, and child benefit payments. The main part of the relief for families is connected with the splitting, where the individual splitting advantage depends on the corresponding marginal tax rate.[7] Independent of child rearing, such a splitting favours exclusively the fact "marriage", especially the nonemployed spouses, thus leading to a horizontal and vertical redistribution with doubtful results.

The increase of the child exemptions within the last income tax reforms has strengthened *the dual system of the FES*. The tax relief as a result of the child exemptions is also due to the individual marginal tax rate and amounts to percentages between 0 and 53 of the exemption's amount, if we take the income tax schedule of 1990. The child benefit is differentiated according to the ordinal number of the children and, from the second child upwards, it is additionally differentiated in accordance with the level of the family income.[8] Families which are not taxed or do not gain the full

4 Distributive neutrality means a constant tax yield of income and expenditure tax within the single income brackets.

5 Also demographic aims are often connected with FES, although the influence on the birth rate is controversial (see SCHWARZ 1987).

6 The total income of spouses is halved and the resulting tax yield then doubled.

7 In the German social account of 1986 the costs of the splitting are estimated with 27.8 Bill. DM, whereas the relief of the child exemptions and the child benefits is numbered with 23.3 Bill. DM.

8 The maximum amount of child benefit is 50 DM (monthly) for the first, 100 DM for the second, 220 DM for the third, and 240 DM for the fourth child and all other children; these amounts are reduced to 70 DM for the second and 140 DM for the third child and all other children if certain income limits are exceeded.

advantage of the child exemption within the first bracket of the income tax schedule, receive an extra allowance which decreases as income increases.

If one considers the total relief of both groups of measures, it becomes obvious that they are *badly harmonized* (OBERHAUSER 1989). The development of the individual relief, given an increasing family income, is discontinual; after surpassing the first (indirect progressive) bracket of the German income tax tariff the total relief contineously rises to the corresponding income limits for the maximum amount of child benefits. Then, total relief decreases because of the compensative effect of the child benefit reduction, and afterwards it increases again due to the tax relief connected with the child exemptions caused by growing marginal tax rates. Such a development of total relief cannot be justified, neither by social nor by efficiency aims, such failures of dual systems cannot be avoided only minimized (KAMMANN 1988).

Scheme 1

Income-Related Child Benefit System

I. Amount of Benefit			
Total Benefit (TB)[1]	Maximum Amount (HA)	Minimum Amount (LA)	Income Limit[2]
one child	3432	2212	39948
two children	6864	4665	72000
three children	10296	7957	76584
four children	13728	11249	81168
five and more (per child)	+ 3432	+ 3292	+ 4584
II. Child Benefit Function			
Up to the income limit: $TB = HA - 0.031 \cdot X$			
Above the income limit: $TB = LA$ (X = taxable base)			

1) Cummulated per year.
2) Defined in relation to the taxable base.

There exist quite a few reform proposals for the solution of these problems; following we want to present *a pure child benefit solution* which will be compared with our current

system. Within this alternative, the above mentioned child exemptions of the income tax are replaced by child benefits and the current splitting is abolished in favour of a separate assessment for spouses (which is actually possible today). Thus *the benefits are solely bound to child rearing*. It is quite obvious that for the concrete structure of such a system political decisions will be necessary; as maximum amount for the child benefit we use the current average standard need of the social aid system for children, thus assuring a socio-economic level of minimum income; the minimal amounts base on todays child exemptions and reduced amounts of child benefits mentioned above (see *Scheme 1*). The reduction is a linear function of the increasing tax base. For a correct comparison according to our incentive term this reform will be revenue neutral (the sum of child benefit payments equals the sum of relief of the current dual system). Since the maximum and minimum level of child benefits are fixed, we will use the slope of the child benefit function as variable.

1.2.3. Integration of Tax and Transfer Systems

The integration of tax and transfer systems has two dimensions: *the external integration between both systems*; this form includes the construction of the tax schedule and the choice and structure of the tax base. Secondly, *the dimension of internal integration within the transfer system*, since its instrumental and conceptual diversity (in contrast to direct taxation) requires a special decision about the kinds of transfers which are to be included.

A decisive factor for the possible integration of transfers is the realization of the *compatibility condition* which because of its instrumental clearness is given by the tax: Therefore, the component of the transfer system is limited to such instruments which lead to unrequited transfers to individuals and, therefore, to interpersonal redistribution. On the one hand, this includes instruments which are organized in correspondence with the *social aid principle* (for poor people) or the *maintenance principle* (for the whole society); on the other hand, those instruments are excluded which are constructed in accordance with the insurance principle (like private insurance systems). The latter instruments only lead to an intertemporal income redistribution due to the life cycle but not to interpersonal income redistribution. Consequently, two extreme forms for the construction of the transfer scheme are possible, on which a normative decision has to be made in the light of the relevant social aims: a design which corresponds to the social aid principle or to the maintenance principle, respectively.

An integrated tax and transfer system consists basically of *three parameters which determine the design*. Besides the schedule and the basis of assessment (tax and transfer base; Y) which solve the external integration, the basic income (Y_B) is of special

interest.[9] The *basic income* is defined as the maximum amount of transfer payment which is paid to the individual or household with a zero market income (quantitative aspect of Y_B).[10] The amount of this transfer is mainly influenced by the number of transfers which should be included into the integrated system and the connected causes which are the precondition for public assistance as well as the intended differentiations due to individual circumstances of life. Thus, the parameter Y_B is expression of the question of internal integration (qualitative aspect of Y_B). Therefore, the determination of the basic income depends, above all, on the normative foundation of social security.

The structural development of the *tax-transfer-schedule* is connected with some special problems due to the close relation to Y_B (which could be defined as the starting point for the tax schedule). Since the fixation of the Y_B depends on different individual situations, an identical Y_B exists only for individuals under the same living conditions. A general schedule does exist for all transfer receivers/tax payers only as formula without concrete parameters. These parameters are primarily defined by the individual Y_B. Depending on the schedule structure, this relation limits the degrees of freedom for the tariffs within integrated systems, if such a schedule fulfills the principles of simplicity and feasibility (HÜTHER 1989). In that case, only one- or more-band *linear* tariffs are practicable.

The *assessment basis* (tax-transfer-object Y) of an integrated system has to be identical for transfers and taxes, especially with regard to the objective (problem of the income definition), personal (individual versus household principle), and temporal delimination (periodical versus life time income).

Out of different combinations of specific parameter values a total concept for the integration of tax and transfer systems will result. In the Federal Republic of Germany a lot of proposals have been made. Out of this set *two extreme examples are chosen which demonstrate the scope for possible solutions*. At first the concept of GRÖZINGER (1986) will be presented which is based on the maintenance principle, and comprehends a minimum income concept for all citizen within the society. Secondly a concept will be analysed which combines the current system of social aid in the FRG with the system of personal income taxation. First of all, the definition of the basic income will be discussed, then the construction of the tariff. As to the assessment basis, only a few but not satisfying hints could be found in literature. Thus we will use the tax base of the German income tax, and as an alternative the gross income defined in the sense of a comprehensive tax base.

9 The often mentioned parameter "critical income" (Y_K) which determines the transition from the transfer to the tax area (where neither an entitlement to transfer nor a tax liability exist) does not have an own normative quality. This parameter is determined by the tariff structure and by fixing Y_B.

10 The question for the exact amount leads us to the discussions under the headline "poverty boundary" and "physical versus socio-economical level of subsistence".

GRÖZINGER's Proposal of a "Warranted Minimum Income" and an "Integrated Tax-Transfer-Rate" (CONCEPT I)

(1) For this integrated reform four aims are set: A better social support in case of loss of market income, more freedom for the individual decisions, an extended distributional justice, and more transparency within the social law (GRÖZINGER 1986, pp. 169 - 170).

(2) The *warranted minimum income* (WMI) should be paid monthly, in a gross amount, to all citizen living permanently within the FRG; net transfers or taxes will result at the end of each month through the connected taxation. The WMI is paid independently from marital status and household situation; it will replace all transfer payments from the social insurance system, the educational grants, the rent allowances, the child benefits, the premiums for wealth formation, and the payments from the social aid system. Instead of child benefits and child exemptions within the income tax system a non-adult-income (NAI) is paid monthly to finance the basic needs for children. To replace the current social health insurance GRÖZINGER (1986) proposes a compulsory insurance with a uniform insurance premium which is guaranteed by the State. The existing social pension system as well as the pension system for governmental officials is also substituted by the WMI, so that all persons beyond the retirement age will receive a uniform mimimum income; people who want to obtain higher pension payments have to insure themselves additonally on a voluntary basis within the private life insurance system.

(3) GRÖZINGER (1986) also proposes an integrated tax-transfer-rate which is applied to all gross wages including the employer's contributions to the former social insurance system.[11] This yields a one-band linear tax and transfer schedule (flat rate) (*see Scheme 2*).

Social Aid as Minimum Income Standard (CONCEPT II)

(1) The aim of social aid is stated in § 1.2 of the German "Bundessozialhilfegesetz" (BSHG): The purpose of social aid is to guarantee the transfer receivers a life in which the dignity of man is protected.

(2) The claim for transfers arises because of distress defined as poverty (insufficient market income; for details see SCHULTE, TRENK-HINTERBERGER 1986). The current

11 GRÖZINGER (1986, p. 17) explains that this schedule has no exemption and no progression. But this is misleading because an integrated system with a linear tax schedule does have a basic exemption which is connected with an indirect progression.

Scheme 2

CONCEPT I - GRÖZINGER

I. Warranted Minimum Income	
1. for all persons between 18 and 60 years, living permanently in the FRG (WMI)	9600 DM/year
2. for children up to 18 years (NAI)	4800 DM/year (or 50 % of WMI)
3. for every person above 60 years	12000 DM/year (or 125 % of WMI)
contribution to health insurance	2400 DM/year
II. Integrated Tax-Transfer-Rate:	**54 %**
Schedule: $T = -12000 + 0{,}54 \cdot X$ with $Y_B = 12000$ (WMI including health insurance) X = taxable income	

Scheme 3

CONCEPT II - Social Aid as Minimum Income Standard

1. *standard need*	year
single adult	4200 DM
household members up to 17 years	3000 DM
household members above 17 years	3600 DM
2. *expenditures*	
rent costs	the effective amount
contributions to health and pension insurance	the effective amount
3. *additional need*	
persons above 65 years	120 % of the standard need
disabled under 65 years	120 % of the standard need

transfer payments are fixed in the BSHG and depend on a basket of available commodities. This market basket is to be adjusted to the development of real wages in order to avoid a permanent sliding of the poverty line as consequence of economic growth and/or inflation (*see Scheme 3*).

(3) In analogy to the minimum income standard as defined in the BSHG, a tariff could be constructed which corresponds to the current status quo within the income tax system. Since a non-linear schedule would create many problems, we take the inital and final marginal rates of the German income tax schedule for 1990 (minimum marginal rate 19 % and maximum marginal rate 53 % beyond a taxable income of 120.000 DM) as a yardstick for the tax range, and, in correspondence with the BSHG, the existing 100 % marginal rate as a yardstick for the transfer range. We can approximate such a schedule with a three-step marginal rate tariff (three-step flat rate tax).[12] The minimum income for a single adult consists of the standard need (4.200 DM), the average rent costs (4.800 DM), the contributions to the health and pension insurance (about 1.000 DM), thus amounting to 10.000 DM per year. Using this information, it is possible to construct a three-step schedule in which the initial value for the third tariff band is fixed with 120.000 DM.

The fact that Y_B is variable presents a serious problem; therefore, it is necessary to define the third band of the schedule in a general way (the exemption Y^* and the initial income Y_E of the third band), because, otherwise, a leap within the tax function would be created at the end of the second band. To ascertain the two above mentioned values another condition besides the one for a continuous tariff should be fulfilled: The third band should start with such a value of the assessment basis which would yield the same amount of revenue as at the end of the second band;[13] the yardstick is the tax yield for a single adult at an income of 120.000 DM (*see Scheme 4*).

12 POLLAK (1987, pp. 79 - 80) points out that such a schedule has more degrees of freedom for different political decisions than a one-band flat rate tax, but does not create a continuous development of average rate progression. If we take the visibility argument (for tax payers or transfer receivers) into consideration, this should be of less relevance.

13 This condition holds also true for Y_K; here it is given with $T(Y_K) = 0$.

Scheme 4

Tax-Transfer-Schedule with Regard to Status quo

I. concrete schedule for single adults

minimum income level (Y_B): 10000 DM
critical income Y_K in the amount of Y_B: 10000 DM

1. schedule bracket (X = taxable income)
$0 \le X \le 10000$: $T_1 = -10000 + X$

2. schedule bracket
$10000 \le X \le 120000$: $T_2 = 0{,}3 \cdot (X - 10000)$

3. schedule bracket
$X \ge 120000$: $T_3 = 0{,}5 \cdot (X - 54000)$
$T(120000) = 33000$

II. general form of the schedule

with Y* = exemption of the third bracket
Y_E = initial income of the third bracket

1. schedule bracket
$0 \le X \le Y_K\ (= Y_B)$: $T_1 = -Y_B + X$

2. schedule bracket
$Y_K \le X \le Y_E$: $T_2 = 0{,}3 \cdot (X - Y_K)$

3. schedule bracket
$X \ge Y_E$: $T_3 = 0{,}5 \cdot (X - Y^*)$

first condition: $T_2(Y_E) = 33000$
second condition: $T_2(Y_E) = T_3(Y_E)$

From the first condition the initial income for the 3. bracket is derived

$$0{,}3 \cdot (Y_E - Y_K) = 33000$$
$$\mathbf{Y_E = 110000 + Y_K} \quad \text{with} \quad Y_K = Y_B$$

From the first and second condition the exemption for the 3. bracket is derived:

$$0{,}5 \cdot (Y_E - Y^*) = 33000$$
$$0{,}5 \cdot (110000 + Y_K - Y^*) = 33000$$
$$\mathbf{Y^* = 44000 + Y_K} \quad \text{with} \quad Y_K = Y_B$$

II. The Data Base

Apart from a correct and total description of the institutional conditions and regulations the choice of an adequate data base is of high importance for the construction of micro-orientated simulation models. This choice is based on general consideration and on the specific aims for the single analysis.

2.1. The Requirements

The use of statistical data brings up *the problem of adequance* (BARTH 1988, p. 63); this includes the *operationalization* of the conceptual terms (e.g., assessment basis) by transforming them into the data base.[14] This problem becomes especially relevant if we choose a sample as basis for our simulations (*sampling error problem*), and if an existing data base has to be completed for the purpose of the specific analysis (*imputation error problem*).[15] From this we derive two conditions: *a maximum representative data base* has to be used, and the need for completion has to be minimized.

These conditions in particular hold good for both aims of our analysis: The analysis of the revenue effect as well as of the distributive effect requires a data base, which in all details (gross income, transfer payments, tax yield, number of households within the single income brackets etc.), represents the values of the german national accounts system (VGR).[16] The analysis of political reform concepts makes only sense if a data base is used which is *up to date*.

2.2. Alternative Data Bases and their Suitability

As data base we use *the income and consumption sample* (Einkommens- und Verbrauchsstichprobe = EVS) of 1983 (STATISTISCHES BUNDESAMT 1987), *the wage and income tax statistics of 1983* (STATISTISCHES BUNDESAMT 1986 and 1987), and *the income and transfer distribution for private households in the FRG* estimated by the DIW (DEUTSCHES INSTITUT FÜR WIRTSCHAFTSFORSCHUNG 1987).[17] For the second phase of our project we plan to use the results of *the Socio-economic Panel* (SONDERFOR-

14 See BARTH (1988, pp. 66 - 68); HUJER, CREMER (1978, pp. 17 - 18) use the term "operationalization" for the solution of the theoretical problem of adequance, and the term "measurement" for the methodical problem of adequance.

15 See BETSON (1990) and his terms for the identification of simulation errors which are connected with the data base; besides the two already mentioned above, he points to the problems of aging error, individual response error and environmental error.

16 For the evaluation of the grades of representation see HUJER, CREMER (1978, pp. 19 - 20).

17 In the following this statistic will be called "DIW-statistic".

SCHUNGSBEREICH 3 and DIW). Each of the three single projects requires an own data base which are derived from the statistics mentioned above.

(1) The *simulation of an expenditure tax system* as a substitute for the existing income tax requires a data base which quantifies the income tax burden as well as the expenditure structures of the private households. On the one hand the EVS represents the data for the expenditure function and on the other hand it is our basis for the analysis of the tariff structure for different distributions in the German household sector (total distribution or different distributions of socio-economic characteristics). The income brackets for the households are established according to the monthly net income of all household members which also includes the transfers paid to the household. The different income-components are presented in a detailed form so that it is possible to identify those parts of income which do belong to the German income tax base. The same holds true for incomes and expenditures which are needed under an expenditure tax regime.

When using the EVS one should be aware that the aggregated results deviate from the figures of the VGR; for instance, only 75 % of the income variables are represented in the EVS. This is also true for the revenue of the income tax with a quota of 82 % compared to the VGR (*see Table 1*). The causes can be found in the sampling techniques (e.g., households with a monthly net income of more than 25.000 DM are excluded); some components of income are not covered (e.g., employer's contributions to social security). Finally, we are confronted with the problem that the EVS is indeed very detailed, but that declarations are often bad or even completely lacking. This points to the basic problems of all samples, the lack in willingness or ability to give correct answers.[18] For tax simulations based on EVS data one has to use as basis for an equal yield comparison not the actual income tax revenue, but the income tax revenue as reported in the EVS itself. Thus we are arguing within a closed system, so that a comparison of different tax schedules is possible without getting problems with the interpretation.

The tax base for the expenditure tax is, as mentioned above, derived from the EVS data. Following the proposals of Irving FISHER, the statistical expenditures for each income bracket are estimated indirectly by taking the difference between the total income of the single household and the taxes and contributions paid, as well as the part of income which was saved (ZUMSTEIN 1977). These expenditures also comprehend the depreciations for consumer durables (see above). After estimating the expenditures on an annual basis we run a regression analysis (simple least square method) in order to gain the expenditure function with the net income as independent variable. This is done for each type of household within different socio-economic distributions, thus obtaining

18 For the problem of "subjective data" see GÜNTHER, STAPF (1987).

Table 1

Representative Quality of EVS and DIW-Statistic Compared to the VGR

variable	VGR Mio. DM	DIW-Statistic 1983 Mio. DM	% VGR	EVS 1983 Mio. DM	% VGR
gross wage and wealth income (including employers social contributions)	1 286 240	1 346 800	104%	903 744	70%
received transfers	355 000	346 103	97%	271 193	76%
direct taxes	175 020	188 840	107%	143 706	82%
social contributions (employers and employees)	268 740	261 113	97%	(174 609)	(65%)
payed transfer	115 900	123 610	106%	87 304	75
residual income	1 081 580	1 119 340	103%	769 318	71%
houshold (in 1000)	25 336	25 175	99%	23 469	93%
with 1 person	7 926	7 955	100%	7 402	93%
with 2 persons	7 283	7 554	103%	7 147	98%
with 3 persons	4 474	4 390	98%	4 125	92%
with 4 persons	3 636	3 436	94%	3 222	89%
with 5 a.m. persons	2 017	1 840	91%	1 573	78%

Source: DIW-Statistik 1983; STATISTISCHES BUNDESAMT: Fachserie 15, EVS 1983, Heft 4; Fachserie 18, Reihe 1: Konten und Standardtabellen 1986, Reihe S7: Lange Reihen 1950 bis 1984; Statistisches Jahrbuch 1986.

a lot of different expenditure functions. In the following only the expenditure function for the total distribution of all German private households is used. We have chosen a linear type where A represents the expenditures (including indirect taxation), Y the gross income, and T the direct taxes:

$$A = 4798 + 0{,}63\,(Y - T)\,.$$

The variance of data is explained on a 99,11 %-level by this function. The expenditure function leads to a deviation of the total sum of expenditures different from the observed ones at a value of 0,32 %.

Since the representation of the EVS data is not sufficient compared to the VGR data, we also use the DIW-statistic. For this purpose it is necessary to transfer the expenditure structures from the EVS to the DIW-statistic. Below, we simulate the expenditure tax schedules and the comparable income tax schedules on the basic of these two income/expenditure distributions.

(2) The *simulation of alternative solutions for the FES* requires a data base which is quite close to the income definition of the tax law. This is especially true for the wage and assessed income tax statistic (STATISTISCHES BUNDESAMT 1986 and 1987) which is published at intervals of three years in the form of a total survey of all wage and income tax payers. The statistics are presented in the form of grouped data; the basic information of the wage tax statistic are gross wage distributions for different socio-economic characteristics, whereas the assessed income tax statistic is grouped according to the "total amount of income" from which some exemptions have already been deducted. The latest statistic is available for 1983.

However, the close relation to the income definition of the income tax law also represents a disadvantage of this data base because only tax payers are covered, but not the total population. Households which do not pay taxes, but receive transfer payments, are not included, so that our simulation results will have a certain bias. Moreover, the income tax statistic comprehends neither the child benefits nor the age and education of the children. For our global question all this might be less important, but for more detailed analysis we require a data base which is more specifically differentiated.[19]

(3) For the *simulation of integrated tax and transfer systems* a data base is needed which quantifies on the one hand an adequate tax and transfer base, and on the other hand the status quo distributions of tax and contribution yield as well as transfer payments. All these requirements are only fulfilled by the DIW-statistic. This statistic is derived from different primary data sources which are put into the context of the VGR system in order to close the existing gap between the two data sources.[20] Due to a lot of necessary transformations, the DIW-statistic does have the characteristics of a empirical model estimation (GÖSEKE 1974, p. 94). The information stem from primary statistics (microcensus, tax statistics, wage statistics, housing samples etc.) and the VGR (income data). The functional income distribution serves as a basis for the estimation and transformation of personal incomes into the income of private households. By combining those data with information about population and demographic characteristics, the income distribution for different types of households is derived.

19 The Socio-economic Panel is such a data base, although the sampling procedure is often criticized. In the second phase of our project we will also use information from that panel.

20 For details see DIW (1982), BEDAU (1985), LINDNER (1986), BEDAU, FREITAG, GÖSEKE (1987), GÖSEKE (1974), KRUPP (1975, pp. 104 - 106).

The condition of sufficient representation is much better fulfilled within the DIW-statistic than within the EVS; in no area a systematical underestimation can be found (*see Table 1*). This statistic has been judged overwhelmingly positive in spite of different conceptual shortcomings. Since it is closely connected with macro data, the existing gap in the official statistics on income distribution is more or less closed. At present no real alternative does exist.

III. Simulation Models and Results

In the literature we face a lot of different contributions in which the simulation method is discussed in the context of system, model, and experiment. The practical use of these studies for concrete simulation projects is rather small because they are mainly determined by the real institutional regulations and the quality of data which are available. General instructions are, above all, relevant for the basic conditions connected with the model construction. Here we use the technique of micro-orientated simulation with grouped data.[21]

3.1. Simulation of a Personal Expenditure Tax System

3.1.1. The Model and its Quality

The model SIMTAX can be briefly described as a *moduled program system*. The input for the model consists of a raw data file for each type of household (146 files with 1600 records) for the EVS as well as the DIW-statistic. The parameter values which are identical for both statistics are written into coefficient-files; in those files the absolute terms as well as the expenditure ratios of the different expenditure functions are saved.

For the simulation of an expenditure tax system both kinds of files are used because the tax base is derived from the insertion of the corresponding variables into the expenditure function. The tax bases which can be used for the simulation of the income tax system (the current eroded tax base or a comprehensive income tax base) have already been written in the raw data files so that a recourse on the coefficient files is not necessary.

If a proportional or indirect progressive tax schedule has been chosen, it is possible to estimate the relevant parameters or to simulate with previously fixed parameters. In

21 For different methods of simulation see KRUPP, WAGNER (1982), PETERSEN (1986), ORCUTT et al. (1986), MERZ (1988).

the case of schedules which are directly progressive (because of increasing marginal rates), the adaptation of marginal rates is possible in order to fulfill the condition of revenue neutrality. In this case some simulation runs are necessary for the approximation of the given tax yield, in which the other parameters of the tax schedule are also adjusted. If another tax base than the taxable income is used, the income brackets are estimated in accordance with the functional relation between the taxable income and the chosen assessment basis.

For the judgement of the models inputs (and, implicitly, also of the quality of outputs) of the model, the estimated values which are relevant for the simulation of the expenditure tax are compared with the observed data. Moreover the figures derived from the EVS and DIW-statistics are confronted with corresponding values of the VGR.

3.1.2. Simulation of Different Expenditure Tax Schedules

In order to simulate a *flat rate expenditure tax schedule*, the basic exemption of the income tax schedule 1990 (5616 DM) was adjusted by using the corresponding expenditure quota. The development of the average and marginal tax rates of the expenditure tax as well as the equal yielding income tax tariff is shown in the upper part of the *Figure 1*. The respective parameter values are reported in *Scheme 5*. The flat rate comes to 30,58 % in the case of an comprehensive expenditure tax base, and to 16,05 % in the case of an equal yielding income tax. For a directly progressive expenditure tax schedule which corresponds to the German income tax tariff of 1990, this leads for the expenditure tax base to marginal rates which are between 23 % in the lower and 57 % in the upper income brackets. The corresponding equal yielding marginal income tax rates are between 8 % and 42 % (see the middle part of *Figure 1* and the *Scheme 5*).

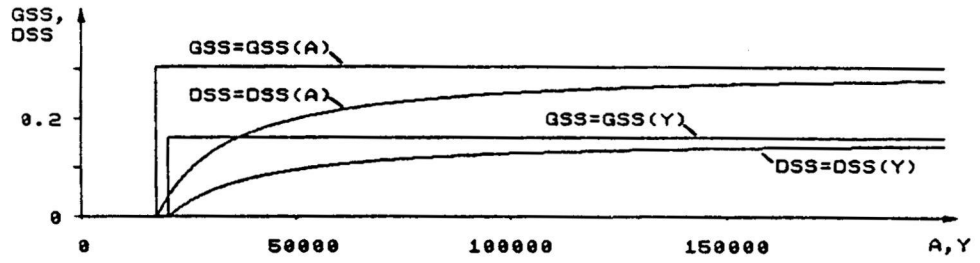
For the simulation of *schedules which are neutral with regard to the individual tax burden* (distributive neutrality), we also use the just mentioned income tax schedule; the derived expenditure tax schedule which is equal yielded and which produces the same distribution of tax burden has an initial marginal rate of 13 % whereas the highest marginal rate amounts to 114 % which is clearly above the 100 % margin. The type of progression deviates from all other types which are of delayed progression. The latter schedule also begins with a delayed progression, but in the second bracket an accelerated progression follows. When the highest marginal rate is reached, we are again confronted with a delayed progression (for details see *Figure 1* and *Scheme 5*).

If we take the total income of a household as an indicator for its ability to pay, one can make no objections against this derived expenditure tax schedule because the parameters of the underlying total income tax schedule deviate only slightly from the current income tax law. However, the *allocative consequences* for the individual behavior to consume (especially in the case of high-cost consumer durables) which

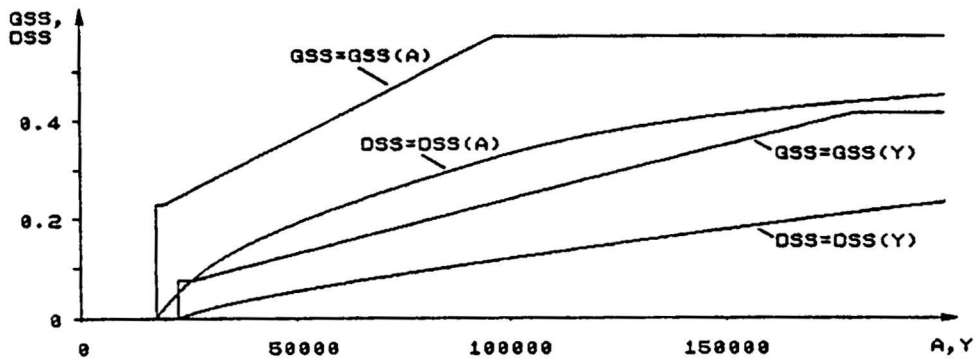
Figure 1

Tax Schedules of Expenditure and Corresponding Income Tax (Marginal and Average Rate Structure)

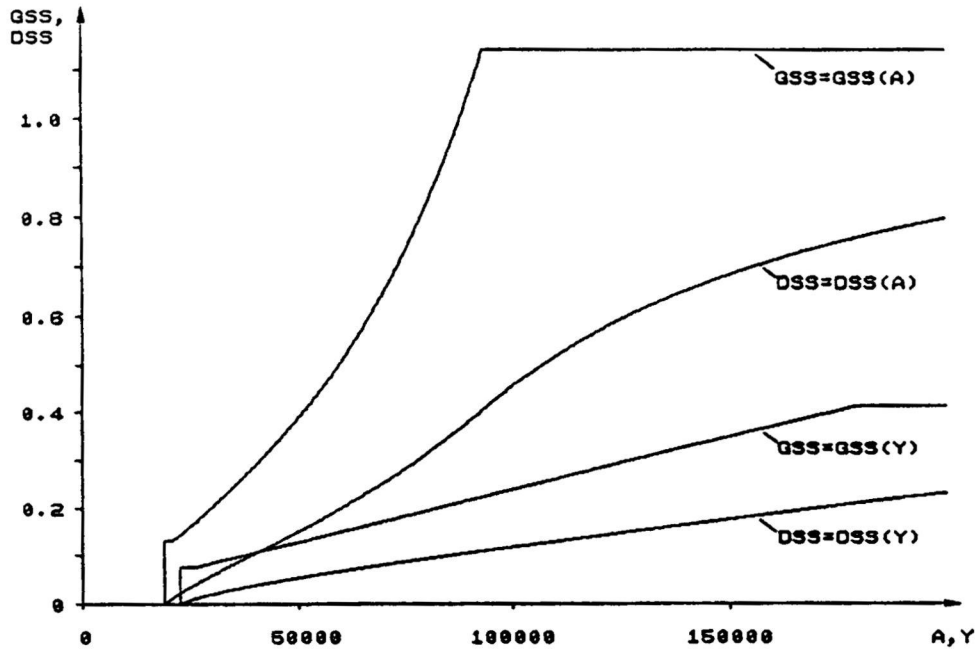
(a) flat-rate schedules



(b) schedules in accordance to the German income tax schedule 1990



(c) schedules under the condition of distributional neutrality



Scheme 5

Tax Schedules for the "Comprehensive-Tax-Base"

flat-rate-schedules	brackets	EVS	DIW
expenditure tax	A < 17564 A ≥ 17564	t(A) = 0 t(A) = -5372 + 0,3058·A	t(A) = 0 t(A) = -4687 + 0,2668·A
income tax	Y < 22619 Y ≥ 22619	t(Y) = 0 t(Y) = -3456 + 0,1528·Y	t(Y) = 0 t(Y) = -3060 + 0,1353·Y

tariff type 1990	brackets	EVS	DIW
expenditure tax, delayed progressive	A < 17564 17564 ≤ A < 19268 19268 ≤ A < 96049 A ≥ 96049	t(A) = 0 t(A) = -4019 + 0,2288·A t(A) = -3197 + 0,1435·A + 2,2141E-6·A^2 t(A) = -23623 + 0,5688·A	t(A) = 0 t(A) = -2600 + 0,1481·A t(A) = -1778 + 0,0627·A + 2,2141E-6·A^2 t(A) = -22204 + 0,4881·A
income tax, delayed progressive	Y < 22619 22619 ≤ Y < 26029 26029 ≤ Y < 179648 Y ≥ 179648	t(Y) = 0 t(Y) = -1719 + 0,0760·Y t(Y) = -969 + 0,0184·Y + 1,1056E-6·Y^2 t(Y) = -36684 + 0,4160·Y	t(Y) = 0 t(Y) = -302 + 0,0134·Y t(Y) = 448 - 0,0443·Y + 1,1066E-6·Y^2 t(Y) = -35267 + 0,3534·Y
expenditure tax, distributionally neutral to delayed progressive income tax	A < 18939 18939 ≤ A < 20909 20909 ≤ A < 93325 A ≥ 93325	t(A) = 0 t(A) = -2492 + 0,1316·A t(A) = 451185 - 1,5995·A - (1,0018 - 7,0802E-6·A)^{0,5}/2,2133E-6 t(A) = -68282 + 1,1394·A	t(A) = 0 t(A) = -410 + 0,0216·A t(A) = 479492 - 1,5995·A - (1,1225 - 7,0802E-6·A)^{0,5}/2,2133E-6 t(A) = -58731 + 0,8740·A

Source: Own estimations.

could be connected with marginal rates on expenditure payments of 100 and more per cent, depend on the awareness of such tax burdens: it might have quite another quality to know that an additional DM earned is taxed "only" with a marginal rate of 42 %, while an additional DM consumed is taxed with a marginal rate of 114 %, whereas the individual tax burden is the same in both cases.

It is quite obvious that the distributive effects of the expenditure tax schedule derived for the total distribution of households are rather different from those effects which will occur within the distributions for different socio-economic groups. An expenditure tax tariff which is obtained under the condition of distributive neutrality for the total household distribution might have serious redistributional effects for certain groups of tax payers. Especially families with children could be burdened; therefore, in the second phase of our project, we will analyse these effects and develop a family equalization system which could reduce the negative redistributional consequences of expenditure tax schemes for larger families. In that phase, the allocative consequences for the individual incentives will also be taken into consideration.

3.2. Simulation of Family Equalization Concepts

3.2.1. The structure of the Model and its Quality

For the simulation of FES concepts, we use the above described tax statistics; the income tax statistic has been adjusted with information of the microcensus 1982 in order to obtain homogeneous distributions for different numbers of children within the single socio-economic groups. In order to estimate the relief effects of the splitting procedure for spouses, some additional information of the tax statistics are necessary for the calculation of the average income parts earned by the single spouses within the different income brackets. As an additional element, a hypothesis of the distribution of income in the income brackets has to be integrated into the model; as the tax yield is a non-linear function of the tax base, the use of class averages would be connected with a strong bias. This is avoided by using a *mean-protecting interpolation method* (see also below).

From the income amounts of this data base quite a few different exemptions have to be deducted in order to obtain the taxable income. All these exemptions are expressed within an *exemption function* which is directly derived from the empirical observations by simple regression analysis. This is done for all single distributions used in the model. The regression provides us with the necessary coefficients of the exemption function; linear functions with absolute and correcting terms as well as cubic functions are used.

The simulation model has a *moduled structure*; the input consists of 100 raw data files with the corresponding parameter values of the exemption functions and about

Table 2

Observed and Simulated Taxes and Tax Bases of the Wage and Income Tax Payers (in Bill. DM)

Classes of Income	Statistic		Simulation		Degree of Representation	
	Tax Base	Tax	Tax Base	Tax	Tax Base %	Tax %
1. Wage Income						
I	142495	30561	144677	30583	102	100
II						
1 child	9016	1910	8917	1854	99	97
2 children	3341	706	3240	663	97	94
3 children	1023	201	1010	193	99	96
4 and more	639	109	640	105	100	96
III						
0 children	57245	10288	56680	9961	99	97
1 child	58349	11056	58303	10941	100	99
2 children	65928	13194	66316	13196	101	100
3 children	20060	4043	19939	3983	99	99
4 and more	6267	1191	6180	1159	99	97
III/V						
0 children	31092	6421	31012	6349	100	99
1 child	39420	7984	39413	7942	100	99
2 children	30969	6479	30671	6640	100	99
3 children	6860	1461	6814	1439	99	98
4 and more	1476	308	1471	307	100	100
IV/IV						
0 children	58875	13378	59521	13553	101	101
1 child	26104	5801	26411	5876	101	101
2 children	13656	3144	13754	3163	101	101
3 children	2889	658	2927	667	101	101
4 and more	700	155	699	154	100	99
2. Income Derived from Farm						
Singles	692	126	684	177	99	140
Spouses	4243	658	4233	856	100	130
3. Business Income						
Singles	14650	5647	14659	6006	100	106
Spouses	63969	22872	63435	23897	99	105
4. Income from Profession or Vocation						
Singles	3405	1252	3405	1311	100	105
Spouses	23980	9080	24137	9467	101	104
5. Income from Investment						
Singles	3747	1293	3753	1348	100	104
Spouses	6137	2519	6131	2620	100	104
6. Income from Rents and Profits of Land						
Singles	3108	850	3102	860	100	101
Spouses	4201	1102	4168	1123	99	102
7. Other Incomes						
Singles	1469	178	1444	164	98	92
Spouses	1337	108	1279	102	96	95

Source: STATISTISCHES BUNDESAMT: Fachserie 14 - Finanzen und Steuern - Reihe 7.3, Lohnsteuer 1983, Stuttgart, Mainz 1966; Fachserie 14 - Finanzen und Steuern - Reihe 7.1, Einkommensteuer 1983, Stuttgart, Mainz 1987; own estimations.

2000 data sets. In connection with our hypothesis of distribution around 40000 average cases with the corresponding income values and number of households are processed. There are different output options; if the form of data file is chosen, there are some additional options for further interpretations of the output.

The *simulation for the basic period* yields the reference values for the judgement of the reform proposal. In the case of the wage tax payers we estimated a tax yield of 118.5 Bill. DM which deviates from the observed value only by 0.5 %. The tax yield for all other income tax payers is less than 5 % higher than in the income tax statistic. *Table 2* demonstrates that for all relevant distributions the taxable base is simulated quite well for all different groups.[22] A similar quality is reached for the tax yield of the wage tax payers, whereas for the remaining groups the tax yield is slightly overestimated. In total, our simulated reference basis is quite close to reality so that the differences in the revenue amounts between our reform proposal and the status are highly significant.

3.2.2. Simulation of Different FES

The starting point of our considerations is the hypothetical amount of relief which results when we take the tax and social law of 1990 as a basis. This amount is estimated as the difference between the tax revenue which would result without the concessions within the FES and the simulated tax revenue which would result when all concessions are applied; to this amount the sum of child benefit payments must be added. The so defined amount of relief mounts up to 43.1 Bill. DM and is identical with the sum we use in the reform proposal if the above mentioned incidence term is applied.

By means of adjusting the slope of our child benefit function the concrete design of our equal yielding reform proposal is estimated iteratively. With a negative slope of about 3 % we got a 99,8 % adjustment to the amount of relief mentioned above; the resulting income limits are shown in *Scheme 1* (see above).

The effects of the relief within the different income groups for the current system and for the reform proposal are demonstrated for the example of taxpaying spouses. *Table 3* shows the average relief for spouses with different numbers of children. In the lower income brackets the child benefit payments dominate, whereas with increasing income, the relief as consequence of the splitting procedure rises. The total amount of support for a childless spouse in this group, for instance, is 21746 DM at an annual income of 250000 DM; this is nearly twice the amount for a double earner spouse

22 The wage tax payers are grouped into five classes; wage class I contains singles, wage class II singles with children, and the wage classes III to V contain spouses with and without children (the choice of class III to V depends on the distribution of total family income on the single income earners); the other groups contain the tax payers who are subejct to the assessed income tax.

Table 3

Relief Effects of the Existing FES[1]

gross wage up to	no children			1 child			2 children			3 children			4 children		
	III	III/IV	IV/IV	III	III/V	IV/IV	III	III/V	IV/IV	III	III/V	IV/IV	III	III/V	IV/IV
2400	0	0	0	1176	1176	1176	2952	2952	2952	6168	6168	6168	9624	9624	9624
4800	0	0	0	1176	1176	1176	2952	2952	2952	6168	6168	6168	9624	9624	9624
7200	0	0	0	1176	1154	1150	2952	2952	2952	6168	6168	6168	9624	9624	9624
9600	0	0	0	1176	979	976	2954	2910	2949	6169	6168	6168	9657	9624	9624
12000	41	0	0	1176	872	943	3088	2721	2839	6274	6168	6168	9783	9624	9624
16000	297	56	1	1227	926	922	3354	2531	2616	6617	6158	6163	10099	9625	9625
20000	707	6	11	1695	884	808	3322	2689	2650	7080	5796	6096	10654	9737	9720
25000	1025	1	14	2210	994	960	3629	2543	2445	6813	5920	5895	11085	9952	9931
30000	1221	13	2	2415	1173	1164	4141	2824	2786	6962	5781	5662	10567	9664	9660
36000	1386	73	0	2629	1271	1200	4416	3048	2967	7563	6199	6124	10711	9306	9253
40000	1572	154	4	2825	1374	1228	4651	3189	3036	7857	6408	6260	11221	9807	9666
45000	1767	205	15	3042	1449	1260	4887	3281	3088	8106	6529	6342	11527	9968	9798
50000	2011	219	25	3311	1486	1292	5204	3344	3144	8433	6609	6422	11871	10077	9900
55000	2276	260	28	3588	1549	1316	5521	3429	3187	8783	6727	6491	12254	10230	9987
60000	2575	294	24	3891	1603	1330	5841	3502	3217	9147	6826	6540	12666	10394	10056
65000	2963	358	23	4311	1686	1355	6266	3602	3265	9601	6945	6609	13173	10550	10148
70000	3388	440	23	4732	1787	1380	6557	3722	3153	10077	7086	6694	13693	10725	10275
75000	3803	551	29	5163	1917	1407	6809	3548	3015	10564	7254	6770	14214	10927	10378
80000	4264	670	33	5664	2056	1433	7302	3666	3058	11089	7431	6839	14739	11134	10468
85000	4747	804	42	6137	2210	1462	7789	3837	3109	11555	7625	6798	15295	11364	10572
90000	5249	947	49	6672	2372	1491	8360	4016	3158	11111	7616	5801	15907	11592	10661
95000	5807	1095	69	7226	2540	1531	8919	4199	3221	11455	6786	5746	16493	11830	10770
100000	6395	1288	93	7828	2751	1577	9529	4428	3288	12113	6964	5836	17193	12114	10881
150000	9327	2241	267	10690	3735	1822	12446	5490	3626	15170	8163	6271	18188	11543	9251
200000	17084	5783	345	18651	7531	2129	20505	9419	4157	23537	12352	6981	26393	15596	9849
250000	21746	9779	922	23513	11735	2926	25609	13939	5201	28819	16952	8246	31922	20139	11397
300000	22856	10502	576	25055	12696	2768	27471	15163	5142	30756	18341	8489	34012	21489	11632
350000	22847	9974	0	25059	12147	2212	27512	14738	4662	30804	17826	7958	34096	21049	11243
400000	22847	9072	0	25059	11272	2212	27512	13832	4665	30804	16923	7957	34096	20173	11249
450000	22847	8526	0	25059	10789	2212	27512	13172	4664	30804	16301		34096	19963	
500000	22847	8807	0	25059	10994	2212	27512	13521	4665	30804	16588	7957	34096	19758	11249
> 500000	22847	3026	0	25059	6452	2212	27512	9308	4665	30804	10984		34096	17337	

1) The decreasing relief within the lower income brackets of double earners is a result of the distribution of the child exemption in the simulation of the situation without FES. If the income of one spouse is lower then the generell exemption (without the share of the child exemption), a lower additional tax burden results from the omission of the child exemption.

Source: Own estimations.

Table 4

Absolute Relief of a Pure Child Benefit System

gross wage up to	no children			1 child			2 children			3 children			4 children		
	III	III/IV	IV/IV	III	III/V	IV/IV	III	III/V	IV/IV	III	III/V	IV/IV	III	III/V	IV/IV
2400	0	0	0	3403	3393	3403	6827	6830	6831	10256	10256	10247	13688	13686	13696
4800	0	0	0	3359	3349	3352	6781	6776	6784	10191	10198	10209	13616	13632	13624
7200	0	0	0	3331	3306	3316	6756	6727	6738	10179	10150	10157	13591	13605	13598
9600	0	0	0	3295	3261	3270	6720	6673	6691	10152	10103	10110	13568	13573	13547
12000	0	0	0	3251	3213	3238	6676	6626	6656	10113	10063	10079	13534	13543	13528
16000	0	0	0	3181	3145	3180	6608	6552	6598	10051	10002	10042	13478	13486	13484
20000	0	0	0	3083	3066	3097	6508	6479	6520	9953	9909	9958	13388	13403	13402
25000	0	0	0	2981	2981	2999	6406	6396	6427	9845	9833	9862	13278	13310	13319
30000	0	0	0	2858	2874	2881	6289	6298	6317	9739	9735	9757	13174	13205	13209
36000	0	0	0	2709	2731	2725	6134	6153	6166	9587	9597	9604	13046	13064	13064
40000	0	0	0	2571	2606	2589	5996	6026	6026	9445	9464	9459	12906	12928	12923
45000	0	0	0	2441	2477	2449	5866	5900	5891	9317	9340	9323	12776	12801	12786
50000	0	0	0	2298	2334	2307	5712	5753	5738	9167	9197	9171	12627	12662	12644
55000	0	0	0	2218	2221	2223	5574	5602	5608	9022	9036	9028	12475	12489	12506
60000	0	0	0	2212	2212	2212	5447	5473	5494	8885	8898	8910	12327	12309	12384
65000	0	0	0	2212	2212	2212	5291	5344	5331	8727	8770	8754	12160	12166	12230
70000	0	0	0	2212	2212	2212	5141	5213	5150	8575	8639	8566	12001	12023	12022
75000	0	0	0	2212	2212	2212	5001	5083	5002	8431	8508	8413	11854	11885	11863
80000	0	0	0	2212	2212	2212	4857	4952	4859	8285	8377	8271	11714	11749	11720
85000	0	0	0	2212	2212	2212	4725	4820	4721	8152	8242	8129	11575	11608	11563
90000	0	0	0	2212	2212	2212	4665	4695	4665	8005	8109	7995	11430	11473	11429
95000	0	0	0	2212	2212	2212	4665	4665	4665	7957	7985	7957	11301	11335	11288
100000	0	0	0	2212	2212	2212	4665	4665	4665	7957	7957	7957	11249	11250	11249
150000	0	0	0	2212	2212	2212	4665	4665	4665	7957	7957	7957	11249	11249	11249
200000	0	0	0	2212	2212	2212	4665	4665	4665	7957	7957	7957	11249	11249	11249
250000	0	0	0	2212	2212	2212	4665	4665	4665	7957	7957	7957	11249	11249	11249
300000	0	0	0	2212	2212	2212	4665	4665	4665	7957	7957	7957	11249	11249	11249
350000	0	0	0	2212	2212	2212	4665	4665	4665	7957	7957	7957	11249	11249	11249
400000	0	0	0	2212	2212	2212	4665	4665	4665	7957	7957	7957	11249	11249	11249
450000	0	0	0	2212	2212	2212	4665	4665	4665	7957	7957		11249	11249	
500000	0	0	0	2212	2212	2212	4665	4665	4665	7957	7957	7957	11249	11249	11249
> 500000	0	0	0	2212	2212	2212	4665	4665	4665	7957	7957		11249	11249	

Source: Own estimations.

Table 5

Absolute Change of the Relief Effects of FES 1990 Connected with the Reform Proposed

gross wage up to	no children			1 child			2 children			3 children			4 children		
	III	III/IV	IV/IV	III	III/V	IV/IV	III	III/V	IV/IV	III	III/V	IV/IV	III	III/V	IV/IV
2400	0	0	0	2227	2217	2227	3875	3878	3879	4088	4088	4079	4064	4062	4072
4800	0	0	0	2183	2173	2176	3829	3824	3832	4023	4030	4041	3992	4008	4000
7200	0	0	0	2155	2152	2166	3804	3775	3786	4011	3982	3989	3967	3981	3974
9600	0	0	0	2119	2283	2294	3766	3763	3742	3983	3935	3942	3911	3949	3923
12000	-41	0	0	2075	2340	2295	3588	3905	3817	3839	3894	3911	3751	3919	3904
16000	-297	-56	-1	1954	2219	2257	3254	4021	3981	3433	3844	3879	3379	3861	3858
20000	-707	-6	-11	1388	2182	2289	3186	3790	3870	2873	4113	3862	2735	3666	3682
25000	-1025	-1	-14	771	1987	2039	2777	3853	3982	3033	3913	3967	2193	3357	3389
30000	-1221	-13	-2	442	1701	1717	2148	3473	3531	2777	3954	4096	2608	3541	3549
36000	-1386	-73	-0	80	1460	1525	1719	3104	3199	2025	3398	3479	2335	3758	3810
40000	-1572	-154	-4	-254	1232	1361	1345	2837	2990	1589	3057	3199	1686	3122	3257
45000	-1767	-205	-15	-600	1028	1189	979	2619	2803	1212	2811	2981	1250	2833	2988
50000	-2011	-219	-25	-1013	848	1015	508	2410	2594	735	2587	2750	755	2585	2744
55000	-2276	-260	-28	-1370	672	907	53	2172	2420	239	2309	2538	221	2258	2520
60000	-2575	-294	-24	-1679	609	882	-394	1970	2277	-262	2072	2370	-338	1915	2328
65000	-2963	-358	-23	-2099	526	857	-975	1743	2066	-874	1825	2145	-1013	1615	2082
70000	-3388	-440	-23	-2520	425	832	-1416	1492	1998	-1501	1553	1872	-1692	1298	1747
75000	-3803	-551	-29	-2951	295	805	-1808	1535	1987	-2134	1254	1643	-2360	959	1485
80000	-4264	-670	-33	-3452	156	779	-2445	1286	1801	-2804	946	1432	-3025	615	1252
85000	-4747	-804	-42	-3925	2	750	-3064	983	1612	-3403	617	1331	-3720	244	991
90000	-5249	-947	-49	-4460	-160	721	-3695	679	1507	-3107	494	2194	-4477	-119	768
95000	-5807	-1095	-69	-5014	-328	681	-4254	466	1444	-3498	1199	2211	-5191	-495	517
100000	-6395	-1288	-93	-5616	-539	635	-4864	237	1377	-4156	993	2121	-5944	-865	368
150000	-9327	-2241	-267	-8478	-1523	390	-7781	-825	1039	-7213	-206	1686	-6939	-294	1998
200000	-17084	-5783	-345	-16439	-5319	83	-15840	-4754	508	-15580	-4395	976	-15144	-4347	1400
250000	-21746	-9779	-922	-21301	-9523	-714	-20944	-9274	-536	-20862	-8995	-289	-20673	-8890	-148
300000	-22856	-10502	-576	-22843	-10484	-556	-22806	-10498	-477	-22799	-10384	-532	-22763	-10240	-383
350000	-22847	-9974	-0	-22847	-9935	0	-22847	-10073	3	-22847	-9869	-1	-22847	-9800	6
400000	-22847	-9072	0	-22847	-9060	-0	-22847	-9167	0	-22847	-8966	0	-22847	-8924	0
450000	-22847	-8526	0	-22847	-8577	-0	-22847	-8507	1	-22847	-8344		-22847	-8714	
500000	-22847	-8807	0	-22847	-8782	-0	-22847	-8856	0	-22847	-8631	0	-22847	-8509	0
> 500000	-22847	-3026	0	-22847	-4240	-0	-22847	-4643	0	-22847	-3027		-22847	-6088	

Source: Own estimations.

(wage tax class IV/IV) with four children and an equal income. As a result of the reduced child benefits, child exemption, and splitting, the relative portion of child benefit on the total relief decreases, given an identical number of children. This relation depends, at the same income level, on the job participation of spouses because of the connected splitting effects. For double earner spouses with equal incomes (wage tax class IV/IV) there is actually no splitting advantage; with increasing income the relief rises according to the child exemptions and decreases compared to the relief effect within the other wage tax classes. A decline of the total relief in consequence of the reduction of child benefits can, for example, be observed in wage tax class IV/IV (e.g., for two children above an income of 70000 DM; see *Table 3*); within the other classes this is partly compensated by the effects of splitting.

However, the simulated reform proposal shows a contineous development of the relief effects (see *Table 4*). Differences in the relieves are only due to different individual exemptions within single income classes. *Table 5* makes obvious that in the lower income brackets a significant increase in the relief level is reached. In the middle and upper income brackets the relief effect depends on the difference between the level of child benefits and the abolishment of splitting; especially families within the wage tax class IV/IV (double earners) are winners. For the other groups the level of relief decreases as a result of the reform proposal if certain income levels are exceeded. The changes in the relative relief amounts show that the diminuition in the relief can be reduced directly to the abolishment of the splitting procedure. The strongest effects can be observed for single earner spouses with incomes between 150000 and 300000 DM; in principle, a corresponding development occurs in the wage class III/V.

The child benefit system according to the simulated reform proposal would lead to more rational results especially with regard to the principle of horizontal equity. But it would also produce a distribution of disposable income which is more equal than todays distribution of residual income.

3.3. Simulation of Integrated Tax and Transfer Systems

3.3.1. The Model and its Quality

For the simulation of the two concepts discussed above some *adaptations of the DIW-statistics* are necessary. At first the gross wage and wealth income has to be transformed into kinds of income which correspond to the definitions of the German income tax law; this is done by using structural data which were derived from the EVS 1983. Beyond that, the household structures of the DIW-Statistic have to be translated into family structures which are pertinent to tax and transfer policy; for better orientation the hypotheses of the microcensus 1982 are used.

The phase of data processing comprehends also the formulation of a *hypothesis about the distribution of incomes within the single income brackets*. A very simple solution is to take the average gross income of the single class which would mean equal distribution of incomes within the class boundaries. Much more sophisticated are attempts to estimate the income distribution by using analytical functions, but these attempts have failed (see SPAHN 1972, p. 121). Therefore today reproductions without theoretical background are used with the help of different interpolation methods and an additional mean-protecting interpolation method.

Table 6

Results of Status Quo-Simulation of the Income Tax Burden by Different Gross Income and Hypothesis about Distribution Compared to the DIW-Statistic

	DIW-Value (1983) Mio. DM 1	simulated values: total BEVE Mio. DM 2	total BEVE % of 1 3	specific EE Mio. DM 4	specific EE % of 1 5
farmers	1236,4	a) 2747,4	222%	994,0	80%
		b) 2756,1	223%	996,9	81%
self-employed	49645,7	a) 96565,8	195%	48494,2	98%
		b) 96644,2	195%	48624,5	98%
employees	67154,0	a) 87280,9	130%	75161,0	112%
		b) 87434,4	130%	75319,1	112%
officials	17763,7	a) 20938,0	118%	17417,3	98%
		b) 20975,1	118%	17448,3	98%
workers	40467,1	a) 50375,3	124%	42060,7	104%
		b) 50492,7	125%	42172,3	104%
social pensioners	7178,7	4813,8	67%	(4813,8)	
pensioners	5393,0	6274,0	116%	(6274,0)	
sum	188838,6	a) 268995,2	142%	195215,0	103%
		b) 269390,3	143%	195648,9	104%

Explanations: 1) The a)-values result from status quo-simulations on the basis of average income within the income brackets as distributional hypothesis;
2) the b)-values result from the simulations on the basis of mean-protecting interpolation.

For the judgement concerning the quality of this hypothesis and the data base the current status quo is simulated.[23] The main results are represented in *Table 6*. The estimations have been made for the gross wage and wealth income (BEVE) and the specific professional income (from wages and business, EE) by using the two distributional assumptions within the income brackets mentioned above. It is obvious that only the use of the specific professional income leads to results which are sufficient. Apparently an important part of the wealth income is currently withdrawn from the fisc. The results are more or less independent from the distributional hypothesis, so that the easier one can be used. Our simulation model reproduces the status quo within the single socio-economic groups (divided into different household sizes) quite well. Therefore, more or less realistic results can be expected from our simulations of the integrated concepts.

The simulation of the status quo and the integration concepts are also put into a *moduled program structure*.

3.3.2. Simulation of the Integrated Concepts

The *simulation of the integration concepts depends on the functional elements and relations of integrated systems*. After the estimation of the taxable base the specific basic income for the household will be determined. As already mentioned the latter is one parameter of the tax and transfer schedule from which the concrete tax liability or transfer payment is derived.

In this analysis we use the *fiction of one central public institution*, neglecting the current problems which are connected with a federal state and the fiscal equalization systems. Beside the simulated amounts of taxes and transfers connected with the integrated concepts, the accordingly "saved" transfer payments as well as the abolished tax yields and social contribution payments are taken into consideration. Concept I is connected with a *negative financial remainder*, concept II with a *positive* one (see *Table 7*). In contrast to these results the nearly identical redistributive effects of both reform proposals are most surprising because the claim of these reforms is quite different (maintenance principle for the whole society versus social aid for the poor). But this claim is only obvious with regard to the amounts for the basic income, whereas the tax-transfer schedules are not very different; thus the high marginal rate in the concept of GRÖZINGER (54 %) compensates the effect of the higher basic income. Beyond that the different abolishment of parts of the current social security system connected with the two proposals has equalizing effects, too: the, at the first view, probably expensive concept of GRÖZINGER replaces almost the whole social security

23 BETSON (1990) talks about the "initial picture of the economy": "a picture of the economy if no change in policy is implemented".

system including the social insurance; whereas the concept with regard to the status quo only substitutes today's social aid and unemployment aid payments. GRÖZINGER's concept leads to an additional revenue for the State in total, but the enterprise sector gains too, because no employer's social security contributions must be paid. If this is not taken into consideration within the wage negotiations of the trade unions this will mean a remarkable redistributive effect in favour of the enterprise sector.

Table 7
Revenue Analysis

Concept assessment base	I. type A	I. type B	II. type A	II. type B
tax revenue	229807,9	304640,8	219316,7	296349,1
transfer amount	263414,9	237087,5	880,1	299,8
substituted transfers	346102,8		11220,0	
substituted tax	195215,0		195215,0	
abolished social contributions	261114,0		-	
remainder	-143833,2	-42675,9	+34441,6	+112054,3

The *redistributive analysis* done by LORENZ curves and GINI coefficients shows no serious differences, either; from both concepts GINI coefficients are estimated which are nearly equal, independent of the assessment base. But it becomes obvious that the shift to a comprehensive tax base leads to a distribution which is more equal. A closer analysis of the effects within the single socio-economic groups demonstrates that - independent of the tax base - the social pensioners and government officials are the losers; in the concept of GRÖZINGER workers and employees are the winners, whereas in the status quo concept these groups also range among the losers (see *Table 8*).

The *introduction of a comprehensive tax base* offers the State a lot of space for political actions, independently from the single social concept. Especially for self-employed persons the tax yield is nearly twice as high and comes close to the amount which resulted for the total professional and wealth income within the simulation of the status quo.

Table 8

Burden/Relief within the Single Socio-economic Groups

CONCEPT I in Mio. DM	Tax simul.	Transfer simul.	Tax subst.	Transfer subst.	Abolished Social Contributions (employees)	Remainder
farmers			994,0	4639,2	1628,7	
type A	661,6	6631,4				3953,5
" B	1404,9	4048,9				627,5
self-employed			48494,2	19088,7	7954,7	
type A	55429,2	1103,4				-16965,6
" B	109700,6	3,7				-72336,7
employees			75161,0	30347,7	56550,2	
type A	100234,5	9931,2				11060,2
" B	108376,5	7582,4				569,4
officials			17417,3	10344,5	4891,55	
type A	18430,4	6300,7				-165,35
" B	25051,3	3348,2				-9738,75
workers			42060,7	35195,4	50469,0	
type A	54972,8	29174,2				31535,7
" B	59929,2	24359,9				21765,0
social pensioners			4813,8	206020,9	-,-	
type A	63,0	191024,3				-10245,7
" B	129,2	179361,5				-21974,8
pensioners			6274,0	40466,2	-,-	
type A	16,4	19249,7				-14958,9
" B	49,1	18385,9				-15855,4

CONCEPT II in Mio. DM	Tax simul.	Transfer simul.	Tax subst.	Transfer subst.	Abolished Social Contributions (employees)	Remainder
farmers			994,0	97,0	-,-	
type A	1089,3	462,2				269,9
" B	2807,8	31,2				-1879,6
self-employed			48494,2	56,5	-,-	
type A	47630,3	0,0				807,4
" B	91848,9	0,0				-43411,2
employees			75161,0	3335,3	-,-	
type A	74398,7	0,0				-2573,0
" B	81014,5	0,0				-9189,0
officials			17417,3	140,5	-,-	
type A	18467,1	0,5				-1189,8
" B	24058,0	0,0				-6780,7
workers			42060,7	5341,2	-,-	
type A	43512,6	276,2				-6516,9
" B	49083,2	190,8				-12172,9
social pensioners			4813,8	2063,1	-,-	
type A	26833,5	84,6				-23998,2
" B	37145,0	29,9				-34364,4
pensioners			6274,0	186,3	-,-	
type A	7385,2	56,6				-1240,9
" B	10391,7	47,3				-4256,7

IV. Summary and Outlook

Our preliminary results derived from micro-orientated simulation models demonstrate the quality of such types of models for the analysis and evaluation of tax and transfer policy as far as the formal incidence is taken into consideration. But *these models also produce the input which is necessary for future behavioral simulation models*. In any case it is possible to simulate every meaningful reform proposal within our models, and we obtain results for the revenue as well as the distributive effects which are highly relevant and quite close to the "first order effects" which will really occur. Now we have an appropriate instrument for policy advices in this political sphere which yields much better results than a lot of expensive reports made by order of the German government (for a very recent report see, e.g., LEIBFRITZ, PARSCHE (1988)).

In order to prove the quality again, we will give a brief summary of our results:

(1) The graduation of the *expenditure tax* scheme depends on the hypothesis about the type of the tax schedule as well as the tax base and the statistical tax yield. The range of marginal rates is between 13 % in the lower and 114 % in the higher income brackets; the condition of equal yield and, much more, the constraint of distributive neutrality lead to strongly progressive expenditure tax schedules.

(2) For the *family equalization system* our model demonstrates the weaknesses and shortcomings of the current solutions. It shows that a pure child benefit system with comparatively high transfer payments to families rearing children leads to more rational results with regard to the principle of horizontal equity and also reduces the concentration in disposable income.

(3) The simulation for two extreme cases of *integrated tax and transfer systems* shows that, if other instruments of social security are abolished, such systems are not more expensive than the current uncoordinated tax and transfer system and simultaneously lead to redistributive effects which are much more distinct. Indeed, it is possible to have a higher redistributive effect in favour of the poor at the same costs, or the same redistributive effect to costs which could substantially be reduced.

All these results are not completely new, because a lot of us perhaps had similar ideas out of theoretical considerations; but *now we do have empirical evidence and can give much more precise hints to politicians*. One should hope that the developed instruments will be used by them for the evaluation of the current system and the judgement of forthcoming reforms. But sometimes, politicians and governments leave the impression on our minds that they are not really interested in knowing the ins and outs of this case, but prefer to be quiet in the dark serving their political clients.

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Chapter 5:

Group- and Microsimulation

5.1.

Simulation Models in Tax and Transfer Policy: Introduction

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(Johann K. Brunner and Hans-Georg Petersen (Eds): Simulation Models in Tax and Transfer Policy, Frankfurt, New York 1990, pp 11 – 18)

5.2.

Microsimulation of Alternative Tax and Transfer Systems for the Federal Republic of Germany

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(Johann K. Brunner and Hans-Georg Petersen (Eds): Simulation Models in Tax and Transfer Policy, Frankfurt, New York 1990, S. 539-572)

5.3.

Revenue and Distributional Effects of the Current Tax Reform Proposals in Germany – An Evaluation by Microsimulation

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(Hans-Georg Petersen and Patrick Gallagher (Eds): Tax and Transfer Reform in Australia and Germany. Australia Center Potsdam, Berlin 2000, pp 219 – 235)

Revenue and Distributional Effects of the Current Tax Reform Proposals in Germany – An Evaluation by Microsimulation

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A. Introduction

The recent change in political leadership in Germany has important implications for tax policy. Shortly after the election, the new government presented plans to change the tax laws. The proposed changes included a reform of income tax, the implementation of 'green taxes', while at the same time social security contributions, eg, the contributions to the old-age insurance, would be reduced.

The aim of the proposed income tax reform is to decrease the tax burden for most taxpayers, and to abolish some tax exemptions and deductions. The blueprint has been devised to achieve greater justice within tax apportionment and regulation. The major questions these new proposals raise are: what kind of distributional effects will result from these plans? Who pays less and who more? Has the new government chosen the right means to achieve its goals?

In our analysis we concentrate on private households. Due to a lack of data, we exclude enterprises. The primary goal is an integrated analysis of how the tax burden will change for all kinds of taxes and social security contributions. For this purpose, we have to use an effective model of analysis of the tax system.

The chosen model adopts the tradition of a group of microsimulation-models developed first by Orcutt[1] and some grouped simulation models developed in different projects by Petersen.[2] One new aspect is that the model has been designed such that it is capable of analysing direct taxes, indirect taxes and social security contributions simultaneously.

The paper is organised as follows. First we present the background relating to the model we have chosen to analyse the distributional and revenue effects of the reform. We then give a brief introduction to the workings of the model, describe the data, the setup of the integrated microdata file and the weights and updates used to represent the actual population.

[1] See for the first approach Orcutt (1957) and for the further development Orcutt, Merz & Quinke (1986) and Harding (1996).

[2] For grouped models see Brunner & Petersen (1990).

Then we validate the model and describe its possibilities and limitations. Finally, we outline the simulated reform proposals and conclude with a discussion of the revenue and distributional effects of the proposals for private households.

B. The model

The microsimulation-model is static and mostly deterministic in nature. At the current stage of its development we can analyse the first-order effects of nearly all types of indirect and direct taxes. The model is modular in structure, and includes modules for direct and indirect taxes, as well as for transfers and social security contributions. Figure 1 provides an overview of the microsimulation-model, from raw data sets to calculation modules.

The direct tax module consists of patterns for income tax, church tax, property taxes and car tax. Value added tax (VAT), gasoline tax, tobacco tax, insurance tax and taxes on alcoholic beverages are included in the indirect tax module. The social security contributions module contains the design of old-age insurance, health insurance, unemployment insurance and nursing cost insurance. The module for transfers covers child and housing benefits, education benefits, social aid and old-age benefits; the last three, however, are not calculated endogenously.

(i) Data

For the construction of a tax and transfer microsimulation-model, one needs detailed information about personal income distribution. In Germany there are not many notable prospective microdata sets available for use. One that is accessible is the income and expenditure survey (EVS), compiled by the German Federal Statistical Office (*Statistisches Bundesamt*, StaBu) in 1993.[3] It contains 40 230 households and 779 variables. The variables cover extensive socio-economic information, such as the composition of households, and household income and expenditure.

In addition, the model takes into account the German Socio-Economic Panel (SOEP) compiled by the German Institute for Economic Research (DIW).[4] For the year 1993, this includes 6 637 households and 13 179 individuals.

For issues relevant to taxation, we work with a micro data set which was generated by a regional tax authority.[5] It contains 88 460 cases and 253 variables. This income tax data includes facts relating to tax exemptions and deductions, and concerns negative incomes, in particular from renting and leasing. This is important because the sum of this kind of income is negative. All other sources provide data the sums of which are usually positive.[6] The EVS, however, is our basic data set. Information from the socio-economic panel is mainly

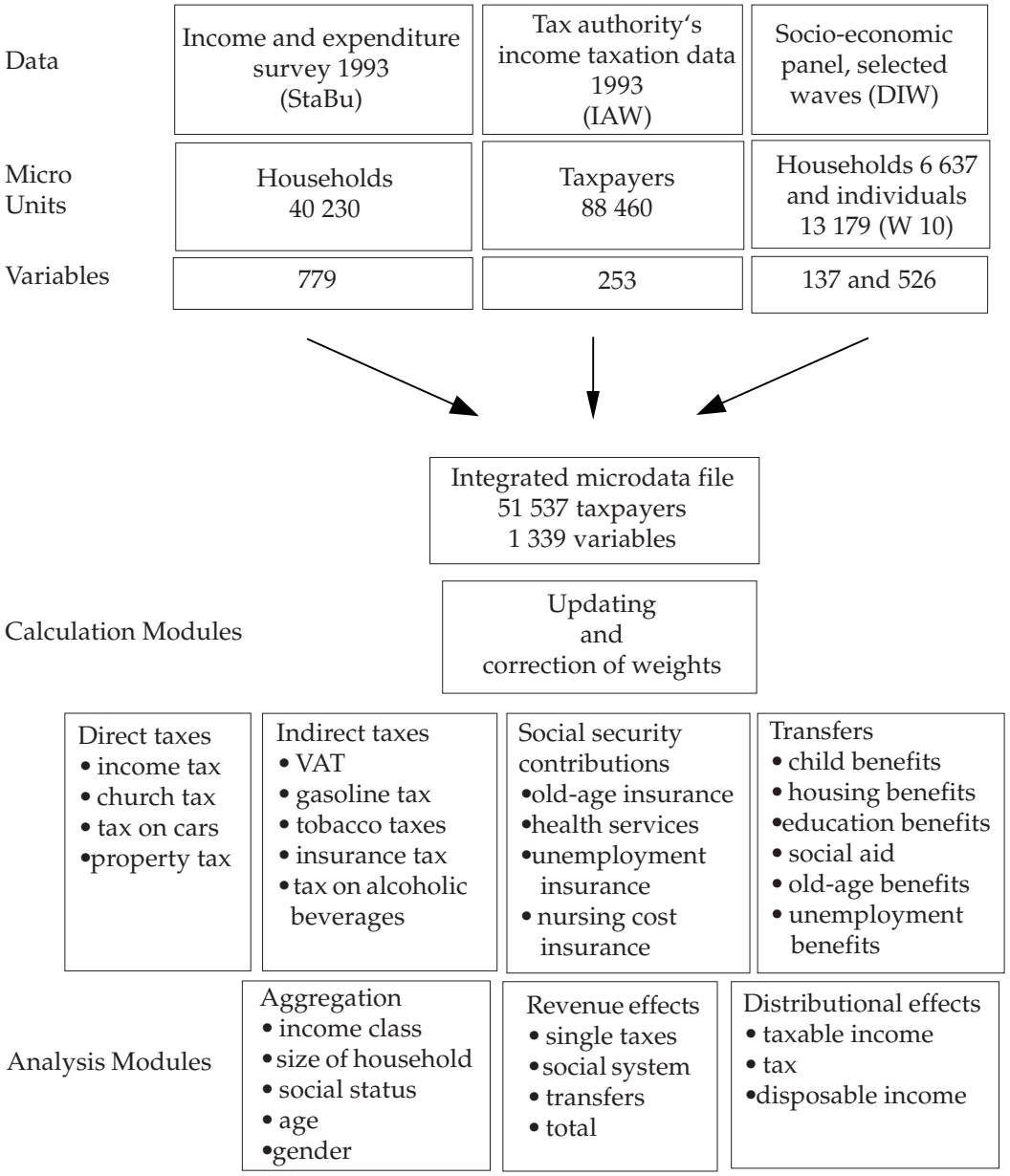
[3] The content of the income and expenditure survey can be found in Statistisches Bundesamt (1997b).

[4] Information about the Socio-Economic Panel is available in Haisken-De New & Frick (1996).

[5] For further information about this data set see Bork, Hochmuth & Kleimann (1998).

[6] We can use this data set as a result of co-operation with the Institute for Economic Research (IAW).

Figure 1: Overview of the Microsimulation-model



used for time allocation of the micro units. The three data sets need to be merged into one integrated microdata file.

Another problem is missing data from the upper income classes in the basic data set. Our basic data set incorporates only household incomes of less than DM 35 000 per month after tax. We attempt to solve this problem by tripling all cases with an income over DM 200 000 per year. We then merge the income information from the tax authority's data set with the cases we have multiplied in the basic set, considering only the predominant income source. The microdata file should adequately represent the German population.

(ii) The integrated microdata file

On the basis of these three datasets, we construct – as mentioned above – one integrated microdata file. Our first task is to transform the household units of the EVS into units of taxpayers, so that we can merge the second file, which consists of taxpayer units, with the basic data set.[7] Capital income and rental income are not assigned to individuals; as a result these sources of income are distributed among the individuals within the household. We assume that the distribution of this category of income is identical with the per capita distribution of other sources of income. We follow the same procedure for the division of expenditure.

We are then able to merge the data from the tax authority with our basic set. We look for similarities and build clusters containing comparable micro units. Common characteristics between the various sources of data are seven income classes, seven predominant income sources, marital status and the number of children of each taxpayer This process results in the formation of approximately 290 clusters for the income and expenditure survey and the tax data. Each case of each cluster of the basic data set is assigned a corresponding case from the second data set by accidental principle.[8] Time allocation data from the socio-economic panel is merged in a similar fashion.[9] The clusters relate only to taxpayers who receive wage income. They are differentiated by gender and by ten income classes. After the second merging we are able to calculate the monthly working hours for people with wage income. As a result of these mergers our integrated microdata file contains 51 537 taxpayers and 1 339 variables, representing 40 income sources[10].

(iii) Weights and updates

The distribution of personal income relevant for tax purposes is provided by the Federal Statistical Office in aggregated tables. To assess the quality of our integrated microdata file, we set out to compare the results of our simulation with these figures. The first application

7 A taxpayer can be only one person, if he or she is not married and two persons if they are married.

8 We have tried this merging method several times to check simulation results. The changes encountered were negligible.

9 In Germany, a part of wages for work on Sundays, public holidays or work during nights are tax-free. If not taken into consideration, this fact would distort our results.

10 For income sources, see appendix.

of our model then was to examine the results of the tax system in 1992 as compared with actual figures, using the weights employed in the EVS. The results are presented in Table 1.

Table 1: Results of the Income Tax Tables 1992 and Deviation from the Simulation Results Using the Weights of the Income and Expenditure Survey

Adjusted gross income from … to … 1 000 DM	Results of 1992 income tax tables				Cases	Deviation between the simulation and 1992 income tax tables			
	Taxpayers	Adjusted gross income	Taxable income	Tax		Taxpayers	Adjusted gross income	Taxable income	Tax
		per million DM				in %			
< 0	1 922 533	9 835	0	1	4 995	115	-212	0	100
1 – 5	1 318 436	3 390	2 064	17	4 461	263	279	532	37
5 – 10	1 440 809	10 959	6 808	148	4 573	282	273	335	176
10 – 15	1 502 930	18 650	11 626	746	3 364	145	141	180	118
15 – 20	1 300 745	22 728	14 139	1 302	2 115	61	59	85	61
20 – 25	1 383 068	31 172	20 280	2 292	1 727	22	22	36	20
25 – 30	1 517 871	41 774	28 873	3 796	1 833	15	15	26	10
30 – 40	3 510 598	123 450	91 452	14 075	4 432	15	14	18	9
40 – 50	3 783 157	169 979	128 148	21 287	4 734	5	4	7	3
50 – 60	2 994 803	163 873	125 693	21 868	4 304	5	5	7	5
60 – 75	3 108 336	208 283	165 182	30 528	5 103	5	5	7	6
75 – 100	2 969 561	254 971	209 067	41 954	4 926	3	3	5	5
100 – 250	2 439 429	328 453	281 702	70 275	4 221	2	-1	2	1
250 – 500	206 609	68 847	62 389	23 528	595	8	8	12	15
500 – 1 000	54 677	36 687	34 083	15 033	111	-19	-20	-18	-14
1 000 – 2 000	16 398	22 120	20 770	9 694	25	-32	-36	-33	-29
2 000 – 5 000	6 592	19 511	18 488	8 762	11	-32	-37	-34	-28
5 000 – 10 000	1 524	10 391	9 900	4 603	4	-11	-2	-1	11
10 000 a. m.	751	14 997	14 344	6 450	2	4	-35	-34	-22
Total	27 556 294	1 550 236	1 245 007	276 357	51 536	59	7	10	2

Source: Statistisches Bundesamt (1997a), pp. 26 – 27; own calculations.

There is a significant divergence between the simulation results and the income tax tables for the lower income classes due to the omission of minor employment contracts in the official tax tables. The deviation in the middle and upper income classes, by contrast, is small. In order to improve our simulation results, then, we adapt the income distribution weights within the income brackets of the official tax tables. The adaptation only affects taxpayers with incomes above DM 20 000 a year. We then adjust the weighting factors to attain the correct number of taxpayers (see Table 2 for post-adjustment results).

Table 2: Simulation Results Using Corrected Weighting Factors and Deviations from the 1992 Income Tax Tables

Adjusted gross income from … to … 1 000 DM	Simulation results for the year 1992				Deviations to the 1992 income tax tables			
	Taxpayers	Adjusted gross income	Taxable income	Tax	Tax-payers	Ad-justed gross in-come	Tax-able in-come	Tax
	per million DM				in %			
< 0	4 128 236	-11 000	-4 490	0	115	-212	0	-100
1 – 5	4 780 883	12 855	13 038	23	263	279	532	37
5 – 10	5 498 550	40 865	29 602	409	282	273	335	176
10 – 15	3 684 753	44 880	32 502	1 627	145	141	180	118
15 – 20	2 089 559	36 229	26 107	2 093	61	59	85	61
20 – 25	1 383 065	31 148	22 704	2 335	0	0	12	2
25 – 30	1 517 874	41 810	31 615	3 828	0	0	9	1
30 – 40	3 510 613	123 000	95 472	14 032	0	0	4	0
40 – 50	3 783 153	169 000	133 000	21 711	0	-1	4	2
50 – 60	2 994 813	164 000	130 000	22 622	0	0	3	3
60 – 75	3 108 337	208 000	169 000	31 454	0	0	2	3
75 – 100	2 969 567	255 000	214 000	43 184	0	0	2	3
100 – 250	2 439 434	319 000	282 000	70 252	0	-3	0	0
250 – 500	206 609	68 846	64 684	25 148	0	0	4	7
500 – 1 000	54 677	36 691	35 089	16 264	0	0	3	8
1 000 – 2 000	16 398	21 100	20 592	10 216	0	-5	-1	5
2 000 – 5000	6 592	18 155	17 953	9 232	0	-7	-3	5
5 000 – 10 000	1 524	11 453	10 955	5 736	0	10	11	25
10 000 a. m.	751	9 394	9 175	4 827	0	-37	-36	-25
Total	42 175 388	1 600 424	1 332 997	284 995	53	3	7	3.1

Source: Statistisches Bundesamt (1997a), pp. 26 – 27; own calculations.

For taking into account changes in employment over time, we utilize the probability of becoming unemployed. According to a random number for each micro unit, we deem the increased number of unemployed people since 1993 as unemployed in the model, and then calculate their unemployment benefits.

It is also necessary to update the integrated microdata file for the years 1993-97; a straightforward procedure in relation to expenditure. We use the inflation rates for nearly 200 different commodities. For the purpose of updating the different incomes of our taxpayers, we choose various growth rates provided in the national accounts and other statistical infor-

mation. In the national accounts, income from business is a residual, which might include computation errors. Hence growth rates are estimated based on another survey, the Socio-Economic Panel. The variance in income growth for different income classes was not taken into account.

(iv) Validation

For validation of the model, we compare the simulation results with actual tax revenue. An overview of actual and simulated tax and social contribution revenue is given in Table 3. The table also provides the deviations between the two.

The various reasons that account for the deviations are noted in the last column. For example, the statistics relating to both revenue and income tax distribution are published only once every three years, with a time lag of up to six years. As a result, the Federal Statistical Office has only published the revenue in cash terms for 1993. Most deviations are due to the missing business sector in our model.

On the whole, our model represents a good estimate for the basic simulation year of 1993. After updating, we reach similar results for the year 1996. Our data set is now adjusted to 1997, although we do not have actual data for a comparison.

(v) Possibilities and limitations

The large number of cases in the integrated microdata file allows for the analysis of subpopulations, which is not possible with other data sets. Furthermore, we have included almost all important taxes and transfers - something unique at this time for the German tax system. As a result, we can examine all taxes simultaneously.

We intend to extend our model according to the linear expenditure system as developed by Stone and Lluch[11], and we will estimate elasticities from our cross-section data. This allows us to examine the adjustments of taxpayers that result as a consequence of commodity price changes. Work on this part of the model is currently in progress. Another possible extension of the model will account for labour supply, but a lot of work remains to be done before this section will be implemented. In addition, we can extend our model to the distribution of property ownership including (public and private) pension entitlements.

After highlighting its possibilities, we should also refer to the limitations of the model. A critical remark must be made on the issue of profits. Taxpayers have to calculate their profits before they complete the tax forms for their local fiscal authority. Consequently, our data does not encompass the methods of profit calculation. When calculating profit, there are numerous tax exemptions and deductions. This problem applies to income from enterprises and self-employment, as well as from rental income. This problem could be solved by integrating data from tax audits, but such data is hard to obtain in Germany.

[11] See Stone (1954) and Lluch (1973).

Table 3: Overview and Comparison Between Actual and Simulated Revenue of Taxes and Social Security Contributions in 1993

Categories of taxes and contributions	Revenue in cash terms 1993	Simulated revenue 1993	Re-present-ation	Reasons for the representation
	in Million DM		in %	
Wage and income tax	291 221	281 846	96.8	Restricted possibility of comparison, because the cash term's revenue also contains revenue from other periods
Church tax	17 002	17 271	101.6	
Gasoline tax	56 300	36 440	64.7	Revenue from the business sector is not included
Value added tax 7 %	..	16 526	..	Comparison not possible
Value added tax 15 %	..	116 250	..	Comparison not possible
Value added tax total	174 491	132 776	76.1	Public consumption is not included
Tax on tobacco	19 459	19 535	100.4	
Coffee tax	2 170	2 295	105.8	
Taxes on liquor, beer and sparkling wine	8 038	5 401	67.2	Alcoholic beverages sold in pubs are not included
Tax on cars	14 058	8 884	63.2	Business sector is not in cluded
Property tax type A	592	155	26.1	Agriculture and forestry enterprises are not recorded
Property tax type B	11 071	4 878	44.1	Taxes from the business sector are not included
Insurance tax	9 290	5 703	61.4	Business sector is not in cluded
Social contributions (only employees)	263 099	247 295	94.0	
Total	885 672	762 479	86.1	

Source: Statistisches Bundesamt (1994), pp. 482, 536, 104 f.; Institut der Deutschen Wirtschaft (1997), Table 78; own calculations.

Another problem is the missing panel feature, which allows changes in individual taxpayers' behaviour to be taken into account. Our population is merely updated with a method of static ageing. Therefore no longitudinal analysis is currently possible.

C. The tax reform proposals

Tax reform is a topic which has long been the subject of discussion in Germany. The last government tried to reform income tax, but without success, as a result of the fact that the majority in the second chamber (*Bundesrat*) blocked the reform. However, since the election last year the new government has a clear majority for reforming tax policy, which is a central element of their agenda.

Nevertheless, we do not want to discuss the reforms in detail, we just want to demonstrate the consequences of changes in tax legislation. The reform include changes in income tax law[12] and other taxes, an undertaking which the government has called the 'start of environmental taxation' *('Einführung der Öko-Steuer')*.[13] This includes an increase in gasoline tax and the introduction of a new tax on electricity. Our analysis only covers the consequences of the new tax policy for private households. Parts of the reform were implemented on January 1, 1999. Other parts will be introduced between April 1999 and January 2002. Due to the number of uncertainties, we have chosen not to update the data set, assuming instead that all parts of the reform take place simultaneously.

We simulate income tax, the removal of tax deductions for school fees, agriculture and forestry exemptions, and the 50 per cent cut in the saving exemption (for interest payments) in detail. Other factors taken into account are changes in the treatment of redundancy payments, limitations in relation to income-splitting for married couples, and restrictions on balancing negative against positive incomes. In addition we simulate the new tax schedules. Figure 2 illustrates intended marginal tax rates compared with current ones.

Changes to indirect taxes include increases in gasoline tax for petrol, diesel, heating oil and gas, as well as the already mentioned introduction of an electricity tax. An increase in child benefits is also simulated. Finally, decreasing social security contributions are included.[14] Additionally, the government plans a further rise in indirect tax rates, especially in relation to environmental taxes in the next few years, but tax schedules are currently only defined for 1999.

D. Revenue and distributional effects

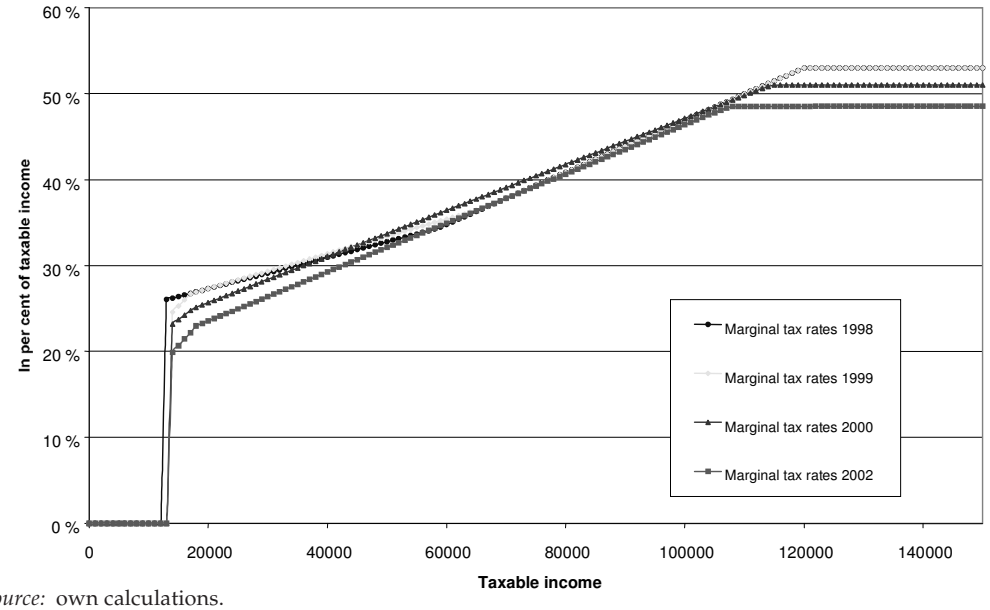
First of all, we have to mention that our model is able to aggregate the results in different ways. We have decided to aggregate our sample in three categories using income classes as the break variable. The first aggregation takes all cases together, the second takes unmarried cases, and the last, married taxpayers. For the income classes, we take gross income as a base.

[12] Further details are provided by the government in Bundestagsdrucksache 14/23.

[13] For details of this part of the reform see Bundestagsdrucksache 14/40.

[14] Decreasing social security contributions should be balanced with increasing indirect tax revenue.

Figure 2: Marginal Tax Rates for 1998, 1999, 2000 and 2002



Source: own calculations.

For an analysis of revenue and distributional effects, the first step is to simulate the current, pre-reform system. These results will be used as a reference point. Table 4 illustrates the simulation results before the tax reform. The table also shows the unweighted number of cases in each income class. Each class has a sufficient number of cases to represent the whole population quite well, while the sampling error is acceptably small.

The impact of the reform proposals with regard to tax revenue is shown in Table 5. For direct taxes (income tax and the related church tax),[15] we have a decreasing revenue amount of DM 8.365 billion in 1999, the first reform year.

Our findings suggest that average tax revenue is decreasing for almost every income class, except for taxpayers with a gross yearly income of between DM 200 000 and DM 500 000 DM. These people will have to pay an additional DM 233 million, although this may not be immediately feasible because of the choice between the receipt of child benefits or a child tax exemption. The tax authority calculates income tax rates considering these two options and uses the option which is more favourable for the taxpayer. Because of increased child benefits for taxpayers in this income bracket, such benefits are the superior option after the reform.

Compared to income tax revenue within each income bracket, the revenue arising from indirect taxes is distributed more or less equally over the whole income scale. Advantages arising from a reduction in social security contributions mostly favour the middle and upper income classes. With regard to disposable income, on average all income classes can expect a higher disposable income. The second step of the reform results in relief of about DM 18 billion in direct taxes, and for the last step in 2002, relief of DM 40 billion is forecast.

[15] The church tax is directly tied to the individual income tax burden (generally 9 per cent of the income tax burden).

Table 4: Simulation Results in 1998: Before the Reform

Gross income from ... to ... 1 000 DM	N unweighted	N weighted	Gross income	Direct taxes	Indirect taxes	Social security contributions
			in million DM			
0 – 5	4 219	2 655 105	2 597	0	835	212
5 – 10	1 515	1 311 065	10 046	0	1 729	869
10 – 15	1 902	2 190 167	27 848	1	4 265	2 224
15 – 20	1 932	2 266 159	39 405	163	5 374	3 422
20 – 25	1 920	2 257 311	50 779	649	6 417	4 518
25 – 30	1 935	2 392 130	65 732	1 496	7 327	6 092
30 – 35	2 131	2 532 484	82 281	2 562	9 000	8 166
35 - 40	2 422	2 778 021	104 309	4 534	10 517	10 566
40 - 50	5 176	5 486 052	246 924	14 403	24 160	27 328
50 - 60	4 952	4 530 238	248 172	19 780	23 312	32 100
60 - 70	4 436	3 572 349	231 285	21 883	21 253	32 524
70 - 80	3 828	2 661 144	199 051	21 440	17 792	27 730
80 - 90	3 227	2 033 129	172 342	21 221	14 497	24 074
90 - 100	2 572	1 568 190	148 708	20 062	12 047	20 668
100 - 110	1 982	1 204 173	126 161	18 225	10 110	17 292
110 - 125	2 095	1 300 327	152 190	23 674	11 454	20 430
125 - 150	2 043	1 281 356	174 460	30 224	12 665	21 711
150 - 200	1 715	1 039 398	176 004	35 124	11 591	17 588
200 - 500	1 298	543 684	156 981	42 301	7 425	8 322
500 - a. m.	236	109 760	127 556	54 873	1 629	1 341
Total	51 536	43 712 244	2 542 831	332 616	213 401	287 178

Source: own calculations.

A proper analysis of the distributional effects of the reforms requires an examination of the significant increase in child benefits and its effect on disposable income. In this respect, all changes introduced by the reform are summarized in one variable.

Figure 3 provides the results of the modifications created by the three reform steps, where each step has similar effects. In the lower income brackets only a marginal increase of disposable income can be observed.

With expanding gross income, the disposable income after the reform rises. The first step has smaller effects than the second, while the impact of the second reform step is smaller than the third.

Table 5: Revenue Changes against the Reference Point in 1999, 2000 and 2002

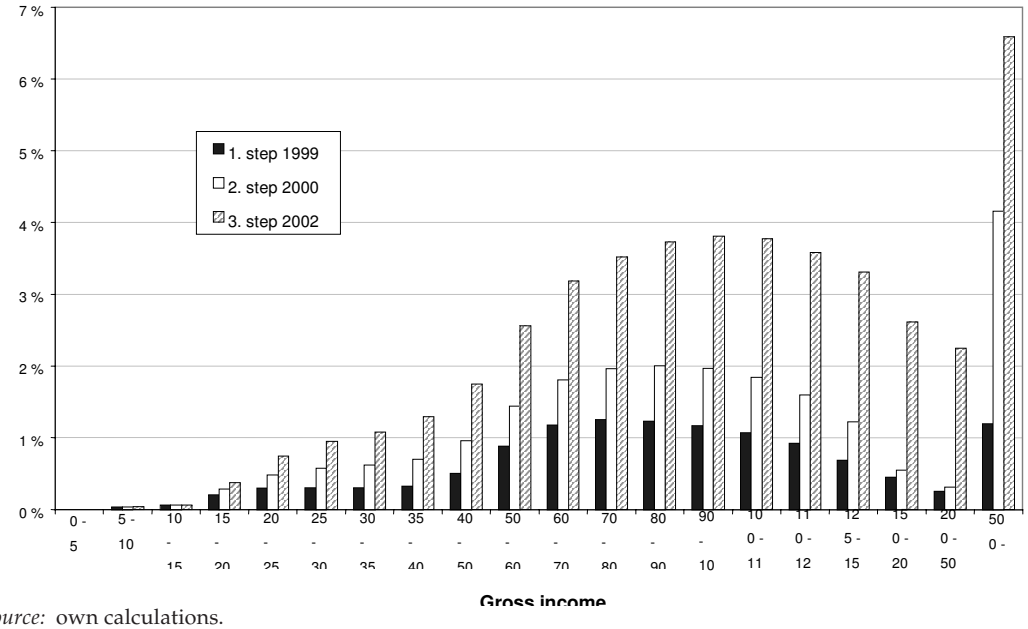
Gross income from ... to ... 1 000 DM	Impact in 1999				Impact in 2000		Impact in 2002	
	Direct taxes	Indirect taxes	Social security contri-butions	Dis-posable income	Direct taxes	Dis-posable income	Direct taxes	Dis-posable income
	in million DM							
0 - 5	0	11	-1	0	0	0	0	0
5 - 10	0	46	-10	3	0	3	0	3
10 - 15	-1	133	-25	14	-1	14	-1	14
15 - 20	-59	179	-33	64	-82	88	-111	119
20 - 25	-129	220	-39	121	-200	195	-298	298
25 - 30	-178	260	-62	158	-310	296	-495	490
30 - 35	-207	311	-92	191	-399	393	-676	684
35 - 40	-275	362	-131	258	-561	559	-1 006	1 027
40 - 50	-797	809	-399	922	-1 579	1 750	-2 936	3 186
50 - 60	-1 070	796	-544	1 548	-2 006	2 536	-3 865	4 500
60 - 70	-1 177	719	-592	1 872	-2 128	2 877	-4 189	5 056
70 - 80	-1 043	586	-521	1 691	-1 944	2 644	-3 920	4 736
80 - 90	-834	478	-468	1 406	-1 665	2 288	-3 521	4 257
90 - 100	-661	395	-415	1 134	-1 391	1 910	-3 069	3 694
100 - 110	-495	335	-353	865	-1 082	1 490	-2 550	3 056
110 - 125	-463	371	-423	897	-1 074	1 548	-2 878	3 471
125 - 150	-337	399	-462	750	-887	1 336	-3 021	3 618
150 - 200	-147	348	-391	499	-252	609	-2 386	2 890
200 - 500	233	200	-199	246	168	303	-1 514	2 153
500 - a. m.	-724	43	-35	784	-2 524	2 718	-3 905	4 305
Total	-8 365	7 002	-5 195	13 420	-17 916	23 555	-40 341	47 557

Source: own estimates.

If we take unmarried taxpayers instead of the whole population, the picture will be different, as depicted in Figure 4. Because of the increases in indirect taxes, the taxpayers in the lowest income classes are burdened by a reduced disposable income for all reform steps. In the second step, where the existing saving exemption is halved, and a new tax schedule is planned, there is a decrease of disposable income for unmarried taxpayers with a gross income of DM 100 000-150 000. Obviously, these taxpayers profit considerably from the current saving exemption which would be decreased in the second step. In the third step, these same taxpayers will be compensated by further reductions in the marginal tax rates.

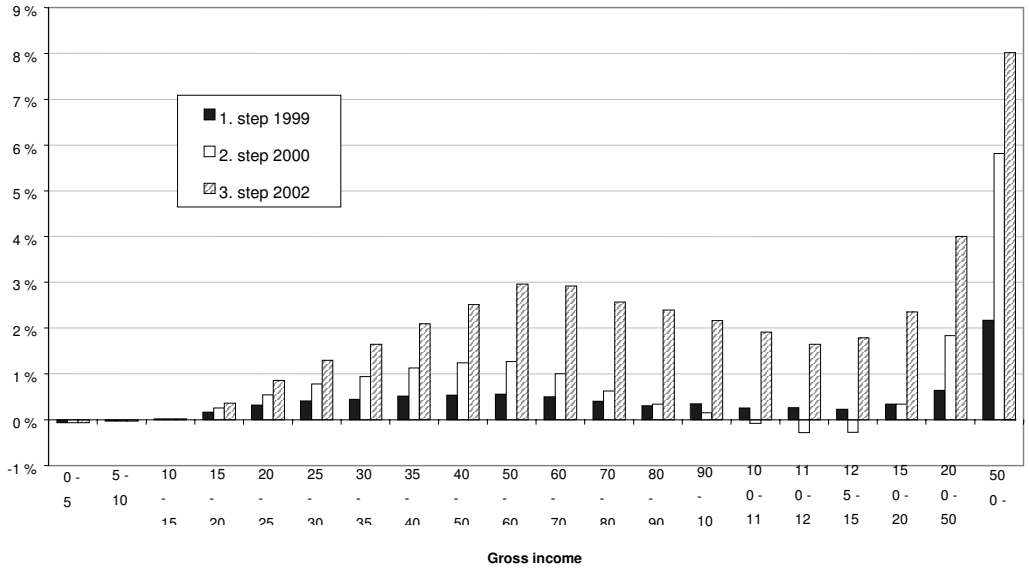
In the last reform step, unmarried taxpayers in the DM 0-20 000 and DM 60 000-200 000 income brackets profit less than the average taxpayer in the general population with the same salary classifications.

Figure 3: Effects on Disposable Income in the Three Reform Stages – Overall Population (in per cent of Disposable Income) in 1999, 2000 and 2002



Source: own calculations.

Figure 4: Effects on Disposable Income in the Three Reform Stages - Unmarried Population (in Per cent of Disposable Income) in 1999, 2000 and 2002

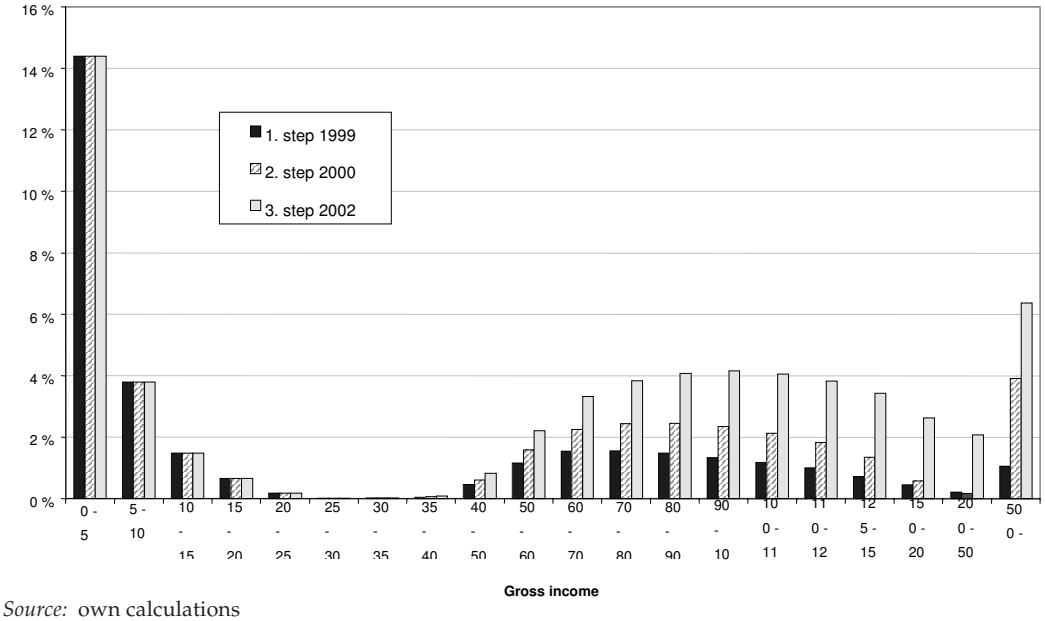


Source: own calculations.

Examining the married taxpayers as represented in Figure 5, the largest advantages can be found in the lowest income brackets, decreasing as gross income increases. This rise is constant in all reform steps, it being a result of increased child benefits, which will raise disposable income.

For gross income from DM 25 000- 40 000, married taxpayers barely profit from the whole reform. In the upper income brackets, the limitation of the splitting advantage for married taxpayers leads to lower tax relief as compared with unmarried taxpayers, in spite of the fact that the marginal tax rate is the same at 48.5 per cent.

Figure 5: Effects on Disposable Income in the Three Reform Stages - Married Population (in per cent of Disposable Income) in 1999, 2000 and 2002



Source: own calculations

Summarising the results, it becomes obvious that almost the whole population benefits from the reform, with only some single taxpayers losing out. The average maximum loss is DM 225 for unmarried taxpayers with a gross income of DM 125 000 - 1500 00 in the second step. The weighted average gain in disposable income for all taxpayers in the first step is 0.6 per cent. In the second step it is 1.0 per cent and in the third 1.9 per cent.

E. Conclusion

When reforming the tax and transfer system, it is important to study the distributional and revenue effects that such a proposal may have. Both politicians and taxpayers have an interest in the impact of such reforms. In Germany, only the revenue effects are calculated by the Ministry of Finance. The leading German research institutes, however, do not have a microsimulation-model to investigate distributional effects. Only the Federal Ministry of

Finance together with the Society for Mathematics and Data Processing (*Gesellschaft für Mathematik und Datenverarbeitung*, GMD) has such a model, but their results are not published. Our simulation model is a suitable instrument for analysing the first-order impacts of reform proposals. In the near future we plan to expand our model and will analyse second-order effects. In addition, labour supply effects of changes in the tax and transfer system will be integrated. Then even behavioural adaptations can be analysed in a mid-term perspective. While we are satisfied with the results our model has yielded so far, much work remains to be done before all questions of interest will have been answered.

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Appendix:

Sources of gross income

1. Income from agriculture and forestry
2. Income from business
3. Income from self-employment
4. Income from employment
5. Income from capital assets
6. Income from renting and leasing
7. Redundancy payments, lay-off benefits, tide-over allowance
8. Premium payments, share in profits, rewards
9. Old-age pensions from the statutory pension insurance from own employment
10. Widow and widower pensions from the statutory pension insurance
11. Orphans' pensions from the statutory pension insurance
12. Old-age pensions from supplementary insurance of public employees and workers from own employment
13. Widow and widower pensions from supplementary insurance
14. Orphans' pensions from supplementary insurance
15. Injury pensions from statutory accident insurance
16. Widow and widower pensions from statutory accident insurance
17. Orphans' pensions from statutory accident insurance
18. Sickness benefits from statutory health insurance
19. Unemployment benefits

20. Short-time workers payments, bad weather payments
21. Other permanent transfer payments from public employment programmes
22. Maternity benefits
23. Social aid
24. Child care benefits/grants from the Federal Education Act
25. Permanent transfers from the Federal Training Assistance Act (*Bafög*)
26. Disability pension from the war victims welfare service
27. Survivors' pension from the war victims welfare service
28. Other permanent transfers from the regional authority
29. Unemployment aid
30. Early retirement payments, old age transition payments
31. Public pensions and pensions from public enterprises from own employment as civil servants
32. Public pensions and pensions from public enterprises for widows and widowers
33. Public pensions and pensions from public enterprises for orphans
34. Company pensions from own employment
35. Company pensions from other claims
36. Permanent transfers from private health, damage and accident insurance
37. Strike support payments (from unions to their members)
38. Other permanent transfers from non-profit organisations (churches, labour unions)
39. Other permanent transfers from private households
40. Child benefits