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Summary

This study on market and non-market labor supply and taxes is based on a theoretical microeconomic model with multiple labor supply in the formal and informal economy. This multiple time allocation model, which explicitly takes into account taxes, transfer payments, socioeconomic characteristics of the individual and the household, is specified in a multiple three-stage approach explaining the participation probability, the relevant wages and the hours of work in different activities. Uncompensated and compensated elasticities on market and non-market labor supply are computed. The estimates are based on data from the enlarged Sfb 3-Secondary Occupation Survey 1984, enlarged by tax and regional information for the economic situation and labor demand consideration. This microanalysis will follow the substantial question whether incentive or disincentive labor supply effects of the 1990 German tax reform are to be expected. The recent German Tax reform impacts are quantified by a combined dynamic and static microsimulation approach based on microeconometric estimated behavioral pattern representative for the Federal Republic of Germany.

JEL: C80, C81 J20, J22, H24, H26, D13

Keywords: *behavioural effects*

Zusammenfassung

Diese Studie über markt- und nichtmarktmäßiges Arbeitsangebot und Steuern basiert auf einem theoretischen mikroökonomischen Modell multipler Aktivitäten in der formellen und informellen Ökonomie. Dieses multiple Zeitallokationsmodell, das explizit Steuern, Transferzahlungen und soziökonomische Charakteristika enthält, wird in einem multiplen dreistufigen mikoökonometrischen Ansatz spezifiziert, der die Partizipationswahrscheinlichkeit, die relevanten Lohnsätze und die Arbeitszeit in den verschiedenen Aktivitäten erklärt. Unkompensierte und kompensierte Elastizitäten markt- und nichtmarktmäßiger Aktivitäten werden berechnet. Die selektionskorrigierten Schätzungen basieren auf Mikrodaten der Sfb 3-Nebenerwerbstätigkeitsumfrage, die um Regionaldaten zur ökonomischen Situation und der Arbeitsnachfrage sowie um spezifische Steuerinformationen aus dem Sozio-ökonmischen Panel erweitert wurden. Diese Mikroanalyse folgt der substantiellen Frage, ob Anreizwirkungen der bundesrepublikanischen Steuerreform von 1990 erwartet werden können. Die kombinierte dynamische und statistische Mikrosimulationsanalyse, mit für die Bundesrepublik repräsentativen Daten, basiert auf den mikroökonometrisch geschätzten individuellen Verhaltensweisen.

JEL: C80, C81, J20, J22, H24, H26, D13

Schlagwörter: *Steuerreformeffekte, Verhaltensreaktion, kombinale und statistische Mikrosimulation*

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0 Introduction

Individual labor supply is an ongoing topic in the economic and social-political discussion and of specific interest, when incentive or disincentive effects of governmental tax and transfer programs are discussed. The actual cause is the 1990 German tax reform. Though there are a many angloamerican studies on labor supply in general (with and without taxes)[1], empirically based micro studies are rare for the FRG[2] and concentrated only on market activities in the formal economy.[3] Since taxes might effect paid market labor supply as well as unpaid non-market economic activities within a household, a combined empirical microanalysis is needed, but until now not available for the FRG. In view of 1990 tax reform policy effects and socioeconomic characteristic influences the following will contribute to such a combined

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1 See the Ashenfelter and Layard 1986 'Handbook of Labor Economics' with its surveys on female (Killingsworth and Heckman 1986) and male labor supply (Pencavel 1986).

2 But see e.g. Hübler 1983 or Franz 1985 based on regional data and Merz 1987, 1990 with representative data for the FRG.

3 See v. Essen, Kaiser and Spahn 1988 and Kaiser, v. Essen and Spahn 1989, Wagenhals 1992 incorporating tax influences.

microanalysis of market and non-market labor supply. In addition the scope is widened and multiple activities within both, paid and unpaid labor supply are considered.

Income taxes, in principle, can contribute to increase or reduce labor supply. In general, the German 1990 tax reform is reducing the tax burden. Therefore compared to the situation before, reduced taxes raise net wages and thus raise labor supply via the substitution effect. At the same time reduced taxes raise total income. This leads to more demand for goods including leisure time activities which then results in an decrease of labor supply. Which kind of effect finally dominates, the substitution or the income effect, and how much labor then is being offered, can only be settled empirically. Moreover the effect of taxes, on unpaid non-market labor supply - on houesehold production activities - is hardly known and not investigated so far.[4] Thus, tax (reform) effects on market and non-market labor supply is the focus of our microeconomic, microeconometric and combined dynamic and static microsimulation analysis with behavioral response.

The topic of this article is threefold: First a microeconomic model of multiple market and non-market labor supply activities is to be formulated within the time allocation framework. Second, based on this theoretical approach the microeconometric specification encompass activity specific participation, endogeneous (marginal) wage rates and hours of work taking into account the selectivity bias problem. Third, microsimulation of the planned German 1990 tax reform will show tax policy time allocation incentive and disincentive effects on market and non-market labor supply. Both, the microeconometric estimation and the microsimulation analysis of tax reform effects are based on a FRG representative sample, the Sfb 3-Secondary Occupation Survey 1984 enlarged by regional economic and labor demand information.

1 A microeconomic labor supply model of multiple market and non-market activities

Analyzing the 1990 tax reform effects on individual market and non-market activities, we want to attach importance to a theoretically and empirically based analysis where the effects of the modifications of the fiscal law are discussed within a microeconomic model and a microeconometric framework. Hence the point of departure of the microsimulation analysis is a time allocation microeconomic model of multiple labor supply activities.

4 But see the Swedish analysis by Flood 1988

1.1 Time allocation of market and non-market labor supply

In the sequence of Becker 1965, Lancaster 1966 and Gronau 1977/1980 an individual receives ***utility*** u not from the purchased goods itselves but from the output of goods and services **z** produced in the household

$$u = u(\mathbf{z}) = u(z_E, z_F). \qquad (1)$$

With respect to the empirical data at hand and described in section 3 the commodities produced are divided into specific 'do it yourself' (DIY) products z_E and in all other household products combined in z_F, thus $\mathbf{z} = (z_E, z_F)$[5]. The efficient production of these non-market commodities on the basis of the household technology being at one's disposal is described by the ***household production function***

$$\mathbf{z} = \mathbf{z}(X, t_C) = \mathbf{z}(X, t_E, t_F), \quad (2)$$

where the Hicksian composite commodity X purchased at the market is combined with consumption time t_C producing $\mathbf{z} = (z_E, z_F)'$, where $z_E = z_E(X, t_E)$ and $z_F = z_E(X, t_F)$.

The inputs in the household production process are restricted by ***a time constraint*** and a ***budget constraint***. Total consumption time t_C is divided into time spent for DIY production t_E and into time spent for all other household production activities t_F, further called leisure; thus $t_C = t_E + t_F$. Time spent in paid market activities t_M is divided into time spent in a primary occupation t_H and in a secondary occupation t_N ($t_M = t_H + t_N$). Together with the time segments spent in household production total time then is allocated within the ***time constraint*** to

$$t = t_M + t_C = t_H + t_N + t_E + t_F. \quad (3)$$

The disposable income available for the consumer expenditures PX (P is the price of the Hicksian 'composite commodity') is made up of labor income and non labor income. With multiple market activities and according to our empirical data, labor income then is subdivided into an income from a primary occupation $w_H^b t_H$ and an income from a secondary occupation $w_N^b t_N$; w_H^b and w_N^b are the gross wages per time unit (e.g. hourly wage rates) in the respective primary and secondary occupation. Then the ***budget restriction*** is

$$PX = V^b + w_H^b t_H + w_N^b t_N, \qquad (4)$$

where V^b is gross non labor income.

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5 A detailed analysis of the more general model with market and non-market activities is given in Merz 1989a.

1.2 Taxes, transfers and socioeconomic characteristics

Taxes which are to be paid either on labor or non labor income reduce the corresponding gross terms, the gross non labor income V^b and the gross labor income $w_H{}^b t_H + w_N{}^b t$ by the tax liability $T(V^b, w_H{}^b t_H, w_N{}^b t_N)$.[6] Considering the taxes explicitly, the ***budget restriction with taxes*** is

$$PX = V^b + w_H{}^b t_H + w_N{}^b t_N - T(V^b, w_H{}^b t_H, w_N{}^b t_N) \text{ or } (5a)$$

$$PX = I = V + w_H t_H + w_N t_N \qquad (5b)$$

where

$$w_H = (1 - \tau_A) w_H{}^b \ , \ w_N = (1 - \tau_A) w_N{}^b \qquad (5c)$$

$$V = V^b - \{T(V^b, w_H{}^b t_H, w_N{}^b t_N) - \tau_A [w_H{}^b t_H + w_N{}^b t_N]\} \qquad (5d)$$

$$\tau_A = |T(V^b, w_H{}^b t_H, w_N{}^b t_N)/|(w_H{}^b t_H + w_N{}^b t_N]. \qquad (5e)$$

With the marginal tax rate regarding the wage income, τ_A, the gross terms (with an upper index b) in (5c) are transformed into ***marginal net wage rates*** w_H and w_N. V is the transformed so-called ***'virtual'*** non labor income and marks that kind of non labor income that is assigned to the net wage rate of a certain segment of the kinked budget curve.[7] As equation (5d) shows, the virtual non labor income is not only directly influenced by the total tax liabilities T(.) but particularly by the marginal tax liability of the labor income $\tau_A [w_H{}^b t_H + w_N{}^b t_N]$.

Transfers will be a part of gross non labor income V^b and may include property income, subsidies of third private parties, and in particular public and social security payments.

The time restriction (3) and the budget restriction (5b) can be integrated in an extended ***full-income equation*** following Becker. The 'full-income' S is total time income, that is to be allocated to the consumption expenditures PX and the valued consumption time $t_C = t_E + t_F$, valued by the wage from secondary occupation w_N:

$$PX + w_N(t_E + t_F) = V + w_H t_H + w_N(t - t_H) = S \ (6)$$

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6 For further discussion of the effects of tax and transfer payments in the microeconomic static labor supply model cp. Killingsworth 1983 chap. 6, Aaron and Pechman 1981 and Hausman 1981, 1985. However, the discussion there is restricted to a single category of paid work.

7 Burtless and Hausman 1978 describe V as 'virtual' because it is assumed that the decision maker acts 'as if' its non labor income is V_i when being on the budget segment i.

The evaluation of the consumption time by the secondary occupation wage as opportunity costs is based on the assumption of a rationed primary occupation with a certain desired income only achievable if a secondary occupation is pursued.[8] Hence the labor supply in the secondary occupation t_N becomes the decision variable in the case of multiple (here twice) market labor supply activities.

The formulation of the time allocation problem so far is based on a representative decision maker (individual/ household). In general different persons will have different preferences which then lead to different allocation decisions even if they face the same non labor income and the same market wage rates.

Different preferences can be explicitly taken into account via individual observed variables, i.e. ***socioeconomic characteristics*** (such as gender, age, household situation etc.). As unobservable they may be included in the error term of the microeconometric specification. As observed ones, they consequently enter the utility function $u = u(\mathbf{z};\mathbf{s})$ as preference factors described by a vector $\mathbf{s}$.

The following derivation of the optimal market and non-market labor supply time allocation equations is taking into account different individual preferences via those socioeconomic characteristics.

1.3 Optimal time allocation equations

An individual now maximizes its utility (1) with regard to the output of household commodities described by the household production function (2). This decision is constrained by the time constraint (3), the budget constraint (5a) and the available household production technology.[9]

The corresponding Lagrangian with respect to the input terms is

$$L(X,t_E,t_F,\lambda_I,\lambda_t;\mathbf{s}) = u[f(X,t_E,t_F);\mathbf{s}] - \lambda_I(PX - V - w_H t_H - w_N t_N) - \lambda_t(t_H + t_N + t_E + t_F - t) . \quad (7a)$$

[8] Shisko and Rostker 1976 use a similar rationing approach. However, they do not include taxes and informal activities.

[9] A similar model was formulated by Flood 1988 who with respect to Gronau 1977, 1980 takes account of taxes; besides taxes and transfer payments we enhance the approach and also include multiple activities.

The first order conditions are[10]

$$u_X = \lambda_I P \ , \ u_{tF} = u_{tE} = \lambda_t \ , \ w_N = \lambda_t/\lambda_I \quad (7b)$$

$$u_X = \lambda_I P \ , \ u_{tF} = u_{tE} = \lambda_t \ , \ w_N = \lambda_t/\lambda_I \quad (7b)$$

and after transformations via $u_{tF}/u_x = \lambda_t/(\lambda_I P) = G^r$ [11] to $(G^r - f') = 0$ with $f' = u_{tF}/u_X$ or

$$t_E(G^r - f') = 0, \qquad (7c)$$

as well via $w_N = \lambda_t/\lambda_I$ with $G = \lambda_t/\lambda_I = G^r P$ to $(G - w_N) = 0$

$$t_N(G - w_N) = 0. \quad (7d)$$

In order to achieve an interior solution[12] regarding the ***optimal home production time*** t_E ($t_E > 0$), the optimum condition is $G^r = f'$, i.e. the shadow price of leisure (G^r)[13] has to be equal to the shadow price of the household production ($f' = f'_{tE}/f'_X$ ratio of marginal productivities). As long as the shadow price of the household production is lower than that of leisure ($f' < G^r$), there will be no time invested for DIY household production: $t_E = 0$.

In order to achieve an interior solution regarding the ***optimal labor supply in secondary occupation*** t_N ($t_N > 0$), the optimum condition is $G = w_N$, i.e. the shadow price of leisure (G = marginal rate of substitution between consumption and leisure) must correspond to the marginal net wage (w_N). As long as the marginal net wage is lower than the shadow price of leisure ($w_N < b$), there will be no secondary labor supply: $t_N = 0$.

The Marshallian allocation equations derived from these optimum conditions for the consumption goods X and the leisure time t_C are

$$X = X(P,w_N,S,\mathbf{s}) = X(P,w_H,w_N,V,t_H,t,\mathbf{s}) \qquad (8a)$$

$$t_C = t_C(P,w_N,S,\mathbf{s}) = t_C(P,w_H,w_N,V,t_H,t,\mathbf{s}) \qquad (8b)$$

The relevant optimal time allocation equations for labor supply in the secondary occupation t_N and in the household production t_E consequently are

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10 Applying the vector chain rule (e.g. see Graham 1981, chapt. 4.2) succeed in $u_X = \partial u/\partial x = (\partial u/\partial z)'(\partial \mathbf{z}/\partial X) = [(\partial z/\partial X)(\partial u/\partial \mathbf{z})]' = (\partial \mathbf{z}/\partial X)(\partial u/\partial \mathbf{z})$.

11 $u_{tF}/u_x = (\mathbf{z}/t_E)/(\mathbf{z}/X) = f'_{tE}/f'_X = f'$ where
$\partial \mathbf{z}/\partial t_E = (\partial z_E/\partial t_E, \partial z_F/\partial t_E) = (f'_{tE}, 0)$ and $\partial \mathbf{z}/\partial X = (\partial z_E/\partial X, \partial z_F/\partial X) = (f'_X, 0)$ if $z_f = f(t_F) = t_F$

12 Given a convex budget set and a quasi concave utility function

13 Relative to the price level P.

$$t_N = t - t_H - t_C = t_N(P,w_H,w_N,V,t_H,t,\mathbf{s}) \quad (8c)$$

$$t_E = t_E(P,w_N,S,\mathbf{s};f'_{tE}) = t_E(P,w_H,w_N,V,t_H,t,\mathbf{s};f') \quad (8d)$$

where t_H again is given rationed primary occupation hours of work.

Note, that the optimal household production in particular results from the ratio of the marginal productivities of the household production function $f' = f'_{tE}/f'_X$. The above ***input oriented time allocation problem*** and its solution in the formal and informal economy is formulated taking account of taxes and transfer payments via the marginal net wages w_H and w_N and the virtual non labor income V. For further details and for studying an ***output oriented formulation*** with explicit household commodity shadow prices arising from a three-stage activity model and with regard to duality, the reader is referred to Merz 1989a.

2 Microeconometric specification of participation, endogeneous wage rates and hours of work in primary and secondary occupation and household production

In accordance with the formulated time allocation model, market and non-market labor supply is among others a function of individual (marginal) market wage rates. These wage rates can be observed for gainfully employed persons in a primary or secondary occupation only. For non-gainfully employed persons it is a unobservable wage rate which an individual could receive in principle.

In order to achieve a correct and consistent estimate on the basis of individuals exerting an activity (and whose wage rates or working hours are observable), but taking into account the information of the non-gainfully employed persons (having non-observable dependent variables) too, the hereby given ***'selectiviy bias'*** has to be corrected for.[14] More general, selectivity is connected with each single market and non-market activity with respective active and non-active persons in a sample.

According to the Heckman 1979 two stage procedure to correct the selectivity bias, first, the participation probability (in primary, secondary occupation and household production) has to be determined for each active person respectively. With herefore estimated coefficients and values of the explanatory variables, (e.g.) on the basis of a PROBIT-index function, a correction variable, called the hazard rate or inverse of Mills' ratio, is then calculated for each respective active person. Then a selectivity bias corrected OLS estimation (COLS) can be carried out with this additional variable based on available positive dependent values only.

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14 For further discussion, cp. Heckman 1974, 1979 and Gronau 1974.

In our model the relevant (marginal) wage rates will be endogenized and then considered explicitly as explanatory variables in the hours of work equations. The wage rates for the primary and secondary occupation may on the one hand depend on individual abilities, such as schooling, vocational training, work experience (human capital terms)[15] and, on the other hand, on labor market conditions which are the elements of an explantory vector $\mathbf{x}_{wi}$ of an individual i. An error term ε_{wi} in the wage equation

$$w_i = w_i(\mathbf{x}_{wi}, \varepsilon_{wi}) \quad (9)$$

stands, among others, for non-observable variables such as motivation, innate abilities etc.

The microeconometric time allocation model then is to be specified in three stages:

Stage 1: Estimation of the participation probability (PROBIT) of an activity j; calculation of the 'selectivity bias' correction term λ_{ji} for all persons with an activity j (j=primary occupation (H), secondary occupation (N), household production (E)) respectively;

Stage 2: 'selectivity bias' corrected estimation (COLS) of the (marginal) wage rate in the activity j (j=H,N);

Stage 3: 'selectivity bias' corrected estimation (COLS) of weekly hours of work with endogenized (marginal) wage rates from stage 2 for all formal and informal activities j (j=H,N,E).

Because of the specific structure of the 1990 German tax reform structure with a broad range of linear marginal tax rates, it seems to be appropriate to approximate the in principle kinked budget curve by a respective linear specification of the model (not following the non-linear Hausmann and Blomquist approach). Hence, the block recursive equation system with a linear approximation of the respective relations is formulated as follows:

15 Cp. e.g. Mincer 1974, Blinder 1976 and Wagner and Lorenz 1988 for testing earnings functions.

$$N^{-1}[p_j(t_{ij}>0)] = \alpha_j'\mathbf{x}_{pji} + \varepsilon_{pji} \quad (i\in A_j, j=H,N,E) \qquad (10a)$$

$$\ln w_{ji} = \boldsymbol{\beta}_j'\mathbf{x}_{wji} + \delta_{wj}\lambda_{ji} + \varepsilon_{wji} \qquad (i\in A_j, j=H,N) \quad (10b)$$

$$t_{Hi} = \gamma_{wHH}(\hat{w}_{Hi}) + \gamma_{VH}V_i + \gamma_{sH}'\mathbf{s}_i + \delta_{tH}\lambda_{Hi} + \varepsilon_{tHi} \quad (i\in A_H) \quad (10c)$$

$$t_{ji} = \gamma_{Nj}(\hat{w}_{Ni}) + \gamma_{wHj}w_{Hi} + \gamma_{tHj}t_{Hi} + \qquad (10d)$$

$$\gamma_{Vj}V_i + \gamma_{sj}'\mathbf{s}_i + \delta_{tj}\lambda_{ji} + \varepsilon_{tji} \qquad (i\in A_j, j=N,E).$$

N^{-1} is the transformation of the dependent 0,1-variable based on the normal distribution (PROBIT-approach); $p_j(\mathbf{x}_{pji})$ is the participation probability; $\mathbf{x}_{pji}$ is the vector of the explanatory variables of stage 1; $\mathbf{x}_{wji}$ is the vector of the explanatory wage rate variables (human capital terms); V_i is the virtual non labor income (trans(transfer payments and property income); $\mathbf{s}_i$ is the vector of socioeconomic characteristics; λ_{ji} is the respective individual selection correction variable; ε_{pji}, ε_{wji} and ε_{tji} are normally distributed error terms and α_j, $\boldsymbol{\beta}_j$, $\gamma_{s.}$, δ_j are parameters respective parameter vectors to be estimated. A_j is the set of persons who are involved in the activity j(j=H,N,E), A is the set of all persons in the sample.

This block recursive model specification (a more generalized approach is specified in Merz 1990b) in particular aims at showing possible different explanatory patterns for time allocation in the secondary occupation (t_{Ni}) and in the DIY household production (t_{Ei}) of an individual i. According to the relations of the rationed theoretical model, the given rationed labor supply in a primary occupation t_{Hi} and the given (marginal net) primary wage rate w_{Hi} enter the time allocation equations of activities in the secondary occupation and the household production corrected for the 'selectivity bias'.

The decision relevant (marginal net) wage of a secondary occupation w_{Ni}, however, is of particular interest and will be endogenized and imputed as an estimated term into the explanation of supplied hours of work. The logarithms of the wage rates are taken to allow for non-linear relations; the imputed wages ($\hat{w}_{ji}$) then are logarithms of the estimated net marginal wage rates ($\ln w_{ji}$). The dependency of the time spent in household production by the ratio of the marginal productivities is approximized by the set of socioeconomic variables designed to describe the household technology.

Finally, in order to correctly determine the significance of the estimated parameters, the correct asymptotic covariance matrix of the parameter vectors, according to Lee et al. 1980, is calculated and shown in the following tables.

3 Microdata base: The Sfb 3 - Secondary Occupation Survey enlarged by regional and specific tax information

The microanalysis will be based on the Sfb 3-Secondary Occupation Survey 1984 of the Special Collaborative Programme 3 (Sonderforschungsbereich 3, Sfb 3) 'Microanalytic Foundations of Social Policy' of the Frankfurt and Mannheim Universities designed by Helberger, Merz and Schneider (1985). The Sfb 3-Secondary Occupation Survey aimed at obtaining representative microdata for the first time for the Federal Republic of Germany on primary occupation, secondary occupation, household production and combined activity patterns thereof. Questions concerning illicit work were embedded in those parts dealing with secondary occupation. Deatilled microanalyses of illicit work are given in Merz 1991d, Wolff 1991, and Merz and Wolff 1993.

Concerning the main topics mentioned above, the kind of activity, the amount of time spent therein and the evaluation of the monetary/non-monetary income of secondary occupation and the saving by do it yourself (DIY) in the household production were explicitly asked for. In addition, information on an involvement in so-called social networks were obtained as well as numerous socioeconomic data on the persons interviewed. The representative survey conducted by MARPLAN is based on the West German residential population aged 14 years and older. There are 7826 interviews within four seasonal subsamples (for descriptive results see Helberger and Schwarze 1986, Merz and Wolff 1988 and Merz 1989a).

Since there is no standard definition of ***'secondary occupation'*** some remarks should be made on our concept of this term. Secondary occupation is, as our results will show, not a phenomenon which is only observed at primarily employed but is of particular importance for non-gainfully employed persons as well. Thus, besides the multiple job holding in primary and secondary occupation, self reported secondary activities of housewives/housemen, unemployed, pupils, students and pensioners were included in the sample, too.

Concerning ***household production***, we concentrate on goods and services, which in particular are accessible to a market substitution (cp. Merz and Wolff 1988, 1993). The chosen open formulation of the question particularly allows for a self-reported statement on the corresponding activities. The given answers altogether describe 'do it yourself' (DIY)-activities. This concept uses a more restricted but at the same time more precise selection criterion as other surveys on household production.

The following microeconometric analysis and the microsimulation of the 1990 tax reform is based on the fourth representative subsample (4th quarter 1984), since this subsample provides particularly detailed information on taxes and transfer payments.

Merged regional and specific tax information

There are two additional features regarding the microdata base for our investigation: regional features and specific tax information. With regard to the analysis of factors of labor demand, we were able to exactly merge ***regional information*** of the respective economic and labor demand situation also dating from 1984 (85 planning regions with regard to economic interesting border lines) of the Bundesforschungsanstalt für Landeskunde und Raumordnung (Federal Research Institute on Regional Planing). These data provide an extended microdata file containing information for every household on the economic situation and the possibilities of employment in the corresponding region (for details, cp. Merz 1989a, par. C).

The second feature is on specific ***tax information***. Based on more detailed and comprehensive microdata according the individual tax situation in the Socio-Economic Panel of the Sfb 3/DIW[16], individual marginal taxes and the tax amount with respect to the household situation could be merged to our Sfb 3 - Secondary Occupation Survey. The tax computations within the Socio-Economic Panel data (1st wave, 1984) were done by the researchers of the Sfb 3 tax project (C-8) (v. Essen, Kaiser and Spahn 1988). I gratefully acknowledge their assistance and support.

In extending microdata by a comprehensive concept on secondary occupation and including the home production in the survey context, and expanded by regional and specific tax information, the enlarged Sfb 3-Secondary Occupation Survey provides detailled microinformation in order to examine market and non-market activities of private households on an individual level.

4 Estimation results of market and non-market labor supply - Participation, marginal net wages and hours of work

According to the available microdata just described, we focus within market labor supply on activities of a possible primary and/or secondary occupation. The secondary activities can either be carried out in addition to a paid main occupation or in addition to a main but not paid activity (for pupil/student, housewife/ houseman or pensioner). A secondary occupation would be illicit work when taxes and/or social welfare contributions are evaded.[17] In addition, unpaid activities in the household production are further classified as non-market economic activities.

Based on the microeconomic/microeconometric specification of the time allocation model of market and non-market activities and taking into account tax influence, transfer payments and

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16 See Sonderforschungsbereich 3 1988 und Hanefeld 1987.

17 According to the studies by Wolff 1991 and Merz and Wolff 1993 based on the same data base, there are about 40% of secondary occupation which could be classified as illicit work.

socioeconomic variables, we now analyze and quantify the determinants of the participation in the respective activity, the endogeneous wage rates in a primary and secondary occupation and the selectivity bias corrected market and non-market labor supply, i.e. hours of work in primary occupation, secondary occupation and household production.

4.1 Participation

The first stage of the three-stage model explains the probability of a participation in market and non-market activities. We want to subdivide the explanatory variables $\mathbf{x}_{pj}$ (j=primary occupation (H), secondary occupation (N), household production (E)) of the PROBIT-index function from equation (10a) into personal characteristics, household characteristics as well as regional and labor market information. Table 1 shows the estimated PROBIT-coefficients[18] as well as their t-values.[19]

Participation in an Primary Occupation

The probability of a ***primary labor force participation*** significantly depends on gender, non-linearly integrated age, school education, personal transfer payments and household characteristics.[20] Transfer payments as pensions, grants from public funds for pupils/students and private subsidies reduce significantly the probability of a primary occupation. The more persons in the household are gainfully employed (with an income of >100DM/month) the higher the probability of a primary occupation of the interviewed person. This indicates that several members of the household have to be gainfully employed (additional worker hypothesis) to provide for the family.

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18 All estimates are computed by the author's TOBIT/COLS program package.

19 The participation quotas in the first line refer for the econometric estimation to non-adjusted values; they are below the values which are indicated for all four subsamples by a weighted analysis of primary occupation (42.3%), secondary occupation (9.3%) and household production (27.8%) (see Merz and Wolff 1988, 1993).

20 The estimated coefficients are related to a reference person; the respective reference characteristic in the tables is marked with +.

tab1

tab 1

tab 1

Tax liabilities refer to the total income and thus to income elements which surpass primary labor income. Since a certain multicollinearity between the tax liabilities and the labor force participation for a one-person-household cannot be excluded, one should not attribute too much causal importance to the positive tax liabilities coefficient, at least for this category of one-person-households.

The formulated theoretical model assumes that the primary occupation is carried out regardless of a secondary occupation and an engagement in the household production. In order to check this hypothesis we have included the secondary occupation and the household activity (in different activity categories respectively) as well as the corresponding time of activity and remuneration into the participation equation of primary labor supply. The results: non-significant coefficients clearly support our theoretical model, a participation in primary occupation is independent from further economic activities.

It is expected that labor market conditions, i.e. the possibility to be gainfully employed at all, as well as and in addition to individual characteristics determine the participation in a primary occupation. The regional and labor demand indicators (class of community size, share of jobholders in the tertiary sector, ratio of vacancies and unemployed, longtime unemployed and economic strength of a region measured at the gross added value per capita), however, are of no significant importance here. Other person and household specific influence factors, such as a specific school-leaving certificate seem to be of greater importance for a primary labor force participation.

Participation in a Secondary Occupation

Considering the ***labor force participation in a secondary occupation***, specific informal activities in the household production are important: DIY-activities such as renovating, house construction and car repair are positively correlated with a higher probability of secondary occupation. Thus, a person who carries out an unpaid activity in this category is also likely to exert a paid secondary occupation.

Unpaid activities in social networks, here in particular help for relatives and friends, increase the probability of a paid secondary occupation. Active social contacts in this area with all its information processes make a paid secondary activity more likely. They also indicate an especially active and multiple engaged part of the population who is also engaged in household production.

Compared with other professional statuses, being a pensioner significantly increases the probability of a secondary occupation. A high household income also increases secondary occupation. Different to the primary occupation, the labor market situation does play a role for the secondary occupation: the more unfavourable a labor market situation (measured at the

quota of vacancies in relation to the unemployed)[21], the higher the probability to have a secondary occupation. An economic need to earn additional money becomes apparent in those regions which have a tight labor market situation.

Participation in Household Production

We have already pointed out a linkage of the activity pattern regarding social network activities; concerning the ***participation in household production*** active social networks supports DIY-activities at home. In addition, there is a linkage to paid secondary market work; the costs of a secondary occupation are important as well. Higher commuting and other secondary occupation costs make a secondary occupation unattractive and consequently saving activities in the home production (significant positive coefficient) arise. Especially women are engaged in particular in non-market economic activities: they have a higher participation probably not only in 'normal' household activities but also in close to the market DIY-activities which go beyond those 'normal' household and housework activitities. A proper flat and/or house increases the DIY participation as expected. Regional and labor market indicators are of importance for the DIY participation in as much as they indicate a higher activity level in smaller towns/communities. A higher quota of regional longterm unemployment reduces the engagement in secondary occupation and in the household production significantly. A certain effect of discouragement or a generally decreasing activity pattern seems to appear together with a lasting unemployment quota in the region.

All in all we can record a clearly different explanatory pattern for the participation in market and non-market labor supply. This also applies for the influence of the household individual tax liabilities which are not of significant importance for exerting a secondary occupation and household activity. It is to be noted that a person pursues a secondary occupation if it practices a second (paid) work besides its main primary occupation or main unpaid household activity. If multiple jobholders had been considered alone, i.e. primary actives who carry on an additional secondary occupation, the influence of tax liabilities might be more distinct for the participation decision.

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21 It is to be indicated that the official statistical data base of the numerator and the denominator are different and the meaningfulness of the indicator 'vacancies' is limited.

4.2 Marginal net wages

In the microeconomic model formulation the influence of taxes is formulated by way of two variables: via the marginal net wage rate and the virtual property income. The endogenous wage rate which is to be explained is thus a marginal net wage rate, which, according to the equation system (10), is to be estimated for a primary and a secondary occupation.

When estimating the tax dependent marginal wage rate there is a simultaneity problem with the finally estimated hours of work. The problem is that individuals will face non-linear budget sets, so that the marginal wage rate varies with how many hours the individual works. In principle, there are three procedures to account for this: a full information approach, a linear approximation[22] and the instrumental variable method.[23]

We use an instrumental variable approach. The marginal tax rate τ is individually computed with the data of the Socio-Economic Panel. Then they are merged via socioeconomic variables to each person in the Sfb 3-Secondary Occupation Survey. Then for each person in our sample the net marginal wage rate is calculated by

$$\hat{w} = (1-\tau)w^b.$$

In our three-stage-model the respective net marginal wage rate (calculated by the individual marginal tax rate) will be estimated endogenously and then will enter the working hours equation.

Table 2 contains the marginal net wages' parameter estimates (PROBIT/COLS approach) and includes the selection correction variable, the hazard rate, computed from the participation equation. Dependent variable is the logarithm of the marginal net wage rate.

Marginal net wages in a primary occupation

Regarding the ***marginal net wage in a primary occupation***, variables according to human capital theory like professional experience[24], school-leaving certificate, position and part time employment prove to be highly significant factors. A non-linear influence of the professional experience as well as the importance of different school-leaving certificates and professional statuses become evident. A gender specific difference has

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22 Both procederes are compared by Wales and Woodland 1979.

23 See e.g. Wales 1973.

24 Approximized by age minus average school education years.

tab 2

tab 2

to be recorded: women have a significantly lower marginal net wage rate in the primary occupation than men. Labor market indicators are not significant. The selection correction variable is significant: thus, an estimation of the marginal net wage rate in the primary occupation with OLS alone would have given biased results. In other words, our theoretical model and estimation approach correspond to the empirical facts observed.

Marginal net wages in a secondary occupation

The explanation of the ***marginal net wage rate in a secondary occupation*** reveals a different structural picture. The respective school-leaving certificates are significant and in their different influence are similarly structured compared with the primary occupation. However, the professional experience and the present professional status are not significant. As expected, illicit work increases the marginal net wage rate and a clear tax effect might well be linked with it. The negative significant coefficient of the gross added value per capita is an indicator for the character of an alternative economy: the worse the economic situation of a region, the higher is the marginal net wage rate, characterizing a special engagement in the secondary occupation. The R^2-values, which are quite high when compared to cross section results in general, show a relatively good fit and explanation of the marginal wage rates in the primary and secondary occupation with our model approach.

4.3 Hours of work

The estimated marginal net wages enter the working hours equations in the formal and informal economy as explanatory equations in form of 'imputed wages'. In order to avoid multicollinearity the labor supply equations do not include the variables which have already been used for explaining the marginal net wages. Those variables encompass gender, work experience, school leaving certificate, occupational status, secondary occupational characteristics including illicit work as well as regional and labor market information.

With the model specification of the equation (10) the own ln marginal primary net wage is the imputed wage for the supplied hours of work in the primary occupation. The own ln marginal secondary net wage is the imputed wage for the labor supply in the secondary occupation and in the household production. The result out of Table 3: A higher remuneration reduces the working hours; we will pick up this result again in the elasticity section.

Hours of work in a primary occupation

With regard to the supplied ***hours of work in a primary occupation***, the (non-linear specified) age and the number of gainfully employed persons in the household in particular play a significant role. In addition to this there is a time interdependency between market and non-market labor supply: regular secondary occupation, handicraft and gardening activities in the household production significantly reduce the supply of primary occupation. If, however, the DIY-activity is carried out on a regular basis, it is rather complementary towards the market activities.

Taxes on market labor income are captured via the own ln marginal primary net wage and the virtual non labor income. The signs of both coefficients are different and virtual non-labor income is highly significant positive correlated with hours of primary work.

Hours of work in a secondary occupation

In view of the ***working hours in a secondary occupation***, human capital theoretical variables are taken into account via the imputed wage. The remaining variables particularly show an association between DIY-activities and unpaid social network activities: multiple activities of this kind are for the account of a paid secondary activity. In addition secondary activities are first of all time consuming in households with a low income; this is a clear hint for necessary additional activities in the alternative economy for lower income people (cp. also Klein, Merz and Wolff, 1986).

Hours of work in the household production

The ***working hours in the household production*** are significantly determined by the nature of the activity. Unpaid neighbourly help reduces the own time spent in household production. Thus social networks are important within the market and non-market activity profiles. As expected owners of proper flats or houses invest more time in repair and maintenance etc.

Many of the interesting single influences in Tables 1 to 3 could be discussed here any further. For the sake of brevity the reader is referred to the tables' information. A structural difference and interdependences in and between market and non-market labor supply has to be recorded. This holds for the respective participation decision, the remuneration as well as for the time use in the specific activity.

tab 3

FS tab 3

4.4 Wage and income elasticities

The effects of the 1990 tax reform on the labor supply in hours of work in the formal and informal economy are of particular importance to answer e.g. the 'incentive-disincentive'-question. After having set out the microeconomic labor supply model, these effects find expression in the hours coefficients of the marginal net wages and the virtual non labor income. According to our model with rationed primary occupation if a secondary occupation is pursued, the decision variable which has to be considered is the marginal net wage of the secondary occupation. If only primary work would be done by an individual the corresponding variable is the marginal net wage of this primary occupation.

For investigating the tax effects we now consider the corresponding elasticities (based on the respective hours coefficients out of Table 3) in Table 4 with regard to the weekly labor supply in hours in primary and secondary occupation as well as in household production.In general, if the (marginal) tax is reduced, the corresponding marginal net wage increases ceteris paribus. The uncompensated elasticities (with a negative sign) show that an increase of 10% of the (ln) marginal net wage will overall reduce the labor supply in a primary occupation only by 0,1%. The reducing effects are more important for a secondary occupation (1,6%) and even more in household production (2,3%). The respective substitution effects (compensated elasticities) are negative and thus do not correspond to the theoretically expected sign.

Negative uncompensated (marginal) wage elasticities are most of all mentioned for men in the empirical labor supply literature (Killingsworth 1983). The elasticities which are calculated for all active persons respectively seem to be characterized by male labor behavior. The respective substitution effects (compensated elasticities) are negative and refer to an inferiority of the marginal net wages. However, the estimated coefficients which are taken as a basis are not significant (see Table 3).

In comparison with the situation in primary occupation there are relatively low (total) income elasticities in secondary occupation and in household production (lower by a factor 10 than in secondary occupation). The influence of the virtual non labor income on labor supply in primary occupation is highly significant, however, a modification of the virtual income shows relatively minor effects. This is mainly due to possible negative individual virtual income amounts which diminishes the overall mean value underlying the elasticity calculation.

tab4

The elasticities above are representing tax effects separately via the marginal wage rate and the virtual non labor income. To analyze the combined effects and to be more specific in investigating the tax effects of the entire estimation situation as well as in particular of the 1990 tax reform, we now discuss the microsimulation results picking up the 'substitution/ income'-effects when discussing group specific influences.

5 Microsimulation of the 1990 German tax reform - Market and non-market labor supply effects

5.1 Characteristics of the 1990 German tax reform

Since the beginning of the 1980s, the wage and income taxation has been repeatedly modified in the Federal Republic of Germany. Besides the re-introduction of the allowance for dependent children in 1983, it is most of all the modifications of the fiscal law in 1986/88 as well as the tax reform in 1990 that should be mentioned here. The paper focusses on both modifications, the 1986/88 and 1990 ones, with regard to its effects on the formal and informal economy and takes into account the allover 1986-1990 fiscal law modifications.

The fiscal policies of 1986/88 aimed at reducing the tax burden in a considerable and lasting way on all wage and income tax payers and at supporting families with children (Presse- und Informationsamt der Bundesregierung 1987). Important ***modifications of the income tax schedule*** lead to an increase of the basic tax-free income from DM 4,212/8,424 [25] up to DM 4,752/9,504 and to a reduction of the marginal tax rate from 28 percentage points to 22.5 percentage points (starting in 1988) in the lower progression range (DM 60,000/120,000 taxable income). In addition there is a reduction of the wage and income tax progression from the third income bracket onwards.[26] The fiscal ***improvement for the families*** mainly centered on an increase in the allowance for dependent children up to DM 2,484, on a doubling of the allowance for children's education and on an increase of the household allowance. The tax program 1986/88 is to result in a tax reduction amounting to about DM 24 billion.[27]

The ***German tax reform in 1990***, with an estimated gross reduction for the taxpayer to the amount of about DM 32.2 billion, will surpass in terms of volume all fiscal law modifications so

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25 The second figure corresponds to the joint taxation scheme for married couples.

26 Cp. Presse- und Informationsamt der Bundesregierung 1987.

27 Cp. Presse- und Informationsamt der Bundesregierung 1988

far. In reducing tax subsidies amounting to DM 19 billion, a net reduction of about DM 20 billion in total is expected.[28]

Apart from strengthening the competitiveness of companies, it is particularly the tax structure that is to be improved effectively by means of introducing low tax rates and broadening the tax base.[29]

The following survey shows the most important characteristics of the planned tax reform in 1990:

- Reduction of the marginal tax rate in the lower proportion zone from 22% (1988) to 19% (1990)
- Reduction of the top rate from 56% (1988) to 53% (1990)
- Introduction of a linear progressive tax schedule with regard to the marginal rate
- Modification of the progression zone from DM 18,036-130,031 (1988) to DM 8,154-120,041 (1990)
- Increase of the allowance for dependent children from DM 2,484 (1988) up to DM 3,024 (1990)
- Reduction of the corporation tax from 56% (1988) to 50% (1990).

Core of the tax program by the West German Government for 1990 is the reduction of the income tax schedule with a linear slope of the marginal tax rates. When the tax rate of 1990 are compared to the old tax rate, the tax reform is first of all to the benefit of all tax payers, where the individual tax reduction - in absolute terms - increases with a growing income.

5.2 Microsimulation results of market and non-market labor supply effects

The microeconomic model and its three-stage microeconometric specification serve as the basis for the 1990 tax reform policy analysis. The estimated coefficients of the behavioral equation based on the enlarged Sfb 3-Secondary Occupation Survey reflect the quantitative influence, the relative importance of the socioecononomic variables and, here in particular, the relevant tax terms.

Our microsimulation approach is based on estimated relations of a sample which is representative for the Federal Republic of Germany. The special advantage of a policy analysis having this kind of microsimulation with a representive sample is that the results do not only refer to so-called typical cases. They rather reflect in a representative way the distribution and

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28 For a critical analysis of the 'Great Tax Reform', cp. Andel 1987, Petersen 1987 and Wiegard 1987.

29 Cp. here and in the following BMF-Finanznachrichten 10 and 46/87 as well as 5 and 15/88.

the relative importance of the real existing individual and household-individual situation. An overview of microsimulation in general is given e.g. in Orcutt 1957, Orcutt, Merz and Quinke 1986. Merz 1991d provides a recent survey of microsimulation principles, developments and applications. Citro and Hanushek 1991a,b broadly review the uses of microsimulation modeling for the US National Research Council. Microsimulation as an Instrument to evaluate economic and social programmes is discussed in Merz 1993.

Our microsimulation approach is based on the microeconomic model, merged microdata, microeconometric estimates capturing behavioral response (second round effects) and the final two step microsimulation (see Figure 0). As usual, microdata bases have to be extrapolated for any actual policy investigation. With the help of the Dynamic Cross-section Sfb 3-Microsimulation Model (Galler and Wagner 1986) the detailled demographic development were forecasted for 1990 and 2000. Respective aggregates then were used for the appropriate demographic adjustment within the Static Sfb3-Microsimulation Model (Merz 1986). Static microsimulation then compared the respective baseline supplied hours of work with the hours supplied according to the new individual tax situation in the respective family and household association via the behavioral equations.

We focus on the policy analysis of the 1990 tax reform in view of a possible change in market and non-market labor supply. Hence, the question to be answered is how the 1990 reform reductions stimulate or reduce market and non-market labor supply. Only a brief sketch of the microsimulation results will be given; extensive results are discussed in Merz 1989a, 1991c.

Taxes enter the time allocation equations of the activities in the formal and informal economy by way of the marginal net wages and the virtual non labor income. A modification of the fiscal system must first and foremost start at these two terms. For all those who are active in a primary occupation, secondary occupation and household production, respectively, the weekly working hours have been computed using the estimated behavioral parameters of the present fiscal system (in force from 1984 onwards) with the individual marginal net wages as well as the virtual non labor income (***before tax reform simulation*** at survey time 1984).

Figure 0

In order then to analyze the policy of the 1990 tax reform, the new marginal net wages and the new virtual non labor income will be computed (again for each active person respectively) applying the new 1990 tax schedules (***after tax reform simulation***).[30] These new variables in combination with the other socioeconomic terms and the estimated behavioral parameters serve at finally computing the new (after tax reform) weekly working hours for each individual's formal and informal activity respectively. With the above described new demographic weights for 1990 (and 2000) the individual results are extrapolated and actualized.

5.2.1 Overall results

A first overall impression of the effects of the 1990 German tax reform on the time allocation in market and non-market labor supply is given in Figure 1 and Table 1 in the Appendix. With regard to primary occupation, secondary occupation and household production, the overall average weekly working hours are indicated for men and women separately and the change according to the 1990 tax reform in hours and relative to the previous tax situation are given.

Overall results are the following: The tax cuts of the 1990 reform show relatively small overall effects, but distinct group specific effects. They reduce the weekly working hours for men in ***primary occupation*** by about -0,2%, whereas female labor supply in primary occupation increases by about 0,3% on average. If in this context it is talked about incentives in primary occupation due to the tax cuts, it then holds rather for women than for men.

In ***secondary occupation*** there is an increase in hours of work for men and woman. The gender specific effect of this increase is more distinct for women (0.9%) than for men (0.2%). Theese incentive effects have not been expected given that as the alternative economy with illicit work is only seen as a tax and social security evasive economy. Thus, other factors like (necessary) multiple income achievement strategies seem to be more important.

So far, and when studying the effect of taxes in general, paid market work is the focus of interest. In the formal and informal economy discussion, howewer and in addition, it is often argued that higher marginal taxes imply less word in the market and more work outside the market, work at home. But the effects on work outside the market are hardly known (but see our estimation results). The tax reform in general will reduce marginal tax rates. The equivalent argument then would state more market work but less non-market work.

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30 In order to follow the concept of imputed wages as an instrument for those without actual respective wages, after tax reform net marginal secondary ln wages are estimated by COLS in a similar way as before tax reform wages and then computed for all persons in the sample.

Our microsimulation results of the 1990 tax reform with reduced marginal tax rates but increased marginal net wages show that economic activity in closed market ***household production***, the so-called DIY-activities, will be diminished in favor of 'pure' leisure activities and other paid activities for men by -3,8% and for women by -2%.. Thus it is to be noted that, first, there are specific tax effects on non-market production, and second, the effects considered absolutely and relatively are greater, than in paid activities.

The tax reform with its generally reduced taxation scheme causes an increase in the marginal net wage. In accordance with the microeconomic theory, the price of leisure then increases which results in a lower demand for leisure and hence a higher demand for working hours. With the hours of work increasing in secondary occupation this substitution effect predominates the opposite income effect.

The results establish for men that, on the overall average, incentives of the 1990 tax reform will increase the hours of work only in paid secondary occupation. With an additional overall reduction in male primary occupation, the 1990 tax reform is thus changing working patterns: there is a shift from a (single) primary job to paid secondary activities.

Women are increasingly engaged in paid economic activities at the cost of unpaid non-market activities. There is a main incentive for additional paid primary and secondary hours. Hence, there is an overall tendency in time allocation patterns with changing working time structures in favor of paid secondary market labor supply for men and women.

Where as in the preceeding table and figure the overall average effects of the 1990 tax reform were shown, effects on time allocation in the ***market and non-market labor supply regarding socioeconomic groups*** are displayed in the following. Such a kind of distributional information is a genuine strength of the microsimulation approach. In demanding such group specific results, we are interested in individual but group specific behavior affected by the 1990 tax reform, if at all, this can be modelled for persons/households. Tax schedule specific grouping may not be equivalently valid or remain explicitly in the background, even though the individual tax characteristics are taken into account for computation.

fig 1

In the following we discuss 1990 German tax reforms effects with respect to the occupational status, the family type and the family income and its distribution; socioeconomic groups which are important in the actual economic and social policy discussion.

5.2.2 1990 German tax reform effects and occupational status

Figure 2a and 2b subdivides the modifications of working hours according to the occupational status in the individual primary occupation.

Remarkable differences in the effects on working hours in the market and non-market effect profiles can be recorded for blue and white collar-workers, for civil servants and for the self-employed. In addition, gender specific differences within these occupational categories become recognizable.

for the self-employed, the white-collar worker, a rather small effect on civil servants, and almost no impact on paid labor supply for blue-collar workers (Figure 2a). With respect to an additional secondary job, there is an overall average male incentive effect for blue-collar workers and civil-servants but disincentive effects for white-collar workers and self-empoyed. The underlying reasons and different behavioral pattern are described and discussed in the microeconometric section with plausible microsimulation results.

There is an overall average male disincentive effect in the primary occupation Women show a different profile: there is a small overall average female incentive effect in primary work especially for the self-employed. Incentives in a secondary job are above all given for white-collar working women..

The household production impacts show both for men and women a negative sign for alloccupational groups. There are consequently remarkable disincentive effects on non-market work. Two figures remain important for a occupational groups: though a tax rerform like the German one clearly focus on paid work in the market, nevertheless there are behavioral remarkable impacts for household production activities; too. Unpaid work is reduced in favor for paid work, which become favorable because of the reduced tax burden in general.

With regard to non primary occupied (Figure 2b) disincentive effects on a secondary job hold for male and female students, whereas housewives will be more engaged in a paid secondary occupation. For all primary non-occupied persons, regardless of their gender, unpaid DIY-activities in the household will be diminished (but in a different magnitude for men and women).

fig.2a

fig2b

5.2.3 1990 German tax reform effects and the family situation

In the tax reform debate the family improvements with increasing child and other allowances play an important role. With Figure 3 we investigate 1990 German tax reform effects according to several family types which are in the special focus of the current social polotical discussion: singles, couples with and without children, and adults households only.

To pick up only some results we concentrate on children's influence on labor supply in market and non-market activities. First, let us look to ***singles with and without children***. Male and female labor supply in primary and secondary occupation will be reduced for of singles without children, whereas the opposite effect is true with respect to singles with children (besides male's reduced secondary activity). In economic terms, the substitution effect of a reduced tax burden is dominating the income effect when there are children.

Regarding ***couples with and without children*** an almost similar effect profile is obvious. In particular, the existence of children will not diminish but increase paid female secondary activities, regardless she is a single or married. Such a result certainly has influence on the discussion of women's role and burden.

Adults only households (with household size > 2) show for men and women increasing paid hours of work with specific incentives in a secondary occupation.

Though for all family situations household production activities are diminished overall, there are distinct differences in the magnitude of men's and women's reduction in different family situations.

To summarize the family effects: there are specific and gender specific effects of the new institutional arrangements within the 1990 German tax reform. Whether they are intended or not intended in the political discussion with respect to the women's role and burden in the family have to be discussed with respect to the 'final' behavioral impacts, like those in our microsimulation analysis, too.

fig3

fig.3

5.2.4 1990 German tax reform effects and family income and its distribution

One additional focus in the fiscal discussion is the family ***income level and its distribution*** before and after the reform of the income tax schedule. We herefore want to subdivide the market and non-market labor supply effects according to the following categories of family/household net income: low <1500 DM; mean 1500-3000 DM; high >3000 DM (Figure 4). This refers to the respective income before the tax reform.

The 1990 German tax reform most of all willincrease labor supply in primary and secondary occupation for families with higher incomes. Whereas for families with higher income the substitution effect of an increased marginal net wage will be dominant in particular for a secondary occupation, the income effect dominates the behavior of families with medium or lower household income. This general pattern, however, is of different magnitude according to gender of the household head and kind of paid activity. Thus all tax scheme regulations together seem to stimulate richer households; a specific labor supply incentive push for low and median income families can not be observed, a remarkable result.

According to unpaid DIY-activities in the household families with higher income (>3000,- DM net) in addition will reduce, relatively speaking, their level of unpaid household production activities more than families with lower income. This reduction seems additionally to turn out in favor of a further stimulated paid work in primary and secondary activity.

To summarize: Family income specific effects with a predominant substitution effect showing specific incentives become appearent for higher income families. Almost no effect, respective dominant income effect will be given for lower and medium income families. These and further microsimulation results as in Merz 1989a, 1991c again show significant different 1990 German tax reform effects according to specific socioeconomic groups.

fig4

6 Concluding Remarks

This study on market and non-market labor supply and taxes is based on a theoretical microeconomic model with multiple labor supply in the formal and informal economy. This multiple time allocation model, which explicitly is taking into account taxes, transfer payments and socioeconomic characteristics, is specified in a multiple three-stage approach explaining the participation probability, the relevant wages and the hours of work in different activities. Uncompensated and compensated elasticities on market and non-market labor supply are computed. The estimates are based on data from the enlarged Sfb 3-Secondary Occupation Survey 1984, enlarged by regional economic and labor demand indicators. Since the planned German tax reform in 1990 is judged as a particulary farreaching economic policy and incentive/disincentive effects are widely discussed but are hardly known in the economic and social policy discussion, labor supply effects of the 1990 tax reform are quantified by a microsimulation approach which is based on microeconometric estimated behavioral pattern.

Besides the specific multiple labor supply model as a theoretical result, the influences of taxes, transfer payments and socioeconomic characteristics and the microsimulation labor supply effects of the 1990 German tax reform have been individually quantified for the first time in such a combined microanalysis of market and non-market economic labor supply representative for the Federal Republic of Germany.

The microsimulation of the 1990 tax reform shows clear gender and activity specific labor supply results: the working time of men in primary occupation will be reduced ('disincentives'); the working time of women will increase ('incentives'). The hours of work in secondary occupation (including illicit work) will in particular increase for women. Unpaid household production activities are effected by the 1990 German tax reform. The tax reductions will general reduce non-market activities for men and women, gender specific in its amount, in favor of paid market activities.

Besides these overall results we have demonstrated that the 1990 German tax reform leads to quite different results for further socioeconomic groups grouped by the occupational status in a primary occupation, the family situation with and without children or for families with lower and higher income. Different labor supply profiles for men and women become appearent for these groups. So, for instance the children situation in the family of singles and couples is incentive for additional earnings in a secondary occupation.Concerning families with a higher income, for instance, paid secondary working hours are stimulated, the substitution effect is dominant (forward bending labor supply curve). Many further results show the relative importance of

various socioeconomic characteristic in a multivariate approach quantifying the relative importance of incentive and disincentive impacts of the 1990 German tax reform for multiple paid and unpaid activities.

Our microsimulation results of the 1990 tax reform are empirically founded on microeconometric estimates which themselves are based on a theoretical microeconomic model of activities. With this procedure and representative microdata, individual behavioral response effects and its relative populational importance were made apparent in a combined dynamic and static microsimulation approach that could have neither been analyzed with typical cases nor with pure analyses of the tax schedule. It is clear, that for real policy advises of further changes in a tax schedule, the microdata base must be enhanced. Nevertheless, a microsimulation analysis like the above in particular promises a fairly adequate analysis of real world pattern incorporating not only institutional regulations but behavioral reactions of those who are affected by.

Appendix

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