POSITIONAL CONCERNS AND THE OPTIMAL PROGRESSIVITY OF THE INCOME TAX CODE

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ABSTRACT. Based on the behavioural model of the selfish homo oeconomicus Conesa and Krueger (2006) find that the optimal income tax code in the US is well described by a flat tax with a constant marginal rate of 17.2 percent and a fixed deduction of about 9,400$. However, in recent years experimental-survey studies have found evidence suggesting that the notion of the selfish homo oeconomicus is at odds with real world human behavior. Specifically the evidence provided amongst others by Solnick and Hemenway (1998) suggests that individual utility or happiness is affected by relative levels of consumption and income as compared to others. As such positional concerns imply that individual behavior exerts a negative externality on the welfare of others, this introduces a potential welfare-enhancing role for government tax policy besides the goal of raising revenue. Building on recent theoretical work the present paper analyzes the quantitative implications of positional concerns for the design of tax policy. To this end we incorporate a positional concern into the framework applied by Conesa and Krueger (2006) to study the optimal progressivity of the income tax code in the US. We derive three main results First, in accordance with Conesa and Krueger (2006) we find that the optimal income tax code is well described by a flat rate tax à la Hall and Rabushka even if positional concerns matter. Second, we find that the optimal tax regime implies considerably higher marginal and average tax rates as compared to an economy populated by homo oeconomicus. For calibrations of the degree of positionalality consistent with existing survey-experimental evidence the optimal flat tax regime is characterized by a uniform marginal tax rate of 26 percent and fixed deduction of about 19,500$. Third, while we find that implementing the optimal tax code derived under the homo oeconomicus assumption always leads to a welfare gain if positional concerns matter, the reverse is in general not true.

KEYWORDS: Positional concerns; Progressive taxation; Optimal taxation; dynamic general equilibrium

JEL CLASSIFICATION CODE: E62; H21; H23; H24

1. INTRODUCTION

Based on the behavioural model of the selfish homo oeconomicus Conesa and Krueger (2006) find that the optimal income tax code in the US is well described by a flat tax with a constant marginal rate of 17.2 percent and a fixed deduction of about 9,400$. These parameters come close to the flat tax proposal of Hall and Rabushka made in the mid-nineties for the US. However, in recent years

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experimental-survey studies have found evidence suggesting that the notion of the selfish homo oeconomicus is at odds with real world human behavior.[2] Specifically the evidence provided by Solnick and Hemenway (1998) suggests that individual utility or happiness is affected by relative levels of consumption and income as compared to others. Besides offering a description of individual decision-making consistent with human behavior the consideration of positional concern has however considerable implications for the design of public policies as shown recently amongst others by Abel (2005), Aronsson and Johansson-Stenman (2008) and Wendner and Goulder (2008). In an overlapping generations economy where individual utility is affected by average consumption Abel (2005) finds that the first-best optimum is characterized by a modified golden rule, which can be implemented in a competitive equilibrium by a combination of a lump-sum pay-as-you go social security scheme and a positive tax rate on capital. While the analysis of Abel (2005) is dynamic in nature, Aronsson and Johansson-Stenman (2008) and Wendner and Goulder (2008) analyze the implications of positional concerns for optimal direct and indirect taxation and the provision of public goods in a static context. For reasonable degrees of the positional concern the results obtained by these authors indicate that optimal tax rates are generally higher and potentially much higher than in the standard case. The reason for why positional concerns lead to higher tax rates is that under these circumstances individual behavior exerts a negative externality on other's welfare, thereby introducing a potential welfare-enhancing role for government tax policy besides the goal of raising revenue.

However, due to fact that papers cited above consider more or less simplified model economies the implications derived thereby for the design of tax policy are mostly qualitative in nature. A natural question to ask is therefore what quantitative implications can be derived from positional concerns for the design of tax policy in more realistic model economies. To this end, the present paper incorporates a positional concern into the model applied by Conesa and Krueger (2006) to study the optimal degree of progressivity of the income tax code. Calibrating the model to the US economy we derive three main results. First, despite the fact that positional concerns strenghten the redistributive goal of taxation we find that the optimal income tax code is well described by a flat rate à la Hall and Rabushka even in the presence of a high degree of positionality. The degree of

[2] See for example Easterlin (1995), Solnick and Hemenway (1998, 2005) and McBride (2001).

positionality affects however the choice of the marginal tax rate and the deductible characterizing a flat tax regime. For a degree of positionalilty at the lower (upper) end of the range consistent with existing evidence we find that the optimal tax code is characterized by a constant marginal tax rate of 26 (54) percent and a fixed deduction of about 19,500 (15,900)\$. Third, while we find that implementing the optimal tax code derived under the homo oeconomicus assumption always leads to a welfare gain if positional concerns matter, the reverse is in general not true.

The remainder of the paper is organized as follows. Section 2 describes the model, while section 3 offers a description of the model's calibration to US data. The results of our computational experiments are presented in Section 4, while section 5 summarizes our findings and concludes the paper.

2. THE MODEL

Following Conesa and Krueger (2006) we consider an economy populated by overlapping generations of heterogenous agents.

DEMOGRAPHICS Agents start their economic life at age 20 and live for a maximum of J periods but can die earlier. As we abstract from agent's life before entry into the labor market we denote the cohort at age 20 by $j = 1$, while the beginning of the retirement phase is denoted by j^R. Mortality risk is represented by the conditional probability of surviving from age $j-1$ to age j denoted by s_j. The total population grows at a constant and exogenously given rate η. Normalizing the population size to unity the population shares of cohorts $j = 2, \ldots, J$ are recursively given by $\mu_j = s_j \mu_{j-1}/(1+\eta)$, while the share of cohort $j = 1$ is implicitly defined by the normalization.

PREFERENCES Agents have preferences over streams of consumption, leisure and relative consumption represented by a additive-separable utility function

$$E\left[\sum_{j=1}^{J} \beta^j \left(\prod_{i=1}^{j} s_i\right) u\left(c_j, 1-n_j, r_j; \gamma\right)\right], \tag{1}$$

where $u_1, u_2 > 0$ and $u_3 \geq 0$, c_j and n_j denote individual consumption and labor supply at age j and $r_j = \frac{c_j}{\bar{c}}$ relative consumption, where $\bar{c}$ is average consumption. The parameter β denotes the discount factor reflecting pure time preference, s_j the conditional probability of surviving up to age $j+1$ if having reached age j and $\gamma \in [0, 1)$ is a measure of the strength of the impact of relative consumption on individual utility. In particular, we follow Wendner and Goulder (2008) in assuming that $\gamma = (\frac{\partial u}{\partial r}\frac{\partial r}{\partial c})/(\frac{\partial u}{\partial c} + \frac{\partial u}{\partial r}\frac{\partial r}{\partial c})$ represents the marginal degree of positionality, i.e. the increase in the marginal utility of consumption stemming from the increase in relative consumption.

Individual Constraints The budget constraint of at age j is given by

$$(1+\tau^c)c_j + a_{j+1} = (1+r)a_j + I_{j<j^R}(1-\tau^s)\alpha\epsilon e_j w n_j + I_{j\geq j^R}p - T(\tilde{y}_j). \tag{2}$$

In each period available resources have to be split up between consumption and the accumulation of assets. Resources consist of assets accumulated in the past and income received from different sources. During period of their working life agents receive labor earnings $\alpha\epsilon e_j n_j w$, where α denotes inherent ability, ϵ an idiosyncratic productivity shock, e_j mean productivity at age j and w the gross wage rate. An agent's ability $\alpha \in \{\alpha_1, \ldots, \alpha_M\}$ is realized at the beginning of the working life and remains constant over the life cycle, where the probability distribution over the M states is denoted by q_i. Regarding the idiosyncratic productivity shock $\epsilon \in \{\epsilon_1, \ldots \epsilon_N\}$ we assume that its evolution over the life-cycle is governed by a Markov chain with transition matrix $\Pi(\epsilon'|\epsilon) = \text{Prob}\,(\epsilon' = \epsilon_j|\epsilon = \epsilon_i)$. Besides earnings agents receive capital income ra_j on assets accumulated in the past, where r denotes the real rate of interest and a_j assets holdings at age j. As agents enter the economy with zero assets and since there are neither intentional bequests nor any uncertainty concerning the maximum age we have $a_1 = a_{J+1} = 0$. Moreover, we follow the literature in assuming that agents face a borrowing constraint given by $a_j \geq 0$. During retirement an agent receives a social security transfer p, while labor supply drops to zero. With regard to lifetime uncertainty we follow Conesa and Krueger (2006) in assuming that all accidental bequests leaved by descendents are fully taxed by the government. Finally, agents have to pay VAT on consumption of goods, social security contributions on labor earnings and income taxes. Thereby the VAT and social security contribution rates are denoted by τ^c and τ^s respectively. The income tax code is represented by

$T(\cdot)$, while taxable income is given by

$$\tilde{y}_j = (1 - .5\tau^s)\alpha\epsilon e_j n_j w + r a_j + p.$$

Production Technology In each period a constant returns to scale production technology is available which turns capital and labor into output serving both as consumption and investment good. We assume that this production technology is represented by a Cobb-Douglas production function

$$XF(K,N) = X(K)^{\alpha}(N)^{1-\alpha}, \tag{3}$$

where K and N denote aggregate inputs of capital and efficient labor. The level of the production technology X improves over time at rate g, while capital depreciates at rate δ.

Government Tax revenue raised by government through VAT, income taxes and the taxation of accidental bequests is used to finance government consumption expenditures G. The pay-as-you-go social security scheme run by the government is financed by payroll taxes on labor earnings and pays a uniform benefit p to all agents above the retirement age, where the replacement rate of social security benefits is equal to a share b of average gross labor earnings.

2.1. *Equilibrium*

Applying standard transformations to make the economy stationary and denoting the state vector of a household by $(x,j) = (\alpha, \epsilon, a, j)$, a stationary equilibrium is given by a set of policy functions $\{a_T(x,j), c_T(x,j), n_T(x,j)\}_{j=1}^{J}$, value functions $\{v_T(x,j)\}_{j=1}^{J}$, factor prices (w,r), aggregate factor inputs (K,N), government policy parameters $(G, T(\cdot), \tau^s)$ and distributions $\{\psi_T(x,j)\}_{j=1}^{J}$ over the state space X such that

(a) $c_T(x,j)$, $c_T(x,j)$, $a_T(x,j)$, and $n_T(x,j)$ solve an agent's dynamic programming problem

$$v_T(x,j) = \max_{a',c,n} \left\{ u(c, 1-n, r; \gamma) + \beta s_j E_j v_T(x', j+1) \right\}$$

subject to

$$(1+\tau^c)c + (1+g)a' = (1+r)a + I_{j<j^R}(1-\tau^s)\alpha\epsilon e_j wn + I_{j\geq j^R}p - T(\tilde{y})$$

$$\tilde{y} = (1-.5\tau^s)w\alpha\epsilon e_j n + ra + p$$

$$c \geq 0, a' \geq 0, v_T(x, J+1) = 0$$

(b) Factor prices equal marginal products:

$$w = XF_N(K,N) \text{ and } r = F_K(K,N) - \delta.$$

(c) Markets clear:

(i) $\sum_j \mu_j \int_X (c_T(x,j) + a_T(x,j))\, d\psi_T(x,j) + G = XF(K,N) + (1-\delta)K,$

(ii) $\sum_j \mu_j \int_X a_T(x,j) d\psi_T(x,j) = (1+\eta)K,$

(iii) $\sum_j \mu_j \int_X \alpha\epsilon e_j n_T(x,j) d\psi_T(x,j) = N.$

(d) Distributions are consistent with individual behavior:

$$\psi_T(B, j+1) = \int_x P_T(x,j,B) d\psi_T(x,j) \text{ for } j = 1, \ldots, J-1 \text{ for all } B \in \mathbf{B}(X),$$

where $\mathbf{B}(X)$ denotes the Borel $\sigma-$algebra on the state space X and $P_T(x,j,B)$ the transition rule induced by the asset policy function $a_T(x,j)$ and the transition matrix $\Pi(\epsilon'|\epsilon)$.[3]

(e) The government's budget constraint is satisfied:

$$G = \sum_j \mu_j \left[\tau^c \int_X c_T(x,j) d\psi_T(x,j) + \int_X T(\tilde{y}_T(x,j)) d\psi_T(x,j) + \frac{1+r}{1+\eta}(1-s_j) \int_X a_T(x,j) d\psi_T(x,j)\right],$$

where

$$\tilde{y}_T(x,j) = (1-.5\tau^s)w\alpha\epsilon e_j n_T(x,j) + ra_T(x,j) + p.$$

(f) The budget constraint of the social security scheme is satisfied:

$$p \sum_{j=j^R}^{J} \mu_j = \tau^s wN,$$

[3]For $x \in X$ the transition rule $P_T(x,j,B)$ denotes the probability of reaching a state $x' \in B$ next period.

Parameter	Value	Target
J	16 (99)	Data
j^R	10 (65)	Data
η	1.1% p.a	Data
s_j	Faber (1982)	Data

Table 1 Demographic parameters

where

$$p = b\frac{wN}{\sum_{j=1}^{j^R-1}\int_X \mu_j n_T(x,j)d\psi_T(x,j)},$$

3. calibration

Except for the period length which is chosen to be 5 years in our model and the parameter measuring the degree of positionality the calibration of the model follows Conesa and Krueger (2006).

Demographics The maximum life-span J is set on a value of 16 corresponding to a maximum age 99, while j^R is set equal to 10 corresponding to a retirement age of 65. The population growth rate η is set to 1.1 percent per annum according to average population growth in the US. Survival probabilities s_i are from Faber (1982) as reported by Hubbard, Skinner, and Zeldes (1994). These are for women and have been adjusted to account for the model period of 5 years. The calibration of the demographic parameters is summarized in table 1.

Households The momentary utility function $u(c,l,r;\gamma)$ is assumed to be of the CRRA type and given by

$$u(c,l,r;\gamma) = \frac{\left[\left(cr^{\frac{\gamma}{1-\gamma}}\right)^{\phi} l^{1-\phi}\right]^{1-\rho}}{1-\rho}$$

where ρ denotes the intertemporal elasticity of substitution and ϕ the share of consumption in utility. Again the assumed specification of the positional concern follows Wendner and Goulder (2008) closely. The parameter ρ is fixed at a value of 4.0. For the calibration of the status parameter γ we

Parameter	Value	Target
β	1.0252 p.a.	$\frac{K}{Y} = 2.7$ p.a.
γ	.2	Wendner and Goulder (2008)
ϕ	.2921	$\bar{n} = \frac{1}{3}$
ρ	4.0	

TABLE 2 Preference parameters

draw on Wendner and Goulder (2008) who report that values in the range $[0.2; 0.4]$ are consistent with existing survey-experimental evidence. Corresponding to the lower bound of this range we set γ equal to 0.2 in the benchmark calibration of the economy with status effects. The share of consumption in utility ϕ is chosen so that average labor supply is equal to 1/3, while the discount factor β is chosen so that the capital-output ratio is equal to 2.7 per annum in the benchmark equilibrium. As in Conesa and Krueger (2006) the calibration of the preference parameters implies a coefficient of relative risk aversion of approximately 2.[4] The calibration of the preference parameters is summarized in table 2.

The age-profile of mean efficiency units e_j is taken from Hansen (1993). The calibration of the ability parameter α and the idiosyncratic productivity shock ϵ is based on Storesletten, Telmer, and Yaron (2004) who report a variance of log earnings of about .27 at the beginning of the life-cycle with a nearly linear increase of about 0.0165 per age. However, due to the endogenous labor supply decisions in our model we follow Conesa and Krueger (2006) in choosing the ability parameter α and the idiosyncratic productivity shock η such that the age-profile of the log earnings variance implied by the model replicates approximately the one implied by the estimates of Storesletten, Telmer, and Yaron (2004). Choosing $M = 2$ and setting the probabilities of both states equal to .5 implies $\alpha_1 = \exp(-\sqrt{.268})$ and $\alpha_2 = \exp(\sqrt{.268})$. In case of the idiosyncratic productivity shock ϵ we choose $N = 7$. The transition matrix $\Pi(\epsilon'|\epsilon)$ and the realizations $(\epsilon_1, \ldots, \epsilon_7)$ were then calibrated by first

[4]For the assumed specification of the utility function the coefficient of relative risk aversion is given by

$$-\frac{cu_{cc}}{u_c} = 1 - \phi\frac{1-\rho}{1-\gamma}.$$

Parameter	Value	q_i
α_1	.596	.5
α_2	1.677	.5

TABLE 3 Ability parameter

Parameter	Value	Initial Distribution at age $j = 1$	Stationary Distribution
ϵ_1	.361	0.0	.1087
ϵ_2	.519	0.0	.1454
ϵ_3	.713	0.0	.1620
$\epsilon_4 = \bar{\epsilon}$	.966	1.0	.1679
ϵ_5	1.308	0.0	.1620
ϵ_6	1.799	0.0	.1454
ϵ_7	2.589	0.0	.1087

TABLE 4 Productivity Shock

approximating the Markov chain by a continuous AR(1) process. In a second step the parameters of the AR(1) process were chosen such that the variance of log earnings increases nearly linear by 0.0165 per annum over the life-cycle as in the data of Storesletten, Telmer, and Yaron (2004). In a final step the transition matrix and the realizations of the productivity shock were obtained by dicretizing the continuous AR(1) process using the method of Tauchen and Hussey (1991). The calibration of the ability parameter and the idiosyncratic productivity shock are summarized in tables 3 and 4

PRODUCTION As in Conesa and Krueger (2006) we chose a value of 0.36 for α, while the depreciation rate δ is chosen such that the model implies a value of 25.5 percent for the investment to output ratio. This implies a depreciation rate of approximately 6.58 percent per annum. In line with the long-run growth rate of GDP per capita in the US the growth rate of productivity g is set equal to

Parameter	Value	Target
α	.36	Data
δ	6.58% p.a.	$\frac{I}{Y} = 25.5\%$
g	1.75% p.a.	Data
X	1.66	$w = 1$

TABLE 5 Technology parameters

1.75 percent per annum. Finally, the level of the production technology is chosen so that the wage rate is equal to unity in the benchmark equilibrium. The calibration of the technology parameters is summarized in table 5.

GOVERNMENT The replacement rate of social security b is set equal to .5, which implies a value of approximately 12.4 percent for the payroll tax τ^s in the benchmark equilibrium. The level of government spending is calibrated so that the government share in GDP is equal to 17 percent in the benchmark equilibrium, while the VAT rate is set to 5.2 percent. As in Conesa and Krueger (2006) we restrict the analysis to income tax codes which can be represented by the functional form motivated in an axiomatic approach to the theory of equal sacrifice by Young (1988) and Berliant and Gouveia (1993). In the generalized form of Gouveia and Strauss (1994) this functional form characterizes an income tax code by merely three parameters and is given by

$$T(y) = a_0 \left(y - \left(y^{-a_1} + a_2 \right)^{-1/a_1} \right),$$

where a_0, a_1 and a_2 are parameters and y denotes taxable income. The marginal and average tax rate functions are given by

$$t(y) = \frac{dT(y)}{dy} = a_0 \left(1 - (1 + a_2 y^{a_1})^{-1-1/a_1} \right)$$
$$\bar{t}(y) = \frac{T(y)}{y} = a_0 \left(1 - (1 + a_2 y^{a_1})^{-1/a_1} \right).$$

Taking the limit $\lim_{y \to \infty} \frac{dT(y)}{dy} = \lim_{y \to \infty} t(y) = a_0$ it is evident that the parameter a_0 defines the limiting marginal and average tax rate. As special cases the tax function collapses to a poll tax

Parameter	Value
$\frac{G}{Y}$	.17
a_0	.258
a_1	.768
τ^c	5.2%
τ^s	12.4%
b	.5

Table 6 Policy parameters

$T(y) = -a_0 a_2$ if $a_1 = -1$ and to a proportional income tax $T(y) = a_0 y$ if $a_1 = 0$. For $a_1 > 0$ the tax function becomes progressive as both the marginal and the average tax rate increase with taxable income, while the revenue elasticity $\frac{dT(y)}{dy}\frac{y}{T(y)}$ becomes strictly larger than unity. Based on the estimates of Gouveia and Strauss (1994) we set a_0 equal to 0.256 and a_1 equal to 0.768 in the benchmark calibration, while following Conesa and Krueger (2006) the parameter a_2 is chosen such that the government budget constraint is satisfied in equilibrium. To account for the period length of 5 years the income tax liability in our simulations was computed by first converting taxable income into annual income before applying the income tax code, and in turn aggregating the resulting tax liability per annum over 5 years. The calibration of the government's policy parameters is summarized in table 6.

4. RESULTS

4.1. *The computational experiment*

As in Conesa and Krueger (2006) our computational experiment consists of finding the tax code which maximizes social welfare. Based on the notion of a choice behind the veil of ignorance the social welfare criterion applied thereby corresponds to the expected utility of an agent just before entering the economy, i.e. the welfare level an agent may expect before his ability type and history of productivity shocks is revealed. The optimal tax code is therefore given as the solution of the maximization problem

$$T^* = \arg\max_{(a_0,a_1)} \sum_{i=1}^{M} q_i v_T(\alpha = \alpha_i, \epsilon = \bar{\epsilon}, a = 0, j = 1).$$

For each choice of tax parameters (a_0, a_1) the parameter a_2 is chosen so that the government's budget constraint is satisfied.

4.2. *The optimal tax code*

The following section presents our results regarding the optimal income tax code. For reasons of comparison results are also presented for the case of a model economy populated by homo oeconomicus, i.e. $\gamma = 0$. Note that varying the degree of positionality affects the calibrated value of consumption's share in utility, but has only a minor impact on the other parameters and a negligible impact on the aggregate state of the economy. Specifically raising the degree of positionality implies a lower value for the parameter ϕ. The reason is, that any reduction in income will reflect itself not only in a welfare loss brought about by less individual consumption but also in a utility loss brought about by a decline in relative consumption. As this raises the opportunity cost of leisure, individual labor supply will ceteris paribus be higher the higher the degree of positionality. Put differently, to match the calibration target of an average labor supply of one third consumption's share has to be lower. However, the implied value for the coefficient of relative risk aversion is always approximately equal to 2.

Summarizing the findings of our computational experiment figure 1 plots the consumption equivalent variations (CEV) for different choices of the parameters a_0 and a_1 as compared to the benchmark tax code. As in Conesa and Krueger (2006), holding labor supply and relative consumption fixed at benchmark levels the CEV is computed for each choice of tax policy parameters (a_0, a_1) as the percentage increase in individual consumption required at all ages and in all circumstances to make the household ex-ante as well off under the benchmark tax code as under the tax code (a_0, a_1).[5] The optimal tax code is then obtained for the tax code (a_0, a_1) for which the CEV is maximized.

[5]Denoting benchmark levels of consumption, labor supply and relative consumption by $\bar{c}$, $\bar{n}$ and $\bar{r}$ the

FIGURE 1 Consumption equivalent variations of different tax codes

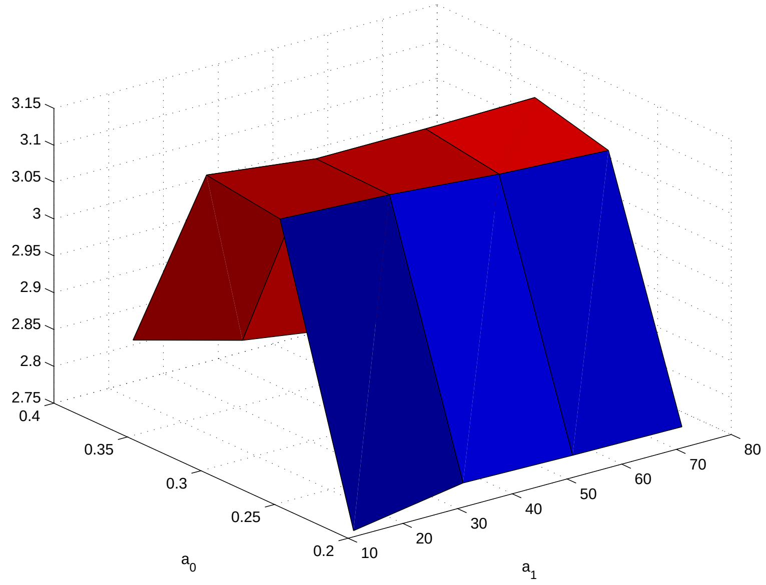
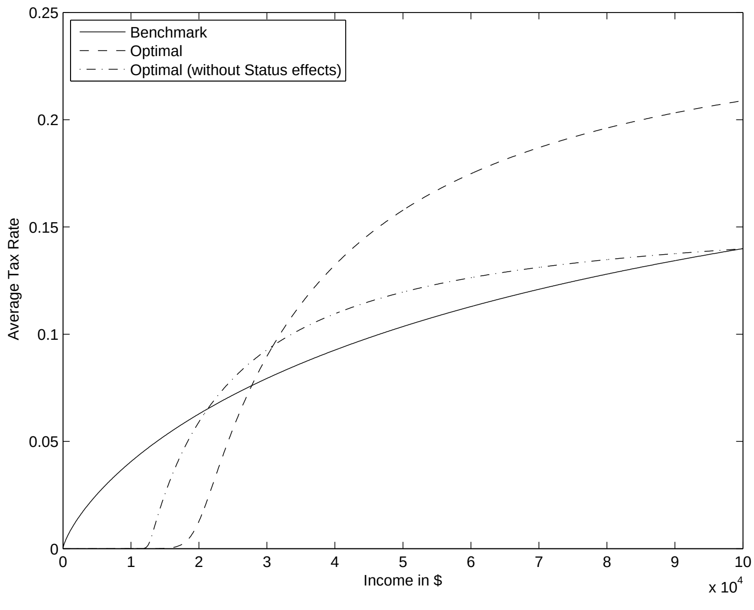


FIGURE 2 Average income tax rates

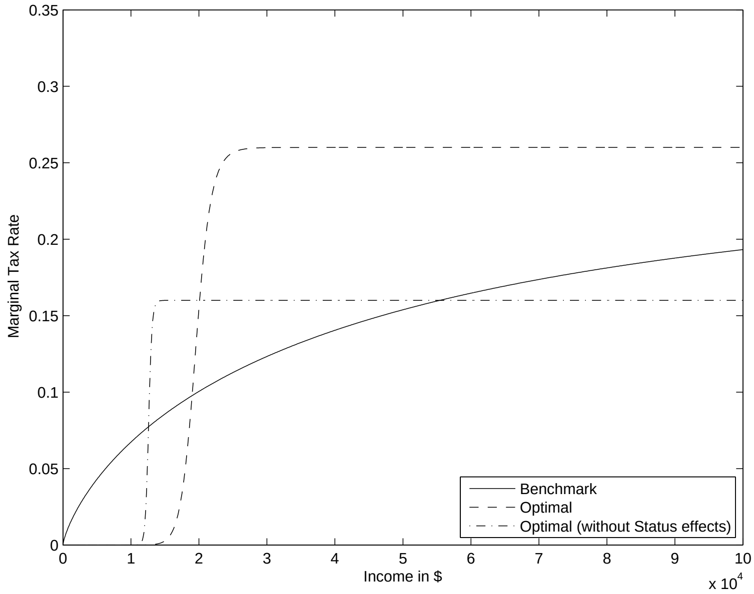


CEV is given by $100 \times (\lambda - 1)$, where λ solves

$$E\left[\sum_{j=1}^{J} \beta^j \left(\prod_{i=1}^{j} s_i\right) u\left(\lambda \bar{c}_j, 1 - \bar{n}_j, \bar{r}_j; \gamma\right)\right] = E\left[\sum_{j=1}^{J} \beta^j \left(\prod_{i=1}^{j} s_i\right) u\left(c_j, 1 - n_j, r_j; \gamma\right)\right].$$

In case of the assumed CRRA function λ is given by $\left(\frac{V_1}{V_0}\right)^{\frac{1}{\phi(1-\rho)}}$, where V_0 denotes the ex-ante utility level

Figure 3 Marginal income tax rates



Compared to the benchmark tax code characterized by $a_0 = 0.256$ and $a_1 = 0.786$ the optimal tax code is given by $a_0 = 0.260$ and $a_1 = 17.0$. These values for the tax policy parameters contrast with the ones obtained in an economy populated by homo oeconomicus which are given by $a_0 = 0.160$ and $a_1 = 53.0$. The implications of these parameters for the shape of the income tax code are shown in figures 2 and 3 which plot average and marginal tax rates for the optimal tax codes with and without a positional concern as well as the benchmark tax code. As shown in 3 despite the strengthening of the redistributive goal implied by a positional concern is the optimal income tax code well described by a flat tax á la Hall and Rabushka. The values obtained for the constant marginal rate and the deductible characterizing a flat tax scheme are however different from the ones in the homo oeconomicus economy. While we find that the optimal tax code is characterized by a marginal income tax rate of 16.0 percent and a deductible of about 13,400$ in case of homo oeconomicus, our benchmark calibration of the positional concern implies a marginal tax rate of 26.0 percent and a fixed deductible of about 19,500$. Hence, even behind the veil of ignorance does a positional concern call for a higher marginal tax rate as well as a higher deductible. The reason is quite apparent. Shifting the tax burden form below average to above average consumers narrows the gap in relative consumption, thereby mitigating the welfare loss implied by the impact of relative

obtained under the benchmark tax code and V_1 the ex-ante utility level corresponding to tax code (a_0, a_1).

Figure 4 Increase in tax burden

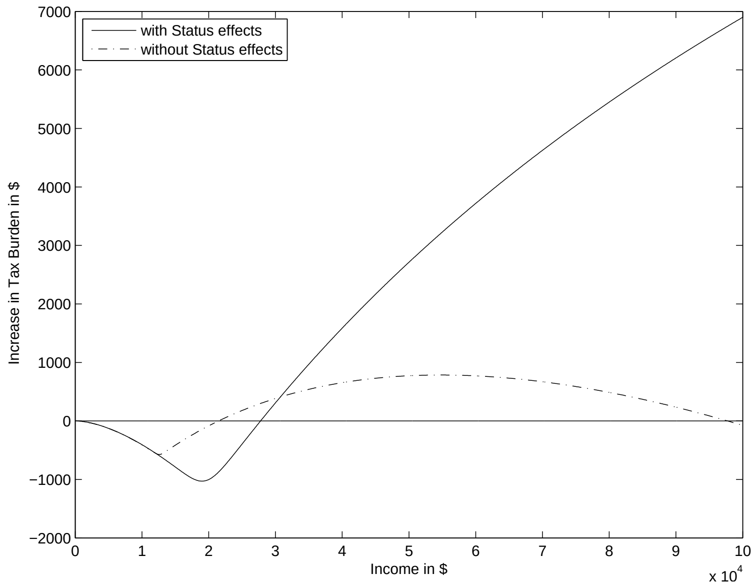
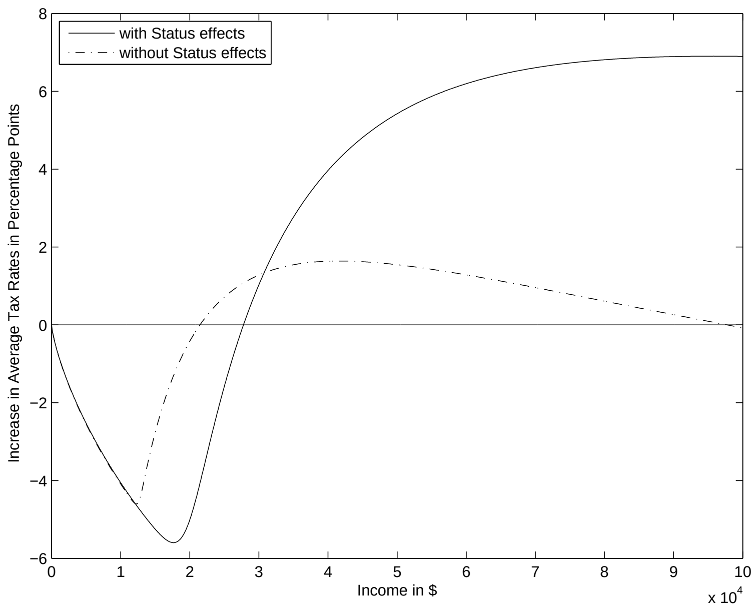


Figure 5 Increase in average tax rates



consumption on individual utility.

This is shown explicitly in figures 4 and 5 which plot the change in tax burdens and average tax rates implied by the optimal as compared to the benchmark tax code for both types of economies. With a positional concern the optimal tax code implies an increase in the tax burden for *all* tax-

Table 7 Comparison across tax codes

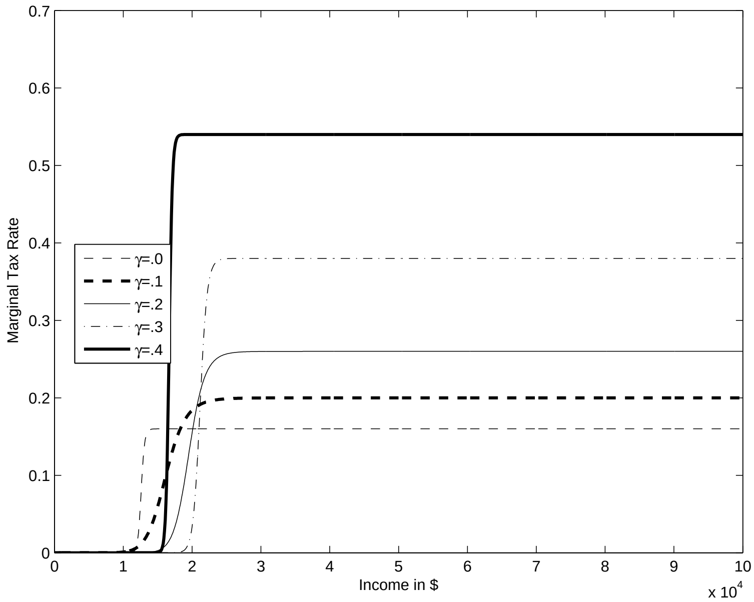
Variable		with Status effects		without Status effects	
	Benchmark	Optimal	fixed (r,w)	Optimal	fixed (r,w)
Parameter a_0	0.258	0.260	0.260	0.160	0.160
Parameter a_1	0.768	17.0	17.0	51.0	51.0
Interest rate r (p.a.)	6.42	6.86	6.42	6.48	6.42
Wage w	—	-2.51%	0.00%	-0.36%	0.00%
Average labor hours $\bar{n}$	0.33	-5.33	-4.71	-1.46	-1.32
Aggregate Labor Supply N	—	-5.40%	-3.96%	0.03%	0.27%
Capital Stock K	—	-11.85%	-3.96%	-0.97%	0.26%
GDP Y	—	-7.77%	-3.96%	-0.33%	0.27%
Aggregate Consumption C	—	-8.37%	-8.60%	-0.16%	-0.16%
Government Share in GDP G/Y	17.00	18.43	17.70	17.06	16.96
Income Tax Revenue in % GDP	9.01	10.80	10.98	9.13	9.15
Gini index of pre-tax income	0.422	0.418	0.425	0.435	0.436
Gini index of net income	0.400	0.366	0.370	0.409	0.409
Gini index of wealth	0.682	0.643	0.676	0.696	0.700
Variance of relative consumption	0.49	0.44	0.43	0.52	0.53
CEV	—	3.16%	4.06%	1.67%	1.73%

payers with taxable income above 27,800 dollars whereas in the homo oeconomicus economy the tax burden is higher for tax-payers in the range of about 21,500 to 97,700 dollars only. Similarly, the maximum increase in the average tax rate amounts to approximately 3 percentage points for homo oeconomicus whereas the rise in tax rates called for by a positional concern implies an increase in the average tax rate of up to 7 percentage points for households earning an income of about 100,000$.[6]

The long-run macroeconomic, distributional and welfare impact implied by a switch to the optimal

[6]Note that the increase in the average tax rate attains its maximum for an income of about 100,000$ and declines thereafter to approach a limiting value of 0.4 percentage points.

FIGURE 6 Marginal tax rates for varying degrees of positionality



tax code is shown in table 7. To separate the direct consequences of switching the tax code from the indirect consequences implied by changing factor prices results are also shown for the case where factor prices have been fixed on their benchmark levels. Concentrating first on the welfare implications switching to the optimal tax code in the status economy implies a long-run welfare gain equivalent to an increase in individual consumption at all ages and in all circumstances of about 3.16%. In contrast, the welfare-gain of switching to the optimal tax code in the no status economy, similar in magnitude as in Conesa and Krueger (2006), amounts to only 1.67%. The magnitude of the welfare gain in the status economy is the more impressive in that the increase in average and marginal tax rates implied by the optimal tax code implies a considerable decline in aggregate capital and labor input of 11.85% and 5.40% respectively. These changes trigger a drop in aggregate output of 7.77% and an even larger drop in aggregate consumption of 8.37%. Despite these adverse effects on the performance of the economy the equalization of after-tax incomes and relative consumption levels implied by the rise in average and marginal tax rates results in a considerable welfare gain for individuals affected by positional concerns.

To investigate the sensitivity of our results figure 6 plot the marginal tax rates implied by the the optimal tax codes for varying degrees of positionylity, while the corresponding welfare implications

Table 8 Optimal tax codes and welfare implications for varying degrees of positionality

Variable	γ				
	.0	.1	.2	.3	.4
Parameter a_0	0.160	0.200	0.260	0.380	0.540
Parameter a_1	51.0	11.0	17.0	41.0	71.0
CEV	1.67%	1.98%	3.16%	6.02%	12.85%

Table 9 Right world, wrong model: Welfare implications of a switch to a false optimal tax code

True γ	CEV of switching to the optimal tax code implied by γ				
	.0	.1	.2	.3	.4
.0	1.67	1.36	0.63	-2.33	-11.72
.2	2.25	2.76	3.16	2.47	-3.16
.4	3.29	5.19	7.55	10.94	12.85

are summarized in table 8. First note, that the welfare impact of switching to the optimal tax code as compared to the benchmark rises with the degree of positionality. The reason is, that the impact on individual welfare implied by any reduction in the variance of relative consumption is higher the higher the degree of positionality. Second, even for a degree of positionality at the upper bound of the range consistent with existing evidence is the optimal tax code well described by a flat tax regime.

Finally, because of the uncertainty regarding the degree of positionality table 9 summarizes what harm can be done by implementing an optimal tax code derived from wrong assumptions about the degree of positionality. Despite the drop in aggregate output and consumption implied by switching to the optimal tax policy derived in case of the benchmark calibration of the degree of positionality, the first row of table 9 shows that such a reform still raises the long-run welfare of individuals in an economy populated by homo oeconomicus. Only for tax codes derived under the assumption of a higher degree of positionality will a switch in tax policy result in a long-run welfare loss. Similarly we find that a switch to the optimal tax code derived in the homo oeconomicus economy will result in a considerable welfare gain even for individuals affected by positional concerns, while a switch to the optimal tax code implied by a high degree of positionality leads to a welfare loss. Finally, for a high degree of positionality the last row of table 9 shows that a switch in tax policy will always result in a considerable welfare gain. These results suggest that switching to the optimal tax code implied by the assumption of homo oeconomicus is painless in so far as to the worst it only means to forego part of the welfare gain to be reaped by correctly accounting for positional concerns. In contrast, the possibility of a welfare loss if the degree of positionality is assumed too high is a more unpleasant prospect.

5. CONCLUSIONS

Based on the behavioral model of the homo oeconomicus as a description of individual decision-making past research on the economics of taxation have taught us that bringing down tax rates will raise consumption possibilities and individual welfare by stimulating capital accumulation, labor supply and economic growth. On the basis that the ultimate goal of public policy is individual well-being the evidence obtained in recent survey-experimental studies on the importance of positional concerns casts however some doubt on the conclusions obtained by economic studies of optimal taxation in the past. Incorporating a positional concern into a standard incomplete-markets model the present paper has reconsidered the recent analysis of Conesa and Krueger (2006) on the optimal progressivity of the income tax code in the US. Calibrating the model to the US economy we derive three main results. First, despite the fact that positional concerns strengthen the goal of redistribution we still find that the optimal income tax code is well described by a flat rate tax. However, because of the negative externality exerted on others welfare by the desire to raise individual consumption we find, second, that even behind a veil of ignorance does a positional concern call for a broad rise in marginal and average tax rates. While the optimal tax code is characterized by a marginal tax rate of 16.0 percent and a deductible of about 13,400$ in an economy populated by homo oeconomicus, our benchmark calibration of the degree of positionality implies a marginal tax rate of 26.0 percent and a fixed deductible of about 19,500$. Despite the fact that such a switch in tax policy will result in considerable decline in aggregate capital, labor, output and consumption as compared to the benchmark tax code, the equalization of after-tax incomes and relative consumption levels implied thereby results in a long-run welfare gain equivalent to an increase in individual consumption at all ages and in all circumstances of 3 percent. Finally, we find that implementing the optimal tax code derived under the homo oeconomicus assumption always leads to a welfare gain if positional concerns matter, while the reverse is in general not true.

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