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Relative Consumption and Tax Evasion

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Abstract:
Relative consumption effects or status concerns that feature jealousy (in the sense of Dupor and Liu, AER 2003) boost consumption expenditure. If consumption is financed by labour income, such status considerations increase labour supply and, hence, the tax base. A higher taxable income, in turn, can make tax evasion more attractive. We show for various specifications of preferences that the tax base effect generally dominates. Consequently, relative consumption effects tend to reduce tax evasion. This is true, irrespective of whether tax parameters are exogenous, guarantee a balanced budget or are set optimally.

Keywords: Income taxes, Optimal taxation, Relative consumption, Tax evasion

JEL-classification: D 62, H 21, H 23, H 24, H 26

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1. Introduction

Traditional analyses in the spirit of Allingham and Sandmo (1972) interpret income tax evasion as a gamble against nature taken by a lonely, risk-averse individual who maximises expected utility. In general, there are no interactions between the tax evader and other members of society. A number of theoretical studies have varied this setting by assuming that evasion activities are influenced by the illegal behaviour of others.[1] We modify the traditional approach in a different way and assume that interdependencies between individuals arise due to their consumption behaviour. Negative relative consumption effects, termed 'jealousy' by Dupor and Liu (2003), imply that individuals have excessive incentives to obtain income in order to acquire consumption goods.[2] To curb such incentives, the government can levy an income tax.[3] Given such a tax, however, individuals can increase disposable income not only by expanding labour supply but also by illegally reducing tax payments, that is, by evading taxes. In this paper, we investigate whether more pronounced relative consumption effects foster or restrict tax evasion activities. On the one hand, the incentives to increase labour supply rise and this, in turn, increases the tax base, implying that tax payments go up.[4] On the other hand, the gain from tax evasion will be altered, which can strengthen, mitigate or reverse the tax base impact. Therefore, the net effect on tax evasion is a priori ambiguous.

Knowledge about the impact of status concerns on tax evasion activities is relevant for various reasons. First, income and consumption comparisons and tax evasion activities are empirically relevant phenomena. Many studies, for example, demonstrate that people prefer to be in a situation in which they have a higher relative and lower absolute consumption level than to be in an alternative state of affairs in which consumption is absolutely higher but less than that of individuals people compare with. In addition, higher income levels of reference groups have often been shown to make individuals worse off. Finally, actual consumption decisions are affected by consumption levels of others.[5] Turning to tax evasion, estimates for

[1] See, inter alia, Gordon (1989), Myles and Naylor (1996), Kim (2003), Panadés (2004), and Traxler (2010). There are also a number of contributions which consider interactions between taxpayers and tax authorities, surveyed, for example, by Andreoni et al. (1998) and Slemrod and Yitzhaki (2002). Hashimzade et al. (2012), Section 4, provide an overview of such approaches.

[2] The claim is been put forward, for example, by Frank (1985) and Schor (1991) and established in models broadly comparable to the ones analysed below by Persson (1995), Corneo (2002), Cahuc and Postel-Vinay (2005), and Alvarez-Cuadrado (2007), inter alia. However, to our knowledge there is currently only one study empirically validating a positive impact of reference income on working time (e.g. Pérez-Asenjo 2011).

[3] See, e. g., Boskin and Sheshinski (1978), Ireland (1998, 2001), Corneo (2002), and Persson (1995).

[4] Balestrino (2006) incorporates consumption externalities into a model of tax evasion but assumes that gross income and labour supply are given.

[5] Clark and Oswald (1996), Solnick and Hemenway (1998), Alpizar et al. (2005), Carlsson et al. (2007), Brown et al. (2011), and Corazzini et al. (2012), inter alia, document such results. Clark et al. (2008) and Dolan et al. (2008) provide wide-ranging surveys.

individual countries suggest that the non-payment of taxes is particularly prevalent among self-employed (Slemrod 2007). Moreover, tax evasion and activities in the black economy are estimated to represent on average between 13% and 17% of GDP in high income OECD countries (Buehn and Schneider 2012).

Second, given the importance of relative consumption concerns, standard models of tax evasion omit important behavioural features. For example, the traditional approach has been criticised for yielding implausibly high predictions of tax evasion levels for individuals who are not subject to third-party withholding (Alm et al. 1992, Feld and Frey 2002, Dhami and Al-Nowaihi 2010, Alm and Torgler 2012). If, however, preferences are inadequately specified due to the omission of a status impact, such evaluation may have to be modified.

Third, when determining optimal tax policy in the presence of consumption externalities, the role of tax evasion has to be taken into account. Otherwise, policy advice will be inadequate. Finally, if the strength of status considerations can be inferred, for example, from the level or composition of consumption, this information could be used to improve tax enforcement. In sum, the existence of negative consumption externalities may substantially affect our understanding of income tax evasion.

Since a general specification of preferences helps to formalise the impact of status concerns on the choice of working time and evasion activities, but does not yield unambiguous predictions, the subsequent analysis assumes specific representations of preferences which allow for closed-form solutions. In particular, in Section 2 we develop a simple model of relative consumption, in order to ascertain whether the tax base or the tax evasion effect dominates. We subsequently distinguish two settings: in the first, parameters of the tax system are given (Section 3). These consist of a linear marginal tax rate and a lump-sum transfer to allow for a progressive tax code. In the second setting, the government's tax revenues equal transfers in expected terms (Section 4.3). In the context of such a framework, we initially assume the marginal income tax rate to be given and the lump-sum payment to balance the budget. Next, the tax system induces individuals to choose the optimal working time, more specifically, the level that would result in the absence of the consumption externality. For both settings we will establish that the tax base always increases with the strength of the consumption externality, thus confirming the conjecture stated earlier. Furthermore, the difference between the tax base and the amount of undeclared income rises with the consumption externality, whereas the ratio of undeclared income to the tax base declines. These two indicators hence suggest that tax evasion declines with status concerns. A third measure of tax evasion, the absolute amount of declared income, provides mixed information.

Undeclared income will rise with the consumption externality, unless the parameters of the tax system guarantee optimal working time.

The intuition for these findings is as follows. If the parameters of the tax system are given, a more pronounced relative consumption effect reduces the marginal utility from consumption because labour supply and the tax base increase. Since the costs of evasion fall by more than the gain, undeclared income rises. However, this increase is less pronounced than the rise in the tax base. This is because the optimal evasion choice is independent of the strength of the status effect, for a given working time. The responses just described imply that expected tax revenues rise. In a balanced-budget setting, the government therefore increases the lump-sum transfer, for a given marginal tax rate. This increase raises the absolute amount of undeclared income further. It turns out that the tax base and the amount of undeclared income change proportionally with stronger relative consumption concerns. All other results derived for given tax parameters continue to hold. If, finally, tax rates ensure undistorted labour supply, greater relative consumption effects induce a higher marginal tax rate which, in turn, reduces evasion (Koskela 1983). Hence, the absolute under-declaration of income declines as well. In sum, these findings indicate that although relative consumption effects alter the incentives to evade taxes, they do not aggravate the problem of insufficient tax payments, but rather tend to mitigate it. Accordingly, with respect to the second argument above we can conclude that the inclusion of consumption interdependencies in traditional models of tax evasion can help to generate more plausible predictions.

The findings described and explained above are derived for a "ratio comparisons model" (Clark and Oswald 1998, p. 138) on the basis of a logarithmic specification of preferences. Hence, individuals are characterised by decreasing absolute risk aversion and an Arrow-Pratt measure of relative risk aversion of unity. In Section 5 we show that our findings can be generalised, since they are also obtained for other functional forms which, in turn, imply different preferences or risk attitudes. In particular, we consider a setting in which individuals exhibit status concerns not only with respect to consumption, but also with respect to leisure. Furthermore, we report the findings for a general iso-elastic utility function and examine the case of preferences which exhibit constant relative risk aversion. Finally, the findings for an additive comparisons model (Clark and Oswald 1998) are reported. The occasionally extensive calculations which constitute the basis for the findings described in Section 5 are relegated to an appendix. In Section 6, we offer some concluding observations.

2. Model

2.1 Set-up

There are a large number of strictly risk-averse individuals who maximise expected utility. They are ex-ante identical, but the model could straightforwardly be expanded to include more than one type of individual, without fundamentally affecting results. An individual has a time endowment t, $t > 0$, and working time is denoted by h, so that leisure equals $t - h$. Gross labour income amounts to hw, where w denotes the exogenously given hourly wage, or earnings per hour in the case of self-employed. Income is taxed at the rate τ, $0 \leq \tau < 1$, and each individual obtains a lump-sum transfer S, $S \geq 0$. The amount of income not declared to tax authorities is denoted by z, $0 \leq z \leq hw$. Tax evasion, which is equivalent to a choice of $z > 0$, is detected with the exogenous probability q. In this case, the individual has to pay the full amount of taxes due and a fine $fz\tau$, $f > 0$, which is a linear function of unpaid taxes and, hence, of undeclared income z. The government uses the receipts from tax and fine payments to finance lump-sum transfers. The budget can – but does not have to – be balanced, as explained in more detail below in Sections 3 and 4.

Normalising the price of the sole consumption good to unity and assuming that available income equals expenditure, consumption will be $c^d = h(1 - \tau)w + S - fz\tau$ if tax evasion is detected and $c^u = hw(1 - \tau) + S + z\tau$ if evasion remains unobserved or cannot be proven by tax authorities. Utility u increases with individual consumption c, leisure $t - h$, and (cardinal) status. The latter is determined by relative consumption $c^d/\bar{c}$ or $c^u/\bar{c}$ (see Section 5.3 for an exception), where $\bar{c} := qc^d + (1 - q)c^u$ is the average level of consumption and q represents the fraction of individuals caught evading taxes. Since the number of individuals is very large, average consumption $\bar{c}$ is exogenous from an individual's perspective. The timing of decisions is as follows. First, individuals decide on working time h and undeclared income z. Subsequently, tax evasion may be detected and will then be punished. Finally, the remaining income is used to purchase the sole consumption good.

Following, for example, Persson (1995), Corneo (2002), Alvarez-Cuadrado (2007), and Tsoukis (2007), we assume that utility is additive, in order to avoid problems of non-uniqueness of the equilibrium, and logarithmic in its components, namely own consumption c^i, leisure $t - h$, and relative consumption $c^i/\bar{c}$, $i = d, u$. In consequence, preferences exhibit decreasing absolute risk aversion and the Arrow-Pratt measure of relative risk aversion is unity. Moreover, we are able to obtain closed-form solutions. The relative weights of leisure and status concerns are denoted by λ and ρ, respectively, where $\lambda > 0$ and $\rho \geq 0$. Utility in state i is hence given by:

$$u(c^{i}, h) = \ln c^{i} + \lambda \ln(t - h) + \rho \ln\left(\frac{c^{i}}{\bar{c}}\right) \tag{1}$$

If there are no taxes, $c^{i} = hw$ will hold, and utility u will be maximised if working time equals $h = (1 + \rho)t/(1 + \rho + \lambda)$. In the absence of a consumption externality, $h^{**} := h^{*}(\rho = 0) = t/(1 + \lambda)$ will represent an individual's choice. The same level of labour supply h^{**} will result if either a utilitarian welfare function is maximised and consumption is proportional to labour supply or a social planner maximises utility in the absence of taxation (and tax evasion) because anticipating $c = \bar{c}$ implies that $\rho\ln(c/\bar{c}) = 0$ holds (cf. Corneo 2002 or Alvarez-Cuadrado 2007, inter alia). This undistorted or optimal amount of labour supply h^{**} could be attained in the absence of tax evasion (that is, assuming $z = 0$) by a linear tax rate $\tau^{*}(z = 0) = \rho/(1 + \rho)$ and a lump-sum transfer $S^{*}(\tau^{*}) = w\tau^{*}h^{**} = tw\rho/((1 + \rho)(1 + \lambda))$, which guarantees that all tax revenues are handed back to individuals.[6] Note that if there were more than one type of individual, optimal working time would continue to equal $h^{**} = t/(1 + \lambda)$ and, hence, be type-specific only if individuals differed in their time endowment t or their relative preference for leisure λ.

Expected utility $EU(h, z) = qu(c^{d}(h, z), h) + (1 - q)u(c^{u}(h, z), h)$ is given by:

$$\begin{aligned} EU(h,z) = q&\left[\ln(hw(1-\tau)+S-fz\tau)+\lambda\ln(t-h)+\rho\ln\left(\frac{hw(1-\tau)+S-fz\tau}{\bar{c}}\right)\right] \\ &+(1-q)\left[\ln(hw(1-\tau)+S+z\tau)+\lambda\ln(t-h)+\rho\ln\left(\frac{hw(1-\tau)+S+z\tau}{\bar{c}}\right)\right] \end{aligned} \tag{2}$$

2.2 Individually Optimal Choices

The first-order conditions for a maximum of EU are:

$$\frac{\partial EU}{\partial h} = q\frac{(1+\rho)w(1-\tau)}{hw(1-\tau)+S-fz\tau} + (1-q)\frac{(1+\rho)w(1-\tau)}{hw(1-\tau)+S+z\tau} - \frac{\lambda}{t-h} = 0 \tag{3}$$

$$\frac{\partial EU}{\partial z} = -q\frac{f}{hw(1-\tau)+S-fz\tau} + (1-q)\frac{1}{hw(1-\tau)+S+z\tau} = 0 \tag{4}$$

[6] For a proof, replace the tax parameters in equation (7) below by the optimal values.

The second-order conditions $\partial^2EU/\partial h^2$, $\partial^2EU/\partial z^2 < 0$ and $D = (\partial^2EU/\partial h^2)(\partial^2EU/\partial z^2) - (\partial^2EU/(\partial h\partial z)^2 > 0$ hold due to the strict concavity of the utility function. Furthermore, an interior choice of undeclared income, $0 < z < hw$, requires $1 - q - qf > 0$ and $hw[(1 - q)(1 - \tau - \tau f) - qf] + S(1 - q - qf) < 0$ (cf. Allingham and Sandmo (1972) for a setting with a linear tax). We assume these conditions to be fulfilled.[7]

Replacing, for example, the second term in equation (3) in accordance with equation (4) and solving the resulting expression for h, we obtain:

$$h(z) = \frac{w(1-\tau)(1+\rho)q(1+f)t - \lambda S + \lambda fz\tau}{w(1-\tau)[\lambda + (1+\rho)q(1+f)]} \tag{5}$$

Furthermore, solving (4) for z yields:

$$z(h) = (hw(1-\tau) + S)\frac{1-q-qf}{f\tau} \tag{6}$$

Combining equations (5) and (6), we obtain expressions for the individually optimal amount of working time $h^*(\tau, S)$ and the level of undeclared income $z^*(\tau, S)$ as functions of the tax rate τ and the transfer component S.

$$h^*(\tau,S) = \frac{w(1-\tau)(1+\rho)t - \lambda S}{w(1-\tau)(1+\rho+\lambda)} \tag{7}$$

$$z^*(\tau,S) = \frac{(w(1-\tau)t + S)(1+\rho)(1-q-qf)}{f\tau(1+\rho+\lambda)} \tag{8}$$

If tax evasion were not feasible and the individual were to maximise expected utility solely with respect to hours of work h, optimal labour supply would also be given by the term defined in equation (7), for given levels of τ and S. Therefore, labour supply in this particular framework, though not in the other specifications of preferences analysed in Section 5 and in more general set-ups (cf. Pencavel 1979), is independent of, for example, the detection probability q and the fine parameter f. Moreover, labour supply will exceed the optimal level $h^*(\rho = 0)$ in the absence of taxation, that is for $\tau = S = 0$.[8] Note finally that optimal choices, as defined by equations (7) and (8), would by type-specific if individuals differed ex-ante, while the basic features of individual behaviour would be unaffected.

[7] Information provided by the OECD (2011) suggests that penalty rates are seldom greater than unity. Given single-digit audit probabilities in most countries, the requirement $1 - q - qf > 0$ is not restrictive from an empirical point of view.

[8] The positive impact of the strength of relative consumption concerns on working time is a common prediction which has been obtained in a variety of settings, for example, by Seidman (1988), Persson (1995), Ljungqvist and Uhlig (2000), Corneo (2002), Alvarez-Cuadrado (2007), Tsoukis (2007), and Peréz-Asenjo (2011).

2.3 Indicators of Tax Evasion

While the extent of evasion is unambiguously measurable in a setting with a given tax base, there will be alternative indicators if labour supply varies. We subsequently use three (tax-exclusive) concepts. We define absolute evasion T^E as the income that is not declared to tax authorities ($T^E := z$); the absolute amount of declared income T^P as the difference between the tax base hw and income not declared z, $T^P := hw - z$; and relative tax evasion T^R as the ratio of undeclared income z to the tax base hw, $T^R := z/(hw)$. Increases in T^E and T^R and a decline in declared income T^P indicate a rise in tax evasion.[9]

3. Exogenous Tax Parameters

In this section we enquire how relative consumption considerations affect evasion behaviour, assuming that the official tax parameters τ and S are given. Such a setting will be relevant, for example, if the government is restricted in its use of the tax parameters or if individuals differ and the government either cannot observe or infer their type or has too few instruments to accommodate this heterogeneity. If this is the case, taxes will not induce undistorted or optimal working time h**. An alternative interpretation is that we compare the behaviour of individuals who differ in the strength of relative consumption concerns but are otherwise identical and do not face type-specific tax rates. The analysis then shows how evasion at the individual level depends on the intensity of comparisons.

Inspection of equations (7) and (8) shows that the strength of relative consumption effects, that is the magnitude of the parameter ρ, does not alter qualitatively the impact of a change in the probability of detection q, the tax parameters τ and S, and the marginal utility from leisure λ on tax evasion choices.[10] Furthermore, we can observe that optimal working time $h^*(\tau, S)$ rises with greater relative consumption effects and that the same is true of undeclared income

[9] Note that a measure of relative honesty, such as $(hw - z)/z$, is related inversely to T^R. Moreover, tax-inclusive definitions of evasion are meaningless in a balanced-budget setting because all tax payments are rebated in expected terms.

[10] A higher probability of detection q and a higher fine f do not affect optimal hours of work $h^*(\tau, S)$ and, hence, the tax base $h^*(\tau, S)w$, as mentioned above, while they reduce undeclared income $z^*(\tau, S)$, so that the absolute amount of declared income $T^P = h^*(\tau, S)w - z^*(\tau, S)$ rises. An increase in the transfer S lowers hours of work $h^*(\tau, S)$ and raises undeclared income $z^*(\tau, S)$, implying an increase in absolute and relative tax evasion (T^E and T^R) and a decline in the absolute amount of declared income T^P. Finally, a higher marginal tax rate τ reduces both hours of work and undeclared income for the particular utility function looked at here, with indeterminate consequences for the amount of taxes evaded (see, e.g., Pencavel (1979) for a comparable setting with a more general utility function or Appendix 2 for alternative specifications of preferences in which most of the above results can be derived as well).

$z^*(\tau, S)$. Comparing both changes, it can be noted that the ratio of undeclared to true income $z^*(\tau, S)/(h^*(\tau, S)w)$, that is relative tax evasion T^R, declines with ρ, whereas the difference $h^*(\tau, S)w - z^*(\tau, S)$, i.e. the absolute amount of declared income T^P, rises with the strength of the relative consumption impact.[11] We can summarise the findings in

Proposition 1:
If the tax rate τ and the lump-sum transfer S are constant, absolute income tax evasion T^E and the absolute amount of declared income T^P will rise with the strength ρ of the relative consumption effect, and relative tax evasion T^R will fall.

The intuition for these effects is as follows. A rise in the parameter ρ has no direct impact on z, for a given level of labour supply (cf. equations (3) and (4)). However, if relative consumption becomes more important, the gains from extended working hours rise, while the decline in utility remains unaffected. Therefore, more pronounced relative consumption effects induce the individual to supply more labour. In consequence, the tax base $h^*(\tau, S)w$ increases, as described in the introduction. This increase in labour supply reduces the marginal utility from consumption and raises the marginal utility from undeclared income. Therefore, the optimal amount of undeclared income goes up. However, the increase in the tax base is more pronounced than in undeclared income. This is the case for two reasons. First, the optimal under-declaration is proportional to the tax base for S = 0 (cf. equation (6)) and must be less than the tax base in an interior solution. Accordingly, a rise in labour supply increases undeclared income by less than the tax base. Second, the positive lump-sum transfer S also ensures that absolute tax evasion T^E rises by a smaller amount and also a smaller fraction than the tax base. The latter impact ensures a decline in relative tax evasion T^R.

In sum, Proposition 1 implies that more pronounced relative consumption effects induce individuals to raise the amount of income not declared, for given tax rates, but that the rise in the tax base dominates the absolute evasion effect. Status concerns can, therefore, be argued to enhance absolute tax evasion, but even more so tax honesty, such that tax evasion becomes relatively less pronounced.

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[11] The finding for $T^R = z^*(\tau, S)/(h^*(\tau, S)w)$ is straightforward to obtain by dividing equation (8) by (7). Since $h^*(\tau, S)w > z^*(\tau, S)$ and $\partial T^R/\partial\rho = [h^*(\tau, S)w(\partial z^*/\partial\rho) - z^*(\tau, S)(\partial(h^*w)/\partial\rho)]/(h^*(\tau, S)w)^2 < 0$, $\partial T^P/\partial\rho = \partial(h^*w)/\partial\rho - \partial z^*/\partial\rho >$ holds. Note, furthermore, that the findings for the tax-exclusive measures of evasion, $z^*(\tau, S)$, $T^P = h^*(\tau, S)w - z^*(\tau, S)$ and $T^R = z^*(\tau, S)/(h^*(\tau, S)w)$ also apply for tax-inclusive indicators, namely $z^*(\tau, S)\tau$, $h^*(\tau, S)w\tau - S - z^*(\tau, S)\tau$ and $z^*(\tau, S)\tau/(h^*(\tau, S)w\tau - S)$ because tax rates are exogenous. Additionally, the results summarised in Proposition 1 will also be valid if the fine is a function of undeclared income.

4. Balanced Budget

4.1 Foundations

Since changes in the strength ρ of relative consumption concerns affect behaviour, a variation in ρ alters government revenues even if tax parameters are constant. As long as the number of individuals is sufficiently large and the variation in ρ affects only one of them, this effect can be neglected. However, if all individuals experience a rise in ρ, the analysis of Section 3 ignores the budgetary repercussions. In this section, we therefore relax the restriction according to which the parameters of the tax system are given. In Section 4.2, tax authorities face a given marginal tax rate and set the lump-sum transfer S so that the budget is balanced in expected terms. In Section 4.3, we analyse a framework in which the marginal tax rate τ and the lump-sum payment S are chosen in order to induce individuals to select the undistorted or optimal level of labour supply h**, while net expected revenues are zero. Accordingly, tax policy leads to the complete internalisation of relative consumption effects.

Incidentally, the labour supply level h** in a setting with ex-ante homogeneous individuals will also be the outcome of a vote on the marginal tax rate if individuals vote sincerely, take into account the budgetary repercussions of changes in the marginal tax rate, as detailed in the next paragraph, and anticipate that variations in tax parameters will affect all individuals equally (see the proof in Appendix 1). Hence, the case considered below in Section 4.3 would also arise in a political equilibrium. In addition, note that setting the tax parameters such that labour supply equals h** will rule out labour supply repercussions in equilibrium, providing a further justification for the assumption of a given wage.

Expected tax revenues in the presence of tax evasion are given by $q\tau wh + (1 - q)\tau(hw - z)$. Furthermore, the government receives expected fine payments $q\tau fz$ from tax evaders. Therefore, total expected revenues which are repaid as lump-sum transfers amount to:[12]

$$S = \tau hw - \tau z(1 - q - qf) \tag{9}$$

Using equation (6) and defining a parameter κ, $\kappa := (1 - q - qf)^2 > 0$, to save on notation, the lump-sum transfer S can be expressed solely as a function of labour supply h:

$$S(h) = hw\frac{\tau f - (1-\tau)\kappa}{f + \kappa} \tag{10}$$

[12] The findings summarised in Propositions 2 and 3 below will also hold if expected fine payments $q\tau fz$ cannot be used to finance transfers and S were given by $S = \tau hw - (1 - q)\tau z$. A proof is available upon request.

4.2 Exogenous Marginal Tax Rate

Assuming the marginal tax rate τ to be given, the budgetary impact of changes in behaviour can be incorporated by taking into account that the lump-sum transfer S varies with the strength ρ of relative consumption concerns via the impact of ρ on optimal working time h^*. Replacing S according to equation (10) in (7) and solving it for h, we obtain a measure of labour supply, $h^*(\tau, S(\tau))$ for a setting in which expected net tax payments are zero.

$$h^*(\tau, S(\tau)) = \frac{(1-\tau)(1+\rho)t[f+\kappa]}{(1-\tau)(1+\rho)(f+\kappa)+f\lambda} \tag{11}$$

Replacing S in equation (6) in accordance with (10), collecting all terms including h and substituting out h by the expression derived in (11), undeclared income can be stated as a function of the marginal tax rate and other parameters, $z = z^*(\tau, S(\tau))$.

$$z^*(\tau, S(\tau)) = \frac{(1+\rho)(1-\tau)wt\sqrt{\kappa}/\tau}{(1+\rho)(f+\kappa)(1-\tau)+f\lambda} \tag{12}$$

Inspection of equations (11) and (12) shows that optimal working time $h^*(\tau, S(\tau))$ and undeclared income $z^*(\tau, S(\tau))$ rise with the strength ρ of relative consumption concerns. Since both variables increase by the same percentage, while gross labour income $h^*(\tau, S(\tau))w$ exceeds undeclared income $z^*(\tau, S(\tau))$, we obtain:

> Proposition 2:
> If the tax rate τ is constant and the lump-sum transfer S balances the government's budget in expected terms, absolute income tax evasion T^E and the absolute amount of declared income T^P will rise with the strength ρ of the relative consumption effect, while relative tax evasion T^R will remain constant.

If relative consumption effects become more pronounced and ρ rises, working time will increase and tax evasion will tend to decline (cf. Proposition 1). Therefore, tax revenues will rise and the lump-sum transfer S which ensures a balanced budget will increase as well (cf. equation (10)). A higher lump-sum payment S has a negative impact on working hours h^* and a positive one on undeclared income z^* (cf. equations (7) and (8)). Therefore, the budgetary repercussions mitigate the effects of a change in the strength of relative consumption concerns on tax evasion activities. Proposition 2 shows that these second-round effects never dominate the initial impact.

4.3 Optimal Tax Code

Taxation can correct the externality due to relative consumption effects. Consequently, the optimal values of the tax parameters τ and S will change in a balanced-budget setting if the externality becomes more pronounced. To analyse the effects of a general rise in the strength ρ of relative consumption concerns in such a framework, we first calculate the tax rate $\tau^{**} := \tau^*(z > 0)$ which ensures that labour supply in the presence of tax evasion ($z > 0$) as defined by equation (11) equals the undistorted or optimal level.

$$\tau^{**} = \frac{\rho f + (1+\rho)\kappa}{(1+\rho)[f+\kappa]} \tag{13}$$

This tax rate τ^{**} increases with the strength of the consumption externality ρ and equals $\rho/(1 + \rho)$ in the absence of tax evasion, i.e. for $z = 0$. The difference between the tax rate which ensures the undistorted amount of labour supply in the presence of tax evasion, τ^{**}, and in the absence of such illegal behaviour, τ^*, is positive:

$$\tau^{**} - \tau^* = \frac{\rho f + (1+\rho)\kappa}{(1+\rho)[f+\kappa]} - \frac{\rho}{1+\rho} = \frac{\kappa}{[f+\kappa](1+\rho)} > 0 \tag{14}$$

In order to calculate the optimal amount of undeclared income $z^*(\tau^{**})$ in the presence of evasion activities, we use equation (8) and substitute out S in accordance with (10). The resulting expression can be solved for h, which can finally be replaced by $t/(1 + \lambda)$. Collecting terms then yields:

$$z^*(\tau^{**}) = \frac{(1+\rho)wt\sqrt{\kappa}}{(1+\lambda)[\rho f + (1+\rho)\kappa]} \tag{15}$$

The level of undeclared income that will result if individuals work the undistorted amount of hours h^{**} decreases with the strength ρ of the externality. In consequence, we obtain

> Proposition 3:
> If the government sets the tax rate τ and the transfer S in such a manner that individuals choose the undistorted or optimal level of labour supply $h^{**} = t/(1 + \lambda)$ and that the government budget is balanced in expected terms, income tax evasion will decline with the strength ρ of the relative consumption effect, irrespective of which measure of tax evasion is considered.

If labour supply h is unaffected by a variation in ρ because tax parameters adjust, the change in undeclared income z is determined by the variation in the ratio of official after-tax income

[$hw(1 - \tau) + S$] to the linear tax rate τ, which results from the adjustment in τ and S (cf. equation (6)). Labour supply h will decrease with both tax parameters (cf. equation (7)). Accordingly, more pronounced relative consumption effects raise the optimal linear tax rate (cf. equation (13)) and the lump-sum payment (according to the budget constraint (10)). Furthermore, substituting the budget constraint into the expression for official after-tax income [$hw(1 - \tau) + S$] and simplifying indicates that it will be unaffected by the adjustment in the tax parameters, implying that the ratio [$hw(1 - \tau) + S$]/τ declines. This is because the linear tax rate τ rises. In consequence, the optimal level of undeclared income will go down. Effectively, a rise in the intensity of status concerns which is countered by balanced-budget tax adjustments, such that working time remains at the optimal level, is comparable to an increase in the marginal income tax rate, holding official after-tax income constant. The first-order condition for the optimal choice of undeclared income (4) reveals that such a rise in the marginal tax rate makes tax evasion less attractive because the fine rises with the marginal tax rate.[13] This is the case because the marginal utility loss from an under-declaration increases, while the gain shrinks. Therefore, the rise in the marginal tax rate induced by the optimal policy response to an increase in the strength of relative consumption effects lowers the indicators $T^E(\tau^{**})$ and $T^R(\tau^{**})$ of absolute and relative tax evasion and raises the absolute amount of declared income $T^P(\tau^{**})$.

5. Extensions

In this section we analyse whether the findings derived above for the logarithmic specification of preferences (cf. equation (1)), characterised solely by relative consumption concerns, can also be obtained for different and more general formulations. As in Sections 3 and 4, statements about changes in the amount of income not declared to tax authorities and the other indicators of tax evasion require closed form solutions.[14] Therefore, we analyse specific functional specifications of utility commonly used in relevant contributions.

[13] See Koskela (1983). The analyses by Yitzhaki (1987) and Goerke (2003) further demonstrate that the impact of tax progression also depends on whether the tax payer optimises with respect to income declarations, as it is assumed here, or tax payments.

[14] Given additive separability, optimal working hours h can be shown to rise with the strength of relative income considerations also for a general specification of utility u. However, statements about z are generally only feasible if the marginal utility from consumption and leisure can be compared explicitly.

5.1 Leisure Externality

The framework of Sections 3 and 4 has been based on the assumption that individuals only compare themselves to others with respect to income or consumption but not with regard to leisure. While there are substantial indications of such income comparisons, as mentioned in the introduction, the according evidence with respect to leisure is much less conclusive (cf. Alpizar et al. 2005, Carlsson et al. 2007, and Frijters and Leigh 2008), thus justifying our approach. Subsequently, we will further show that our findings are robust with respect to leisure externalities, as long as the utility loss from leisure comparisons is not too strong. Suppose, therefore, that utility is not only rising in relative consumption, but also positively affected by an individual's own leisure, relative to average leisure $t - \bar{h}$, where $\bar{h}$ denotes the average working time in the population.[15] The utility function (1) could then be rephrased as:

$$\bar{u}(c^i, h) = \ln c^i + \lambda \ln(t-h) + \rho \ln\left(\frac{c^i}{\bar{c}}\right) + \mu\rho\lambda \ln\left(\frac{t-h}{t-\bar{h}}\right) \tag{16}$$

Below, we will investigate a rise in the parameter ρ, which in this sub-section reflects the strength of comparative concerns, while μ, $\mu \geq 0$, measures the intensity of leisure comparisons, relative to consumption considerations. Thus far, $\mu = 0$ has been assumed.

Maximisation of (16) with respect to working time h and undeclared income z yields two conditions which can be manipulated in the same way as equations (3) and (4). Further calculations then generate expressions which are analogous to those in equations (7) and (8).

$$h^*(\tau, S, \mu) = \frac{w(1-\tau)(1+\rho)t - \lambda(1+\mu\rho)S}{w(1-\tau)(1+\rho+\lambda(1+\mu\rho))} \tag{17}$$

$$z^*(\tau, S, \mu) = \frac{(w(1-\tau)t + S)(1+\rho)(1-q-qf)}{f\tau(1+\rho+\lambda(1+\mu\rho))} \tag{18}$$

Working hours h(τ, S, μ) and the amount of income not declared to tax authorities z(τ, S, μ) will rise with an increase with the strength ρ of relative concerns, if $1 - \mu > 0$.[16] Therefore, the findings derived in Sections 3 and 4 continue to apply as along as comparative concerns with respect to consumption are more important than with respect to leisure.

[15] Seidman (1988), Arrow and Dasgupta (2009), and Hansen et al. (2012), inter alia, provide models in which relative leisure considerations play a role.

[16] In a different context, Choudhary and Levine (2006) derive a condition which basically collapses to $1 - \mu > 0$ if appropriate adjustments due to different assumptions are undertaken. Choudhary and Levine (2006) provide evidence at an aggregate level for the United States and the Euro-Zone that this inequality holds.

5.2 Risk Attitudes

The logarithmic specification of preferences utilised above gives rise to an Arrow-Pratt measure of relative risk aversion of unity and, hence, to decreasing absolute risk aversion. However, our findings are not determined by this simplification. To illustrate this claim, we first consider a general iso-elastic utility function (cf. Gali 1994 and Dupor and Liu 2003). Thus, the Arrow-Pratt measure of relative risk aversion is constant but not restricted to unity. In particular, we assume:

$$\tilde{u}(c^i, h) = \frac{(c^i)^{1-\eta} - 1}{1-\eta} + \lambda \frac{(t-h)^{1-\eta} - 1}{1-\eta} + \rho \frac{(c^i/\bar{c})^{1-\eta} - 1}{1-\eta}, \ \eta > 0 \qquad (1')$$

Second, we allow for constant absolute and, hence, increasing relative risk aversion. The specification of preferences is then given by

$$\hat{u}(c^i, h) = A - e^{-c^i} - \lambda e^{-(t-h)} - \lambda e^{-(t-h)} - \rho e^{-(c^i/\bar{c})}, \ A > 0 \qquad (1'')$$

For both specifications of preferences and for given tax parameters τ and S, optimal working time $h^*(\tau, S)$, increases with the strength ρ of relative consumption concerns and also depends on the parameters q and f of the tax enforcement system.[17] In addition, the optimal level of undeclared income $z^*(\tau, S)$ rises with the strength of relative consumption concerns ρ in the case of decreasing absolute risk aversion ($\tilde{u}$) and does not vary with ρ if absolute risk aversion is constant ($\hat{u}$). In consequence, a greater strength of the relative consumption effect will either raise ($\tilde{u}$) or leave unaffected ($\hat{u}$) absolute income tax evasion $T^E(\tau, S)$, increase the absolute amount of declared income $T^P(\tau, S)$, and reduce relative tax evasion $T^R(\tau, S)$ (see columns 2 and 3 and rows 7 to 9 in Table 1 in Appendix 2). Therefore, the findings summarised in Proposition 1 can basically be extended to a setting with a more general utility function exhibiting decreasing absolute risk aversion and to a model in which preferences are characterised by constant absolute risk aversion.

Assuming that the marginal tax rate is given and the budget has to be balanced in expected terms, implies that all tax revenues and fine payments are returned to tax payers by means of the lump-sum subsidy S. Working time and the level of undeclared income then only depend

[17] This and the subsequent statements about working time choices, evasion behaviour and optimal tax parameters are based on calculations which are documented in Appendix 2. The derivation of the findings for preferences as defined by equation (1'') follows the procedure outlined in Sections 3 and 4 and details are available upon request. The results for specification (1') are more elaborate to obtain, once it is taken into account that the reference level of consumption $\bar{c}$ will be affected by changes in tax parameters, for example. Accordingly, the findings for the utility function $\tilde{u}$ are developed in detail in Appendix 2.

on the income tax rate τ, $h^*(\tau, S(\tau))$, $z^*(\tau, S(\tau))$. If preferences exhibit decreasing absolute risk aversion ($\tilde{u}$, column 2, rows 14 to 16, Table 1 in Appendix 2), absolute tax evasion $T^E(\tau, S(\tau))$ and the absolute amount of undeclared income $T^P(\tau, S(\tau))$ rise with the strength of relative consumption concerns, while relative tax evasion $T^R(\tau, S(\tau))$ remains constant, as it is the case for the setting analysed in Section 4.2. If constant absolute risk aversion is assumed ($\hat{u}$; column 3, rows 14 to 16), absolute evasion $T^E(\tau, S(\tau))$ will not change, undeclared income $T^P(\tau, S(\tau))$ will rise and relative tax evasion $T^R(\tau, S(\tau))$ will decline. Accordingly, the predictions summarised in Proposition 2 for logarithmic preferences are basically confirmed.

Finally, a setting is analysed in which the budget is balanced and the marginal tax rate τ and the lump-sum transfer S together ensure that the consumption externality is fully internalised. The marginal tax rate τ^{**} which induces optimal working time h^{**} rises with the strength of relative consumption concerns (rows 14 & 18, columns 2 & 3 in Table 1, Appendix 2) and absolute tax evasion $T^E(\tau^{**})$ declines with ρ. Since optimal working hours are constant, all measures of tax evasion shrink with the strength ρ of relative consumption considerations. In consequence, the findings summarised in Proposition 3 for the utility function u are also obtained for more general ($\tilde{u}$) or alternative ($\hat{u}$) specifications of preferences. Therefore, the analysis of this sub-section allows us to conclude that the risk attitude of individuals is without impact on the relationship between relative consumption considerations and tax evasion activities.

5.3 Additive Comparisons

The utility functions employed thus far all share the feature that the gain from comparisons is determined by the ratio of own commodity or leisure consumption to the reference level. However, we have little knowledge as to the exact impact of comparison utility. As a final robustness analysis, therefore, we investigate an additive comparisons model (Clark and Oswald 1998). In such a framework, the difference between c^i and $\bar{c}$ affects utility. More precisely, we rely on a specification initially employed by Ljungvist and Uhlig (2000) and also utilised, for example, by Pérez-Asenjo (2011):

$$\hat{u}(c^i, h) = \frac{(c^i - \rho\bar{c})^{1-\eta} - 1}{1-\eta} + \lambda(t - h),\ \eta > 0 \qquad (1''')$$

The parameter ρ, $0 \leq \rho < 1$, once again indicates the strength of relative consumption concerns. In this setting, optimal working hours h^{**} are not identical to working time resulting in the absence of relative consumption concerns, h(ρ = 0). In consequence, when investigating the effects of changes in ρ for a given marginal tax rate τ, either a completely individualistic perspective can be adopted or the effects on all identical individuals can be analysed. In the former setting, the reference consumption level $\bar{c}$ is given; in the latter setting, $\bar{c}$ is endogenous. In either case, we find that the effects of a greater strength ρ of relative consumption concerns on the indicators of tax evasion defined in Section 2.3 coincide with those applying for the utility function $\hat{u}$ (see Table 1, columns 3 & 4 in Appendix 2). Consequently, additive and ratio comparisons have the same impact on tax evasion behaviour.

6. Conclusions

If individuals exhibit relative consumption considerations in the form of jealousy as specified above, they will increase labour supply and their income, relative to a setting without such status concerns (ρ = 0). Moreover, the gains from evading taxes also increase with the strength of the consumption externality because the rise in disposable income has more pronounced utility effects than in a world without status considerations. Therefore, relative consumption effects can be argued to enhance tax evasion. The present analysis has revealed that such a conclusion is, however, premature. We have demonstrated in Section 3 that if tax rates are constant, stronger relative consumption effects will indeed raise the absolute amount of taxes evaded, but not relative to official after-tax income, since labour supply rises. This effect for a logarithmic specification of preferences also obtains for a more general iso-elastic characterisation of preferences. However, if relative risk aversion is not constant, there no longer has to be an impact of relative consumption concerns on the absolute amount of undeclared income. Furthermore, if the parameters of the tax system are chosen in such way that the resulting working time equals the optimal level, stronger relative consumption effects reduce tax evasion absolutely and also in relative terms. This prediction can be obtained for all specifications of preferences analysed. In consequence, status considerations can be argued to mitigate tax evasion.

It has often been observed that standard models of tax evasion predict implausibly high amounts of undeclared income, given reasonable estimates of an individual's risk aversion.[18]

[18] Cf. Feld and Frey (2002), Dhami and Al-Nowaihi (2010), Alm and Torgler (2012), and Hashimzade et al. (2012). Alm et al. (1992) claim that observed compliance rates in the United States will only be consistent with the standard expected utility framework for plausible values of the detection probability and the fine if the Arrow-Pratt measure of relative risk aversion exceeds a value of 30. Slemrod (2007, p. 39), however, expresses scepticism with respect to this conclusion "because the low average audit coverage rate (underlying these

Therefore, taking into consideration relative consumption effects can contribute to a reconciliation of observed tax evasion behaviour with an analysis of individual behaviour based on an expected utility framework. A simple numerical example based on the logarithmic specification of preferences can demonstrate the impact relative consumption concerns may have. Assuming that the tax parameters guarantee a balanced budget and the optimal number of working hours, allows calculating relative tax evasion T^R directly. If the fine is set equal to $f = 1$ ($f = 2$), relative tax evasion will be 80% (35%) in the absence of relative consumption concerns, i.e. for $\rho = 0$, and will drop to 66% (32.3%) for a value of $\rho = 0.5$ of relative consumption concerns, that is by 17.5% (7.7%).[19] This example indicates, first, that the predicted extent of tax evasion is very high, unless the fine exceeds empirically observable levels. Second, relative consumption effects can substantially decrease the predicted amount of tax evasion.

The results of the analysis have been derived for particular utility functions and, hence, the universality of our findings can be called into question. However, we believe that such scepticism is not justified. First, the crucial starting point of the analysis, namely that individuals work too much, can also be derived for more general utility functions (cf. Dupor and Liu 2003). Second, the predictions regarding the impact of a higher detection rate q, fine f and tax rate τ are the same as obtained for more general utility functions. Third, our analysis for various specifications of preferences has demonstrated that the results are basically robust to alterations of functional forms, as long as the marginal utility from consumption and leisure can be compared quantitatively. Nonetheless, it may be a promising avenue for future research to combine the investigation of status considerations and tax evasion or welfare fraud behaviour in experimental studies, in order to ascertain the empirical robustness of our theoretical predictions.

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calculations, L.G.) vastly understates the chances that the average dollar of unreported net income would be detected".

[19] For $\rho = 0.2$ the respective fractions are 72.3% and 33.6%. These calculations are based on the further assumptions that $t = 1$ and $q = 0.1$.

7. References

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Appendix 1: Marginal Tax Rate in Political Equilibrium

Assume that if individuals vote on the marginal tax rate τ, they anticipate that (1) variations in tax parameters affect all individuals equally, and (2) an adjustment in the marginal tax rate τ requires a change in the lump-sum transfer S in order to balance the budget. Using equations (6) and (10), and $0 < \kappa := (1 - q - qf)^2 < 1$, we obtain:

$$z\tau = \frac{hw\sqrt{\kappa}}{f + \kappa} \tag{A.1}$$

Employing (10) and (A.1), consumption levels c^d and c^u can be expressed as functions of h and parameters only:

$$c^d = h(1 - \tau)w + S - fz\tau = hw - z\tau(f + \sqrt{\kappa}) = hw\frac{f(1-\sqrt{\kappa})}{f+\kappa} \tag{A.2}$$

$$c^u = h(1 - \tau)w + S + z\tau = hw + z\tau(1 - \sqrt{\kappa}) = hw\frac{(f+\sqrt{\kappa})}{f+\kappa} \tag{A.3}$$

Further combining the definition of average consumption, $\bar{c} = qc^d + (1 - q)c^u$, (A.2) and (A.3), we obtain $\bar{c} = hw$. Therefore, given logarithmic preferences, the voter's objective is:

$$EU = (1+\rho)q\ln\underbrace{\left(hw\frac{f(1-\sqrt{\kappa})}{f+\kappa}\right)}_{=c^d} + (1+\rho)(1-q)\ln\underbrace{\left(hw\frac{(f+\sqrt{\kappa})}{f+\kappa}\right)}_{=c^u} + \lambda\ln(t-h) - \rho\ln(wh) \tag{A.4}$$

The only endogenous variable h in (A.4) is determined by the marginal tax rate τ. In any pair-wise voting exercise, the tax rate which maximises (A.4) would win. Therefore, given sincere voting, the tax rate we look for is the one which maximises (A.4). The first-order condition for a maximum of $EU(h(\tau))$ is given by:

$$\frac{\partial EU}{\partial \tau} = \frac{q(1+\rho)}{c^d}\frac{c^d}{h}\frac{\partial h}{\partial \tau} + \frac{(1-q)(1+\rho)}{c^u}\frac{c^u}{h}\frac{\partial h}{\partial \tau} - \frac{\lambda}{t-h}\frac{\partial h}{\partial \tau} - \frac{\rho}{h}\frac{\partial h}{\partial \tau}$$

$$= \frac{\partial h}{\partial \tau}\frac{1}{h}\left[1 + \rho - \frac{\lambda}{t-h} - \rho\right] = 0 \tag{A.5}$$

The tax rate defined by (A.5) induces the undistorted amount of labour supply $h^*(\rho = 0)$.

Appendix 2: Alternative Specifications of Preferences

The derivations based on the utility functions (1'') and (1''') proceed in the same way as those for the specification (1) discussed in Sections 3 and 4. Therefore, only the main findings are reported in Table 1 below. The table also includes the results for logarithmic preferences derived in Sections 3 and 4 in order to facilitate comparisons across different preference specifications.

For the utility function (1'), it is not feasible to derive explicit solutions easily, once the reference level of consumption $\bar{c}$ is endogenised. Therefore, only rows 1 to 13 (column 2, Table 1) can be obtained in the same manner as for the other three utility specifications. Consequently, we next describe in more detail the derivation of the results stated in Table 1, column 2, rows 14 to 22, that is when repercussions via $\bar{c}$ are taken into account.

For the utility function $\tilde{u}$, the condition describing the optimal choice of working time h*(τ, S(τ)), for a given marginal tax rate τ and assuming the government's budget to be balanced in expected terms (cf. equation (9)), can be expressed as (see line 10, column 2, Table 1):

$$\Omega := h - \frac{t\gamma_5}{w(1+f)\gamma_4\left[\dfrac{\bar{c}^{1-\eta}}{\bar{c}^{1-\eta}+\rho}\right]^{1/\eta}+\gamma_5} = h - \frac{t\gamma_5}{w(1+f)\gamma_2(\bar{c})+\gamma_5} = 0 \qquad \text{(A.6)}$$

To subsequently save on notation, we use $\gamma_5(q,f) = 1 + f\gamma_1 + \sqrt{\kappa}(\gamma_1 - 1)$ for $\gamma_1(q,f) = [(1-q)/qf]^{1/\eta} > 1$, $\sqrt{\kappa} = 1 - q - qf$, as defined below equation (9) in Section 4, and $\gamma_2(\bar{c}) = \gamma_4[\bar{c}^{1-\eta}/(\bar{c}^{1-\eta} + \rho)]^{1/\eta}$. Note that $\gamma_4(\lambda, q, w, \tau, f) := [\lambda/(qw(1-\tau)(1+f))]^{(1/\eta)} > 0$ is independent of ρ. Since average consumption equals $\bar{c} = qc^d + (1-q)c^u = wh(1-\tau) + S + \tau z\sqrt{\kappa}$, and a balanced budget requires $\tau hw - S - \tau z\sqrt{\kappa} = 0$ (cf. equation (9)), we obtain $\bar{c} = wh$. Therefore, γ_2 is given by:

$$\gamma_2(\lambda,q,w,\tau,f,h,\rho) = \gamma_4\left[\frac{(wh)^{1-\eta}}{(wh)^{1-\eta}+\rho}\right]^{1/\eta} = \gamma_4(\lambda,q,w,\tau,f)\gamma_3(w,h,\rho) \qquad \text{(A.7)}$$

The derivative of γ_3 with respect to hours h is:

$$\frac{\partial\gamma_3}{\partial h} = \frac{\partial\left(\left[\frac{(wh)^{1-\eta}}{(wh)^{1-\eta}+\rho}\right]^{1/\eta}\right)}{\partial h} = \frac{\gamma_3(1-\eta)\rho}{\eta h((wh)^{1-\eta}+\rho)} = \frac{\partial\gamma_3}{\partial\rho}(\eta-1)\rho \tag{A.8}$$

Therefore, the impact of a rise in h on $\Omega = h - t\gamma_5/[w(1+f)\gamma_4\gamma_3 + \gamma_5]$ is positive:

$$\Omega_h = 1 + \frac{t\gamma_5 w(1+f)\gamma_4}{(w(1+f)\gamma_4\gamma_3+\gamma_5)^2}\frac{\partial\gamma_3}{\partial h} = 1 + \frac{hw(1+f)\gamma_4}{(w(1+f)\gamma_4\gamma_3+\gamma_5)}\frac{\gamma_3(1-\eta)\rho}{\eta h((wh)^{1-\eta}+\rho)}$$

$$= \frac{\gamma_5\eta((wh)^{1-\eta}+\rho) + w(1+f)\gamma_4\gamma_3\left[\eta(wh)^{1-\eta}+\rho\right]}{(w(1+f)\gamma_4\gamma_3+\gamma_5)\eta((wh)^{1-\eta}+\rho)} > 0 \tag{A.9}$$

Note that use has been made of equation (A.6) in the derivation of (A.9). Moreover, the derivative of Ω with respect to ρ is negative.

$$\Omega_\rho = -\frac{hw(1+f)\gamma_4\gamma_3}{(w(1+f)\gamma_4\gamma_3+\gamma_5)\eta((wh)^{1-\eta}+\rho)} < 0 \tag{A.10}$$

The change in working time $h^*(\tau, S(\tau))$ owing to a general rise in the strength ρ of relative consumption concerns will hence be positive if the reference level of consumption is endogenised, the marginal tax rate τ is given and adjustments in the lump-sum transfer S balance the budget.

$$\frac{dh^*(\tau,S(\tau))}{d\rho} = -\frac{\Omega_\rho}{\Omega_h} = \frac{hw(1+f)\gamma_4\gamma_3}{\gamma_5\eta((wh)^{1-\eta}+\rho) + w(1+f)\gamma_4\gamma_3\left[\eta(wh)^{1-\eta}+\rho\right]} > 0 \tag{A.11}$$

The optimal amount of undeclared income $z^*(\tau, S(\tau))$, assuming an endogenously determined reference level of consumption, is given by (cf. line 11, column 2 Table 1):

$$T^E(\tau,S(\tau)) = z^*(\tau,S(\tau)) = \frac{wt(\gamma_1-1)}{\tau[\gamma_5+w(1+f)\gamma_2]} \tag{A.12}$$

In order to determine the direction of the change in γ_2 owing to a rise in ρ, we need to take into account that γ_3 in (A.7) shrinks with ρ directly and is affected indirectly via the adjustment in working time h. Making use of equations (A.8) and (A.11), we obtain:

$$\frac{d\gamma_3}{d\rho} = \frac{\partial\gamma_3}{\partial\rho} + \frac{\partial\gamma_3}{\partial h}\frac{\partial h}{\partial\rho}$$

$$= \frac{\gamma_3}{\eta h((wh)^{1-\eta} + \rho)} \left[\frac{(1-\eta)\rho w(1+f)\gamma_4\gamma_3}{\gamma_5\eta((wh)^{1-\eta} + \rho) + w(1+f)\gamma_4\gamma_3(\eta(wh)^{1-\eta} + \rho)} - 1 \right]$$

$$= -\frac{\gamma_3(\gamma_5 + w(1+f)\gamma_4\gamma_3)}{\gamma_5\eta((wh)^{1-\eta} + \rho) + w(1+f)\gamma_4\gamma_3\left[\eta(wh)^{1-\eta} + \rho\right]} < 0 \qquad \text{(A.13)}$$

Therefore, $d\gamma_2/d\rho < 0$ holds. Since the amount of income not declared to tax authorities $z^*(\tau, S(\tau))$ declines with γ_2, $z^*(\tau, S(\tau))$ will rise if relative consumption concerns ρ become more pronounced (cf. line 14, column 2, Table 1). $d\gamma_2/d\rho < 0$ also implies that the absolute amount of income declared $T^P(\tau, S(\tau))$ increases with ρ (cf. rows 12 & 15, column 2, Table 1).

In order to determine the impact of more pronounced relative consumption concerns in a setting in which the government sets the tax parameters in such a way that, first, the budget is balanced and, second, the optimal amount of working time h** is induced, we proceed as follows. First, we note that working time $h^*(\tau, S(\tau))$ declines with the marginal tax rate τ, if the lump-sum payment $S(\tau)$ adjusts in order to balance the budget. This is the case because $\Omega_\tau = (\partial\Omega/\partial\gamma_4)(\partial\gamma_4/\partial\tau) > 0$, where $\partial\Omega/\partial\gamma_4 > 0$ from (A.6) and $\partial\gamma_4/\partial\tau > 0$ from the definition of γ_4 below that equation. Furthermore, we have established $\Omega_h > 0$ (cf. equation (A.9)). This implies that $dh^*(\tau, S(\tau))/d\tau = - \Omega_\tau/\Omega_h < 0$. Second, we take into account that $dh^*(\tau, S(\tau))/d\rho > 0$ (see (A.11)). Since $h = h(\tau, \rho)$ and h is fixed by assumption at the optimal level $h^{**} = t/(1 + w^{1-1/\eta}\lambda^{1/\eta})$, more pronounced relative consumption concerns imply that the tax rate τ has to be raised in order to guarantee h**.

Furthermore, for a given level of working time the optimal amount of undeclared income $z^*(\tau, S(\tau))$ depends negatively on the tax rate τ. Inspection of line 19, column 2, Table 1 clarifies that this negative effect is due to a direct impact and an indirect one via $\gamma_2 = \gamma_3\gamma_4(\lambda, q, w, \tau, f)$. Consequently, a rise in relative consumption concerns ρ will reduce the absolute amount of taxes evaded $T^E(\tau^{**})$. Therefore, relative tax evasion $T^R(\tau^{**})$ will decline with the strength ρ of relative consumption concerns, while the absolute amount of income declared to tax authorities $T^P(\tau^{**})$ will rise (cf. rows 20 – 22, column 2, Table 1).

Table 1: Working Time, Tax Evasion Indicators, Comparative Static Properties for Four Specifications of Preferences

		1	2	3	4
Utility function		$u = \ln c^i + \lambda \ln(t-h) + \rho \ln\left(\frac{c^i}{\bar{c}}\right)$	$\tilde{u} = \frac{(c^i)^{1-\eta}-1}{1-\eta} + \lambda \frac{(t-h)^{1-\eta}-1}{1-\eta} + \rho \frac{(c^i/\bar{c})^{1-\eta}-1}{1-\eta}$, $\eta > 0$	$\hat{u} = A - e^{-c^i} - \lambda e^{-(t-h)} - \lambda e^{-(t-h)} - \rho e^{-(c^i/\bar{c})}$	$\hat{u} = \frac{(c^i - \rho\bar{c})^{1-\eta}-1}{1-\eta} + \lambda(t-h)$ $\eta > 0,\ 0 \le \rho < 1$
Risk attitudes		DARA, CRRA (= 1)	DARA, CRRA (= η)	CARA (= 1), IRRA	DARA, DRRA
h**	1	$\frac{t}{1+\lambda}$	$\frac{t}{1+w^{1-1/\eta}\lambda^{1/\eta}}$	$\frac{t+\ln w - \ln\lambda}{1+w}$	$\left(\frac{w(1-\rho)}{\lambda}\right)^{1/\eta} \frac{1}{1-\rho}$
τ*	2	$\frac{\rho}{1+\rho}$	$\frac{\rho}{1+\rho}$	$\frac{\rho}{1+\rho}$	ρ
h*(τ, S)	3	$\frac{w(1-\tau)(1+\rho)t - \lambda S}{w(1-\tau)(1+\rho+\lambda)}$ (7)	$\frac{t(1+f\gamma_1) - S\gamma_2(\bar{c})(1+f)}{w(1-\tau)\gamma_2(\bar{c})(1+f)+1+f\gamma_1}$	$\frac{\gamma_7 + \gamma_6 f/(1+f) + t - S}{1+w(1-\tau)}$	$\frac{\gamma_8(1+f\gamma_1)+(1+f)(p\bar{c}-S)}{(1+f)w(1-\tau)}$ $\bar{c}$ endogenised: $\frac{\gamma_8(1+f\gamma_1)+\rho\sqrt{\kappa}(\gamma_1-1)}{(1+f)w(1-\tau)(1-\rho)} - \frac{S}{w(1-\tau)}$
$T^E(\tau, S)$	4	$\frac{(w(1-\tau)t+S)(1+\rho)\sqrt{\kappa}}{f\tau(1+\rho+\lambda)}$ (8)	$\frac{(\gamma_1-1)[w(1-\tau)t+S]/\tau}{w(1-\tau)\gamma_2(\bar{c})(1+f)+1+f\gamma_1}$	$\frac{\gamma_6}{\tau(1+f)}$	$\frac{(\gamma_1-1)\gamma_6}{\tau(1+f)}$
$T^P(\tau, S)$	5	$\frac{wt(1+\rho)[(\tau(f+\sqrt{\kappa})-\sqrt{\kappa}]}{(1+\rho+\lambda)f\tau} - \frac{S\left(\lambda f\tau + (1-\tau)(1+\rho)\sqrt{\kappa}\right)}{(1+\rho+\lambda)f\tau(1-\tau)}$	$\frac{wt\gamma_7}{(1-\tau)w\gamma_2(\bar{c})(1+f)+1+f\gamma_1} - \frac{w(S\gamma_2(\bar{c})(1+f)\tau+\gamma_1-1)}{(1-\tau)w\gamma_2(\bar{c})(1+f)+1+f\gamma_1}$	$\frac{\gamma_7 + \gamma_6 f/(1+f) + t - S}{1+w(1-\tau)} - \frac{\gamma_6}{\tau(1+f)}$	$\frac{\gamma_8\gamma_9 + (1+f)\tau(p\bar{c}-S)}{(1+f)(1-\tau)}$ $\bar{c}$ endogenised: $\frac{\gamma_8(\gamma_9+(\gamma_1-1)(1-\tau)\rho)+\rho\tau\sqrt{\kappa}(\gamma_1-1)}{(1+f)(1-\tau)(1-\rho)} - \frac{S}{w(1-\tau)}$
$T^R(\tau, S)$	6	$\frac{(w(1-\tau)t+S)\sqrt{\kappa}}{f\tau\left[wt - \frac{\lambda S}{(1+\rho)(1-\tau)}\right]}$	$\frac{(\gamma_1-1)[w(1-\tau)t+S]}{w\tau[t(1+f\gamma_1)-S\gamma_2(\bar{c})(1+f)]}$	$\frac{\gamma_6(1+w(1-\tau))}{(1+f)\left[\gamma_7+t-S\right]+w\tau\gamma_6 f}$	$\frac{(\gamma_1-1)\gamma_8(1-\tau)}{\tau(\gamma_8(1+f\gamma_1)+(1+f)(p\bar{c}-S))}$ $\bar{c}$ endogenised: $\frac{(\gamma_1-1)\gamma_8(1-\tau)(1-\rho)}{\tau[\gamma_8(1+f\gamma_1)+\rho\sqrt{\kappa}(\gamma_1-1)-S(1+f)(1-\rho)]}$
$\partial T^E(\tau,S)/\partial\rho$	7	> 0 (cf. Proposition 1)	> 0	0	0
$\partial T^P(\tau,S)/\partial\rho$	8	> 0 (cf. Proposition 1)	> 0	> 0	> 0

$\partial T^R(\tau,S)/\partial\rho$	9	<0 (cf. Proposition 1)	<0	<0	<0
$h^*(\tau, S(\tau))$	10	$\frac{t[f+\kappa](1+\rho)(1-\tau)}{\gamma_0(1-\tau)+f\lambda}$ (11)	$\frac{t\gamma_5}{\gamma_5+w(1+f)\gamma_2}$	$\frac{\gamma_7+t+\gamma_6(f+\sqrt{\kappa})/(1+f)}{1+w}$	$\frac{\gamma_8\gamma_5}{(1-\rho)w(1+f)}$
$T^E(\tau, S(\tau))$	11	$\frac{(1-\tau)(1+\rho)\sqrt{\kappa}wt}{\tau[\gamma_0(1-\tau)+f\lambda]}$ (12)	$\frac{wt(\gamma_1-1)}{\tau[\gamma_5+w(1+f)\gamma_2]}$	$\frac{\gamma_6}{\tau(1+f)}$	$\frac{(\gamma_1-1)\gamma_8}{\tau(1+f)}$
$T^P(\tau, S(\tau))$	12	$\frac{(1+\rho)w(1-\tau)t[(f+\kappa)\tau-\sqrt{\kappa}]}{\tau[\gamma_0(1-\tau)+f\lambda]}$	$\frac{wt[\tau\gamma_5-\gamma_1+1)}{\tau[\gamma_5+w(1+f)\gamma_2]}$	$\frac{\gamma_7+t+\gamma_6(f+\sqrt{\kappa})/(1+f)}{1+w}w-\frac{\gamma_6}{\tau(1+f)}$	$\frac{\gamma_8}{1+f}\left[\frac{\gamma_5}{(1-\rho)}-\frac{\gamma_1-1}{\tau}\right]$
$T^R(\tau, S(\tau))$	13	$\frac{(f+\kappa)\tau}{\sqrt{\kappa}}$	$\frac{\gamma_1-1}{\tau\gamma_5}$	$\frac{\gamma_6(1+w)}{\tau\left((\gamma_7+t)(1+f)+\gamma_6(f+\sqrt{\kappa})\right)}$	$\frac{(\gamma_1-1)(1-\rho)}{\tau\gamma_5}$
$\partial T^E(\tau,S(\tau)/\partial\rho$	14	>0 (cf. Proposition 2)	>0	0	0
$\partial T^P(\tau,S(\tau)/\partial\rho$	15	>0 (cf. Proposition 2)	>0	>0	>0
$\partial T^R(\tau,S(\tau)/\partial\rho$	16	0 (cf. Proposition 2)	0	<0	<0
τ^{**}	17	$\frac{\rho f+(1+\rho)\kappa}{\gamma_0}$ (13)	not explicitly defined	$1-\frac{(qf/(1-q))^{1-q}}{q(1+f)(1+\rho)}$	$1-\left[\frac{(1-\rho)(1+f)}{\gamma_5}\right]^{1/\eta}\frac{1}{q(1+f)}$
$\partial\tau^{**}/\partial\rho$	18	>0	>0	>0	>0
$T^E(\tau^{**})$	19	$\frac{(1+\rho)wt\sqrt{\kappa}}{(1+\lambda)[\gamma_0-f]}$ (15)	$\frac{wt(\gamma_1-1)}{\tau^{**}[\gamma_5+w(1+f)\gamma_2]}$	$\frac{\gamma_6}{\tau^{**}(1+f)}$	$\frac{(\gamma_1-1)\gamma_8}{\tau^{**}(1+f)}$
$\partial T^E(\tau^{**})/\partial\rho$	20	<0 (cf. Proposition 3)	$\frac{\partial T^E}{\partial\tau^{**}}\frac{\partial\tau^{**}}{\partial\rho}<0$	<0	<0
$\partial T^P(\tau^{**})/\partial\rho$	21	>0 (cf. Proposition 3)	>0	>0	>0
$\partial T^R(\tau^{**})/\partial\rho$	22	<0 (cf. Proposition 3)	<0	<0	<0

Notes to Table 1:

- The numbers in brackets in column 1 refer to equations in the main text.

- "$\bar{c}$ endogenised" in column 4 implies that $\bar{c}$ is replaced by $\bar{c} = qc^d + (1-q)c^u = wh(1-\tau) + S + fz(1-q-qf)$ and that the resulting terms are then solved for the endogenous variables of interest, namely h and z. Once, a balanced budget is presumed ($wh\tau - S - fz(1-q-qf) = 0$), $\bar{c}$ is given by $\bar{c} = wh$.

- The following abbreviations are used to condense the exposition, in addition to those ($T^E = z^*$, $T^P = h^*w - z^*$, $T^R = z^*/(h^*w)$; $\kappa(q,f) = (1-q-qf)^2$) already employed in the main text:

$\gamma_0(\rho,q,f) = (1+\rho)(f+\kappa)$; $\bar{\gamma}_1 = \dfrac{1-q}{qf} > 1$; $\gamma_1(q,f) = \bar{\gamma}_1^{1/\eta} > 1$; $\gamma_6(q,f) = \ln\bar{\gamma}_1 > 0$; $\gamma_5(q,f) = 1 + f\gamma_1 + \sqrt{\kappa}(\gamma_1 - 1)$; $\gamma_9(q,f,\tau) = 1 - \gamma_1 + \gamma_1\tau(1+f)$

$$\gamma_2(\bar{c}) \coloneqq \gamma_2(\lambda,q,w,\tau,f,\rho,\bar{c}) = \gamma_4\left[\frac{\bar{c}^{1-\eta}}{\bar{c}^{1-\eta}+\rho}\right]^{1/\eta};\ \gamma_4(\lambda,q,w,\tau,f) = \left[\frac{\lambda}{qw(1-\tau)(1+f)}\right]^{1/\eta}$$

$$\gamma_2 \coloneqq \gamma_2(\lambda,q,w,\tau,f,\rho,\bar{c} = wh) = \gamma_4(\lambda,q,w,\tau,f)\gamma_3(w,h,\rho);\ \gamma_3(w,h,\rho) = \left[\frac{(wh)^{1-\eta}}{(wh)^{1-\eta}+\rho}\right]^{1/\eta}$$

$$\gamma_7(q,f,w,\tau,\rho,\eta) = \ln\left(\frac{qw(1-\tau)(1+\rho)(1+f)}{\lambda}\right);\ \gamma_8(q,f,w,\tau,\rho,\eta) = \left(\frac{qw(1-\tau)(1+\rho)(1+f)}{\lambda}\right)^{1/\eta}$$

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