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TAX PROGRESSIVITY AND TAX EVASION

LASZLO GOERKE

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TAX PROGRESSIVITY AND TAX EVASION

Abstract

More progressive income taxes raise employment in models of imperfectly competitive labour markets. However, this prediction is not robust to modifications of the analytical structure. For example, in an efficiency wage setting, more progressive taxes reduce profits. This induces firms to exit the market such that the positive employment effect can vanish in a framework with a constant profit constraint. In this paper, it is demonstrated for an according model that tax evasion opportunities raise the likelihood of positive employment effects due to higher tax progressivity.

JEL Classification: H24, H26, J41.

Keywords: efficiency wages, employment, income tax, tax evasion, tax progressivity.

Laszlo Goerke
Johannes Gutenberg-University Mainz
Department of Economics (FB 03)
55099 Mainz
Germany
Laszlo.Goerke@uni-mainz.de

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1. Introduction

More progressive income taxes raise employment in models of imperfectly competitive labour markets. The basic intuition for this result is that an increase in the marginal tax rate, holding constant the level of tax payments, reduces the gain from a wage rise, while the cost of a higher wage remain the same. The notion that "tax progression is good for employment" (Koskela and Vilmunen 1996) holds for models of collective wage (and employment) determination, efficiency wage settings and also matching frameworks.[1]

However, the basic relationship between tax progressivity and employment is often contingent on there being solely one type of adjustment mechanism available in response to the increase in tax progressivity, namely a change in employment owing to a tax induced wage variation. If a lower wage induces other reactions than higher employment or if the alteration of the tax structure has other effects than a wage variation, then tax progressivity may no longer be good for employment. Suppose, for example, that a reduction in wage alters working hours, affects human capital formation, or alters profits. In frameworks which include such additional adjustment channels, higher tax progressivity may still reduce wages. However, lower wages need no longer entail higher aggregate employment. Instead, the wage reduction can increase working time, reduce human capital formation or the number of firms. In either of these cases, the number of workers may fall in response to an increase in tax progressivity.[2]

In this paper, the consequences of allowing for a further adjustment channel, that is tax evasion, are investigated. The analysis is conducted in a benchmark setting, a long-run constant profit efficiency wage economy. In this benchmark economy, an increase in tax progressivity has no employment effects in the absence of evasion opportunities. This is the case, because the higher marginal tax rate decreases wages such that effort per worker declines. Firms react to lower wages and a fall in output per worker by an increase in the number of workers. If all firms employ more workers, aggregate employment rises and effort declines further because effort is a decreasing function of unemployment. Since wages and employment are chosen optimally by each firm, the direct wage and firm-specific employment effects of higher tax progressivity have no (first-order) repercussions on profits. However, the reduction in unemployment lowers profits via the decline in effort. If profits are fixed in the long-run, some firms have to leave the market until the original level of profits is restored. This will be the case at the initial level of unemployment.[3] Given the absence of

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[1] According results have, for example, been provided by Hoel (1990), Lockwood and Manning (1993), Goerke (1997, 1999), Malcomson and Sartor (1987), Holmlund and Kolm (1995), Bovenberg and van der Ploeg (1994), Sørensen (1997, 1999), Pissarides (1999, 2000), and Bovenberg (2003). A survey of the relevant literature is provided by Goerke (2002) who also summarises the empirical evidence.

[2] Exceptions to the rule that higher income tax progressivity raises employment in models of imperfectly competitive labour markets, based on the existence of an additional adjustment mechanism, are derived by Andersen and Rasmussen (1999), Fuest and Huber (1998, 2000), Goerke (2000), Hansen et al. (2000), and Rasmussen (2002) inter alia.

[3] See Goerke (2000) for the basic model, which employs the approach by Albrecht and Vroman (1996). Related issues are investigated by Fuest and Huber (1998) and Rasmussen (1998, 2002).

any employment effect of higher tax progressivity in a setting without tax evasion opportunities, any positive employment impact in a world which allows for evasion activities - but is otherwise identical - would solely be due to tax evasion.

This paper shows that an employment expansion will occur if the penalty for tax evasion depends at least in part on the undeclared income, rather than solely on the amount of taxes evaded. In this case, more progressive taxes raise the gain from evasion. The worker's income rises and s/he provides higher effort. Wages can be lowered, new firms enter the market and employment increases. Accordingly, tax evasion can represent a mechanism by which the progressivity of the tax system affects the behaviour of workers and, hence, employment outcomes. Section 2 presents the model, while Section 3 analyses the employment consequences of more progressive taxes. Section 4 concludes.

Apart from analyses of tax progressivity in imperfect labour markets, this paper is related to two further strands of literature: tax evasion in efficiency wage models has been looked at by Watanabe (1996), Chang and Lai (1996) and Lai et al. (1999). These authors do not analyse tax progressivity. The impact of tax progressivity on evasion has been analysed by Koskela (1983a, b) and Trandel and Snow (1999), inter alia. In those papers, a given wage or a competitive labour market is presumed.

2. Model

In the economy there are a fixed number of workers whose only source of income are wages w and who can evade income taxes. Employed workers maximise their expected utility by choosing tax evasion activities. The (indirect) utility function v is strictly concave in net income, $v' > 0$, $v'' < 0$. With an exogenous probability $1 - p$, a worker evades taxes successfully and the net income becomes $y^e \equiv w - (w - s)t(1 - h)$, where s is the level of tax exemption, $0 < s < w$, t the marginal income tax rate, $0 \leq t \leq 1$, and h the degree of tax evasion, $0 \leq h \leq 1$. With the probability p, a worker is caught evading taxes, has to pay a penalty $\tilde{F}(\cdot)$, and obtains an income $y^c \equiv y^e - \tilde{F}(\cdot)$. In the economic analysis of tax evasion, two penalty functions have almost exclusively been analysed. Either the penalty is an increasing function of undeclared income $(w - s)h$ (Allingham and Sandmo 1972) or of evaded taxes $(w - s)th$ (Yitzhaki 1974). To merge the two approaches, a general penalty function $\tilde{F}(\cdot)$ is assumed which depends on a linear combination of evaded taxes and undeclared income, the relative importance of the former being measured by a parameter β, $0 \leq \beta \leq 1$, such that $\tilde{F}(\cdot) \equiv F*[(w - s)h(1 - \beta + \beta t)]$. Accordingly, the expected utility U(h) of an employed worker becomes:

$$U(h) = (1-p)v(w-(w-s)t(1-h)) + pv(w-(w-s)t(1-h) - F*[(w-s)h(1-\beta+\beta t]) \quad (1)$$

If tax evasion choices are unrestricted, the maximisation of expected utility (1) with respect to the optimal degree of tax evasion h implies:

$$H \equiv (w-s)\left((1-p)v'(y^e)t + pv'(y^c)[t - F(1-\beta+\beta t)]\right) = 0 \quad (2)$$

An interior solution requires, inter alia, $t(1 - F\beta) < F(1 - \beta)$, such that the ensuing restriction on F varies with the penalty system, i.e. the value of β, while the second-order condition entails $H_h < 0$. The variations in the optimal degree of evasion h*, owing to a higher level of tax exemption s or the marginal income tax rate t, are governed by:

$$\frac{H_t}{w-s} = -(1-p)v''(y^e)t(w-s)(1-h) + (1-p)v'(y^e) + pv'(y^c)(1-\beta F)$$
$$- (w-s)\Big(pv''(y^c)[t - F(1-\beta+\beta t)][1-h+F\beta h]\Big) \tag{3}$$

$$\frac{H_s}{w-s} = (1-p)v''(y^e)t^2(1-h) + pv''(y^c)[t - F(1-\beta+\beta t)][t(1-h) + Fh(1-\beta+\beta t)] \tag{4}$$

The prior analysis presumes an interior solution to a worker's tax evasion choice. However, given withholding regulations, workers may only be able to select a value of h such that h < h*. Moreover, withholding regulations would prevent adjustments in evasion activities in response to a change of tax progressivity. Both cases, an optimally chosen (h = h*) and an exogenously given degree of tax evasion (h < h*) are investigated below. This distinction proves to have an impact on the employment consequences of more progressive taxes.

In the framework set out above, the effort of a worker is determined by an exogenously given effort function e. Since the impact of tax evasion on work effort is not well documented, two distinct functions are considered. Effort e is assumed to increase with the unemployment rate u ($e_u > 0$, a subscript indicating a partial derivative) and to be either a function of the income y^e in the case of successful tax evasion, $e = \tilde{e}(y^e, u)$, or alternatively of the expected utility if employed U, $e = \hat{e}(U, u)$. The effort functions are strictly concave in their first arguments. The rationale for the effort function $e = \tilde{e}(y^e, u)$ is that a penalty on which the firm has no (direct) influence does not affect the worker's performance. The second specification, $e = \hat{e}(U, u)$, will be more appropriate if expected utility determines effort, irrespective of its source. Given these restrictions on e, effort is strictly concave in wages w ($e_w > 0$, $e_{ww} < 0$). To make results, furthermore, comparable to those of other studies on the employment consequences of more progressive taxes in an efficiency wage setting, which generally assume that the equilibrium wage declines with unemployment u, entailing $dw/du = (e_u - we_{wu})/(we_{ww}) < 0$ (cf. Hoel 1990), for simplicity the cross-derivatives of the effort function are assumed to be zero, i.e. $\tilde{e}_{y^e u} = \hat{e}_{Uu} = 0$ is presumed.

In the economy, there are many ex-ante identical firms with a constant capital stock and characterised by a production function f which is strictly concave in efficiency units of labour, $f'(en) > 0$, $f'' < 0$, n being employment per firm. The output price of the homogeneous good is unity. As usual in simple efficiency wage models, firms choose wages and employment optimally (Solow 1979), such that wages are determined by the Solow-condition, $e - we_w = 0$. In addition, in the present setting the number of firms is endogenous and regulated by a constant or zero profit situation. Accordingly, the framework may be regarded as describing a long-run equilibrium. For simplicity, however, entry and exit decisions are not modelled. Finally, note that aggregate labour demand is determined by the profit constraint $\pi = 0$.

3. More Progressive Income Tax System

In a setting without tax evasion opportunities, an increase in tax progressivity, i.e. a combined rise of the marginal income tax rate t and the level of tax exemption s, holding constant taxes at the original wage, will lower unemployment if firms are profitable, while there not be any employment effect in the case of constant profits (Goerke 2000). These differential employment effects of higher tax progressivity result since the decrease in unemployment in an efficiency wage setting occurs at the expense of lower profits. To illustrate this claim, let higher tax progressivity be tantamount to an increase in the level of income tax exemption s and assume that unemployment u declines with tax progressivity, implying $\partial u/\partial s < 0$. Since firms choose wages and employment optimally, the profit effect of higher tax progressivity is found to be unambiguously negative:

$$\frac{d\pi}{ds} = \left[\frac{\partial\pi}{\partial n} + \frac{\partial\pi}{\partial n}\frac{\partial n}{\partial w}\right]\frac{\partial w}{\partial s} + \frac{\partial\pi}{\partial e} e_u \frac{\partial u}{\partial s} < 0 \tag{5}$$

If some firms react to the decline in profits by leaving the market, the reduction in the number of firms will exactly balance the rise in the number of workers per firm such that the overall employment effect is zero. These results imply that if a zero profit constraint in an efficiency wage economy is combined with a tax reform which leaves constant the level of statutory tax payments (w - s)t at the initial wage, any employment effect of tax progressivity will entirely be attributable to tax evasion opportunities.

The economic system which governs the employment effects of higher income tax progressivity is defined by the Solow-condition $e - we_w = 0$ and the profit constraint $\pi = 0$. The level of tax exemption s represents the policy parameter. Total differentiation, taking into account that the marginal income tax rate t varies with the level of tax exemption s to allow for constant statutory tax payments, such that dt/ds = t/(w - s), while w and u are the endogenous variables, yields:

$$\begin{bmatrix} -we_{ww} & e_u \\ 0 & f'e_u n \end{bmatrix}\begin{bmatrix} dw \\ du \end{bmatrix} = \begin{bmatrix} -e_s + we_{ws} - (e_t - we_{wt})\dfrac{dt}{ds} \\ -f'n\left(e_s + e_t\dfrac{dt}{ds}\right) \end{bmatrix}[ds] \tag{6}$$

Accordingly, the unemployment effect of a more progressive tax system is given by:

$$\frac{du}{ds} = -\frac{Z}{(w-s)e_u}, \text{ where } Z \equiv e_s(w - s) + te_t \tag{7}$$

The sign of Z depends, inter alia, on the nature of the effort function. If effort is determined by the income of successful evasion, $e = \tilde{e}\,(y^e, u)$ will hold, and e_t and e_s are found to be:

$$e_t = \tilde{e}_{y^e}(w-s)\left(th_t^* - (1-h)\right) \tag{8}$$

$$e_s = \tilde{e}_{y^e} t\left((1-h) + (w-s)h_s^*\right) \tag{9}$$

In equations (8) and (9), the derivatives of h* represent the adjustment in the optimal degree of tax evasion. For an exogenously given degree of tax evasion (dh = 0), the terms involving these

derivatives will drop out if the optimal value of h subsequent to the tax reform is still above the feasible degree of evasion. From equations (7) to (9) it can then be seen by setting h = dh = 0, i. e. by assuming a framework without evasion opportunities, that there is no change in employment due to an increase in tax progressivity. Hence, the employment effects of higher tax progressivity in a world with an exogenously given degree of tax evasion (h < h*) are the same as in a setting without tax evasion. The intuition for the equivalence is that the tax reform does not alter effort due to the assumption of a given tax level. Moreover, there is no effect of tax progressivity on evasion - by assumption since dh = 0. Hence, effort is unaffected, while profits and employment remain constant.

Assuming optimal evasion activities, the unemployment effect of higher tax progressivity becomes:

$$Z\Big|_{e=\tilde{e}(y^e,u),h=h^*} = \tilde{e}_{y^e}\left((w-s)h_s^* + th_t^*\right)(w-s)t$$

$$= -\frac{\tilde{e}_{y^e}}{H_h}\left((w-s)H_s + tH_t\right)(w-s)t$$

$$= -\frac{(w-s)^3 t\tilde{e}_{y^e}}{H_h} pv''(y^c)\left[t - F(1-\beta+\beta t)\right]Fh(1-\beta)$$

$$-\frac{(w-s)^2 t^2 \tilde{e}_{y^e}}{H_h}\left\{(1-p)v'(y^e) + pv'(y^c)(1-\beta F)\right\} > 0\text{, if } \beta < 1 \quad (10)$$

If the penalty depends at least in part on undeclared income (β < 1), an interior solution to the evasion problem (cf. equation (2)) ensures that the term in square brackets subsequent to the last equality sign in (10) is negative, while the expression in curly brackets is greater than zero. Accordingly, the optimal degree of tax evasion h* rises because a more progressive income tax reduces the penalty.[4] Higher tax evasion increases the income of successful evasion y^e and thereby effort. Greater effort allows firms to reduce the wage and to increase employment; implying Z > 0 and du/ds < 0.

In an efficiency wage economy with variable profits but without tax evasion, higher statutory tax progressivity at the initial wage reduces the firm's incentives to raise wages, because the increase in effort due to higher wages is mitigated by the higher marginal income tax rate. Lower wages result in a reduction of effort and in lesser profits and greater employment. If firms face a (zero) profit

[4] This can be seen most clearly by rewriting the penalty as F(•) =F*h[β(w – s)t + (1 - β)(w – s)] and is due to the fact that an increase in the level of tax exemption s lowers undeclared income. For a given statutory tax burden (w – s)t and a given degree of evasion h*, the penalty declines. See also Koskela (1983b), who shows for a model with exogenous income that tax evasion will rise with an increase in tax progressivity if the fine is a function of undeclared income, and the government's expected tax revenues or the worker's expected utility are held constant.

constraint, the reduction in profits causes some firms to leave the market such that unemployment rises until profits have attained their original level again. A new equilibrium is reached at the old level of employment, with fewer firms each having more workers (Goerke 2000). In the presence of tax evasion, the change in statutory tax progressivity induces workers to provide more effort at a given wage and unemployment level for $\beta < 1$, because evasion activities intensify. Thus, profits rise. Employment increases until profits have fallen to the pre-tax reform level of zero. Given these differential effects for a model without evasion and a setting with tax evasion opportunities, the employment expansion is solely due to the existence of tax evasion.

Turning to the effort function $e = \hat{e}(U, u)$, the derivatives with respect to the marginal income tax rate and the level of tax exemption are given by:

$$e_t = -\hat{e}_U (w-s)\left[(1-p)v'(y^e)(1-h) + pv'(y^c)\{1-h+F\beta h\}\right] + \hat{e}_U H h_t^* \tag{11}$$

$$e_s = \hat{e}_U\left[(1-p)v'(y^e)t(1-h) + pv'(y^c)\{t(1-h)+F(1-\beta+\beta t)h\}\right] + \hat{e}_U H h_s^* \tag{12}$$

Using equations (7), (11), and (12), the change in unemployment due to higher tax progressivity is found to be:

$$\left.\frac{du}{ds}\right|_{e=\hat{e}(U,u)} = -\frac{\hat{e}_U pv'(y^c)hF(1-\beta)}{\hat{e}_u} < 0 \text{, if } \beta < 1 \tag{13}$$

This result is independent of whether evasion choices are optimal or not, since an optimal selection implies $H = 0$, while an exogenously determined degree of tax evasion entails $dh^* = 0$. Accordingly, the last terms in equations (11) and (12) drop out, irrespective of whether evasion activities are optimal ($h = h^*$) or restricted exogenously ($h < h^*$). The reason for the positive impact of higher tax progressivity on employment is that a greater level of tax exemption s affects all payoffs equally. However, if the penalty also depends on undeclared income, implying $\beta < 1$, a higher marginal income tax rate t will raise the penalty by less than the increase in the level of tax exemption s will reduce it. This implies a lower penalty. Expected income and effort rise. Higher effort allows for a reduction in wages and induces a fall in unemployment.

The findings can be summarised as follows: a more progressive income tax system, holding constant the statutory tax level at the initial wage, will reduce unemployment in a constant profit efficiency wage economy if the penalty for tax evasion depends at least marginally on undeclared income and either effort is a function of the expected utility of an employed worker or effort rises with the income of successful evasion while evasion choices are unrestricted.

4. Discussion

The employment effects of more progressive taxes in an efficiency wage economy have been analysed in the presence of tax evasion in a setting in which such policy changes have no employment consequences in the absence of evasion. If the penalty for evasion is influenced by undeclared

income and tax evasion choices are unrestricted, then a rise in statutory tax progressivity increases employment and tax evasion can be argued to re-establish the positive employment impact of more progressive income taxes. If evasion choices are restricted, for example, due to withholding regulations, the employment effects of higher statutory tax progressivity depend on the nature of the effort function.

The analysis has presumed a constant level of statutory tax payments at the initial wage level. However, any employment change due to the penalty also being an increasing function of un-declared income requires adjustments in evasion behaviour and, therefore, in the efficiency wage. Accordingly, constant statutory tax payments neither guarantee the expected income of workers, nor expected tax payments, nor a balanced budget. If an increase in tax progressivity is combined with the requirement of either constant tax payments or a balanced-budget, the positive employment effects of higher tax progressivity can no longer be ascertained, even in the absence of tax evasion (cf. Fuest and Huber 1998 or Rasmussen 2002). This ambiguity is aggravated in the presence of tax evasion because wage changes affect evasion behaviour which, in turn, alters the level of effort. As the impact of tax variations on effort, taking into account direct tax and indirect wage and evasion effects, cannot be determined unambiguously, the employment consequences of tax reforms become uncertain.

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