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Abstract

This study investigates whether excess effort to climb a career ladder justifies policy interventions. The answer depends on whether the government is able to levy a higher tax burden on career workers than on non-career workers. Both a tax on top income aimed at lowering the rewards of promotion and a labour law that restricts excess effort require such a differentiation in the tax burden to improve welfare. The differentiation in tax burden prevents that the welfare gain of reducing excess effort is neutralized by the welfare cost connected to an increase in the number of career workers.

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1. Introduction

Long-term trends show that an increasing share of the population are employed in high-skilled occupations where career opportunities are common. The trends also show that wage differences are increasing in many countries, and that the increase in top incomes is substantial; see Piketty and Saez (2006) and Atkinson et al. (2011). Empirical observations of payment schemes within firms show that wage levels is linked to career ladders within internal hierarchies; see Baker et al. 1994a and 1994b. Workers' wages are partly determined by job level, where top positions are rewarded with substantial wages. These trends are consistent with literature on tournaments and promotions; see Malcomson (1984), Bognanno (2001) and DeVaro (2006). The theoretical literature on promotions and tournaments mainly concerns how rules and contracts should be designed to stimulate effort and to allocate the right type of workers to the right tasks; see e.g. Lazear and Rosen (1981) and Fairburn and Malcomson (2001). Lazear and Rosen (1981) show that rank-order tournaments lead to a socially optimal allocation of effort when workers are risk neutral. Persson and Sandmo (2005) study welfare-maximizing taxation within the simple framework of Lazear and Rosen (1981), and find that zero taxation maximizes the welfare when society is only concerned with equal opportunities. A tax would distort the effort of identical and risk-neutral individuals, and hence reduce expected utility. A non-zero redistributive tax is optimal if society's welfare function displays inequality aversion in ex-post outcomes. This conflict between efficiency and equity is also demonstrated by Meyer and Mookherjee (1987). Empirical evidence, however, suggests that career workers aiming for promotion work inefficiently long hours compared to a socially efficient level; see Landers et al. (1996), who also argue that a maximum hour law generates a Pareto improvement. In their study, the income sharing of partners in a law firm creates an incentive to promote associates who have a propensity to work very hard. Associates have to work inefficiently long hours to separate themselves from potential free riders in a game of adverse selection. A maximum hour law generates a Pareto improvement within this setting. Another source of inefficiency arises as a result of rivalry among workers to win a promotion race; see Frank and Cook, (1995). Sandmo (1994) concludes that "a study of tax effects on labour effort in the particular context of promotions must explicit account of the interaction between individuals. It cannot be analyzed properly, as in the standard labour supply framework, by means of a representative worker".

The literature has neglected studying how policy should be designed when firms avoid regulations and taxation by adjusting the number of career workers competing for promotions. A policy aimed at lowering the inefficiently long hours of career workers may also improve working conditions, and hence incentives to become a career worker. Thus, such a policy may lead to an increase in the number of career workers working inefficiently long hours. Lander's recommendation of imposing laws and regulations aimed at restricting excess effort of career workers may induce firms to hire more career workers. Hence, the social loss may increase as the number of career workers working inefficiently long hours may increase. The Persson and Sandmo recommendation of introducing an income tax designed to lower the wage premium of career workers seems to be desirable as both efficiency and ex-post redistribution may improve. Firms, however, may attempt to avoid the tax by awarding smaller wage premiums to several career workers. This may increase incentives to become a career worker, and hence lead to an increase in the number of career workers working inefficiently long hours. The aim of the current study is to analyse how policy should be designed in a market solution that considers both inefficiencies in the number of hours worked and the number of workers choosing a career job. The study focuses on how policy should be designed to combat excess effort of career workers. The study is not concerned with shirking due to asymmetric information that leads to lack of effort.

This study shows that the welfare effects of public policies depend on whether the government is able to levy a higher tax burden on career workers than on non-career workers. The government is not likely to implement policies that differentiate between career workers and non-career workers. A tax wedge between career workers and non-career workers is, however, generated by both proportional and progressive taxation when career workers earn more than non-career workers. The study shows that both a tax on top income aimed at lowering the rewards of a promotion and a maximum hour law that restricts excess effort increase welfare when the tax burden on career workers exceeds the tax burden on non-career workers. The tax burden prevents the welfare gain of reducing excess effort per worker from being neutralized by the welfare cost connected to an increase in the number of career workers. The inequality in ex-post outcomes is also reduced by the tax policy. Hence, in contrast to the conclusions in Persson and Sandmo (2005) and Meyer and Mookherjee (1987), there is no conflict between ex-post equity and efficiency.

A tax on top incomes does not improve welfare when the tax burden on career workers equals the tax burden on non-career workers. Efficiency is not improved because more workers are hired to compete for promotions. A proportional tax contributes to increase welfare when such taxation contributes to increase the tax wedge between career and non-career workers. The welfare is unaffected when this tax wedge is unaffected by proportional taxation. A maximum hour law contributes to lower effort per worker. The subsequent welfare gain is however exactly neutralized when the tax burden on career workers equals the tax burden on non-career workers as firms respond by hiring more career workers working inefficiently long hours.

The model framework is presented in Section 2. Policy is analysed and evaluated in Section 3. Section 4 concludes.

2. The model framework

The model framework is constructed by modifying existing model frameworks and implementing these into the present framework. The model framework in this study is constructed to analyse effects of government policy on two aspects of distortions connected to rivalry for promotions. The first aspect concerns the amount of effort each career worker employs to obtain a promotion, and the second aspect concerns the number of workers competing for promotions. The model framework assumes that there are two types of firms. The non-career type of firm observes the effort of each worker, or the output of each worker which is perfectly correlated with effort. Firms where salespeople are paid according to their easily observable output constitute an example. In contrast, the career-type firm is unable to observe each worker's effort without substantial monitoring costs. A business organization where managers/ trainees compete to become chief executives is a typical example of a career firm. It is difficult to determine each person's effort or productivity based on his effect on the profitability of the whole enterprise. The career firm is, however, able to preserve incentives for effort and avoid substantial monitoring costs by designing a contest where career workers compete for promotions. The effort of career workers is determined by the Nash equilibrium in a non-cooperative game where own effort relative to others' effort increases the probability of being promoted. This reward structure is designed as a promotion rat race where effort triggers effort, which triggers more effort etc. The most successful and productive worker in this promotion game is promoted. Effort, which is unobservable to firms, is indirectly rewarded when the output of workers is positively correlated with effort. The promotion game is simplified compared to the game in Lazear and Rosen (1981), where the effort per worker is determined in a Nash equilibrium where the worker with the highest output is promoted and the output per worker is determined by effort and luck. Yet the key features of the promotion game in the present study are similar to the key features of the game in Lazear and Rosen. The described features of the career firm are also consistent with the wage contracts offered by firms in Malcomson (1984), who finds that contracts with payment based on ranking of employee performance can provide performance incentives even under asymmetric information that prevents payment based on individual performance. Assuming internal promotions are consistent with the result derived in Waldman (2003). He studies promotion rules that are concerned both with efficient assignment of workers to tasks and with rewarding performance, and finds that internal promotion constitutes a rule that addresses both objectives.

The features of promotion rat races are likely to differ among firms and contests; see Moldovanu (2007). Any formal specification of promotion games is likely to be sensitive to specifications and assumptions. The effort of career workers is e.g. likely to approach zero if the abilities of the workers differ and both effort and ability are common knowledge among workers. Firms, however, have an incentive to organize contests that stimulate the effort of career workers, as this contributes to increase profit. The results derived in the present study are based on effort generated by such a contest. The model framework is also confined to a single period to avoid sequential and dynamic aspects of promotions. The same approach is chosen in Lazear and Rosen (1981). The dynamic aspect may limit firms' ability to implement a fair winner-takes-all game, as losers may exit to an ordinary job. Time inconsistency problems connected with promising and actually promoting workers as well as risk aversion may also limit firms' ability to design contracts. These limitations should be considered when interpreting the results.

Assume that $\overline{N}$ identical and risk-neutral individuals choose between a career job and a non-career job. *N* individuals choose the career job, while $\overline{N}-N$ choose the non-career job. All workers supply a working time/effort of *h*, while career workers supply an additional effort of *e*, which is determined in a race for a promotion. The production function of both types of firms is represented by a simple fixed unit cost function where one unit of labor generates one unit of a homogenous consumer good. The production of career firm *i*, x_i, is given by

(1) $x_i = n_i(h+e)$.

The production of ordinary firm *j*, x_j, is given by

(2) $x_j = no_j h$,

where n_i equals the number of career workers in firm *i* and no_j equals the number of non-career workers in firm *j*. The number of career firms is fixed at *S,* while there is free entry of non-career firms. The free entry condition together with the fixed unit cost function implies that the wage rate equals the price of the consumer good, which is normalized to unity. The aggregate production function is found by adding the production of all firms given by equations (1) and (2).

$$(3)\ X = \left(\overline{N} - N\right)h + N(h+e) = \overline{N}h + Ne$$

Hence, the production is determined by Ne as $\overline{N}$ and *h* are given.

2.1. Individuals

Individuals' expected utility is given by

$$(4)\ U_j = \gamma c_j + \mu(T - h - e_j) + \frac{e_j}{Q_i}\gamma\left(R_i + F_i\right) - \left(1 - \frac{e_j}{Q_i}\right)\frac{\gamma F_i}{(n_i - 1)}.$$

Expected utility, U_j, equals the utility from consumption of worker *j* when the rewards of the promotion game are excluded, c_j, plus utility from leisure, $T - h - e_j$, plus the probability of being promoted, e_j/Q_i, multiplied by the utility of the rewards of being promoted, $R_i + F_i$, minus the probability of not being promoted, $1 - e_j/Q_i$, multiplied by the loss of utility of not being promoted, $\gamma F_i/(n_i - 1)$.

$Q_i = \sum_{j=1}^{n_i} e_j$, i.e. the sum of additional effort of career workers in firm *i*.

R_i equals the non-pecuniary value of the position within firm *i*.

F_i equals the gain of a fair winner-takes-all game introduced by firm *i*.

$\frac{F_i}{n_i - 1}$ equals the loss of a fair winner-takes-all game introduced by firm *i*. The loss is found by dividing the reward of the game by the number of losers, $(n_i - 1)$. The expected payment offered by the fair winner-takes-all game equals zero as losers finance the prize of the winner. These rewards and losses can be awarded to workers as differences in wages of promoted and non-promoted workers and as bonuses.

n_i equals the number of workers in firm *i*.

c_j equals the consumption of worker *j* when the rewards of the game are excluded.

T equals total time.

γ and μ are parameters in the utility function.

The parameters in the utility function are chosen so that one additional unit of effort generates a social loss of unity. This assumption is incorporated to be able to study how public policy should be designed to combat excess effort of career workers. A social loss due to excess effort is therefore chosen as a point of departure in the present study. Hence, parameters in the utility function are chosen so that $\mu = \gamma + 1$. One additional unit of effort that generates one additional unit of the consumer good generates a loss of utility of unity.

The utility of workers in non-career jobs is found by setting R_i, F_i and e_j equal to zero. The budget net of the rewards of the game for worker *j* is given by

(5) $c_j = h + \pi_{red} - t_j$,

where t_j equals net tax paid by worker *j*, where $j = c, o$ for career and non-career workers respectively. All workers are assumed to own equal shares of all career firms. Hence, the profit distributed to each worker, π_{red}, equals

(6) $\pi_{red} = \dfrac{\sum_{i=1}^{S} \pi_i}{\overline{N}}$,

where π_i equals profit earned by career firm *i*. The budgets of career workers and non-career workers when rewards of the game are excluded only differ with respect to the tax paid by each worker. Hence, career workers receive the same fixed wage as non-career workers, and do not receive additional payment for their additional supply of effort.

Individuals who choose a career job participate in a contest to obtain desirable positions. The effort supplied by career workers is determined by a Nash equilibrium solution in a simple rent-seeking game. Individuals maximize expected utility, U_j, with respect to excess effort, e_j. The maximization problem of each of the n_i individuals working in a career firm becomes

(7) $\underset{e_j}{Max} U_j$,

where U_j is given by equation (4).

The first-order condition of this problem becomes

$$(8)\ -\mu+\frac{(Q_i-e_j)}{Q_i^2}\gamma\left(R_i+F_i+\frac{F_i}{n_i-1}\right)=0\,.$$

All career workers face the same problem. Hence, effort becomes identical for each career worker, $e_j=e$ for all *j*. This implies that $Q_i=en_i$. Implementing these solutions into the first-order condition implies that effort is given by

$$(9)\ e=\frac{(n_i-1)}{n_i^2\mu}\gamma\left(R_i+F_i+\frac{F_i}{(n_i-1)}\right).$$

Effort increases with the rewards of winning the contest, R_i and F_i, and effort decreases when the number of contestants increases.

Individuals also choose between a career job and a non-career job. A market solution where the work force is split between these types of jobs implies that

(10) $U_c=U_o$,

i.e. that both types of jobs yield the same ex-ante expected utility.

2.2. Firms

The profit of career firm *i* is given by

(11) $\pi_i=x_i-hn_i$.

Implementing equation (1) into equation (11) gives

(12) $\pi_i=n_i(h+e)-hn_i=n_ie$.

The profit of non-career firm *i* is given by

(13) $\pi_i=x_i-hn_i$.

Implementing equation (2) into equation (13) gives

(14) $\pi_i=no_ih-hno_i=0$.

Note that firms do not pay for the additional effort supplied by career workers to obtain a promotion. The expected payment of the fair winner-takes-all game equals zero as losers finance the prize of the winner.

A fixed number of career firms design profit-maximizing contracts by adjusting the number of career workers and by stimulating the effort of career workers by increasing the prize of a fair winner-takes-all game.[1] The model framework assumes that promotions are accompanied by a non-pecuniary reward. Strong empirical evidence supports the view that promotions to a position include a non-pecuniary reward; see Brown et al. (2008) and Kosteas (2011).[2] Each firm, however, is forced to offer contracts that imply that the expected utility of career workers equals the utility of non-career workers. Monitoring costs are not included in the model framework. However, contracts are constrained to preserve the competition for promotions. The firm is constrained to set the prize of the fair winner-takes-all game and the number of career workers. Assuming a fixed wage rate equal to the wage rate offered to non-career workers prevents career firms from selling desirable positions by lowering the wage rate of career workers. Selling the position by lowering the wage rate would remove incentives for effort to obtain a promotion, and hence generate a need to monitor workers. The number of career workers is constrained to be larger than a minimum to prevent that the competition is cancelled. A cancelled competition is likely to generate a need to monitor workers. These assumptions also contribute to simplify the calculations. The career firm's problem is given by

(15) $\underset{n_i, F_i}{Max}\, \pi_i$

given equation (10), (i.e. $U_c = U_o$, where the net budget constraint given by equation (4) and

$Q_i = en_i$ is implemented,

and effort given by equation (9),

and $n_i \geq 2$.

This problem can be simplified. The condition given by equations (10) and (4) gives

(16) $$U_c = \gamma(h + \pi_{red} - t_c) + \mu(T - h - e) + \frac{\gamma}{n_i}\left(R_i + F_i + \frac{F_i}{n_i - 1}\right) - \frac{\gamma F_i}{n_i - 1}$$

[1] A wage gap between the winner and the losers is also implemented to adjust the effort in the framework of Lazear and Rosen (1981).

[2] There are also substantial disadvantages connected to positions at the bottom of the hierarchies. Hierarchical positions affect people's life expectancy (Marmot et al., 1978) and health (Marmot et al., 1991; Marmot, 2004). It has been shown that interaction with a superior produces less momentary happiness than any other normal form of social contact; see Layard (2005a). There is also evidence indicating a genetic disposition to compete for positions in a hierarchy; see Brammer et al. (1994) and McGuire et al. (1993).

$$= \gamma(h + \pi_{red} - t_o) + \mu(T - h) = U_o .$$

Equation (16) is simplified to

(17) $-\mu e + \frac{\gamma R_i}{n_i} = \gamma(t_c - t_o)$.

Inserting equation (9) into equation (17) gives

(18) $\gamma R_i - \gamma(t_c - t_o)n_i = \frac{(n_i - 1)}{n_i}\gamma\left(R_i + F_i + \frac{F_i}{(n_i - 1)}\right)$.

Inserting equation (18) and equation (9) into equation (12) gives

(19) $\pi_i = n_i e = \frac{\gamma R_i - \gamma(t_c - t_o)n_i}{\mu}$.

A fixed number of career firms together with non-pecuniary rewards attached to promotions softens the competition among career firms. Firms' endowment of positions with non-pecuniary rewards is transformed into excess effort that does not require pecuniary compensation. Hence, this excess effort generates profit as well as inefficiencies. The assumption of a fixed number of career firms can be justified when non-pecuniary gains are attached to promotions within incumbent firms only. The model framework would have to be modified if non-pecuniary gains were attached to promotions within newly entered career firms. Lazear and Rosen (1981), in contrast, assume that competition together with free entry force firms to offer contracts that generate the socially efficient outcome of effort.

The maximization problem of the firm illustrated in (15) becomes

(20) $\underset{n_i}{Max} \frac{\gamma R_i - \gamma(t_c - t_o)n_i}{\mu}$,

given that $n_i \geq 2$.

The profit equals $\gamma R_i / \mu$ when the tax burden on career workers equals the tax burden on non-career workers. The firm is indifferent between combinations of n_i and e that generate this fixed profit. The derivative wrt n_i equals $-\frac{\gamma(t_c - t_o)}{\mu}$, which is negative when $t_c > t_o$. Hence, the solution implies that $n_i = 2$ when $t_c > t_o$. The difference in tax burden tightens the no-arbitrage condition as each additional career worker implies an additional tax burden of $t_c - t_o$. This reduces firms ability to extract profit by increasing the number of career workers. The firm is able to extract more profit by stimulating the effort of the two remaining workers compared to increasing the number of workers.

It follows from equation (12) that $e = \frac{\pi_i}{n_i}$. Inserting equation (19) into this expression gives the market solution for effort of each career worker:

$$(21)\ e = \frac{\frac{\gamma R_i}{2} - \gamma(t_c - t_o)}{\mu}.$$

The total demand for career workers, *N*, becomes

$$(22)\ N = \sum_{i=1}^{S} n_i = n_i S = 2S .$$

The total non-pecuniary value of positions equals

$$(23)\ R = \sum_{i=1}^{S} R_i = R_i S .$$

Note that *R* is determined by exogenous parameters. Hence, the promotion game does not affect the non-pecuniary reward of the game.

2.3. The government

The government is assumed to maximize an ex-ante individualistic welfare function, W. The $U_c = U_o$ constraint in the market solution implies that all individuals are rewarded with the same ex-ante utility. Hence, the government is not concerned with ex-ante redistribution issues within this model framework. The welfare function is given by

$$(24)\ W = NU_c + (\overline{N} - N)U_o .$$

Inserting equations (4) and (5) and $Q_i = en_i$ into equation (24) gives

$$(25)\ W = N\left(\gamma\left(h + \pi_{red} - t_c\right) + \mu\left(T - h - e\right) + \frac{\gamma}{n_i}\left(R_i + F_i + \frac{F_i}{n_i - 1}\right) - \frac{\gamma F_i}{n_i - 1}\right)$$
$$+ \left(\overline{N} - N\right)\left(\gamma\left(h + \pi_{red} - t_o\right) + \mu\left(T - h\right)\right) .$$

Inserting equations (6), (12), (22) and (23) into equation (25) gives

(26) $W = \overline{N}(\gamma h + \mu(T-h)) - \overline{N}\gamma t_o + N\gamma t_o - N\gamma t_k - Ne + \gamma R$.

The fixed level of government spending, G, equals the net tax revenue generated by the taxes implemented. Hence,

(27) $G = (\overline{N} - N)t_o + Nt_c$.

Implementing equation (27) into equation (26) gives

(28) $W = \overline{N}(\gamma h + \mu(T-h)) - Ne + \gamma R - \gamma G$.

Hence, the only variable that can be affected by policy is the term $-Ne$. All other variables are exogenous and fixed. It is difficult to determine the net welfare effect of an increase in the number of career firms based on existing empirical evidence. Assuming a fixed number of career firms prevents questionable welfare gains connected to an increase in the number of positions with a non-pecuniary reward.[3] The fixed number of positions with a fixed non-pecuniary value constitutes a "fixed cake" from a social planner's point of view. This simplifies the calculations as effort by career workers to acquire such positions constitutes pure waste from a social planner's point of view[4]. The government's objective is consistent with the objective of minimizing the social loss defined as the maximum attainable welfare minus the achieved welfare, W, where the maximum attainable welfare is found by setting $Ne = 0$. Note that the sum of career firms' profits also equals Ne . Hence, firms objective of maximizing profits implies that the welfare is minimized and that the social loss is maximized. The invisible hand of Adam Smith generates distortions rather than efficiency within the present model framework.

2.4. Equilibrium

Aggregate consumption is found by adding the consumption of all agents in the economy. Hence, aggregate consumption is given by

(29) $C = N(h + \pi_{red} - t_c) + (\overline{N} - N)(h + \pi_{red} - t_o) + G$.

Implementing equation (6), (12), (22) and (27) into equation (29) gives

[3] Non-pecuniary welfare losses connected to an increase in the number of workers at the bottom of the hierarchy are not incorporated into the model framework.

[4] Distortions in the supply of labour due to this type of effort are added to distortions due to a desire to consume more than others and to unforeseen habit formation; see Layard, 2005b.

(30) $C = \overline{N}h + Ne$.

Hence, aggregate consumption equals the aggregate production given by equation (3).

3. Policy analyses

The policy tools available are rather limited, as the government is unable to observe different motives for effort. Hence, the government is unable to observe to what extent workers can be labelled career workers or non-career workers. Appropriate adjustments in the design of the income tax system represent a way for the government to differentiate the taxation of career workers and non-career workers. In fact, career workers who earn more than ordinary workers pay more taxes within both a proportional and a progressive income tax system. Implementing a larger tax wedge between career workers and ordinary workers, however, is likely to generate distortions that are not incorporated into the current model framework. Yet conducting a trade-off between such distortions and distortions connected to rivalry for promotions is beyond the scope of this study, which is confined to policy implications generated by rivalry for promotions. The results derived within the current model framework should be interpreted within this context.

3.1. A proportional income tax

Assume that the government implements a proportional tax on income or consumption and that the tax burden of other types of taxes is equal for career workers and non-career workers, i.e. $t_c = t_o$. The government budget constraint is preserved by adjusting other taxes or via government transfers. The proportional income tax reduces the expected gains and losses of the promotion game by the same factor. The no-arbitrage equation, (16), is however unaffected by proportional taxation as the expected income for career workers equals the income for non-career workers. Hence, firms are able to extract the same amount of effort by increasing the reward of the promotion game or by increasing the number of career workers. The no-arbitrage equation, (16), implies that profit, $n_i e$, is determined by exogenous parameters. The discussion in Section 2.3 demonstrates that the sum of career firms' profits equals the total social loss, which determines the ex-ante welfare. Hence, the ex-ante welfare is determined by exogenous parameters that are unaffected by a proportional tax. The ex-post distribution of outcomes is not determined when $t_c = t_o$. Hence, the model framework does not predict effects of proportional taxation on the distribution of ex-post outcomes in this case.

Empirical observations, however, suggest that the expected income of a career worker exceeds the expected income of a non-career worker. This empirical feature is excluded from the model framework to preserve a simple yet tractable framework. Introducing a proportional income tax with such a difference in expected income implies that the tax burden of career workers increases compared to non-career workers. The effect of increasing the tax burden on career workers compared to non-career workers is analysed by introducing/increasing the tax on career workers relative to non-career workers.[5] Inserting equation (22) into equation (28) gives

(31) $W = \overline{N}\left(\gamma h + \mu(T-h)\right) - 2Se + \gamma R - \gamma G$.

Hence, a policy that lowers the effort of career workers contributes to increase welfare. The market solution for e is given by equation (21). It follows from this equation that an increase in t_c, and a reduction in t_o to preserve the budget constraint, imply a reduction in e. Hence, the welfare increases as a result of such a tax change. Note that an increase in the tax wedge increases the incentive for firms to reduce the number of career workers. Such a reduction would contribute to increase the remaining career workers' effort to be promoted, as their chances of being promoted improve. The number of career workers, however, is already set equal to the minimum constraint in the market solution; see the solution of the problem in equation (20). The tax incentive, however, forces firms to reduce the wage premium for workers who are promoted. The effort of career workers is subsequently reduced to a level that restores the market equilibrium where career and non-career workers are equally well off. Equation (18) and the market solution of n_i imply that

(32) $F_i = \frac{R_i}{2} - 2\left(t_c - t_o\right)$.

Equation (32) implies that F_i is falling when $(t_c - t_o)$ is increasing. This contributes to reduce the inequality in ex-post utility outcomes. Hence, the government is able to improve efficiency and the distribution of ex-post utility by increasing the tax wedge between career jobs and non-career jobs. This conclusion contradicts the conclusion in Persson and Sandmo (2005) and Meyer and Mookherjee (1987), where there is a conflict between efficiency and equity in ex-post outcomes. The difference in conclusions emerges because taxation lowers effort below the socially optimal level within the two quoted papers, while in the present study effort is lowered from a level above the socially desirable level.

[5] The tax wedge between career workers and non-career workers may also increase when tuition subsidies linked to career jobs are reduced.

The government is able to remove all distortions by implementing tax rates such that $t_c - t_o = R_i/2$.

Equation (21) shows that such rewards generate zero effort to obtain a promotion. The net loss of choosing a career job versus a non-career job generated by this tax reform exactly equals the expected non-pecuniary gain of obtaining a promotion. Hence, firms are not able to exploit career workers by stimulating effort as this would lower the utility of career workers below that of non-career workers. These tax rates implemented into equation (32) imply that $F_i = -R_i/2$. Hence, the expected gain of obtaining a promotion equals zero as the non-pecuniary reward is exactly neutralized by a negative wage premium. Note that F_i is positive when $R_i/2 > 2(t_c - t_o)$. This means that firms have added a pecuniary reward to the non-pecuniary reward connected to a promotion, which contributes to increase career workers effort to obtain a promotion. Hence, the social loss generated by the market solution exceeds the social loss connected to rivalry for the non-pecuniary rewards only. A negative value of F_i is feasible within the model framework. Such a wage spread, however, does not seem to be consistent with empirical observations of wage spreads.

Assume that the government implements a proportional tax on income or consumption and that other types of taxes such as tuition subsidies imply that career workers are taxed heavier than non-career workers, $t_c > t_o$. A proportional tax on income or consumption contributes to reduce the rewards of the promotion game, which in turn contributes to reduce the effort of career workers. A proportional income tax, however, does not alter the no-arbitrage condition, $U_c = U_o$. This can be illustrated by multiplying the income components of equation (16) with $(1 - t_{prop})$, where t_{prop} equals the proportional income tax rate. Hence, the constraint of the firm's maximization problem remains unchanged. The solution of the firm's maximization problem implies that $n_i = 2$ when $t_c > t_o$. The effort of career workers is obtained by dividing the profit by the number of career workers. The rewards of the promotion game, however, are increased so that the incentive for effort is unchanged. Hence, the effort solution is unaffected by the proportional tax.

3.3. A tax on top income

Assume that the government implements a tax rate on top income, t_{top} , which only affects the winner of the promotion game. Such a tax would of course also affect workers career decisions and the effort to be promoted. The effort given by equation (9) is changed to

$$(33)\quad e = \frac{(n_i - 1)}{n_i^2 \mu} \gamma \left(R_i + F_i - F_i t_{top} + \frac{F_i}{(n_i - 1)} \right).$$

The constraint that says that the ex-ante utilities of career workers and non-career workers are identical in equation (17) is changed to

$$(34)\quad -\mu e + \frac{\gamma(R_i - t_{top} F_i)}{n_i} = \gamma(t_c - t_o) .$$

The maximization problem of the firm given by (15) can be written as

$$(35)\quad \underset{n_i, F_i}{Max}\, n_i e ,$$

given that

$$e = \frac{(n_i - 1)}{n_i^2 \mu} \gamma \left(R_i + F_i - F_i t_{top} + \frac{F_i}{(n_i - 1)} \right),$$

$$-\mu e + \frac{\gamma(R_i - t_{top} F_i)}{n_i} = \gamma(t_c - t_o) \text{ and}$$

$$n_i \geq 2 .$$

This problem can be simplified by manipulating the constraint given by equation (34), and inserting this equation into the objective function and the constraint given by equation (33). The remaining constraint of the problem becomes

$$(36)\quad F_i = \frac{R_i - (t_c - t_o) n_i^2}{n_i + t_{top}} .$$

Implementing this constraint into the maximization problem gives

$$(37)\quad \underset{n_i}{Max} \frac{\gamma \left(R_i - t_{top} \left(\frac{R_i - (t_c - t_o) n_i^2}{n_i + t_{top}} \right) \right)}{\mu} - \frac{\gamma (t_c - t_o) n_i}{\mu}$$

First, consider the case where $t_c = t_o$ and $t_{top} = 0$. The profit given by the maximization problem in equation (37) equals $\gamma R_i / \mu$, and is hence determined by exogenous variables. Second, consider the case where $t_c = t_o$ and $t_{top} > 0$.

The derivative of (37) with respect to n_i becomes

(38) $$\frac{\partial \pi}{\partial n_i} = -\frac{\gamma t_{top}}{\mu}\left(\frac{-2(t_c - t_o)n_i(n_i + t_{top}) - (R_i - (t_c - t_o)n_i^2)}{(n_i + t_{top})^2}\right) - \frac{\gamma(t_c - t_o)}{\mu}.$$

Implementing $t_c = t_o$ into equation (38) gives

(39) $$\frac{\partial \pi}{\partial n_i} = \frac{\gamma t_{top} R_i}{\mu(n_i + t_{top})^2} > 0.$$

Thus, the profit is increasing in n_i when $t_{top} > 0$. The constraint given by equation (36) implies that F_i is approaching zero when n_i is approaching infinite. The profit of career firms is approaching $\frac{\gamma R_i}{\mu}$, which is identical to the profit when $t_{top} = 0$. Hence, firms completely avoid the tax burden of the top tax in this case. The social loss, which consists of the sum of profits from career firms, is approaching $\frac{S\gamma R_i}{\mu}$. This expression for the social loss is determined by exogenous variables only. Hence, the ex-ante welfare is unaffected by a marginal change in the top tax rate.

Consider the case where $t_c > t_o$ and t_{top} is marginal. It follows from equation (38) that profit is decreasing in n_i. Hence, firms choose to hire the minimum number of career workers, $n_i = 2$. It follows from equation (36) that the reward of the promotion game, F_i, is reduced when t_{top} is introduced/increased. It follows from equation (33) that effort, e, is reduced when F_i is reduced, Hence, profit, $n_i e$, is reduced by a marginal increase in the tax on top income in this case. This implies that the welfare is increased by a tax on top income in this case because the social loss equals the sum of the profits of career firms. The top tax rate could be increased to a level where firms decide to increase the number of career workers. This strategy, however, triggers taxation as the tax burden on career workers exceeds the tax burden on non-career workers.

These results show that firms change the conditions of the promotion game according to the tax system. A tax on the reward of the promotion game in combination with no additional tax wedge between career workers and non-career workers leads to a game with no pecuniary rewards, but with many contestants. The ex-ante welfare is unchanged when the tax on the reward is introduced, even though excess effort per career worker is reduced. The reason is that more workers employ excess effort to be promoted. The inequality in ex-post outcomes is reduced as the rewards of the promotion game is reduced. More workers, however, face unequal outcomes as the number of career workers increases.

A tax system with a tax wedge between career workers and non-career workers, and no tax on the rewards of the promotion game, leads to a game with a big reward and few contestants. An increase in the tax wedge between career workers and non-career workers contributes to lower the rewards of the promotion game. The ex-ante welfare is increased as excess effort per worker is reduced while the number of career workers remains unchanged. Inequality in ex-post outcomes is reduced as the rewards of the promotion game is reduced.

3.4. Laws and regulations

The government may, however, restrict excess labour effort by imposing laws and regulations that restrict each worker’s labour supply. Assume that the government implements a restriction on excess effort in a given market solution. This changes the maximization problem of firms, as they are no longer able to manipulate the solution of effort by adjusting the prize of the fair game or the number of competing career workers. Hence, profit equals

$\pi_i = n_i e$, where e is fixed for the firm.

Profit-maximizing firms would like to increase the number of career workers. The increase, however, is restricted by the condition $U_c = U_o$. The reduction in effort contributes to increase the welfare, but the increase in the number of career workers contributes to reduce the welfare. The net welfare effect is found by implementing the solution for n_i given by the condition $U_c = U_o$ into the expression for the welfare. Equation (17) implies that

(40) $$n_i = \frac{\gamma R_i}{\gamma(t_c - t_o) + \mu e}.$$

Inserting equations (22) and (33) into equation (28) gives

(41) $W = \overline{N}(\gamma h + \mu(T-h)) - S\left(\frac{\gamma R_i}{\gamma(t_c - t_o) + \mu e}\right)e + \gamma R - \gamma G$.

The welfare effect of a marginal change in effort is found by taking the derivative of (41) with respect to *e*.

(42) $\frac{\partial W}{\partial e} = \frac{-S\gamma^2 R_i(t_c - t_o)}{(\gamma(t_c - t_o) + \mu e)^2} < 0$ when $t_c > t_o$.

The welfare is unaffected by the maximum hour law when the tax burden on career workers equals the tax burden on non-career workers. A reduction of effort by imposing laws and regulations leads to an increase in welfare for a given set of differentiated tax rates. The government is able to remove the entire social loss within the model framework by restricting effort to zero. This case implies that $\gamma(t_c - t_o) = \frac{\gamma R_i}{n_i}$. Hence, the net taxation of career workers compared to non-career workers equals the expected non-pecuniary gain of obtaining a promotion.

It follows from the expression of the derivative of the welfare function with respect to *e* that the increase in welfare generated by a reduction in *e* is positively correlated with the tax wedge between career workers and non-career workers. It follows from equation (40), where the restriction on effort is binding, that n_i is reduced when the tax difference, $(t_c - t_o)$, is increased. This contributes to increase the welfare since a reduction in n_i contributes to increase the welfare. Hence, the welfare gain of restricting effort increases when restrictions on effort are combined with an increase in the tax difference, $(t_c - t_o)$.

Implementing laws and regulations to reduce the effort of career workers is likely to generate other distortions not incorporated into the model framework used in this study. A welfare-maximizing government has to balance the welfare losses generated by such distortions against the welfare gain found in this study. Conducting such a trade-off is beyond the scope of this study. This section of the study is confined to evaluate whether imposing laws and regulations that restrict the effort of career workers contributes to reduce distortions connected to rivalry for promotions.

3.5. The labour/ leisure choice

The objective of this study is to analyse public policy to combat excess effort of career workers. The traditional policy recommendation would be to adjust the income tax to neutralize the distortion. The problem with this policy recommendation is first of all that the income tax does not differentiate between career and non-career workers. Hence, an income tax adjustment would distort the labour/leisure choice of non-career workers. The second problem is that very little is known about how income taxation affects the promotion game and, hence, the excess effort. The objective of this study is to illuminate this issue.

One may argue that this study excludes several important aspects of distortions in the labour/leisure choice. Both direct and indirect taxes reduce the rewards of working. Such taxation contributes to distort the labour/leisure choice, as workers respond by working less. Hence, these taxes contribute to neutralize or even reverse the excess effort of career workers studied within the current model framework. Layard, however, argues that individuals' desire to consume more than others (see e.g. Carlson et al., 2007) and a failure to foresee expensive habits distort the labour/leisure choice, as these factors make workers work too much from a social planner's point of view. Layard (2005b) also argues that such distortions in the supply of labour are exactly cancelled out by distortions due to the tax rates implemented in many industrialized countries. Hence, the excess effort of career workers studied within the current model framework is not removed or neutralized when Layard's arguments hold. There is an ongoing debate on whether public policy should respond to positional externalities; see Frank (2008).

3.6. Other incentive schemes

The fair winner-takes-all game was constructed by adjusting the wage paid to winners and losers of the promotion game. Firms, however, may construct identical games with alternative forms of payment. The wage prize could be replaced with the right to transfer unattractive work assignments, i.e. where the winner transfers unattractive work assignments to the losers. Another alternative would be to allow the winner to transfer a pressure to work long hours to the losers. Both these alternative forms of payments would generate an incentive to increase the effort to win the promotion game. The effect on expected utility would be identical to the effects generated by the wage game when expected gains and losses are identical to the ones in the wage game. The profit of firms is determined by the total effort of labour. Profit is unaffected when the effort of one worker is transferred to another worker. Hence, the effect on expected profit would also be identical to the effect generated by the wage game.

Firms may also boost effort by implementing games where the reward is divided among most contestants, and where few suffer a loss. This strategy can be implemented to preserve incentives for effort when a tax on top income is introduced. Hence, in this case the tax on top income becomes inefficient because it is avoided via changes in firms' reward systems. A strategy to inflict losses upon losers may spread down to the bottom of a hierarchy. Low-ability workers may exit the labour market and enter welfare benefit systems. Hence, the cost of such a strategy is partly transferred to the government in this case. Firms may also issue a bonus to a group of workers to trigger monitoring among workers. Group interaction effects similar to those in athletics may even diminish the discomfort of working long hours. This strategy is, however, also likely to harm a minority of the workers.

4. Conclusion

This study investigates whether excess effort to climb a career ladder justifies policy interventions. The study shows that both a tax on top income aimed at lowering the rewards of a promotion and a maximum hour law that restricts excess effort increase welfare when the tax burden on career workers exceeds the tax burden on non-career workers. The inequality in ex-post outcomes is also reduced by the tax policy. Taxation and/or a maximum hour law do not improve welfare when the tax burden on career workers equals the tax burden on non-career workers. The welfare does not improve because the welfare gain of reducing excess effort per worker is neutralized by the welfare cost connected to an increase in the number of career workers. A proportional tax contributes to increase welfare when such taxation contributes to increase the tax wedge between career and non-career workers. The welfare is unaffected when this tax wedge is unaffected by proportional taxation.

One may question whether these model predictions are consistent with empirical observations of tax rates and management payment schemes. Long-term trends show that the compensation to managers increases as the tax rate on labour income declines; see Frydman and Molloy (2011). Short-run dynamics, however, unveil that changes in tax rates have a marginal effect on executive compensation. They also suggest that slow-moving social norms may have favoured higher compensation and lower tax rates. It is difficult to conclude on this issue as many factors are likely to influence the design of the tax system and management payment schemes.

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