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# Sickness Absence and Relative Income

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Abstract:

We analyse labour supply and absence from work choices, assuming that individual preferences exhibit relative consumption concerns. We show that contractual hours and the length of absence periods may vary equally with the strength of positional considerations. In this case, positional concerns do not affect their difference, i.e. overall or effective working time. Moreover, the nature and intensity of relative consumption effects influence the impact of sick pay and of true illness periods on contractual work hours and absence behaviour. Consequently, the profitability of employing individuals also varies with the strength of their positional concerns.

Keywords: Absence, Labour Supply, Positional Concerns, Relative Consumption, Sick Pay

JEL-classification: D 62, H 53, I 18, J 22, J 32

## 1. Introduction

Absence from work is inevitable if employees are ill and cannot fulfil their contractual obligations. However, absence behaviour is also influenced by economic incentives. On the one hand, absence enables people to undertake activities which may not have been feasible if regular hours had been worked. On the other hand, absence is associated with a reduction in expected income, in particular if sick pay does not fully replace foregone wages. The resulting trade-off is usually based on the idea that individuals care only about their personal consumption. This assumption is in conflict with substantial evidence according to which people also have positional consumption concerns and compare themselves to other individuals. Such preferences can alter their incentives to be absent from work.

In this paper, we theoretically analyse how relative consumption concerns influence labour supply and sickness-related absence choices. Moreover, since sick pay is a constituent element of employment relations in virtually all industrialised countries,[1] we scrutinise how sick pay affects these decisions. Finally, we look at the impact of true illness, which results in an exogenous variation in absence. We can establish three main results.

First, effective or overall working time, i.e. contractually agreed hours of work less the duration of absence, can be independent of positional concerns since relative consumption effects only alter the composition of effective working time. This prediction contrasts with theoretical findings for settings in which individuals can choose only one component of working time. In such frameworks, positional concerns will raise working time if they increase the marginal utility from consumption and reduce hours if marginal utility declines. Assuming an increasing marginal utility, we show that the neutrality result we derive hinges on the relationship between absence and its monetary or non-monetary consequences which occur in addition to the immediate loss of wage income. Accordingly, our first result indicates the sensitivity of policy conclusions relating to relative consumption concerns.

A second major prediction is that sick pay reduces effective working time, but to a different extent for individuals who exhibit positional concerns. This is the case because such positional preferences alter the utility loss resulting from a decline in income due to fewer hours of work.

Third, the change in effective working time in response to a greater duration of true illness

[1] According to Heymann et al. (2010), Canada, Japan and the United States are the only industrialised countries that do not guarantee paid sick days to employees who are absent for 5 days to recover from a minor illness. Susser and Ziebarth (2016) document regulations for the United States and show that despite this lack of a national rule more than 55% of employees have some form of sick pay coverage.

periods – to be defined precisely below – also depends on the nature and strength of positional considerations.

These findings have important implications. With respect to economic policy it has been shown that relative consumption effects can provide individuals with excessive incentives to work and that working time in market equilibrium rises with the strength of such positional concerns. This feature can justify progressive income taxation (see, Boskin and Sheshinski 1978, Persson 1995, Corneo 2002, Pérez-Asenjo 2011, Dodds 2012, Aronsson and Johansson-Stenman 2013, and Eckerstorfer 2014, inter alia). If, however, positional concerns do not inevitably raise effective working time, the case for taxation is weakened. This is because there no longer necessarily exists a direct relationship between observed hours of work and the income tax rate which induces efficient behaviour. Furthermore, if adverse effort consequences of sick pay depend on the nature and strength of relative consumption concerns, optimal sick pay may be related to indicators of positional concerns, such as working time. Turning to a firm's personnel policy, our findings indicate that employing individuals who compare themselves to others can be beneficial for companies. In particular, if employees exhibit 'Keeping up with the Joneses' (KUJ) preferences (in the sense of Dupor and Liu 2003), the adverse effort consequences of sick pay may be mitigated. Moreover, if true illness periods become more extensive, effective working time may decline by less for individuals who exhibit KUJ preferences than for employees with different positional concerns. Finally, from a research perspective, our findings indicate that empirical analyses of the impact of positional preferences on working time should attempt to take all components of the latter into account and not only standard hours.

The subsequent analysis is mainly related to contributions analysing (a) the impact of positional income or consumptions concerns on working time and (b) the determinants of sickness absence.

(a) If consumption of a reference group reduces utility, positional concerns will raise labour supply above the Pareto-efficient level. This is the case because each individual will expand labour supply in order to raise positional utility. Since such improvement creates a negative externality by reducing other individuals' positional utility, the incentives to work are excessive. Variants of this theoretical prediction have been derived by Seidman (1988), Persson (1995), Ljungqvist and Uhlig (2000), Corneo (2002), Dupor and Liu (2003), Cahuc and Postel-Vinay (2005), Alvarez-Cuadrado (2007), Tsoukis (2007), Pérez-Asenjo (2011), and Goerke and Hillesheim (2013). In general, only one dimension of working time is considered. Moreover, there are a number of analyses in which relative leisure considerations play a role, such as by Seidman (1988), Choudhary and Levine (2006), Arrow and Dasgupta (2009), Hansen et al. (2012), and Aronsson and Johansson-Stenman (2013). In these settings, working time consequences usually depend on the relative strength of the two types of positional concerns. In a further related contribution, Mujcic and Frijters (2015) assume relative health considerations and investigate their implications for optimal taxation. The prediction relating to the efficiency of labour supply is different in models in which positional concerns are defined with respect the individual's own past consumption, often referred to as habit formation. In such settings, there will generally be no distortion unless the individual does not fully anticipate the consequences of today's labour supply choice on tomorrow's utility (Alonso-Carrera et al. 2005, Cremer et al. 2008).

In addition to a fairly extensive theoretical literature on the labour market effects of positional concerns, there are some empirical studies. Neumark and Postlewaite (1998), Park (2010), Pérez-Asenjo (2011), and Oh et al. (2012) provide evidence of a positive correlation between income or consumption levels of (selected) reference groups and either labour force participation or various indicators of working time. These findings are consistent with the assumption of preferences exhibiting KUJ. However, distinctions with regard to alternative measures of working hours have not played a role.

(b) The determinants of sickness absence have been analysed extensively (see Brown and Sessions (1996) and Treble and Barmby (2011) for surveys). The value of leisure has been shown to positively affect sickness absence (Skogman Thoursie 2007 and Shi and Skuterud 2015), indicating the relevance of economic incentives for absence behaviour. Moreover, the positive impact of sick pay on absence is a robust theoretical prediction, for which there is also substantial empirical support (see Allen 1981, D'Amuri 2017, Engström and Holmlund 2007, Johansson and Palme 2005, Lusinyan and Bonato 2007, and Ziebarth and Karlsson 2010). The distinction between true illness and resulting absence on the one hand and voluntary absence on the other is well established, for example, in psychology (Steers and Rhodes 1978), while it has not been a major issue in economics.

In the remainder of the paper, we describe the model in Section 2. Section 3 looks at the impact of positional concerns on working time choices, while Section 4 investigates a rise in sick pay. Section 5 considers the effect of true illness and Section 6 concludes. An appendix contains calculations establishing the robustness of our findings, which we summarise in a number of propositions in the main text.

## 2. Model

In this section, we initially describe the model. In Sub-section 2.2, we derive the features of the Pareto-efficient outcome, while Sub-section 2.3 is used to characterise the market equilibrium. Finally, we analyse the efficiency properties of the market equilibrium in Sub-section 2.4.

### 2.1 Set-up

There are a large number of ex-ante identical individuals who decide about contractual working hours and the duration of sickness absence in one period. All individuals are initially employed by a representative firm. To guarantee interior solutions, individuals may incur a utility loss at the end of the period under consideration which becomes more probable or larger the longer they are absent from work. Labour and output markets are competitive and labour is the only input used to produce the single consumption good.

In this sub-section we, first, describe in more detail the individual's time constraints and choice set. In order to do so, we characterise the components of sickness-related absence and working time. We then outline how working time and absence affect current income and future payoffs. Subsequently, we illustrate individual preferences, focussing on positional consumption aspects and formulate the individual's maximisation problem. As the last part of Sub-section 2.1, the production side of the economy is delineated.

*Sickness-related Absence*: Individuals can either be truly sick and, hence, unable to attend work. In addition, they may not feel completely well, or simply claim to do so, and decide whether to attend work or nor. For simplicity and notational clarity, we refer to this type of non-attendance as voluntary absence.[2] The different types of absence are not discernible for the employer. The duration of truly sickness-related absence is denoted by i and the length of voluntary absence by v. There is a basic level of true illness which is unrelated to working time and another component, which increases in the difference, h – v, between official working time, h, and voluntary absence, v. This specification is based on empirical findings that adverse working conditions and longer working hours are positively associated with absence (Barmby and Stephan 2000, Ose 2005, Dionne and Dostie 2007, Böckerman and Ilmakunnas 2008, Beblo and Ortlieb 2012, Mastekaasa 2013). Therefore, truly illness-related

[2] Barmby et al. (1994) and Ose (2005) present analytical contributions which are based on a similar distinction between voluntary and truly sickness-related absence.

absence is specified as $i(h - v) = I + \kappa[h - v]$, where I is a non-negative constant. Without substantive impact on our findings, the function $\kappa$ is modelled as linear and $0 \leq \kappa < 1$ holds. In order to simplify the analysis, illness is assumed to be deterministic. This implies, inter alia, that individuals cannot use voluntary absence to self-insure ex-post against illness-related absence, by reducing the former when the latter occurs. Therefore, we can bypass the issue of how positional concerns affect the willingness to insure against adverse events.[3]

*Effective Working Time*: Effective working time, z, is defined as the difference between official or contractually agreed upon hours of work, h, and the duration of absence, such that $z = h - i(h - v) - v = [h - v][1 - \kappa] - I$ holds. Effective working time, z, is assumed to be positive, implying that $\kappa$ and I are sufficiently small. Hence, we only consider individuals who are not absent all the time. Since our approach includes $\kappa = 0$ as special case the findings will also apply if working time does not affect illness-related absence.

*Income*: Initially, individuals are employed and earn a wage, w, per hour of effective working time, z. When absent from work, they receive sick pay. We specify sick pay as a constant multiple s of the duration of absence, $v + i(h - v)$. Alternatively, sick pay could be modelled as a linear function of wages, w, without qualitatively affecting subsequent findings. In line with evidence for European Union and EFTA-countries (cf. MISSOC 2017), we assume that sick pay is less or at most equal to the wage, $0 \leq s \leq w$, and paid for by firms (OECD 2010, pp. 128 f). Normalising the price of the sole consumption good to unity, personal consumption for the period under scrutiny is given by $c = w[h - v - i(h - v)] + s[v + i(h - v)] = wh - [w - s][v + I + \kappa[h - v]]$.

*Further Consequences of Absence*: To ensure that the optimal amount of voluntary absence is less than the theoretically maximal level, even if absence does not cause income to decline (that is, for s = w; see below equations (6)), we assume that individuals may lose their job at the end of the period under consideration. The future (discounted) utility stream from being unemployed is denoted by U and falls short of the according utility stream when having a job, E, such that E > U. These utility streams are additive and independent of the duration of absence. The implicit assumption underlying this simplification is that the effects of changes in behaviour on current payoffs dominate alterations in future payoffs.

[3] Galí (1994) and Huang and Tzeng (2008) analyse such an issue in different contexts.

The probability of becoming unemployed, and of incurring the utility loss U – E, rises with the duration of absence and is given by $P(v + i(h – v))$, $P' > 0$. Such a relationship can arise because firms dismiss those employees with the highest absence rates first or because employment protection legislation establishes illness as an admissible reason for discharge. Alternatively, one may interpret P as the probability of not being promoted in the future, which can also plausibly be argued to be higher for those individuals who are absent more often than others (see Chadi and Goerke (2018) for according evidence). Given this interpretation, E represents the utility stream from being promoted, while U captures utility from retaining the current position or being demoted. A further interpretation of the expected income loss resulting from absence, $P(v + i(h – v))[U – E]$, is that absence not only has monetary consequences but utility effects reaching beyond this direct impact. This would, for example, be the case if absence has a negative impact on future working conditions or since it raises the work load after having ended the absence spell. The decisive feature of the approach is that the expected costs of absence rise with its duration (see Hansen 2000, Hesselius 2007, Markussen 2012, and Scoppa and Vuri 2014 who provide according empirical evidence). However, these additional costs can also occur in the period under investigation. For simplicity, we motivate these costs with a change in future payoffs. Given $v + i(h – v) > 0$ and $U < E$, we define $p := P(v + i(h – v))[U – E] < 0$ to simplify subsequent notation. The expected income loss resulting from absence $p(v, h, \kappa, I, U, E)$ rises with the duration of total absence in absolute magnitude, such that $p' < 0$ applies.

The available empirical evidence referred to above does not provide a consistent picture with respect to the curvature of p. If long-term sickness has less pronounced detrimental consequences on dismissals (Chadi and Goerke 2018) and unemployment risk (Hesselius 2007) than shorter absence durations, $p'' > 0$ may hold. This effect could arise, either because the probability, P, declines at a decreasing rate that the utility loss occurs, or because the magnitude of the loss, U – E, shrinks. Note, though, that although an employer's response to absence may vary with its duration, usually also the level of sick pay changes, which is financed by the employer. Such direct monetary consequences could also explain a non-linear relationship between the duration of absence and the dismissal and unemployment risk. Therefore, the available empirical evidence does not provide a clear indication with respect to the sign of $p''$. Consequently, we will focus on a linear p-function ($p'' = 0$). In addition, we will comment on the case of $p'' \neq 0$ in the main text, while the computations for this generalisation are relegated to the appendix.

*Preferences*: Our specification of preferences follows the encompassing approach suggested by Dupor and Liu (2003). Current utility, u, increases with personal consumption, c, of the sole private commodity and leisure. For a fixed time endowment, this is equivalent to assuming that utility decreases with working time, h – v. Hence, voluntary absence is akin to leisure with regard to its immediate utility consequences. However, individuals derive no direct utility from being truly sick. Moreover, utility, u, is a function of average consumption, $\bar{c}$. The parameter ρ indicates the strength of such positional consumption concerns, $\rho > 0$. In consequence, we specify utility as $u = u(c, \rho\bar{c}, h - v)$, where $u_1 > 0 > u_3$ describe the above restrictions, and subscripts denote partial derivatives. A situation in which utility, u, decreases with average consumption, $\bar{c}$, implying that the derivative with respect to $\bar{c}$, which we label $u_2$, is negative, such that $u_2 < 0$ holds, has been termed 'jealousy' or 'envy', whereas $u_2 > 0$ has been labelled 'admiration' (Dupor and Liu 2003, Eaton and Eswaran 2003). The assumption $u_1 + \rho u_2 > 0$ (for $c = \bar{c}$) ensures that a general rise in consumption is beneficial from an individual's perspective, such that jealousy never dominates the direct utility impact of higher income.

In order to focus on relative income concerns and because the relevant empirical studies either indicate that income externalities are more important than leisure externalities (see Solnick and Hemenway 2005 and Carlsson et al. 2007) or do not provide a consistent picture (cf. Hesselius et al. 2009, 2013, Dale-Olsen et al. 2015, Mujcic and Frijters 2015), we normalise potential relative leisure, absence and health effects to zero.[4] Finally, 'Keeping up with the Joneses' (KUJ) preferences are characterised by a marginal rate of substitution between consumption and leisure, $u_3/u_1$, which increases with average consumption, $\bar{c}$, while the opposite holds for 'Running away from the Joneses' (RAJ) preferences (see Abel 1990, Galí 1994, and Dupor and Liu 2003).

The utility function, u, is strictly concave in each argument and separable in consumption and leisure, so that $u_{13} = u_{23} = 0$ hold. This separability assumption has often been employed (cf. Persson 1995, Corneo 2002, and Cahuc and Postel-Vinay 2005) because it substantially simplifies the formal analysis, without imposing too much structure on results. Moreover, given separability, KUJ (RAJ) is equivalent to $u_{12} > (<)\ 0$ (cf. Dupor and Liu 2003). In the

[4] The absence of leisure externalities is often assumed in models with consumption or income externalities (e.g. Persson 1995, Ljungqvist and Uhlig 2000, Corneo 2002, Dupor and Liu 2003, and Dodds 2012). Arrow and Dasgupta (2009) and Aronsson and Johansson-Stenman (2013) represent exceptions. As long as jealousy (admiration) with respect to leisure of others is not too strong, or if utility rises (declines) with leisure of the reference group, the subsequent findings for jealousy (admiration) will qualitatively continue to apply.

case of KUJ, we furthermore assume $u_{11} + \rho u_{12} < 0$ and $u_{11} + 2\rho u_{12} + \rho^2 u_{22} < 0$, while these restrictions are always fulfilled for RAJ preferences. The first constraint ensures that an encompassing rise in consumption lowers the marginal utility from personal consumption, $u_1$, while the second constitutes a sufficiency condition for the existence of a Pareto-efficient allocation.

Since the number of individuals is very large, each of them takes average consumption, $\bar{c}$, as given when independently choosing the number of official working hours, h, and the duration of voluntary absence, v. Combining all of the above information, expected utility EU can be expressed as:

$$EU(h, v) = (1 - P)[u(c, \rho\bar{c}, h - v) + E] + P[u(c, \rho\bar{c}, h - v) + U]$$

$$= u(w[h - v - i(h - v)] + s[v + i(h - v)], \rho\bar{c}, h - v) + E + p(v, i, \kappa, I, U, E), \quad (1)$$

where we have substituted the budget-constraint, $c = w[h - v - i(h - v)] + s[v + i(h - v)]$, and the definition of p, $p(v, i, \kappa, I, U, E) = P(v + i(h - v))[U - E]$, in the second line.

The above, rather general specification (1) of preferences $u(c, \rho\bar{c}, h - v)$ encompasses numerous variants commonly used in the literature in order to investigate the consequences of positional concerns. To illustrate, note that, for example, Ljungqvist and Uhlig (2000) employ a variant of (2a), for which A, $\beta > 0$ and $\rho < 1$ hold, and which is based on the assumption that the difference between own and reference consumption determines utility.

$$u(c, \bar{c}, h - v) = \frac{1}{1 - \beta}\left(\frac{c - \rho\bar{c}}{1 - \rho}\right)^{1-\beta} - A(h - v)^2 \quad (2a)$$

If, additionally, $\rho > 0$ applies, (2a) indicates KUJ preferences, if ρ is negative, the individual described by (2a) would exhibit RAJ preferences.

Galí (1994) proposes a ratio specification, for which again A, $\beta > 0$ and $\rho < 1$ are imposed, and $\beta > 1$ ($< 1$) is commensurate with KUJ (RAJ) preferences.

$$u(c, \bar{c}, h - v) = \frac{1}{1 - \beta}\left(\frac{c}{\bar{c}^{\rho}}\right)^{1-\beta} - A(h - v)^2 \quad (2b)$$

In both specifications (2a) and (2b), setting the parameter ρ to zero would indicate the absence of relative consumption concerns. Moreover, both formulations are compatible with the restrictions on preferences which we have imposed above.[5] Therefore, our subsequent results

[5] In the case of the ratio specification (2b), some restrictions, such as $u_1 + \rho u_2$ need to be reformulated appropriately, because the multiplicative formulation, $\rho\bar{c}$, implied by $u = u(c, \rho\bar{c}, h - v)$, is not applicable.

can be derived for many, frequently used, less general specifications of preferences than employed below. Importantly, they do not depend on whether positional concerns are determined by the difference between own and reference consumption or their ratio (Clark and Oswald 1998).[6]

*Production and Profits*: Production of the single consumption good takes place with labour as the sole factor in a representative firm. Output increases with effective working time, z, at a decreasing rate. Normalising, for simplicity, the number of individuals to unity, the production function can be expressed as f(z). Its derivatives satisfy $f' > 0 > f''$ for $z > 0$.

The firm is a price taker on the input and output market. We normalise the output price to unity. Since the firm will incur the costs of sick pay if the worker is absent, profits are given by:

$$\pi(h) = f(h - v - i(h - v)) - w[h - v - i(h - v)] - s[v + i(h - v)] \tag{3}$$

2.2 Pareto-Efficiency

In a Pareto-efficient, i.e. first-best, allocation all ex-ante identical individuals are assumed to be treated identically. This implies that the expected income loss due to unemployment is zero, such that p = 0. In addition, there is no voluntary absence, v = 0, since consumption is determined directly. Consequently, Pareto-efficiency can be characterised by maximising utility, u, with respect to working time, h, and consumption, c, subject to the constraint that aggregate consumption, c, and output, f(h – i(h)), coincide. Furthermore, any change in individual consumption, c, alters average consumption, $\bar{c}$, by the same amount, so that $c = \bar{c}$ holds. The resulting objective Γ is given by:

$$\Gamma(c, h, \lambda) = u(c, \rho c, h) + \lambda[f(h - i(h)) - c] \tag{4}$$

Maximising Γ, yields $\partial\Gamma/\partial\lambda = 0$ and:

$$\frac{\partial \Gamma}{\partial c} = u_1 + \rho u_2 - \lambda = 0 \tag{5a}$$

[6] I am grateful to an anonymous colleague for pointing out the encompassing nature of $u(c, \rho\bar{c}, h - v)$. Bilancini and Boncinelli (2012) show that the distinction between cardinal status concerns, in which the absolute difference between own and reference consumption is relevant, and ordinal considerations, for which primarily the rank in the distribution plays a role, can affect the implications of comparisons. The analysis of such distinction is beyond the scope of this paper, given the assumption of homogeneous individuals, and represents an interesting extension for future analysis.

$$\frac{\partial \Gamma}{\partial h} = u_3 + \lambda f'[1-\kappa] = 0 \tag{5b}$$

The second-order conditions are fulfilled, given the restrictions on the utility function, u, imposed above. Denoting Pareto-efficient outcomes by a '*', the combination of equations (5a) and (5b) yields:

$$f'(z^*)[1-\kappa] = -\frac{u_3(h^* - v^*)}{u_1(c, \rho c) + \rho u_2(c, \rho c)} \tag{6}$$

Accordingly, Pareto-efficiency is characterised by an effective working time, $z^* = h^* - i(h^*)$, such that marginal productivity equals the marginal rate of substitution between leisure ($-u_3$) and consumption ($u_1 + \rho u_2$), where the former incorporates the impact of working time on sickness-related absence and the latter the consumption externality.

2.3 Market Outcome

Maximising EU(h, v) with respect to official working time and absence, yields:

$$A := u_1(\underbrace{w[h - v - i(h-v)] + s[v + i(h-v)]}_{c}, \rho\bar{c}) \times [w[1-\kappa] + s\kappa]$$
$$+ u_3(h - v) + p'\kappa = 0 \tag{7a}$$

$$u_1(c, \rho\bar{c})[s - w][1-\kappa] - u_3(h-v) + p'[1-\kappa] = 0 \tag{7b}$$

The second-order conditions are warranted due to the strict concavity of the utility function, u, and the separability assumption. If sick pay is zero, s = 0, voluntary absence (v > 0) does not have a beneficial impact on utility which could not also be obtained by a reduction in official working time, h. However, absence is costly in expected terms since the individual may incur the utility loss U – E. Therefore, absence will be zero if s = 0. We subsequently assume s > 0, such that the optimal level of absence in market equilibrium is positive, $v^M > 0$.

For later use note that combining (7a) and (7b) yields:

$$B := u_1(c, \rho\bar{c})s + p' = 0 \tag{8}$$

In a competitive market, the firm maximises profits, defined by equation (3) and assumed to be non-negative, with respect to contractual hours of work, h. Hence, the labour demand curve is implicitly defined by:

$$C := f'(z)[1-\kappa] - w[1-\kappa] - s\kappa = 0 \tag{9}$$

Summarising the above, the market equilibrium can be described by equations (7a), (8) and (9). It is characterised by contractual working hours and effective working time, denoted by $h^M$ and $z^M$, respectively, and a duration of voluntary absence $v^M$.

In market equilibrium, $h^M$, $v^M$, and the wage, w, are determined jointly. Since variations in all endogenous variables affect individual consumption, c, and average consumption, $\bar{c}$, equally, the respective derivatives of equations (7a), (8), and (9) for $p'' = 0$ are given by:

$$A_h = [u_{11} + \rho u_{12}][w[1-\kappa] + s\kappa]^2 + u_{33} < 0 \tag{10a}$$

$$A_v = [u_{11} + \rho u_{12}][w[1-\kappa] + s\kappa][s-w][1-\kappa] - u_{33} > 0 \tag{10b}$$

$$A_w = u_1[1-\kappa] + [u_{11} + \rho u_{12}][w[1-\kappa] + s\kappa][h - v - i(h-v)] \tag{10c}$$

$$B_h = [u_{11} + \rho u_{12}][w[1-\kappa] + s\kappa]s < 0 \tag{10d}$$

$$B_v = [u_{11} + \rho u_{12}]s[s-w][1-\kappa] \le 0 \tag{10e}$$

$$B_w = [u_{11} + \rho u_{12}]s[h - v - i(h-v)] < 0 \tag{10f}$$

Furthermore, we have $C_h = -C_v = f''[1-\kappa]^2 < 0$ and $C_w = \kappa - 1 < 0$. The determinant of the system, which describes the market equilibrium, taking into account $c = \bar{c}$, is given by $D := [\kappa - 1][u_{11} + \rho u_{12}]s^2[u_{33} + f''[1-\kappa]^2 u_1] < 0$.

If the expected income loss resulting from absence p is non-linear ($p'' \neq 0$), the determinant of equations (7a), (8) and (9) is labelled $D(p'' \neq 0)$ and given by (see Appendix 8.1)

$$\begin{aligned} D(p'' \neq 0) := D - [1-\kappa]p''[u_1 f''[1-\kappa]^2 + u_{33}] \\ -p''[1-\kappa]^3[u_{11} + \rho u_{12}]w[f'' z^M + w] \end{aligned} \tag{11}$$

This determinant $D(p'' \neq 0)$ will surely be negative if $p'' < 0$ and the wage is high enough for $f'' z^M + w \geq 0$ to hold. If expected income loss resulting from absence, p, is decreasing in its arguments at a decreasing rate, such that, $p'' > 0$, the sign of the determinant $D(p'' \neq 0)$ becomes analytically indeterminate. This ambiguity for a non-linear p-schedule arises because changes in official working time, h, and absence, v, affect the expected income loss due to absence differently. We subsequently assume that $D(p'' \neq 0)$ is negative, without restricting the sign of $p''$ when analysing the robustness of our findings.

2.4 Inefficiency of Market Outcome

In order to compare the market equilibrium with the Pareto-efficient outcome, we substitute equation (9) into (7a) and rearrange the equality to obtain:

$$f'(\underbrace{h^M - v^M - i(h^M - v^M)}_{z^M})[1-\kappa] = -\frac{u_3(h^M - v^M) + \rho'\kappa}{u_1(c, \rho c)} \tag{12}$$

Comparison of equations (6) and (12) reveals that the market equilibrium is characterised by two distortions. First, individuals do not take into account that their consumption choices affect utility of others. In the case of jealousy (admiration) this externality, ceteris paribus, raises (reduces) labour supply to above (below) the Pareto-efficient level. This is the standard prediction also found in earlier contributions (cf., f. e., Dupor and Liu 2003). Second, the positive probability that illness-related absence results in a decline of expected income makes supply of labour, ceteris paribus, less attractive in market equilibrium, relative to the Pareto-efficient amount. This impact is due to the assumption that higher official working hours are positively associated with absence, i.e. that $\kappa > 0$ holds. Moreover, absence results in an expected income reduction in market equilibrium (because U < E) which does not arise in a first-best world. The net effect of both distortions, as summarised in Proposition 1 below, is unambiguous in the case of admiration and depends on their relative strength of both distortions if there is jealousy.

Proposition 1

Effective working time in market equilibrium, $z^M$, is insufficient, i.e. $z^M < z^*$ holds, if individuals' preferences exhibit admiration ($u_2 > 0$).

Effective working time is excessive, i.e. $z^M > z^*$ applies, if individuals' preferences exhibit jealousy ($u_2 < 0$) and the impact of working hours on involuntary absence, as measured by the parameter $\kappa$, is small relative to the strength of jealousy.

Proof: Follows from the above.▪

Note that the relationship between positional consumption concerns and working time is not affected by the level of s, although sick pay, s, creates a second externality which reduces the price of leisure. Therefore, sick pay is likely to mitigate the distortion resulting from a negative consumption externality, i.e. of jealousy. However, if sick pay raises absence, an issue analysed below, Proposition 1 implicitly states that its impact will never be strong enough to compensate the consequences of the consumption externality on effective working time. The reason is that sick pay also changes the incentives to provide official working hours.

## 3. Effective Working Time, Sickness Absence and Relative Consumption Effects

In the model described in Section 2, preferences characterised by jealousy induce individuals to work excessive hours if $\kappa = 0$. Furthermore, in the case of KUJ preferences, official working hours in market equilibrium, $h^M$, tend to rise with the strength of positional concerns (see below). Additionally, a greater importance of the consumption externality reduces the gain from voluntary absence in the case of KUJ preferences, as the derivative of equation (7b) with respect to $\rho$ clarifies. This is the case because a lower duration of absence constitutes an alternative means of increasing consumption, as long as sick pay, s, is less than the wage, w. All these effects suggest that effective working time rises with the intensity of positional concerns, while voluntary absence declines. However, the decrease in leisure resulting from the expansion of official working time, $h^M$, raises the gain from absence because of the concavity of the utility function in effective working time. Hence, there are conflicting effects of stronger positional concerns on voluntary absence, $v^M$, and effective working time, $z^M$. Consequently, the overall impact of positional preferences needs to be determined precisely.

In order to do so, we consider the effect of a general increase in the parameter $\rho$.[7] Focussing on p'' = 0 and using $A_\rho = u_{12}[w[1-\kappa] + s\kappa]\bar{c}$, $B_\rho = u_{12}s\bar{c}$, and $C_\rho = 0$, we find that relative consumption effects alter official working time, $h^M$, and the duration of voluntary absence, $v^M$, equally, irrespective of whether individuals exhibit jealousy or admiration:

$$\frac{dh^M}{d\rho} = -\frac{u_{12}\bar{c}}{[u_{11} + \rho u_{12}]s} = \frac{dv^M}{d\rho} \tag{13}$$

If official working time is chosen optimally, $v^M > 0$ requires $s > 0$ (cf. equations (6)). For $s > 0$, $dz^M/d\rho = 0$ from equation (13), given $z^M = h^M - v^M - i(h^M - v^M)$. Therefore, we have:

Proposition 2

The strength of positional concerns will not alter effective working time, $z^M$, in market equilibrium if official working time is chosen optimally, the optimal

[7] If, instead, the change in relative consumption concerns affected only a single individual, the assumption of homogeneous individuals and the specification of the reference level of consumption, $\bar{c}$, would have to be modified. However, results would qualitatively be unaffected, as long as the term $u_{11} + \rho u_{12}$ remained negative.

duration of voluntary absence, $v^M$, is positive and the expected income loss resulting from absence is linear in its duration ($p'' = 0$).

Proof: Follows from the above.▪

*Intuition for Proposition 2*

The economic rationale for Proposition 2 will be provided for the case of preferences exhibiting KUJ.[8] Assume that relative consumption effects become more pronounced. Hence, marginal utility from personal consumption will rise. This will, ceteris paribus, induce an individual to provide more official working hours ($dh^M/d\rho > 0$). However, stronger relative consumption effects also raise the marginal utility loss, $u_1[s - w]$, from absence (for $w > s$). Moreover, the increase in official working time augments the gain from more absence. Inspection of equation (13) clarifies that the hours effect dominates. In consequence, the duration of voluntary absence rises with a greater importance of the consumption externality ($dv^M/d\rho > 0$). The two effects, greater official working time and longer voluntary absence, just balance out, because, first, such an adjustment retains the marginal utility from leisure, $-u_3(h^M - v^M)$, at the original level and, second, the expected income loss resulting from absence, p, is linear, for example, in its duration $v + i$. Furthermore, the adjustments summarised in Proposition 2 enable the individual to compensate the greater marginal utility from consumption due to stronger positional concerns (cf. equation (7a)) by a rise in income. This increase in income takes place because the duration of absence rises, while effective working time, which is remunerated at the wage w, remains constant.

Inspection of equations (7a) and (8), furthermore, clarifies that any change in the determinant of the marginal utility from consumption, $u_1$, can be neutralised, such that the first-order conditions hold again, if the marginal utility from leisure, $-u_3(h^M - v^M)$, remains constant. Given the assumption of preferences which are separable in consumption and leisure, this will be the case if effective working time remains unchanged, that is, for $dh^M = dv^M$. In this case, the adjustment in $v^M$, for $d(h^M - v^M) = 0$, must compensate for the rise in ρ, i.e., $(\partial A/\partial\rho)d\rho + (\partial A/\partial v)dv = u_{12}\bar{c}\,d\rho + s[u_{11} + u_{12}\rho]dv = 0$ has to hold. Solving the above equality gives rise to equation (13). If the outcome defined by equations (7a), (8), and (9) is unique, this feasible response will also be the only possible one.

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[8] In case of RAJ, the same basic line of argument will apply, albeit in the opposite direction.

*Robustness*

Inspection of the first-order conditions shows that a constancy of the difference $h^M - v^M$ will no longer warrant optimal choices if the marginal expected income loss resulting from absence, p', varies with official working time, $h^M$ and/ or the voluntary duration of absence, $v^M$. This is because the expected income loss is incorporated into the first-order conditions (7a) and (7b) with different weights. In the case of $p'' \neq 0$, the change in $h^M - v^M$ will be determined by the signs of $u_{12}$ and p''. If preferences are characterised by KUJ ($u_{12} > 0$) and if $p'' < 0$ holds, effective working time will rise with more pronounced positional concerns; while it will fall for $p'' > 0$.[9] The intuition is as follows: If $p'' < 0$ applies, the expected income loss rises disproportionately with the duration of absence. Thus, the incentives to raise effective working time are greater than for $p'' = 0$. Since the change in effective working time is zero if the expected income loss resulting from absence is linear in the duration of absence, it rises with the strength of positional concerns if p is strictly concave. The scarce empirical evidence, however, suggests that the expected income loss due to absence may actually rise with the duration of absence at a decreasing rate, implying that $p'' > 0$ holds. In this case, more pronounced KUJ-preferences reduce effective working time.

*Implications of Proposition 2*

If individuals can only choose official working time, $h^M$, optimally, whereas absence is not a choice variable, the change in $h^M$ due to a rise in ρ is given by $dh^M/d\rho = A_\rho/(A_h C_w - A_w C_h)$, where $A_\rho > 0$ if preferences exhibit KUJ. The denominator of this expression will unambiguously be positive if the aggregate labour supply curve has a non-negative slope, that is, if $dh/dw = - A_w/A_h \geq 0$, or equivalently $A_w \geq 0$. Accordingly, also in our model official working time in market equilibrium is predicted to be higher in a society with more pronounced positional concerns of the KUJ type if absence is no choice variable.

The relatively scarce empirical evidence cited in the Introduction is consistent with this expectation. Proposition 2, however, clarifies that this prediction need no longer hold when focusing on effective working time and allowing for paid absence. More precisely, equation (13) shows that effective working time, $z^M = h^M - v^M - i(h^M - v^M)$ is unaffected by the strength of the consumption externality if absence is determined endogenously and the expected income loss resulting from absence is linear in its duration. In the case of $p'' > 0$, the

[9] In case of RAJ-preferences, the predictions are reversed. See Appendix 8.2 for a derivation.

standard result that KUJ preferences induce an expansion in labour supply would even be reversed. Therefore, positional concerns may have different consequences for working time, depending on whether individuals can adjust behaviour at one or more margins. Consequently, empirical analyses of the relationship between positional concerns and working time have to carefully consider which dimension of effective labour supply to look at. Moreover, as explained above, the invariance of effective working time constitutes a kind of knife-edge prediction. If the expected income loss resulting from absence p were not linear in working time and absence, effective working time may vary with positional considerations in either direction. Therefore, the first implication of Proposition 2 is not contingent on the specific modelling set-up.[10]

A second consequence of Proposition 2 relates to the optimal marginal tax rate which balances the negative externality resulting from excessive working hours due to positional concerns. This tax rate has been shown to increase with the strength of positional effects (Persson 1995). Proposition 2 and equation (6) taken together indicate that the difference between the Pareto-efficient level of effective working time and the market outcome indeed rises with the strength of relative consumption concerns in the case of jealousy. Furthermore, Proposition 2 indicates that a tax which is intended to correct the externality due to positional concerns cannot necessarily be a function of effective working time chosen by individuals. Moreover, any tax inducing efficiency would have to include sick pay into its base since wage income – resulting from effective working time – need not vary with the strength of positional concerns. While the analysis of an optimal progressive income tax system is beyond the scope of this paper, given the assumption of homogeneous individuals, the above considerations suggest that the optimal rate may have to be established jointly with the determinants of income support in the case of non-work, such as sick pay.

As a further implication, note that total absence of individuals whose preferences exhibit KUJ (RAJ) will be higher (lower) than of individuals who do not care about relative consumption, irrespective of the curvature of p (see Appendix 8.2). In consequence, employing people with KUJ preferences will generate lower levels of profits, at given wages (for $dv^M/d\rho > 0$), than of hiring individuals with RAJ preferences. This last result can be established by applying the envelope theorem to equation (4). This yields $d\pi/d\rho = -s(dv^M/d\rho)$, such that the variation in profits depends (inversely) on the change in the duration of absence.

[10] Since the neutrality result summarised in Proposition 2 also depends on the assumption that the marginal utility from leisure, $-u_3(h - v)$, is independent of the strength of positional concerns, ρ, it can also be overturned by altering this specification.

## 4. Effective Working Time, Sickness Absence and Sick Pay

In this section, we consider the impact of sick pay and enquire how the strength of relative consumption considerations alters its consequences. For given choices, sick pay, s, raises personal as well as average consumption, $c = \bar{c} = wz + s[v + i(h - v)]$, and increases labour costs, $C_s = -\kappa < 0$. Moreover, sick pay has a direct positive impact on voluntary absence, $v^M$ (cf. equations (7b) and (14b) below), because, first, the income loss from absence (for $s < w$) is reduced and, second, it becomes more attractive to substitute absence for work. Finally, the immediate impact of sick pay on official working hours, $h^M$, is ambiguous because of conflicting income and substitution effects.

$$A_s = [u_{11} + \rho u_{12}]\,[w[1-\kappa] + s\kappa]\,[v^M + i(v^M - h^M)] + u_1\kappa \tag{14a}$$

$$B_s = u_1 + [u_{11} + \rho u_{12}]\,[v^M + i(v^M - h^M)]s \tag{14b}$$

In sum, the overall changes in official working hours, $h^M$, and voluntary absence, $v^M$, cannot be determined (so that explicit derivations of $dh^M/ds$ and $dv^M/ds$ are not presented, irrespective of whether the expected marginal income loss resulting from absence is constant, $p'' = 0$, or not, $p'' \neq 0$). The net impact, though, of both variations can be computed because ambiguous effects cancel out. In particular, effective working time, $z^M$, declines with sick pay, s (for $p'' = 0$).

$$\frac{dz^M}{ds} = [1-\kappa]\left[\frac{dh^M}{ds} - \frac{dv^M}{ds}\right] = \frac{[1-\kappa]u_1}{s}\,\frac{w[1-\kappa]+s\kappa}{u_{33} + f''[1-\kappa]^2 u_1} < 0 \tag{15}$$

Additionally, the negative impact of sick pay, s, on effective working time, $z^M$, will be weaker (stronger) the more important relative consumption concerns are in the case of KUJ (RAJ). In order to establish this claim, note that the parameter, ρ, measuring the strength of relative consumption concerns, only affects marginal utility in equation (15) and that its impact on $u_1$ is given by $u_{12}\bar{c}$. Therefore, we have:

$$\left(\frac{dz^M}{ds}\right)\Big/d\rho = \partial\left(\frac{dz^M}{ds}\right)\Big/\partial u_1 \times \left(\frac{\partial u_1}{\partial \rho}\right) = u_{12}\bar{c}\underbrace{\frac{u_{33}[w[1-\kappa]+s\kappa][1-\kappa]}{s[u_{33} + f''[1-\kappa]^2 u_1]^2}}_{(-)} \tag{16}$$

Moreover, the optimal amount of effective working time, z*, is independent of s. Thus, the difference between $z^M$ and z* will shrink (rise) with s if the difference is positive (negative). We can summarise these insights as:

Proposition 3

Let the duration of voluntary absence in market equilibrium, $v^M$, be positive and the expected income loss resulting from absence be linear in its duration (p'' = 0).

a) A rise in sick pay, s, reduces effective working time, $z^M$.

b) An increase in sick pay reduces a positive difference (raises a negative difference) between the Pareto-efficient level of effective working hours and the market outcome, $z^* – z^M$.

c) The negative impact of sick pay on effective working time will be weaker (stronger), the more important positional concerns are, if individuals exhibit KUJ (RAJ) preferences, such that $u_{12}$ > (<) applies.

Proof: Follows from equations (15), (16), and (6) above. ▪

*Intuition for Proposition 3*

The equilibrium changes in official working time, $h^M$, and voluntary absence, $v^M$, cannot be signed because the rise in sick pay, s, has income, relative consumption and substitution effects. However, the difference $h^M – v^M$ is unaffected by these ambiguities because the first two effects cancel out and only the substitution impact remains. Higher sick pay lowers the costs of leisure and, hence, individuals choose more of it. Part b) of Proposition 3 states that any policy change which reduces effective hours of work will lower (raise) the difference between the market outcome and efficient working time if this difference is positive (negative). This effect arises because the optimal amount of effective working time, z*, is independent of sick pay, such that the change in the difference between optimal amount and market outcome is resulting from the variation in the later. Finally, part c) indicates that the substitution effect determining part a) is weaker if individuals try more intensively to keep up with the Joneses (KUJ). Therefore, the fall in effective working time is smaller. If, however, individuals exhibit RAJ preferences, the reduction in income resulting from substituting effective working time by leisure has a greater detrimental (marginal) utility impact. Hence, individuals exhibiting RAJ will respond more strongly to the increase in sick pay by adjustments in effective working time, the more pronounced positional preferences are.

*Robustness*

If the expected income loss resulting from absence is strictly concave in the overall duration of absence, p'' < 0, the negative impact of sick pay on effective working time is strengthened (see Appendix 8.3). This is the case because the rise in absence increases the resulting expected income loss. This enhances the costs of expanding official working time and of absence. Inspection of equations (7a) and (8) clarifies that the effect on the duration of absence is more pronounced. Therefore, part a) of Proposition 3 continues to hold for $p'' < 0$. The same is true with respect to part b), according to which higher sick pay reduces a positive difference between the Pareto-efficient level of effective working hours and the market outcome, $z^* - z^M$, as $z^*$ does not vary with sick pay. The final part c) of Proposition 3 establishes a relationship between the negative impact of sick pay on effective working time and the strength of positional concerns. This link can no longer be derived in the same way as in equation (16) because $dz^M/ds$ depends on $\rho$ not only via marginal utility, $u_1$, if the expected income loss resulting from absence is non-linear in the overall duration of absence ($p'' \neq 0$). In sum, we can conclude that the main results captured by Proposition 3 are robust with respect to the impact of the overall duration of absence on the resulting marginal expected income loss, $p'$.

*Implications of Proposition 3*

Part a) of Proposition 3 clarifies that the detrimental effort effects of sick pay constitute a robust theoretical prediction which is unaffected by incorporating positional consumption concerns. Moreover, parts b) and c) of Proposition 3 indicate that an optimal level of sick pay which balanced the beneficial effects of income smoothing and the negative incentive impact, would be influenced by the strength of positional concerns. Finally, part c) suggests that it may be more beneficial for firms to employ individuals who exhibit KUJ preferences, because the negative working time consequences of sick pay are less pronounced. However, this favourable impact of employing such individuals must be balanced with the negative effects for firms due to higher absence levels (cf. Proposition 2). In addition, the derivation of this effect requires the expected income loss due to absence, p, to be linear in its duration ($p'' = 0$).

## 5. Effective Working Time, Sickness Absence and True Periods of Illness

There is an extensive discussion on the impact of health outcomes on labour supply (see Currie and Madrian 1999). In this section, we contribute to this debate from a theoretical vantage point by considering the impact of an increase in truly sickness-related absence, I, on effective working time, $h^M$, and voluntary absence, $v^M$. Furthermore, we analyse how these changes depend on positional concerns.[11] Assuming the expected income loss resulting from absence to be linear in its duration (p'' = 0), the derivatives of (7a), (8) and (9) are given by $C_I = f''[\kappa - 1] > 0$ and:

$$A_I = [u_{11} + \rho u_{12}][s - w][w[1-\kappa] + s\kappa] = B_I \frac{w[1-\kappa] + s\kappa}{s} > 0 \tag{17}$$

Combining these changes, we obtain:

$$\frac{dh^M}{dI} = -\frac{u_{33}}{s} \frac{s - w - f''z^M}{u_{33} + f''[1-\kappa]^2 u_1} \tag{18}$$

A rise in absence due to true illness, I, which can also be interpreted as a longer duration of true illness, has ambiguous consequences with respect to official working time, $h^M$, if sick pay is less than the wage, $s < w$. This is the case because an increase in I reduces income which, in turn, entices individuals to work more official hours. However, more truly sickness-related absence, I, reduces effective working time, $z^M$, and, hence, improves the marginal productivity of labour, $f'(z^M)$. This effect, in turn, raises demand for official hours and, hence, wages. The labour demand induced income effect mitigates or may over-compensate the direct income change such that the overall impact of longer true illness on official working time, $h^M$, cannot be determined. Moreover, voluntary absence, $v^M$, rises by less (or falls by more) than official working time, $h^M$, because there is no direct labour demand impact. Finally, effective working time, $z^M = [h^M - v^M][1 - \kappa] - I$, declines because the direct negative impact of a rise in I dominates the change in $h^M - v^M$.

$$\frac{dz^M}{dI} = [1-\kappa]\left[\frac{dh^M}{dI} - \frac{dv^M}{dI}\right] - 1 = \frac{[1-\kappa]^2 f'' u_1}{\underbrace{u_{33} + f''[1-\kappa]^2 u_1}_{(+)}} - 1 = \frac{-u_{33}}{u_{33} + f''[1-\kappa]^2 u_1} < 0 \tag{19}$$

Furthermore, it is possible to ascertain how the changes in $h^M - v^M$ and $z^M$ are affected by the strength of positional concerns.

$$\frac{\partial\left(\frac{dz^M}{dI}\right)}{\partial \rho} = \frac{\partial\left(\frac{dz^M}{dI}\right)}{\partial u_1}\left(\frac{\partial u_1}{\partial \rho}\right) = \frac{u_{33}[1-\kappa]^2 f'' u_{12}\bar{c}}{\underbrace{[u_{33} + f''[1-\kappa]^2 u_1]^2}_{(+)}} = \frac{\partial\left(\frac{d(h^M - v^M)}{dI}\right)}{\partial \rho}[1-\kappa] \tag{20}$$

This yields:

[11] Furthermore, the strength of the impact of effective working time on true illness, as captured by the parameter κ, affects working time. The overall effect of such a change is uncertain because the consequences on labour demand cannot be determined. Given this ambiguity, the variations in all other endogenous variables cannot be ascertained either and we subsequently focus on the parameter I.

Proposition 4

Let the optimal duration of voluntary absence in market equilibrium, $v^M$, be positive and the expected income loss resulting from absence be linear in its duration (p'' = 0).

a) A general rise in the duration of true illness, I, increases the difference between official working time and voluntary absence, $h^M - v^M$, and reduces effective working time $z^M = [h^M - v^M][1 - \kappa] - I$.

b) If preferences exhibit KUJ ($u_{12} > 0$), stronger positional concerns will mitigate the negative impact of I on $z^M$. If preferences exhibit RAJ ($u_{12} < 0$), the prediction is reversed.

Proof: Part a) follows from equation (19), while part b) is proven by equation (20).▪

Note that a given loss in income has a more pronounced utility impact the stronger positional concerns are. Since more absence lowers income, the resulting reduction in effective working time will be less for an individual characterised by KUJ preferences, relative to someone for whom $u_{12} = 0$ holds. In the case of RAJ preferences, the fall in income due to a higher illness will be less detrimental in terms of utility, and the incentives to lower effective working time, $z^M$, will be emphasised.

*Robustness*

If the expected income loss resulting from absence is strictly concave in the overall duration of absence, p'' < 0, the increase in the difference between official working time and voluntary absence, $h^M - v^M$, owing to general rise in the duration of true illness, I, will become more pronounced (see Appendix 8.4). This is the case because rise in I, ceteris paribus, increases the expected income loss, p. Therefore, both contractual hours working and voluntary absence decline. As argued above, the effect on the duration of voluntary absence is more pronounced. Thus, the difference, $h^M - v^M$, rises on account of the variation in p. As $h^M - v^M$ rises by more for p'' < 0 than in the linear case, the difference $z^M = [1 - \kappa](h^M - v^M) - I$ can no longer be shown to fall, as it is feasible for an expected income loss due to absence which is linear in its arguments. Hence, the second half of part a) of Proposition 4 may not hold for a more general specification. Similarly, part b) of Proposition 4 is based on the assumption of

$p'' = 0$ because otherwise $dz^M/dI$ depends on the duration of true illness, I, via the derivatives $u_{11}$ and $u_{12}$.

*Implications of Proposition 4*

One important implication of Proposition 4 relates to the profitability of employing individuals with different positional concerns. Those individuals whose duration of true illness is higher, as indicated by a greater value of I, exhibit more work effort, as measured by the difference between official working time and voluntary absence. However, their effective working time may be lower than that of more healthy people (and will certainly be so if $p'' = 0$), because greater effort does not fully compensate higher truly sickness-related absence. Moreover, for a given level of true illness, I, work effort may be greater for employees exhibiting KUJ preferences and rise with the strength of these preferences. This suggests that it is more profitable to employ individuals with KUJ rather than RAJ preferences; on account of their differential responses to (exogenous changes in) the duration of true illness, I.

In addition, our findings cast some doubt on the interpretation of absence as an indicator of work effort.[12] If true illness periods rise, total expected absence, $I + \kappa(h - v)$ will go up. Work effort, as measured by the difference between official working time and voluntary absence, $h^M - v^M$, however, will also rise. While the essence of the theoretical prediction is not altered by the existence of positional concerns, the intensity of adjustments varies with the strength of relative income considerations.

## 6. Concluding Remarks

Our theoretical analysis generates two main insights: First, if individuals can determine more than one component of working time optimally, these elements may be affected in a qualitatively different manner by the intensity of income or consumption comparisons. In the basic setting investigated above, stronger positional concerns alter official working time and absence by the same amount. In consequence, effective working time may not be affected by the intensity of positional considerations. Depending on how the expected income loss resulting from absence, p, varies with the duration of absence, effective working time may also rise or fall. However, irrespective of this modelling characteristic, Proposition 2 shows

[12] This perspective has been adopted, often in the context of analysing the effect of employment protection on sickness-related absence, by Riphahn (2004), Engellandt and Riphahn (2005), Ichino and Riphahn (2005), Olsson (2009), Cornelissen et al. (2013), Block et al. (2014), and Bradley et al. (2014), inter alia. For a discussion and empirical evidence, see Chadi and Goerke (2018).

the relevance of allowing for additional adjustment opportunities. Moreover, empirical analyses of the labour supply consequences of positional concerns should consider a variety of working time indicators. Findings with respect to only one component are not really informative concerning the impact of positional concerns for labour supply behaviour.

Second, while there is ample empirical evidence of positional consumption and income concerns, which, ceteris paribus, enhance labour supply, our findings cast doubt on policy conclusions derived from these results, according to which labour income or consumption taxes can enhance efficiency. If individuals possess further margins of adjustment, in addition to contractual working time, such as sickness-related absence periods, or if they are characterised by positional concerns with regard to leisure, effective labour supply need not be excessive. Hence, taxes may have detrimental welfare effects even if individuals exhibit KUJ preferences. The design of optimal tax policy in the presence of positional concerns, multiple margins of adjustment, and sick pay remains a topic for future research.

Third, the impact of sick pay and true illness on working time is affected by the nature and strength of positional concerns. Hence, productivity and labour costs are likely to vary with relative consumption considerations. Accordingly, the profitability of employing two otherwise identical people who only differ in the nature and/or strength of positional concerns will diverge. While it seems plausible that it is more profitable to employ individuals with KUJ preferences, Proposition 2 indicates that this conjecture need not be correct.

More generally, our theoretical investigation suggests that the labour market consequences of positional consumption concerns need to be explored more thoroughly than they have been investigated thus far. Along the same lines, the analysis indicates that the effectiveness of social policy, such as a variation in sick pay, can be affected by positional considerations.

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## 8. Appendix – the Case of a Non-linear Expected Income Loss Due to Absence, p

### 8.1 Determinant

If the expected income loss resulting from absence p = P(v + i(h – v))[U – E] is not linear in v + i, the following relationships hold, $p_h = p'\kappa$, $p_v = p'[1-\kappa]$, $p_{hh} = p''\kappa^2$, $p_{vv} = p''[1-\kappa]^2$, and $p_{hv} = p''\kappa[1-\kappa]$, where subscripts denote partial derivatives. The optimality conditions A and B and their derivatives then change, relative to those depicted in equations (7a), (8), and (10), and are given by:

$$A(p \neq 0) = u_1[w[1-\kappa] + s\kappa] + u_3 + p'\kappa = 0 \tag{A.1}$$

$$B(p \neq 0) = u_1 s + u_3 + p' = 0 \tag{A.2}$$

$$A_h = [u_{11} + \rho u_{12}][w[1-\kappa] + s\kappa]^2 + u_{33} + p''\kappa^2 \tag{A.3}$$

$$A_v = [u_{11} + \rho u_{12}][w[1-\kappa] + s\kappa][s - w][1-\kappa] - u_{33} + p''\kappa[1-\kappa] \tag{A.4}$$

$$B_h = [u_{11} + \rho u_{12}][w[1-\kappa] + s\kappa]s + p''\kappa \tag{A.5}$$

$$B_v = [u_{11} + \rho u_{12}]s[s - w][1-\kappa] + p''[1-\kappa] \tag{A.6}$$

In (A.3) to (A.6) and also to some extent subsequently, we omit the characterisation of derivatives by p ≠ 0, as an indication of the non-linearity of p, in order to simplify notation.

Using (10c), (10f), (A.3) to (A.6), the derivatives of C, and $z^M = h^M - v^M - i(h^M - v^M)$, the determinant D(p ≠ 0) of the system consisting of (A.1), (A.2) and (9) can be calculated as:

$$\begin{aligned} D(p'' \neq 0) &= [A_h + A_v]C_h B_w + C_w[A_h B_v - A_v B_h] - A_w C_h[B_h + B_v] \\ &= -[1-\kappa][u_{11} + \rho u_{12}]s^2[u_1 f''[1-\kappa]^2 + u_{33}] \\ &\quad -p''[1-\kappa]^3\left[u_1 f'' + \frac{u_{33}}{[1-\kappa]^2} + [u_{11} + \rho u_{12}]w[f'' z^M + w]\right] \end{aligned} \tag{A.7}$$

### 8.2 Proposition 2

The changes in official working time and the duration of absence for p'' ≠ 0 are given by:

$$\begin{aligned} \frac{dh^M}{d\rho}_{|p''\neq 0} &= \frac{A_\rho[[1-\kappa]B_v - C_h B_w] - [1-\kappa]A_v B_\rho + A_w B_\rho C_h}{D(p'' \neq 0)} \\ &= u_{12}\bar{c}[1-\kappa]\frac{s[u_{33} + f''[1-\kappa]^2 u_1] + [1-\kappa]^2 p'' w}{D(p'' \neq 0)} \end{aligned} \tag{A.8}$$

$$\left.\frac{dv^M}{d\rho}\right|_{p''\neq 0} = \frac{[1-\kappa]A_h B_\rho - A_\rho[[1-\kappa]B_h + C_h B_w] + A_w B_\rho C_h}{D(p''\neq 0)}$$

$$= u_{12}\bar{c}[1-\kappa]\frac{s[u_{33} + f''[1-\kappa]^2 u_1] - [1-\kappa]\kappa p'' w}{D(p''\neq 0)} \tag{A.9}$$

Hence, $dh^M/d\rho > 0$ for $p'' \leq 0$, while $dv^M/d\rho > 0$ requires the opposite restriction $p'' \geq 0$ as a sufficiency condition. Combining both derivatives shows that $h^M - v^M$ and effective working time will rise if individuals exhibit KUJ-preferences and the p-function is strictly concave ($u_{12} > 0 > p''$). If $u_{12}$, $p'' > 0$, effective working time, $z^M = h^M - v^M - i(h^M - v^M)$, will fall.

$$\left.\frac{d(h^M - v^M)}{d\rho}\right|_{p''\neq 0} = \frac{u_{12}\bar{c}[1-\kappa]^2 p'' w}{D(p''\neq 0)} \tag{A.10}$$

The change in absence, $v^M + i(h^M - v^M)$, is given by:

$$\left.\frac{d(v^M + i(h^M - v^M))}{d\rho}\right|_{p''\neq 0} = \left.\frac{dv^M}{d\rho}\right|_{p''\neq 0} + \kappa\left.\frac{d(h^M - v^M)}{d\rho}\right|_{p''\neq 0}$$

$$= u_{12}\bar{c}[1-\kappa]s\frac{u_{33} + f''[1-\kappa]^2 u_1}{D(p''\neq 0)} \tag{A.11}$$

8.3 Proposition 3

The derivatives of (7a), (8), and (9) with respect to s are not affected by the assumption relating to the curvature of p and given by (14a), (14b) and $C_s = -\kappa$. While the changes in official working hours, $h^M$, and voluntary absence, $v^M$, remain ambiguous, the variation in their difference can be signed for $p'' < 0$.

$$\left.\frac{d(h^M - v^M)}{ds}\right|_{p''\neq 0} = [\kappa - 1]u_1\frac{[u_{11} + \rho u_{12}]s[w[1-\kappa] + s\kappa] + p''\kappa}{D(p''\neq 0)}$$

$$+p''[\kappa - 1]w[u_{11} + \rho u_{12}]\frac{\kappa h^M - v^M - i(h^M - v^M)}{D(p''\neq 0)} \tag{A.12}$$

The expression in the numerator in the second line of (A.12) is negative. If, therefore, the expected income loss resulting from absence is concave, $p'' \leq 0$, effective working time will decline with s. Note, furthermore, that the derivative in (A.12) does not only depend on the strength of positional concerns, $\rho$, via the marginal utility from consumption, $u_1$, as it is the case for $p'' = 0$ (cf. equation (16)). In addition, the parameter $\rho$ affects (A.12) via $u_{11}$ and $u_{12}$.

Hence, the impact of positional concerns on the effect of sick pay on working time depends on the third derivative of the utility function and cannot be determined for p'' ≠ 0.

8.4. Proposition 4

The derivatives of (7a), (8), and (9) with respect to I are given by $C_I = f''[1-\kappa]$ and by:

$$A_I = [u_{11} + \rho u_{12}][s - w][w[1-\kappa] + s\kappa] + p''\kappa \qquad (A.13)$$

$$B_I = [u_{11} + \rho u_{12}]s[s - w] + p'' \qquad (A.14)$$

The changes in official working time and absence are ambiguous.

$$\frac{dh^M}{dI}_{|p''\neq 0} = \frac{-A_I[[\kappa-1]B_v + C_h B_w] + A_v[B_I[\kappa-1] - C_I B_w] + A_w[B_I C_h + C_I B_v]}{D(p''\neq 0)}$$

$$= u_{33}[1-\kappa][u_{11} + \rho u_{12}]s\frac{s - w - f''[h^M - v^M - i(h^M - v^M)] + p''}{D(p''\neq 0)} \qquad (A.15)$$

$$\frac{dv^M}{dI}_{|p''\neq 0} = \frac{C_w[A_I B_h - A_h B_I] + B_w[A_h C_I - A_I C_h] - A_w[B_h C_I - C_h B_I]}{D(P''\neq 0)}$$

$$= [1-\kappa]u_{33}[u_{11} + \rho u_{12}]s\frac{[s - w - f''[h^M - v^M - i(h^M - v^M)] + p''}{D(p''\neq 0)}$$

$$+\frac{[1-\kappa]^2 f'' u_1[[u_{11} + \rho u_{12}]s^2 + p''] + p''[u_{11} + \rho u_{12}][w^2[1-\kappa] - s\kappa f'' z^M]}{D(p''\neq 0)} \qquad (A.16)$$

From this we obtain:

$$\frac{d(h^M - v^M)}{dI}_{|p''\neq 0} = -[1-\kappa]^2 f'' u_1\frac{[u_{11} + \rho u_{12}]s^2 + p''}{D(p''\neq 0)}$$

$$-[1-\kappa]p''[u_{11} + \rho u_{12}]\frac{w^2[1-\kappa] - s\kappa f'' z^M}{D(p''\neq 0)} \qquad (A.17)$$

Therefore, the difference between official working time and absence surely declines with I, if $p'' \leq 0$ holds. The change in effective working time, $z^M = [1-\kappa][h^M - v^M] - I$, is given by:

$$\frac{dz^M}{dI}_{|p''\neq 0} = [1-\kappa]\frac{d(h^M - v^M)}{dI}_{|p''\neq 0} - 1$$

$$= [1-\kappa]\frac{[1-\kappa]p''[u_{11} + \rho u_{12}]f'' z^M[w[1-\kappa] + s\kappa] + [[u_{11} + \rho u_{12}]s^2 + p'']u_{33}}{D(p''\neq 0)} \qquad (A.18)$$

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