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A note on the substitution between wage and non-wage benefits in spot labour markets

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Abstract

Recent empirical work suggests that spot labour market workers have a strong preference towards wages over fringe benefits. This paper provides a theoretical framework based on this finding. After a discussion of the utility function and equilibrium, the paper proceeds to a comparative statics analysis. An important result is that workers spend all extra compensation on wages only. This is shown to be true in the case that wage benefits are taxed. Furthermore, proportional taxes have no effect for workers' choice between wage and non-wage benefits.

JEL classification: J3

1. Introduction

The subject of substitution between wage and non-wage benefits has started to receive increasing attention in the last decade. One of the reason for this interest was the question of differences in benefit coverage across industries and their effect on the labour market. There seems to be lack of theoretical work on the subject, since the bulk of the existing work is concerned with empirical testing. Consequently, there has not been much work on the theoretical issue of the structure of the utility function which includes wage and non-wage benefits. Most of the papers assume or test a standard, well-behaved utility function of a CES or Stone–Geary type which is assumed to hold across the labour market [Wales (1973), Wales and Woodland (1979), Woodbury (1983), Parker and Rhine (1991)].

However, recent empirical work points to the fact that the standard approach to substitution between wage and non-wage benefits (mainly pension schemes) might be true only in the case of contract labour markets. This implies that the standard utility function might not be appropriate for the whole labour market. In particular, the empirical work indicates that the

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spot market exhibits limited substitution between wage and fringe (pension) benefits [Montgomery et al. (1992)].

Thus this paper concentrates more on the appropriateness of the structure of the utility function for the spot labour market given the latest empirical indications. In particular, the paper suggests a utility function which takes into account the idea that spot labour market workers place more emphasis on wage benefits rather than on non-wage ones. One simple theoretical reason for this pattern could be that wage benefits imply a much higher degree of consumption choice for workers who are likely to have a short-run horizon in a non-contractural job. Thus after a discussion of the utility function and equilibrium, the paper presents some comparative static results. Finally, there is a discussion of the effects of taxation on the choice between wage and non-wage benefits.

2. Utility function and equilibrium

In general terms, the workers' utility function is a function of the quantities of wages and fringe benefits received. We suggest a specific form utility function of a quasilinear type which captures the idea that spot market workers have a strong preference towards wages. One could also argue that young workers' preferences might also be characterized by such a utility function [see also Eaton and Rosen (1983)]:

$$U = w + \varphi(z)\,, \quad \text{where } \varphi'(z) > 0 \text{ and } \varphi''(z) < 0\,. \tag{1}$$

The employer offers the worker maximum wages, and fringe benefits. Now P_w is the price of wages and P_z is the price of fringe benefits. The concept of the price of wages and the price of fringes is not very common but one can approach it as similar to shadow or hedonic prices [see Rosen (1974), Woodbury (1983), Atrostic (1982)]. We also make the relatively reasonable assumption that wages are taxed proportionally and that fringes are untaxed. Thus, any combination of wages and fringes will be lying on the locus:

$$P_w w(1+t) + P_z z = M\,, \tag{2}$$

where t is a marginal tax and M is total compensation. The maximization problem of the workers is the following:

$$\max_{w,z} U = w + \varphi(z)$$

$$\text{s.t. } P_w w(1+t) + P_z z = M\,.$$

The solution of the above will give us the following first-order conditions (L is the Lagrangian function and λ the Lagrangian multiplier):

$$\begin{aligned} \frac{\partial L}{\partial w} &= 1 - \lambda P_w(1+t) = 0\,, \\ \frac{\partial L}{\partial z} &= \varphi'(z) - \lambda P_z = 0\,, \\ \frac{\partial L}{\partial \lambda} &= -P_w(1+t) - P_z z + M = 0\,. \end{aligned} \tag{3}$$

Given the above, the equilibrium relation is

$$\varphi'(z) = \frac{P_z}{P_w(1+t)}. \tag{4}$$

3. Comparative statics

It would be interesting to see what happens when the key variables like the price of wage and non-wage benefits, tax rate and total compensation change. The simplest way to see that is by taking the total differentials of the equations of the first-order conditions. This will give us a linear system from which we can calculate the comparative static results. The obvious starting point is to see how a change in total compensation affects the quantity of wages:

$$\frac{\partial w}{\partial M} = \frac{1}{P_w(1+t)} > 0. \tag{5}$$

This is an expected result, and can be seen as a sort of income effect. It implies that wages are a normal good. Let us see now how a change in the price of wages affects the quantity of wages chosen by the workers:

$$\frac{\partial w}{\partial P_w} = \frac{\lambda P_z^2}{[Pw(1+t)]^2 \varphi''(z)} - \frac{w}{P_w(1+t)} < 0. \tag{6}$$

As before, the result is as expected. One can see it as the equivalent of the Slutsky equation. Thus the demand curve for wages is downward sloping and w is a normal good. Furthermore, the 'expenditure' compensated version of the above is equivalent to the substitution effect. Next, the same comparative statics are calculated for fringe benefits:

$$\frac{\partial z}{\partial M} = \frac{0}{[P_w(1+t)]^2 \varphi''(z)} = 0. \tag{7}$$

Now this is an important result since it reveals that an increase in total compensation will be taken as wages and not fringe benefits. This theoretical result might be an explanation for recent empirical findings [Montgomery et al. (1992)]. It can also be viewed in terms of choice: wage income is much more flexible than fringe income:

$$\frac{\partial z}{\partial P_z} = \frac{\lambda}{\varphi''(z)} < 0. \tag{8}$$

Again the substitution effect, which is also the compensated one, is negative. At this stage, it would be useful to calculate the elasticity of substitution between wage and non-wage benefits ($\sigma_{w,z}$). After some calculations, we get

$$\sigma_{w,z} = \frac{\varphi'(z)[w + \varphi'(z)]}{-wz\varphi''(z)} > 0. \tag{9}$$

The positive sign implies that wage and non-wage benefits are substitutes. We can also see some additional cross effects:

$$\frac{\partial z}{\partial P_w} = \frac{-\lambda P_z}{P_w(1+t)\varphi''(z)} > 0 \tag{10}$$

and

$$\frac{\partial w}{\partial P_z} = \frac{-\lambda P_z + \varphi''(z)z}{[P_w(1+t)]^2\varphi''(z)} > 0\,. \tag{11}$$

The positive signs in the above relations confirm that wage and non-wage benefits are substitutes.

4. The effect of taxes

The starting point is to compare the above situation in which wages are taxed with the simplest case when the total compensation equation (2) does not incorporate taxes. Thus the compensation equation is simply: $P_w w + P_z z = M$.

After recalculating all the previous comparative statics results, we can compare them with the tax on wages case [we use (t) to refer to the case in which we assume that wages are taxed]. Comparing magnitudes we can see that

$$\frac{\partial w}{\partial M} > \frac{\partial w}{\partial M}(t)\,. \tag{12}$$

The income effect is less strong when wages are taxed. Also,

$$\frac{\partial w}{\partial P_w} < \frac{\partial w}{\partial P_w}(t)\,. \tag{13}$$

This implies that the substitution effect becomes stronger when wages are taxed. Clearly, this happens because the opportunity cost of wages increases. The cross effects are

$$\frac{\partial z}{\partial P_w} > \frac{\partial z}{\partial P_w}(t)\,, \tag{14}$$

$$\frac{\partial w}{\partial P_z} > \frac{\partial w}{\partial P_z}(t)\,. \tag{15}$$

Relations (14) and (15) are expected given relation (13) and their positive signs. Also we get

$$\frac{\partial_z}{\partial P_z} = \frac{\partial z}{\partial P_z}(t)\,. \tag{16}$$

There is no effect on the quantity of fringe benefits when wages are taxed. Returning to our original specification, we can calculate the comparative statics results with respect to taxes:

$$\frac{\partial w}{\partial t} = \frac{\partial w}{\partial P_w} < 0 \quad \text{and in general} \quad \frac{\partial \cdot}{\partial t} = \frac{\partial \cdot}{\partial P_w}\,. \tag{17}$$

This implies that proportional taxes have no effect at all on workers' choice. Even if we allow

fringes to be taxed proportionally, then the constraint will be $P_w w + P_z z(1 + t') = M$. However we can see again that

$$\frac{\partial \cdot}{\partial P_z} = \frac{\partial \cdot}{\partial t'} . \tag{18}$$

The same will happen if there is a proportional tax on income or workers' compensation (t_m):

$$\frac{\partial w}{\partial t_m} = \frac{\partial w}{\partial M} \quad \text{and} \quad \frac{\partial z}{\partial t_m} = \frac{\partial z}{\partial M} = 0 . \tag{19}$$

The interesting implication of the above is that an increase in proportional taxes has similar effects on the wage–fringe mix as an increase in the opportunity cost of wages and fringes.

5. Conclusion

This paper suggests a quasilinear utility function as more appropriate for capturing the spot labour market workers' preferences of wage and non-wage benefits. In this framework, such utility functions imply that wage benefits are much more important than non-wage benefits. The justification for this lies in the idea that wage benefits provide a higher degree of consumption choice which is favoured by spot market workers. It is also in line with recent empirical findings.

The paper proceeded to a comparative static analysis. The analysis showed that both goods are normal. An important result was that workers spend all extra compensation on wages only. This is also true in the case that wage benefits are taxed. Furthermore, it was shown that proportional taxes have no effect on workers' choice between wage and non-wage benefits. It is hoped that the paper will provide the basis for further research and especially empirical research on this topic.

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