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NOTA DI LAVORO 21.2006

FEBRUARY 2006

SIEV – Sustainability Indicators and Environmental Valuation

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Summary

Recognizing that people value employment not only to earn income to satisfy their consumption needs, but also as a means to gain socio-psychological (nonpecuniary) benefits, we show that once nonpecuniary work incentives are incorporated into standard labor supply theory, (i) the wage rate *under-estimates* (*over-estimates*) the true value of nonwork/leisure time when work has nonpecuniary benefits (costs), (ii) nonpecuniary benefits can be a substitute for monetary wages as work incentives, (iii) at very low wage rates, work can become a net source of *utility*, and (iii) the shape of labor supply curve *differs* from standard theory. We also identify conditions under which a greater nonpecuniary work incentive generates a larger individual labor supply, and examine the effects of non-wage income on labor supply both for paid and voluntary work.

Keywords: Nonpecuniary incentives, Labor supply, Non-wage income, Voluntary work

JEL Classification: D62, J22, I31

For helpful comments and suggestions, we thank Carlo Beretta, Richard Carson, Faraz Farzin, Jonathon Kaplan, Stephan Kroll, Cheryl Long, Phillip Martin, Siwa Masengi, and participants at the Annual Conference of Public Economic Theory, Marseille, France, June 16-18, 2005, and at the seminars at Waseda University, University of Wyoming, and University of California at Davis. The usual caveat, however, applies.

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1 Introduction

If being employed is not only a source of earning income to satisfy materialistic needs, but also the principal means of community involvement, then employment can provide socio-psychological (or nonpecuniary) benefits. However, the standard theory of individual labor supply focuses on an individualistic notion of work and abstracts from the nonpecuniary benefits. It considers work as a source of disutility, and any time off work (leisure) as a source of utility, assuming that utility *always* decreases with hours worked.[1] Standard labor-leisure choice theory asks how an individual makes a tradeoff between consumption (made possible by work) and leisure (time not allocated to work), but ignores the socio-psychological effects of employment. This shortcoming of the standard theory, which treats labor time merely as a means of earning income, is lucidly expressed by Krugman (1998, P.15): "*Economics textbooks may treat the exchange of labor for money as a transaction much like the sale of a bushel of apples, but we all know that in human terms there is a huge difference. A merchant may sell many things, but a worker usually has only one job, which supplies not only his livelihood but often much of his sense of identity. An unsold commodity is a nuisance, an unemployed worker a tragedy*". This raises a basic question: How is the individual labor supply decision affected by the nonpecuniary effects of work?

In this paper, we go beyond the standard neoclassical income-leisure choice, where the value of leisure is the cost of income foregone, and follow sociologists and psychologists (see, for example, Jahoda (1981)(1982), Whelan (1994) and Agerbo et al (1998)), who recognize that, in addition to being a source of income and material satisfaction, employment can provide non-materialistic individual satisfactions. By incorporating the positive nonpecuniary effects of employment on individual well-being, we extend the standard labor supply model and provide several new insights.[2]

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[1] See, for example, Deaton and Muellbauer (1980, Ch. 4 and 11), Varian (1984, Ch. 6), and Killingsworth (1986), for a standard treatment of labor supply.

[2] A notable departure from the standard model is Becker's (1965) insightful model of choice where an individual (or household) combines nonwork time with market goods to produce commodities or

The next section briefly reviews some of the empirical studies indicating the presence of nonpecuniary benefits from work. In Section 3.0 we extend the standard labor supply model, showing in Section 3.1 that, when work involves nonpecuniary benefits (costs), the standard theory's valuation of nonwork/leisure time at the wage rate results in an under-estimation (over-estimation) of its true value, thus leading to an over-allocation (under-allocation) of time to nonwork activities. This simple but quite striking result has important implications for correct cost-benefit assessment of nonwork activities (such as recreational, transportation, household and do-it-yourself activities) and unemployment, retirement, and disability compensation schemes. The extended model shows explicitly that nonpecuniary benefits and monetary wages are substitute incentives in employment and labor supply decisions. As such, it can help to explain, among other things, why people sometimes choose lower-paying jobs and resist retirement despite financially attractive compensation and benefits schemes, or even offer their labor voluntarily. Section 3.2 shows that in the presence of nonpecuniary work incentives, as the wage rate, and hence income and consumption, declines below a critical level, the time not allocated to work (leisure) may lose its desirability to such an extent that one chooses to work as much as possible. Indeed, it shows that at very low wage rates, work can even become a source of *utility*. As such, our model implies an individual labor supply curve that differs markedly from that derived from the standard theory. Section 4 extends the analysis of Section 3 by examining the effects of non-wage income on labor supply both when the individual earns wage income and when she works voluntarily. It shows that depending on the individual's preferences and the share of non-wage income in total income, an increase in non-wage income can *enlarge or shrink* the range of wages at which labor is supplied fully and perfectly inelastically. It also shows that

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services whose consumption yields utility. In that model, leisure is not the same as nonwork time; it is a consumption good or service whose production is time intensive and its full cost consists of both the direct cost of market goods and the foregone earnings due to spending time to produce leisure activities. Becker examines the effects of changes in the foregone income on hours of work, productivity measurement and economics of queues. As such, Becker's model and the focus of analysis differ from those of the present paper which concentrates on the socio-psychological (nonpecuniary) effect of work on utility and hence labor supply. In fact, in Becker's model the amount of time allocated to work ".. would be determined solely by the effect on income and not by any effect on utility" (p.498), where income denotes "the money income achieved if all the time available were devoted to work" (p.497).

below a critical income level voluntary work will be offered fully, but for higher incomes, voluntary work *decreases* with income. Section 5 presents concluding remarks.

2. Nonpecuniary Value of Employment

Employment is a principal means for people to connect and become involved with communal activities. In turn, whether through self-assessment or assessment by others, community involvement directly or indirectly brings a sense of self-esteem, self-respect, belonging, identity, recognition, reputation, friendship, security, and status, all of which are ingredients of one's quality of life and satisfaction (Jahoda (1988)).[3] In fact, the phrase "I am what I do" is sometimes used to express the socio-psychological importance of work. Being employed is an essential determinant of happiness; the unemployed have significantly lower well-being scores in the social psychology and labor economics literature (see, for example, Fryer and Payne (1986), Feather (1990) and Argyle (2001)). Further, Lucas, *et al* (2004), find strong statistical evidence that the adverse effect of unemployment on individuals' subjective well-being persists even after they become re-employed. More interestingly, empirical work in labor economics has established that unemployment is strongly negatively correlated with individual well-being, *even after controlling for income and other individual characteristics.* In other words, the unemployed are generally worse off than the employed, and by more than their lower income would predict (see, for example, Clark and Oswald (1994), Korpi (1997), Winkelmann and Winkelmann (1998), Di Tella, MacCulloch and Oswald (2001)(2003), and Clark (2003) and references cited therein). For example, Winkelmann and Winkelmann (1998) used panel data on life satisfaction from German-Socio-Economic Panel for 1984-1989, where the individual's subjective well-being was measured on an ordinal scale from 0 to 10. After controlling for income and various observed individual characteristics and specific fixed effects, they found that (a) being unemployed has a statistically significant and substantial negative effect on satisfaction, and (b) the pecuniary costs of unemployment, occurring directly through reduced income, are

[3] For a general treatment of the effects of identity on economic behavior and outcomes, see Akerlof (2000). See particularly Akerlof and Kranton (2003)(2005) for a novel and insightful principal-agent model analyzing the effects of workers' identification with a firm, or with a job, or with a work group, on their incentives to exert effort, on wage rate variation, and on firms' optimal management strategies. For a survey of the social psychological consequences of unemployment and implications for behavioral macroeconomic model and policy see Darity and Goldsmith (1996).

much smaller than the nonpecuniary costs, occurring indirectly through reduced well-being. They estimated that income would have to be increased by a factor of seven in order to generate an increase in satisfaction large enough to offset the adverse effect of unemployment. Di Tella, MacCulloch and Oswald (2001) came to similar conclusions. Using the Euro-Barometer data on individual life satisfaction, ordered on a four-point scale for 12 European countries for the period 1975-91, they found that, controlling for the income loss and other indirect effects, being unemployed has a strong negative effect on well-being. Based on Di Tella *et al*'s estimated happiness function, Frey and Stutzer (2002) calculated the compensation variation for being unemployed rather than holding a job and noted that "a move from the lowest income quartile to the highest income quartile would not be enough to offset the adverse effect of unemployment, suggesting that unemployed people suffer high nonpecuniary costs (p.402)". These results suggest that being unemployed significantly reduces people's well-being, even when receiving the same income as when employed. As Di Tella, MacCulloch and Oswald (2003, pp. 819-820) note "Being unemployed is much worse than is implied by the drop in income alone. The economist's standard method of judging the disutility from being laid off focuses on pecuniary losses. According to our calculations, that is a mistake, because it understates the full well-being costs, which according to the data, appear to be predominantly nonpecuniary." The facts that in advanced industrial countries, where social safety nets cushion joblessness, some individuals prefer to be employed with earnings less than the unemployment benefit or to engage in voluntary work are evidence of nonpecuniary value of employment.[4] Furthermore, the presence of nonpecuniary value of employment is strongly suggested by Mulligan's (1998) insightful empirical study of the dramatic increase in civilian work in the United States during World War II. Ruling out the changes in workers' budget sets (the after-tax real wages were substantially lower than either before or after the war) or other pecuniary explanations such as wealth effects of government policies, wage-induced interpemporal substitution, and changes in the nonmarket price of time, she concluded that nonpecuniary motives such as patriotism and changing discrimination against women can explain the phenomenon.

[4] Moffitt (1983) finds strong empirical support for the existence of welfare stigma among eligible but non-participants in AFDC-U, the welfare program for which families with an unemployed male were eligible.

Finally, using data from the Alaska salmon fisheries, which have been subject to entry limitations since 1975, Karpoff (1985) tested the hypothesis that fishermen receive significant nonpecuniary benefits from work by estimating the present value of the expected rent stream from fishing and examining whether permit prices reflected a premium above what monetary income alone would suggest. He found that the continued presence of many low-income fishermen in the fisheries was evidence that they derive nonpecuniary benefits from fishing.

3.0 An Extended Model of Labor Supply

The findings of the empirical studies cited in the previous section and those of many others for different countries and time periods suggest the presence of nonpecuniary benefits from work, thus contradicting the standard theory's basic assumption that work is merely a burden and source of disutility to individuals. In this section, we incorporate the nonpecuniary benefits of work in the standard model and derive implications for valuation of nonwork time and individual labor supply.

Let $U = U(c, z, m)$ be the individual utility function, where $c \geq 0$ is consumption, $z \geq 0$ is leisure time, and $m \geq 0$ captures all the nonpecuniary effects (NPE) of employment. We assume that one's involvement with the community, and hence the NPE, increases with the labor time $l \geq 0$ (i.e. $m'(l) > 0$).[5] We make the standard assumptions that the utility function is increasing in each of its arguments (i.e., $U_c > 0, U_z > 0, U_m > 0, U_c \to \infty$ as $c \to 0$) at decreasing rates (i.e., $U_{cc} < 0, U_{zz} < 0, U_{mm} < 0$) and that both leisure and NPE are complements with consumption (i.e., $U_{cz} > 0, U_{cm} > 0$).[6] Additionally, although not essential

[5] For analytical simplicity, and as an approximation to reality, we are assuming that the nonpecuniary effect of work is a continuous and increasing function of the amount of work, l. In reality, it may generally be an increasing step function. Furthermore, beyond the assumption that $m'(l) > 0$, it is difficult to be sure about the curvature of this function, although it seems plausible to assume that beyond certain level, the *marginal* value of NPE declines as labor time increases, i.e., that $m(l)$ becomes an increasing concave function. Also, we abstract from the interdependence of preferences among individuals and the effect it may have on an individual's nonpecuniary value of employment. For example, the nonpecuniary cost of unemployment can well depend on the rate of unemployment among peer groups and the degree of adherence to the social norm of employment (see Clark (2003) for an empirical study of this).

[6] Wherever no confusion arises, subscripts denote partial derivatives.

to our analysis, we assume that $U_{zm} \geq 0$, implying that leisure and NPE are complements in the individual's preferences: the greater the nonpecuniary effects of one's employment the better one would appreciate additional leisure time. Of course, one can think of some extreme preferences, such as those of either 'isolationist" or "community devout" persons, for which leisure and NPE can be substitutes.

Let $T \geq 0$ be the individual's total available time per decision period, which may be a day, week, month, etc. This fixed total time can be allocated between work and leisure, so that $z = T - l$. We can then rewrite U in the reduced form of

$$u(c,l) = U(c, T - l, m(l)) \tag{1}$$

The overall, or net, marginal utility of labor time is

$$\partial u / \partial l = dU / dl = -U_z + U_m m'(l) \tag{2}$$

where the first term on the right-hand side is the marginal *disutility* of labor and the second term is the marginal *utility* of labor that arises from the non- pecuniary value of employment. It seems plausible to think that, at any given consumption level c, for sufficiently large values of l the first term dominates the second one (implying that at the margin labor becomes a net source of disutility, $u_\ell(c,l) \equiv \partial u / \partial l < 0$) and vice versa for sufficiently small values of l. So, we assume:

(A1): For each $c > 0$, there exists a unique $\hat{l}(c) > 0$ such that

$$\partial u(c,l)/\partial l = -U_z + U_m m'(l) = 0 \text{ for } l = \hat{l}(c) \quad \text{and} \quad u_l(c,l) \gtrless 0 \Leftrightarrow l \lessgtr \hat{l}(c) \tag{3}$$

That is, $\hat{l}(c)$ is the threshold labor time, at consumption level c, so that the marginal disutility of labor exactly offsets its marginal utility. In Figure 1, $\hat{l}(c)$ is shown by the dashed curved. Furthermore, we assume that:

(A2): $u(c,l)$ is strictly quasi-concave.

(A3): As consumption level rises, leisure becomes more valuable than the NPE of work. Formally, we assume

$$u_{cl}[c,\hat{l}(c)] = \frac{\partial}{\partial c}[U_m m'(l) - U_z] < 0 \text{ for all } c > 0 \tag{4}$$

Noting from (3) that at along the $\hat{l}(c)$ locus, one has $m'(l) = U_z / U_m$, condition (4) can also be written as

$$u_{c\ell}[c, \hat{l}(c)] = \frac{U_z}{c}[\frac{cU_{cm}}{U_m} - \frac{cU_{cz}}{U_z}] < 0 \quad \text{all } \left(c, \hat{l}(c)\right) > 0 \tag{4'}$$

That is, we assume the elasticity of marginal value of leisure with respect to consumption (the second-term in the bracket) exceeds that of the nonpecuniary effects (the first term in the bracket).

Assumption (A3), as presented formally by (4), together with assumption (A2), imply that $\hat{l}(c)$ is decreasing in c [7]; that is, the richer is a household the *lower* is the threshold labor time where labor becomes a net source of disutility. This seems quite plausible; the higher the living standard of a household the more distasteful become the additional working hours (the larger the marginal *dis*utility of work) and therefore the smaller will be the critical working time $\hat{l}$.

Figure 1 below depicts the indifference curves associated with the utility function $u(c,l)$ under assumptions (A1)-(A3).[8] Above the curve of $\hat{l}(c)$, the indifference curves slope upward everywhere since $u_l(c,l) < 0$, indicating that, *on net*, work is a source of disutility at the margin. The opposite is true everywhere below the curve of $\hat{l}(c)$.[9]

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[7] To derive this formally, totally differentiate $u_l[c, \hat{l}(c)] = 0$ to have $d\hat{l}(c)/dc = -u_{lc}[c, \hat{l}(c)]/u_{ll}[c, \hat{l}(c)]$. On the other hand, by (A2), u is strictly quasi-concave and thus, $2u_c u_l u_{cl} - [u_{cc}(u_l)^2 + u_{ll}(u_c)^2] > 0$, which upon substituting $u_l[c, \hat{l}(c)] = 0$ yields $u_{ll}(u_c)^2 < 0$. That is, $u_{ll}[c, \hat{l}(c)] < 0$. Thus, $d\hat{l}(c)/dc = -u_{lc}[c, \hat{l}(c)]/u_{ll}[c, \hat{l}(c)] < 0 \Leftrightarrow u_{lc}[c, \hat{l}(c)] < 0.$

[8] An example of a utility function satisfying assumptions (A1)-(A3) is $u(c,l) = c^{\eta_c} l^{\eta_l} + \gamma c(1 - l)$, where the time endowment is normalized so that $T = 1$ and $l \in [0,1],\ 0 < \eta_l < \eta_c < 1,\ \gamma > 0$. The indifference map illustrated in Figure 1 corresponds to this utility function.

[9] As depicted in Figure 1, it seems plausible to assume that no matter how high one's consumption level, some amount of time allocated to work is always desirable (i.e., $\lim_{c \to \infty} \hat{l}(c) = \underline{l} \geq 0$) and that at the subsistence level of living ($\underline{c}$) the marginal value of leisure tends to zero, implying that one would supply as much labor as feasible (i.e., $\lim_{c \to \underline{c}} \hat{l}(c) = T$, where $0 \leq \underline{c} < \infty$).

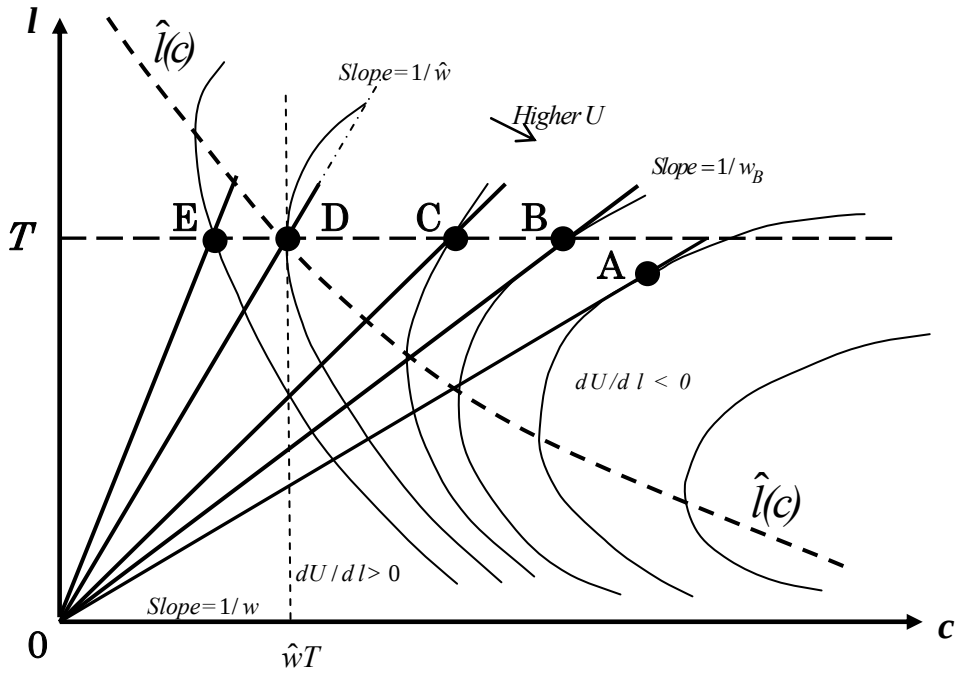

Figure 1: *labor supply with nonpecuniary incentives*

Now, consider an individual's decision problem. Let $w > 0$ be the given wage rate in terms of the consumption good whose price is normalized to be $p = 1$. Then the problem is

$$\begin{aligned} &\underset{c,l}{Max} \quad u(c,l) \\ &s.t. \quad wl - c \geq 0,\ c \geq 0, \\ &and \quad T - l \geq 0,\ l \geq 0 \end{aligned} \tag{5}$$

The Lagrangian is $L = u(c,l) + \mu(wl - c) + v(T - l)$, where μ and v are the Lagrange multipliers. Given our assumption that $u_c \to \infty \ as \ c \to 0$, implying $c^* > 0$, and hence $l^* > 0$, the necessary conditions for optimal (c^*, l^*) are

$$\begin{aligned} &u_c(c^*, l^*) - \mu = 0; \\ &u_l(c^*, l^*) + \mu w - v = 0; \\ &wl^* - c^* = 0,\ \mu > 0; \\ &v(T - l^*) = 0,\ v \geq 0. \end{aligned} \tag{6}$$

For the optimal (c^*, l^*), we have the following three cases:

$$\begin{aligned} &\text{Case (1): } v = 0 \text{ so that } l^* \leq T, \text{ and } u_l(c^*, l^*) < 0, \\ &\text{Case (2): } v > 0 \text{ so that } l^* = T, \text{ and } u_l(c^*, l^*) \leq 0, \\ &\text{Case (3): } v > 0 \text{ so that } l^* = T, \text{ and } u_l(c^*, l^*) > 0. \end{aligned} \tag{7}$$

The three cases distinguished in (7) are presented graphically in Figure 1. As we show in the following sections, these cases enable us to obtain several new insights about labor supply decisions.

3.1 Value of Leisure/Nonwork Time

We note that in Case (1), at the optimum, the *net* marginal utility of labor is negative, $u_l(c^*, l^*) < 0,$ thus resembling the assumption of the standard model of labor-leisure choice where labor is regarded only as a source of disutility. This case characterizes an interior solution which satisfies the condition $-\frac{u_c(c^*, l^*)}{u_l(c^*, l^*)} = \frac{1}{w}$ (shown by point A in Figure 1), and includes the boundary solution at $l^* = T$ (at point B) satisfying the condition $-\frac{u_c(w_B T, T)}{u_l(w_B T, T)} = \frac{1}{w_B}$, where $\frac{1}{w_B}$ is the slope of the budget line OB in Figure 1. Although at first sight this condition appears to be the familiar optimality condition of the standard theory, requiring the equality of the marginal rate of substitution of consumption for leisure $[MRS_{c,z} \equiv -\frac{dz}{dc} = \frac{dl}{dc} = -\frac{u_c(c^*, l^*)}{u_l(c^*, l^*)}]$ with the price ratio $(\frac{1}{w})$, there is, however, a subtle difference because in our model $u_l(c,l) = -U_z + U_m m'(l)$ represents the *net* effect of an additional unit of work on utility. To see this difference more clearly, let us substitute for $u_l(c,l) = -U_z + U_m m'(l)$ and recall that $u_c \equiv U_c$ to rewrite the optimality condition in the equivalent (inverse) form of

$$MRS_{z,c} \equiv -\frac{dc}{dz} = \frac{dc}{dl} = -\frac{u_l(c^*, l^*)}{u_c(c^*, l^*)} = \frac{U_z}{U_c} - \frac{U_m m'(l)}{U_c} = w \qquad (8)$$

In contrast to our model, the standard theory, by ignoring the marginal nonpecuniary value of work, incorrectly equates the marginal opportunity cost of leisure with the wage rate alone (*i.e.*, $\frac{U_z}{U_c} = w$) whereas in fact the opportunity cost of an additional unit of leisure consists of the foregone wage rate and the marginal nonpecuniary value of work. As such, it

is equal to the wage rate *plus* the marginal nonpecuniary value of work, expressed in terms of units of consumption good (*i.e.*, $\frac{U_m m'(l)}{U_c}$). Thus, from (8) we have

$$\frac{U_z}{U_c} = w + \frac{U_m m'(l)}{U_c} = [1 + \frac{U_m m'(l)}{U_c w}] w \qquad (8')$$

which leads us to the following proposition.

Proposition 1: *By ignoring the NPE of work and equating the value of leisure time with the wage rate, the standard labor theory* ***under-estimates (over-estimates****) the true value of leisure time when there are nonpecuniary benefits (costs) associated with work.*

This result has important implications for valuation of time allocated to nonwork activities (such as recreational, do-it-yourself, and household activities) or in cost-benefit assessment of unemployment, retirement, and disability compensation schemes, and the like. It shows that valuing nonwork time at the individual's wage rate (as prescribed by the standard theory) suffers from a downward (upward) bias when the time spent on work involves nonpecuniary benefits (costs), leading to more (less) time to be allocated to such activities, or to less (more) unemployment/disability/retirement compensation payment, than would be optimal. [10]

Interestingly, consistent with Proposition 1, in a survey of the empirical studies of travel-time valuation in the literature on demand for recreation services and on transportation planning, Cesario (1976) noted that the available estimates of the value of travel time had been consistently substantially less than the wage rate- ranging between one-forth and one-half of the wage rate- leading him to conclude that "It is clear from these findings that the use of the marginal wage rate for the value of travel-time values in recreation benefit estimation is inappropriate, both from the theoretical and practical points of view."(P.37). Cesario's theoretical justification for the travel-time value being less than the wage rate hinged on his assumption that there is always "disutility" (or, more precisely, nonpecuniary costs) associated with work. Although this assumption is unnecessarily too narrow, in terms of the result furnished in (8') it implies $\frac{U_m m'(l)}{U_c w} < 0$ and hence a value of leisure time less than the

[10] Viscusi (1993, p.1943) notes that prior to 1980s, the U.S. Federal agencies such as Occupational Safety and Health Administration (OSHA) and EPA would use the estimates of value of life based on assessing only the lost present value of the earnings of the deceased and ignoring the nonpecuniary aspects of life, thus leading to dramatic underestimation of the benefit value.

wage rate.[11] Based on the empirical results surveyed, Cesario (1976) assumed the opportunity cost of travel time to be equal to one-third of the wage rate, and used this assumption to generate benefit estimates for a set of parks in the northeastern United States. On the other hand, testing this assumption versus the hypothesis of the wage rate as the opportunity cost of time, Smith, et al (1983) found that neither hypothesis was unambiguously superior to the other as approximations for the opportunity cost of nonwork (leisure) time. In fact, estimating the multiple factor relating the opportunity cost of nonwork time to the wage rate, Smith et al found that twelve of the twenty-two estimated values for this multiple were *negative* and a majority of the remaining estimates were *greater* than unity, leading them to the conclusion that both hypotheses should be rejected and that "the estimation of the multiple relating these opportunity costs to the wage rate is not a trivial task. Moving beyond a judgmental guess for this multiple will be difficult within the constraints of existing data" (p.276).

Against this background, our result presented in (8') and Proposition 1 can be viewed as providing a general theoretical basis which reconciles these ambiguous, and seemingly conflicting empirical findings as special cases resting on some set of restrictive assumptions. This is seen clearly once we note that depending on whether we assume (1) individuals' preferences to be identical or heterogeneous, (2) nonpecuniary effects associated with work are positive or negative, or (3) nonpecuniary effects associated with travel itself are positive or negative, and on allowing for the multiple factor $[1+\frac{U_m m'(l)}{U_c w}]$ to be a nonlinear function of the wage rate, our result in (8') can be consistent with empirical estimations of travel-time values that are less than, greater than, or, for that matter, equal to, the wage rate, and estimated values that can be increasing, constant, or decreasing in the wage rate. For instance, when travel time competes with other nonwork (leisure) activities in allocation of the leisure time, z, and if we assume that a typical individual derives nonpecuniary benefits

[11] Becker (1965) also notes that the value of nonwork time may deviate from the wage rate but for different reasons than that in the present model; namely, the constraint of the period in which time is spent (i.e., the "timing" of the time spent) and the indirect positive effect of consumption of leisure goods or services on a person's productivity. For example, he holds that the value of nonwork time "is often less [than the wage rate] on week-ends and in the evenings because many firms are closed then" (p.503), and is also less when it is spent on such activities as sleeping, eating, reading, taking a hair cut, commuting, recreation, or in general on "productive consumption".

both from work and from travel itself, then our extended theory predicts the value of travel time to exceed that of leisure, which in turn will be greater than the individual's wage rate. In the opposite case, where the typical individual has preferences such that there are nonpecuniary costs associated with both work and travel, then our theoretical result suggests that the travel time value will be less than the opportunity cost of leisure which itself will be less than the wage rate.

At the macroeconomic level, the result provides a theoretical basis for the empirical findings noted in Section 2; namely, the welfare loss from unemployment is much more than what the loss of wages alone predicts. In a similar vein, it can explain why some people resist retirement or being laid off despite being offered financially attractive retirement or unemployment benefit packages.

Furthermore, recalling that the marginal opportunity cost of leisure, $\frac{U_z}{U_c}$, also represents an individual's supply (reservation) price of labor, the result, $\frac{U_z}{U_c} = w + \frac{U_m m'(l)}{U_c}$, shows that in meeting one's reservation price of labor, the monetary reward (wage) and nonpecuniary incentives are substitutes. An important policy implication of this result is that a firm or employer may be able to pay lower compensations by taking actions to create and enhance employees' nonpecuniary work motivation, or by employing workers who intrinsically identify themselves with the firm's goal or ideal. Inversely, when employees of a firm or an occupation do not derive nonpecuniary benefits from their jobs, or may even incur nonpecuniary costs, a firm may need to pay a premium wage (rent) to keep them motivated. Real-world observations supporting this result abound. For example, recognizing the tradeoff between salary and prestige, highly prestigious institutions may pay a relatively lower compensation to attract their employees (it has been said that for years Harvard University was notorious for asking new faculty recruited to take a pay cut to join it). Employment with military offers another example. As Akerlof and Kranton (2005) emphasize military officers are trained to identify themselves with the goals of military and believe in "service before self", so that they are willing to trade off monetary rewards for nonpecuniary gains of being a military officer. This trade off between nonpecuniary and monetary incentives in military contrasts with that usually observed among civilian

employees, and, as Akerlof and Kranton note, may explain why in the United States for a comparable position and rank military pay was significantly less than civilian pay until recent times. Other notable examples where employees strongly trade off monetary rewards for nonpecuniary work incentives are nurses, policemen, firefighters, artists, public-service minded bureaucrats and politicians, and not-for–profits organizations working for public or humanitarian causes. In fact, voluntary work is an extreme case where people supply labor without any monetary incentives. Conversely, most people shy away from occupations deemed personally or socially stigmatic, and those who choose such jobs demand comparatively much higher monetary rewards (wage rates) in compensation for a lack of, or negative, nonpecuniary incentive. Examples of these kinds of jobs are those linked to criminal or socially and personally undignified activities such as drug trafficking, money laundering, prostitution, and other underground activities.[12]

It is interesting to note in passing that our result goes somewhat against the wage efficiency result in the standard literature (see Shapiro and Stiglitz (1984)). According to the latter, to induce efficient supply of effort, a firm makes unemployment, the consequence of shirking, more costly by offering a worker a rent beyond the market wage rate (or worker's reservation wage). On the contrary, our result implies that a sufficiently large nonpecuniary value of employment, rather than high wages, can provide the incentive for a worker not to lose his job, and, in fact, given the substitutability of this incentive for monetary incentive, when a worker's nonpecuniary incentive is substantial, a firm may even pay a lower wage rate than otherwise the market would offer. The implication of this contrast between our result and the wage efficiency is consistent with the interesting result furnished by Heyes (2005); namely, for jobs that confer significant nonpecuniary benefits (that is, vocation-intensive jobs such as nursing and teaching), the efficiency wage theory can in fact lead to a *reduction* in the average quality of applicants attracted: higher wages may attract 'wrong sort" of individuals-those who are driven principally by higher wages but have no intrinsic motivation or a vocation.

[12] It should be noted that in emphasizing the nonpecuniary work incentives we are focusing on socio-psychological factors affecting an individual's utility and not on work conditions, such as ease or difficulty of a job, its stimulating or boring nature, the prospects of progress in the job, etc., which are more or less reflected in the wage rate. Thus, as Akerlof and Kranton (2003, P. 23) note " Fast food workers in Harlem and Washington Heights-despite the grease, heat, disrespect from customers (especially teenagers), and low wages- still take pride that they earn their money".

3.2. Labor Supply in the Extended Model

Returning to Case (2) in (7), we note that, as in Case (1), the *net* effect of labor on utility is negative. However, Case (2) represents corner solutions characterized by the inequality $-\frac{u_c(c^*,T)}{u_l(c^*,T)} > \frac{1}{w}$ (point C), and includes the border case (point D) where at the optimum $u_l(c^*, l^*) = u_l(wT,T) = 0$. By the definition of $\hat{l}(c)$, point D must be at the intersection of the curve of $\hat{l}(c)$ and the budget line and therefore satisfies $T = \hat{l}(wT)$. We denote by $\hat{w} \equiv \hat{l}^{-1}(T)/T$ the critical wage rate that satisfies this condition. In Figure 1, the inverse of this wage rate ($\frac{1}{\hat{w}}$) is the slope of the budget line OD. Thus, for all the wage rates lying in between those corresponding to the slopes of budget lines OB and OD, that is, for $\hat{w} \le w \le w_B$, the optimum labor supply is $l^* = T$ and $u_l(wT,T) \le 0$.

Of special interest is Case (3) since, in contrast to Case (1) and Case (2), here labor is a net source of *utility,* $u_l(c^*, l^*) > 0$. Point E represents a typical solution corresponding to this case. Recalling that at the border point D, $\hat{w} \equiv \hat{l}^{-1}(T)/T$, Case (3) holds if $w < \hat{w}$.

We thus can state:

Proposition 2: O*nce the standard theory is extended to include the nonpecuniary effects of employment in the individual's utility function, then for sufficiently low wage rates* ($w < \hat{w} = \hat{l}^{-1}(T)/T$) *employment becomes a net source of utility, inducing the individual to supply labor to the extent feasible.*

Accordingly, our extended model implies a labor supply curve that differs starkly from the one derived under the assumptions of the standard model. In the standard, the labor supply curve starts with an upward sloping section, that is, the labor supply initially increases with the wage rate ($\frac{\partial l}{\partial w} > 0$, or, equivalently, $\frac{\partial z}{\partial w} < 0$ for $w > 0$), implying that at low wage rates leisure is a *normal* good in that it has a downward sloping demand curve. Then, beyond a sufficiently high wage rate, it can become backward bending ($\frac{\partial l}{\partial w} < 0$, or, equivalently, $\frac{\partial z}{\partial w} > 0$ for $w > \tilde{w} > 0$), implying that leisure becomes a *Giffen* good! In contrast, in our model the labor supply curve begins with a *vertical* section at

$l^* = T$ (perfectly inelastic labor supply) at wage rates below w_B (or equivalently at incomes below $w_B T$), although, for $w > w_B$ the labor supply curve could take various shapes including backward bending, depending on individual's preferences for consumption, leisure, and nonpecuniary value of work.

That for wage rates less than w_B the labor supply curve is vertical at $l^* = T$ is easy to explain. We recall that at the wage rate w_B, corresponding to the boundary solution at point B, labor supply is $l^* = T$. We also recall from condition (4) that $u_{lc}[c,\hat{l}(c)] = \frac{\partial}{\partial c}[U_m m'(l) - U_z] < 0 \text{ for all } c > 0$. So, as the wage rate falls below w_B, and hence income falls below $c = w_B T$, the net marginal utility of labor, $u_l(c,l) = -U_z + U_m m'(l)$, increases, and exceeds $u_l(w_B T, T) < 0$, thus inducing an increase in labor supply. But, since the total time availability constraint is binding, we have $l^* = T$ for all wage rates less than w_B. It is important, however, to note that the vertical labor supply curve at $l^* = T$ consists of two different segments each presenting a different regime. One regime pertains to wage rates $w_B > w > \hat{w}$, or, equivalently, to income levels $w_B T > c > \hat{w} T$, for which, the marginal value of leisure ($U_z > 0$) is still large enough to dominate that of NPE ($U_m m'(l) > 0$) and hence yield $u_l = -U_z + U_m m'(l) < 0$. The other regime pertains to wage rates below $\hat{w}$ or, equivalently, to income levels below $\hat{w} T$. In this regime, the marginal value of leisure ($U_z > 0$) for a very poor individual becomes so small that it is dominated by the marginal value of NPE, thus rendering the net marginal effect of work on utility positive ($u_l = -U_z + U_m m'(l) > 0$).

Figures *2.a* and *2.b* below depict two examples of the labor supply curve implied by our model. Figure *2.a* represents the labor supply curve of an individual who, due to nonpecuniary value of work, supplies as many hours of work as possible when the wage rate is at or below w_B. However, if she has a target income or a certain consumption standard represented by $w_B T$, she *reduces* her work hours as the wage rate rises above w_B, although she always works a minimum of $\underline{l}$ hours no matter how high the wage rate may become. This may reflect the labor supply behavior of poor or low-income individuals or

households[13]. In the Appendix we show that for the specific example of the utility function noted in footnote 7, i.e., $u(c,l) = c^{\eta_c} l^{\eta_l} + \gamma c(1-l)$, the labor supply curve would indeed look like that pictured in Figure 2.a.

Figure *2.b*, on the other hand, presents the labor supply curve of an individual who, as in the previous case, works as much as possible when the wage rate is less than or equal to w_B, and reduces his labor supply for the medium wage rates between w_B and $\overline{w}$. But, perhaps because he has no target income level or is strongly driven by nonpecuniary value of his work, the backward bending supply curve reverses its direction at sufficiently high wage rates, so that the individual *increases* his work hours as his wage rate increases beyond a certain (presumably very high) level, $\overline{w}$. The individual, however, chooses to enjoy some minimum leisure time ($T - \hat{T}$) no matter how high his wage rate may become. Some empirical evidence for this type of labor supply behavior is noted by Morgan (1968, p.33) who found that " [T]he very highest income people are so driven to work, but by forces other than the monetary rewards, that they are deterred little if at all by the bite of income taxes on those rewards".

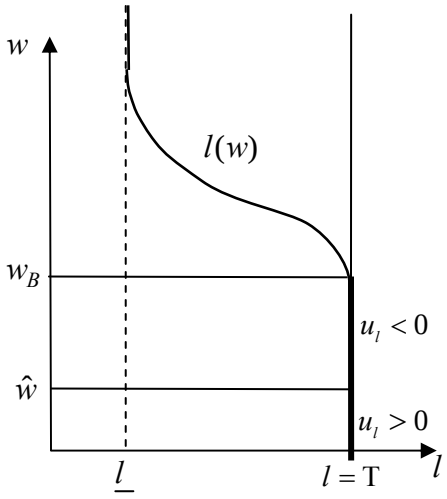

Figure 2.a

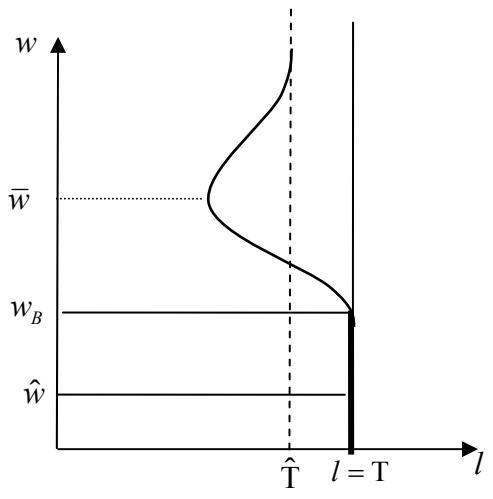

Figure 2.b

[13] For some empirical evidence of the negatively-sloped labor supply curve see, for example, Camerer et al. (1997)(2002) and Morgan (1968).

Two further questions of interest are: First, how is the individual's labor supply affected by the extent of the NPE an individual derives from employment? Specifically, does a greater NPE imply a greater individual labor supply? Second, as a special interesting case of this question, would labor supply always be greater if the individual derives positive NPE from work than if, as assumed in the standard theory, she does not? To answer these questions, let, as before, $m(l)$ capture all the NPE as a function of time worked, where it is assumed that $m'(l) > 0$ and $m''(l) \leq 0$. The extent to which the individual considers these effects is indicated by the parameter $\alpha \in [0,1]$. Thus, $\alpha = 0$ if, as assumed in the standard theory, the individual does not consider the NPE of her working time, and $\alpha = 1$ if she fully takes these effects into account. More generally, let $n = \alpha m(l)$ be the extent to which the individual accounts for the NPE, and $U(c,z,n)$ be her utility function, which she maximizes subject to the time and budget constraints given in (5). Denoting the value function by $v(l^*,\alpha) \equiv \max U(wl, T-l, \alpha m(l))$, the first and second order conditions for a locally unique interior optimum are

$$\partial v(l^*,\alpha)/\partial l = wU_c - U_z + U_n \alpha m'(l^*) = 0 \tag{9}$$

$$\partial v^2(l^*,\alpha)/\partial l^2 < 0, \tag{9'}$$

where for notational convenience the arguments of the utility function are omitted. Differentiating (9) totally, we have

$$\frac{\partial v^2(l^*,\alpha)}{\partial l^2} dl + \frac{\partial v^2(l^*,\alpha)}{\partial \alpha \, \partial l} d\alpha = 0 \tag{10}$$

and therefore

$$\frac{\partial l^*}{\partial \alpha} = -\frac{\partial v^2(l^*,\alpha)/\partial \alpha \, \partial l}{\partial v^2(l^*,\alpha)/\partial l^2} \tag{10'}$$

Recalling from the second order condition (9') that $\partial v^2(l^*,\alpha)/\partial l^2 < 0$, the sign of $\partial l^*/\partial \alpha$ is the same as that of

$$\frac{\partial v^2(l^*,\alpha)}{\partial \alpha \, \partial l} = \frac{\partial m(l^*) U_n}{\partial l} = m'(l^*)U_n + m(l^*)\left[wU_{nc} - U_{nz} + U_{nn}\alpha m'(l^*)\right] \tag{11}$$

Since by assumption $U_{cn} > 0$ and $U_{zn} > 0$, the sign of $\frac{\partial l^*}{\partial \alpha}$ is generally ambiguous. However, when the utility function is additively separable in n, implying $U_{cn} = U_{zn} = 0$, equation (11) simplifies to

$$\frac{\partial v^2(l^*, \alpha)}{\partial \alpha \, \partial l} = m'(l^*)U_n \left(1 + \frac{\alpha m(l^*)U_{nn}}{U_n}\right) \tag{11'}$$

Denoting by $\varepsilon_n \equiv -\alpha m(l^*)\frac{U_{nn}}{U_n}$ the elasticity of the marginal utility of NPE, then from (9') and (10'), it follows that

$$\frac{\partial l^*}{\partial \alpha} \begin{Bmatrix} > \\ = \\ < \end{Bmatrix} 0 \quad \Leftrightarrow \quad \varepsilon_n \begin{Bmatrix} < \\ = \\ > \end{Bmatrix} 1 \tag{12}$$

Thus, by (12), the answer to the first question posed above can be stated as

Proposition 3: *If individual preferences are additively separable in nonpecuniary effects of employment, then the greater the nonpecuniary effects (i.e., the larger α) the greater will be individual labor supply, provided that the elasticity of the marginal utility of NPE is less than unity.*[14]

The additively separable preferences in Proposition 3 can generally take the form of $U(c, z, n) = U^S(c, z) + U^N(n)$, where $U^S(c, z)$ is the standard utility function where utility depends only on consumption and leisure, and $U^N(n)$ denotes the utility from NPE of employment. This has a number of interesting implications. For example, when $U^N(n) = B$, that is, the utility of nonpecuniary effects the individual derives from work is simply a flat amount and hence invariant with hours of work, then $U_n \equiv 0$ in (11') so that, by (10'), the nonpecuniary incentive would not affect labor supply, although it would still play a key role in individual's employment choice. It is also clear that if the utility of NPE increases linearly with hours worked, i.e. $U^N(n) = \beta n$, $\beta > 0$, then $\varepsilon_n = 0$ for all $n > 0$, so that, by (12), the individual will supply more labor than she would in the absence of nonpecuniary work incentive.

[14] While we have focused on the positive non-pecuniary effects of employment, it should be clear that the reverse of the result furnished in Proposition 3 holds when the individual associates negative non-pecuniary effects with work, thus exacerbating the disutility of work.

Furthermore, to answer the second question posed above, we note that for the special case when the individual does not take any of the NPE of her employment into account, $\alpha = 0$, and hence $\varepsilon_n = -\alpha m(l^*)\frac{U_{nn}}{U_n} = 0$, so that, by (12), $\frac{\partial l^*}{\partial \alpha}\Big|_{\alpha=0} > 0$. Thus,

Corollary 1: *When preferences are additively separable in nonpecuniary effects of employment, the individual's labor supply will be greater when she takes the nonpecuniary effects into account* $(\alpha > 0)$ *than when, as assumed in the standard theory, she does not* $(\alpha = 0)$*.*

4. Non-wage Income and Nonpecuniary Effect of Employment

So far we have assumed that the individual's income derives entirely from working hours supplied. One would like, however, to know how would (a) non-wage income (for example, income derived from wealth or transfers), and (b) voluntary work affect labor supply in the presence of nonpecuniary work incentives. In particular, does, as intuition suggests, non-wage income counteract the nonpecuniary effects of work to result in reduced individual labor supply? How does non-wage income affect labor supply when labor is supplied voluntarily?

(a) The Effect of Non-wage Income

Denoting the non-wage income by $\pi > 0$, it alters the individual's budget constraint in the optimization problem (5) to

$$\pi + wl - c \geq 0,\ c \geq 0 \qquad (13)$$

but leaves the optimality conditions (6) unchanged. Figure 3 depicts the optimal choices corresponding to different cases.

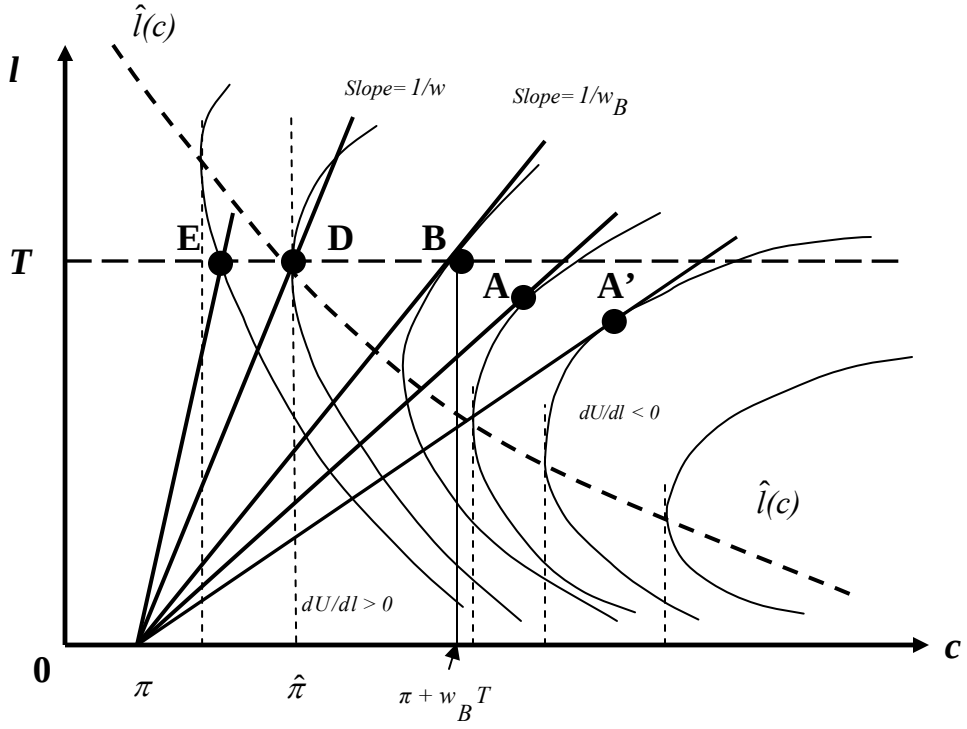

Figure 3: labor supply with nonpecuniary incentives and non-wage income

Our interest is to determine the sign of $\frac{\partial l^*}{\partial \pi}$. Obviously only Case (1) that characterizes an interior solution is the relevant case for this purpose. Recalling from (7) that for this case $\nu = 0$ and using the first two optimality conditions in (6) and the new budget constraint (10), we have at the optimum, (c^*, l^*), that

$$u_l(\pi + wl^*, l^*) + w u_c(\pi + wl^*, l^*) = 0 \qquad (14)$$

Clearly, in order for an interior optimum to exist, for any given non-wage income, $\pi \geq 0$, the wage rate must exceed a critical minimum level $w_B(\pi)$, corresponding to the wage rate for the boundary optimum at B. That is, we must have $w > w_B(\pi)$, where $w_B(\pi)$ is the solution to

$$u_l(\pi + w_B T, T) + w_B\, u_c(\pi + w_B T, T) = 0 \qquad (14')$$

Differentiating (14) totally with respect to l^* and π, and omitting the (c^*, l^*) arguments of the functions, we have

$$\frac{\partial l^*}{\partial \pi} = -\frac{2w u_{lc} + w^2 u_{cc} + u_{ll}}{u_{cl} + w u_{cc}} \qquad (15)$$

Recalling that at the optimum $u_l < 0$, $u_{ll} < 0$ and that by assumption $u_{cc} < 0$ and $u_{cl} \le 0$, it follows from (15) that $\frac{\partial l^*}{\partial \pi} < 0$. Thus,

Proposition 4: *For any $\pi \ge 0$, as long as $w > w_B(\pi)$, an increase in the individual's non-wage income induces a reduction in her labor supply.*

This result is in accord with the standard model and therefore should come as no surprise. Given that labor is a source of disutility for the case under question, a higher non-wage income motivates the individual to substitute leisure for consumption. On the other hand, for any non-wage income π, a wage rate *less* than the corresponding minimum wage, $w < w_B(\pi)$, induces the individual to supply labor as much as possible (corner solutions, $l^* = T$, in Case (2) and Case (3)). So, a question of interest is whether an increase in the non-wage income would enlarge or reduce the range of wage rates for which labor would be fully and perfectly inelastically supplied. The answer to this question depends on the sign of $\frac{\partial w_B(\pi)}{\partial \pi}$, which can be determined by differentiating (14') totally with respect to w_B and π, and simplifying to yield

$$\frac{dw_B}{d\pi} = -\frac{u_{cl} + w_B u_{cc}}{T\,u_{cl} + u_c + T\,w_B u_{cc}} = \frac{1}{T}\,\frac{\left(\varepsilon_l + (1-\frac{\pi}{c})\,\varepsilon_c\right)}{1-\left(\varepsilon_l + (1-\frac{\pi}{c})\,\varepsilon_c\right)} \qquad (16)$$

where $\varepsilon_l \equiv -\frac{l\,u_{cl}}{u_c}$ and $\varepsilon_c \equiv -\frac{c\,u_{cc}}{u_c}$ are the magnitudes of the elasticities of the marginal utility of consumption with respect to labor and consumption, respectively, *evaluated at the optimum* $(\pi + w_B T, T)$. Since the numerator in (16) is positive, it follows that

Proposition 5: $\frac{\partial w_B(\pi)}{\partial \pi} \begin{Bmatrix} > \\ < \end{Bmatrix} 0$ *, implying that an increase in the individual's non-wage income will* $\begin{Bmatrix} enlarge \\ shrink \end{Bmatrix}$ *the range of wage rates for which she will supply labor fully, depending on whether* $\varepsilon_l + (1-\frac{\pi}{c})\,\varepsilon_c \begin{Bmatrix} < \\ > \end{Bmatrix} 1$.

This is a rather striking result, for economic intuition would suggest that a higher non-wage income raises the marginal value of leisure and thus should necessitate a higher wage rate in order to motivate the individual to supply as many work hours as possible. That is, one would normally expect $\frac{\partial w_B(\pi)}{\partial \pi} > 0$ to be *always* the case. Noting that, by substituting from (4'), one has $\varepsilon_l = -\frac{l\,u_{cl}}{u_c} = \frac{l}{c}\frac{U_z}{u_c}(\frac{cU_{cz}}{U_z} - \frac{cU_{cm}}{U_m})$, we can identify the conditions under which this would indeed be the case. Namely, if individual preferences are such that: (i) additional consumption is not much valued (implying a small value of ε_c), or (ii) leisure is not much valued (small U_z), or (iii) consumption value is almost equally raised by an increase in the amount of leisure or in nonpecuniary effect of work (the latter two conditions implying a small value for ε_l), or (iv) if the individual derives a large portion of his income from non-wage sources, or (v) a combination of these conditions so that $\varepsilon_l + (1-\frac{\pi}{c})\,\varepsilon_c < 1$. These seem to fit well the case of a rich, "workaholic" person. Surprisingly, however, as Proposition 4 indicates, the opposite case may also hold if an increase in the non-wage income, and hence consumption, lowers the marginal utility of consumption significantly and makes work so unpleasant (or equivalently, raises the value of leisure so strongly) that only a reduction in the wage rate can counteract these effects to motivate the individual to work as much as she did before the non-wage income increase. This rather counter-intuitive case is more likely to hold for a very poor individual who depends predominantly on wage income for her livelihood and attaches little nonpecuniary value to work.

Some special cases of preferences that support each of the two opposite effects in Proposition 4 are noteworthy. One is the case where individual preferences are additively separable in consumption, implying $u_{cl} = \varepsilon_l = 0$, so that

$$\frac{\partial w_B(\pi)}{\partial \pi} \begin{Bmatrix} > \\ < \end{Bmatrix} 0 \;\Leftrightarrow\; (1-\frac{\pi}{c})\,\varepsilon_c \begin{Bmatrix} < \\ > \end{Bmatrix} 1 \qquad (16')$$

Recalling that $\varepsilon_c \equiv -\frac{c\,u_{cc}}{u_c}$ measures the degree of relative risk aversion, we can state the following

Corollary 2: *When individual preferences are additively separable in consumption, an increase in the non-wage income is more likely to enlarge (shrink) the range of wage rates for which labor is supplied fully, the less (more) risk averse and/or the less (more) dependent the individual is on wage income for livelihood.*

In particular, for the isoelastic utility function, $u(c) = \frac{1}{1-\varepsilon_c} c^{1-\varepsilon_c}$, with $\varepsilon_c \leq 1$, a higher non-wage income enlarges the wage range for which labor is fully supplied.

(b) Voluntary Work

Voluntary work can take a wide variety of forms, including work for charity and religious institutions, work to promote a public cause such as education, political awareness, promotion of social and economic equality, reduction of poverty, prevention of diseases, promotion of peace, or solidarity with one's group or community, among many others. The common feature of all such works is that the individual supplies labor without receiving monetary rewards. Instead, it is the nonpecuniary benefits that motivate people to engage in voluntary work. Accordingly, the decision about how much voluntary work to supply presents a special case of our model when $w = 0$ so that the budget constraint simplifies to $c = \pi$. For this special case, the necessary optimality condition reduces to $U_l(c, T-l, m(l)) \equiv u_l(c,l) = 0$. But, as we already know from (3), the implicit solution to this equation is none but $l = \hat{l}(c)$, which for any c (or equivalently any non-wage income π) gives the supply of labor that maximizes utility by equating the marginal utility of leisure with that of nonpecuniary effect of labor, i.e. $\partial u(c,l)/\partial l = -U_z + U_m\, m'(l) = 0$. Thus, the curve labeled $\hat{l}(c)$ in Figure 3 represents the optimal decision about the amount of voluntary work. As is noted from point D in Figure 3, there is a critical non-wage income level $\hat{\pi}$ (= consumption level $\hat{c}$), determined by $\hat{\pi} = \hat{c} = \hat{l}^{-1}(T)$, which separates interior solutions from corner solutions. Furthermore, since $\hat{l}(c)$ is a decreasing function of $c(=\pi)$, it is clear that $\frac{\partial l}{\partial \pi} < 0$ for $\pi > \hat{\pi}$. Thus, we have

Proposition 6: *When an individual chooses voluntary work, there is a critical non-wage income level* $\hat{\pi} = \hat{c} = \hat{l}^{-1}(T)$ *such that for any income at or below this level the individual will always supply work as much as possible, while for income levels above it she will choose to enjoy a level of leisure that increases with her income.*

This proposition suggests a theoretical prediction that seems consistent with casual observations; namely, other things being equal, one should expect rich people to supply less voluntary work than poor people do. The economic intuition for this hypothesis is clear: rich people value leisure and can afford to spend time on leisure, more than poor people do. They also tend to derive nonpecuniary benefits more from other sources (for example, donating money to charitable institutions, political parties, and alike) than from doing voluntary work.

5. Concluding Remarks

We have shown that once the standard theory of individual labor supply is extended to allow for socio-psychological (nonpecuniary) work incentives, several new and important insights emerge about individual labor supply decisions.

First, we have seen that the opportunity cost of nonwork/leisure time consists of a pecuniary component (the wage rate) and a nonpecuniary element, and an individual trades off one for the other in making labor supply decision and employment choices. This result has important implications for valuation of individual's nonwork time and can help to explain many phenomena that in the context of standard theory may seem puzzling. For example, it tells us that,, contrary to what is customary in cost-benefit analyses of nonwork activities, valuing nonwork time at individual's wage rate understates (overstates) its true value when time spent on work renders nonpecuniary benefits (costs).. It can also help explaining (i) why it can be difficult to induce early retirement even when attractive unemployment (or retirement) benefits are available, (ii) why the civilian labor supply was at a record high (Mulligan (1998) during World War II despite a significant decrease in after-tax real wages (iii) why permit prices exceed the present value of the expected stream of rents from fishing in limited-entry fisheries, and why poor fishermen continue fishing rather than selling their permits (Karpoff (1985)), and why, in contrast to wage efficiency theory, offering high wage rates in vocation-intensive professions may reduce the quality of candidates. At the same, this result suggests a broad guide for firms to improve the efficiency of their employment strategies by taking actions that enhance their workers' nonpecuniary incentives. Such actions could include, for example, offering (a) workers paid child care on site, (b) flexible working hours including telecommuting, (c) job training courses that can have positive nonpecuniary effects by helping to foster a sense of learning new things even if

they have no effect on the workers' actual productivity, (d) opportunities to participate and make suggestions on how to improve manufacturing processes, (e) a say in selecting supervisors as a means of worker empowerment, (f) various group social events that contribute to a feeling of worker cohesion and belonging, and (g) various award programs for recognizing outstanding performance in public.

Second, we have shown that at very low wage rates, work can become a net source of utility, thus inducing very poor individuals to work at a *maximum feasible* level. An important implication of this finding is that the labor supply curve implied by the extended model differs sharply from the standard textbook curve. Here the supply curve begins with a vertical segment, showing that labor is supplied as much as feasible for an initial range of low wage rates, and then follows a downward sloping segment for higher wage rates.

Third, we have identified the conditions under which a greater nonpecuniary effect of employment unambiguously leads to a greater individual labor supply; namely, when preferences are additively separable in nonpecuniary effect and the elasticity of the marginal utility of nonpecuniary effect is less than one.

The introduction of non-wage income in our model has yielded further insights. We have shown that for any given non-wage income, as wage rates increase beyond a certain critical level, labor supply shrinks, as should be normally expected. However, this critical wage rate may *increase or decrease* as the non-wage income increases, depending on the magnitudes of the elasticities of marginal utility of consumption and the share of non-wage income in total income. In particular, when magnitudes of these factors are sufficiently small-as is more likely to be the case for a rich individual- then a higher non-wage income induces the individual to supply as much labor as feasible for a *wider* range of wage rates. The opposite is more likely to hold for a very poor worker whose preferences exhibit large values of the elasticities of marginal utility of consumption. Another insight is that when income consists entirely of non-wage income, as in the case of people doing voluntary work only, our model predicts that the supply of voluntary work will be greater the *lower* is the individual's income.

The simple model developed in this paper can be extended in several interesting directions. For example, we could investigate how the individual's labor supply decision would be affected by allowing for other sources of nonpecuniary incentives, such as

charitable donations. Another extension would consider the household's rather than the individual's labor supply while allowing for the heterogeneous nonpecuniary work incentives of household members. Of particular interest would be to conduct empirical studies to measure the significance of nonpecuniary work incentives in labor supply decisions, and to test how it may be affected by idiosyncratic factors such as individual's age, gender, education level, marital status, household size, cultural and ethnic background, the employment status (self-employed versus wage earners, unpaid voluntary work and housework), the geographical location of work (urban versus rural), and so on. The insights from such studies could aid policymakers to address unemployment issues more effectively by considering not only the policies that merely affect individuals' monetary work incentive but also those that enhance their nonpecuniary incentives. Finally, the nonpecuniary value of employment has an important implication for welfare policy: if unemployment is the cause of poverty and its associated welfare loss, then a policy of income transfer to people will only compensate for the pecuniary effect. To improve welfare, policy should aim at providing suitable employment.

Appendix

Derivation of an example of the labor supply curve shown in Figure 2.a.

We first derive a general condition determining the slope of the labor supply curve, $\frac{dl}{dw}$.

The first order condition for an interior optimum is

$$\frac{d}{dl}u(wl,l) = wu_c(wl,l) + u_l(wl,l) = 0 \qquad \text{(A1)}$$

The second order condition is

$$d^2u(wl,l)/dl^2 < 0 \qquad \text{(A2)}$$

Totally differentiating (A1) with respect to l and w, we have

$$\frac{du^2(wl,l)}{dl^2}dl + \frac{d}{dw}\left(\frac{du(wl,l)}{dl}\right)dw = \frac{du^2(wl,l)}{dl^2}dl + \left(u_c(wl,l) + wlu_{cc}(wl,l) + lu_{cl}(wl,l)\right)dw = 0$$

Using (A2), and letting $\varepsilon_c \equiv -\frac{c\,u_{cc}}{u_c}$ and $\varepsilon_l \equiv -\frac{l\,u_{cl}}{u_c}$ denote the magnitudes of the elasticities of the marginal utility of consumption with respect to consumption and labor, we have

$$sign\left[\frac{dl}{dw}\right] = sign\left[u_c\left(1 + \frac{wlu_{cc}(wl,l)}{u_c} + \frac{lu_{cl}(wl,l)}{u_c}\right)\right] = sign\left(1 - \varepsilon_c - \varepsilon_l\right)$$

Therefore,

$$\frac{dl}{dw}\begin{Bmatrix}>\\<\end{Bmatrix}0 \quad \Leftrightarrow \quad \varepsilon_c + \varepsilon_l \begin{Bmatrix}<\\>\end{Bmatrix} 1 \qquad \text{(A3)}$$

Now consider the utility function

$$u(c,l) = c^{\eta_C} l^{\eta_l} + \gamma c(1-l), \quad l \in [0,1],\ 0 < \eta_l < \eta_C < 1, \gamma > 0 \qquad \text{(A4)}$$

where the time endowment is normalized so that $T = 1$

The first order condition for an optimum is

$$\frac{w\eta_C}{c}c^{\eta_C}l^{\eta_l} + w\gamma(1-l) + \frac{\eta_l}{l}c^{\eta_C}l^{\eta_l} - \gamma c = \left[\left(\eta_C + \eta_l\right)c^{\eta_C}l^{\eta_l} + c\gamma(1-2l)\right]/l = 0 \qquad \text{(A5)}$$

Notice that to satisfy this equation, it must be that $l > 0.5$.

Calculating ε_c and ε_l, we obtain

$$\varepsilon_c = \frac{(1-\eta_C)\eta_C c^{\eta_C} l^{\eta_l}}{\eta_C c^{\eta_C} l^{\eta_l} + c\gamma(1-l)}, \quad \varepsilon_l = \frac{-(\eta_l \eta_C c^{\eta_C} l^{\eta_l} - c\gamma l)}{\eta_C c^{\eta_C} l^{\eta_l} + c\gamma(1-l)}.$$

Therefore,

$$\begin{aligned} 1-(\varepsilon_c+\varepsilon_l) &= \frac{\left[\eta_C c^{\eta_C} l^{\eta_l} + c\gamma(1-l)\right] - \left[(1-\eta_C-\eta_l)\eta_C c^{\eta_C} l^{\eta_l} + c\gamma l)\right]}{\eta_C c^{\eta_C} l^{\eta_l} + c\gamma(1-l)} \\ &= \frac{(\eta_C+\eta_l)\eta_C c^{\eta_C} l^{\eta_l} + c\gamma(1-2l)}{\eta_C c^{\eta_C} l^{\eta_l} + c\gamma(1-l)} = \frac{(\eta_C+1)c\gamma(1-2l)}{\eta_C c^{\eta_C} l^{\eta_l} + c\gamma(1-l)} < 0. \end{aligned} \tag{A6}$$

where the third equality and the last inequality are derived by using (A5).

The inequality (A6) implies that the associated labor supply decreases with the wage rate.

Further, since $\eta_C < 1$ and

$$u_l(c,T) = u_l(c,1) = \eta_l c^{\eta_C} - \gamma c = c\eta_l(c^{-(1-\eta_C)} - \gamma/\eta_l)$$

It follows that $u_l(c,T) > 0$ for all sufficiently small $c > 0$ (specifically for all $c < (\frac{\gamma}{\eta_l})^{-\frac{1}{1-\eta_c}}$), so that the labor supply curve starts from $l = T(= 1)$. This together with (A5) and (A6) imply a labor supply curve as depicted in Figure *2.a*.

Finally, notice from (A3) that for a labor supply curve like that depicted in Figure *2.b*, the individual's preferences are such that at a sufficiently high wage rate the sum of the two elasticities $(\varepsilon_c + \varepsilon_l)$ changes from being greater than unity to being less than unity.

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(lxxviii) This paper was presented at the Second International Conference on "Tourism and Sustainable Economic Development - Macro and Micro Economic Issues" jointly organised by CRENoS (Università di Cagliari and Sassari, Italy) and Fondazione Eni Enrico Mattei, Italy, and supported by the World Bank, Chia, Italy, 16-17 September 2005.

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