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ABSTRACT. This note elaborates an extension of the paper "Social Norms, the Welfare State, and Voting" by Lindbeck, Nyberg, and Weibull [1]. That paper studies the effects of a social norm against living off others work. In the welfare-state context of their model, this means that individuals who live on public transfers experience disutility. One limitation in the model is that the individual's choice is binary: either to work full time or not at all. Here we allow individuals to choose working hours on a continuous scale. We derive a fixed-point equation that determines all individuals number of work hours, and show that the limitation to a binary choice is not binding if individuals have Cobb-Douglas preferences an no non-labor incomes. (Doc: dsjw.tex.)

1. INTRODUCTION

The paper "Social Norms, the Welfare State, and Voting" by Lindbeck, Nyberg, and Weibull [1] (henceforth LNW) develops a model of the interplay between economic incentives and social norms in the modern welfare state. It is assumed that there exists a social norm against living off others work. Individuals who deviate from this norm are supposed to experience disutility, and this disutility is taken to be decreasing in the population share of individuals who deviate from the norm. In the welfare-state context of their model, this means that individuals who live on public transfers experience disutility - in the form of embarrassment or social stigma - and this disutility is stronger the fewer individuals do likewise. Individuals make two choices, one economic and one political.

One limitation in the LNW model is that the individual's economic choice is binary: either to work full time or to live on transfers only. Here we relax this limitation by allowing individuals to choose the number of work hours on a continuous scale. The transfer scheme is adapted accordingly; it provides a certain minimal consumption level to all individuals with little disposable income. We derive a fixed-point equation that determines all individuals' number of work hours. It is shown that if they have Cobb-Douglas preferences over consumption and leisure, and lack non-labor income, then the limitation to a binary choice is not binding. Individuals with low wage rates will live off the transfer and not work while individuals with high wages will receive no transfer and they will all work the same number of hours.

The note is organized as follows. Section 2 develops a bench-mark model without social norms. Section 3 adds a social norm to the model with the transfer scheme, modelled in the same fashion as in LNW. Section 4 presents a model of a somewhat different social norm against living off others work - expressed in terms of hours worked.

2. A MODEL WITHOUT SOCIAL NORMS

There is a continuum of individuals with wages distributed according to a cumulative distribution function Φ with positive density $\varphi(w) = \Phi'(w)$ at all wage levels $w > 0$.

2.1. Without Transfers. Each individual is assumed to have the same Cobb-Douglas utility function, of the form

$$u(c, l) = a \log c + b \log l \ , \tag{1}$$

where c is her consumption and l is her leisure, $a, b > 0$ and $a + b = 1$. Her budget set is given by

$$c \leq (1 - t)\, hw + s \ \text{ and } \ 0 \leq h \leq 1,$$

where t is the tax rate, h is hours worked, w is the individual's real wage rate, and s her fixed non-labor income, which is taken to be the same for all and to be untaxed.[1] Leisure is defined by $l = 1 - h$.

The disposable total wealth endowment of an individual with wage rate w is $(1 - t)\, w + s$, a quantity to be divided between consumption and leisure. As is familiar, the optimal division in an interior solution under Cobb-Douglas utility is

$$c = a(1 - t)\, w + as \tag{2}$$

and

$$l = \frac{b(1 - t)\, w + bs}{(1 - t)\, w} = b\left[1 + \frac{s}{(1 - t)\, w}\right] . \tag{3}$$

Accordingly, optimal working hours are then

$$h = a - \frac{bs}{(1 - t)\, w} . \tag{4}$$

However, granted the non-labor income s is positive, individuals with low wage rates will optimally choose not to work at all. This corner solution holds for all individuals with wage rates $w < \bar{w}(t, s)$, where

$$\bar{w}(t, s) = \frac{bs}{a(1 - t)} .$$

For such an individual, $c = s$, $l = 1$, and $h = 0$.[2]

In sum, optimal consumption and leisure are given by

$$c = c(w, t, s) = \begin{cases} s & \text{if } w < \bar{w}(t, s) \\ a(1 - t)w + as & \text{otherwise} \end{cases} \tag{5}$$

[1] The generalization to an economy where individuals differ in their non-labor incomes s is straight-forward. Replace the c.d.f Φ for w by a c.d.f. Ψ for (w, s). The critical wage rate (see below) is then replaced by a critical wage/income curve in the (w, s)-plane.

[2] The critical wage rate $\bar{w}(t, s)$ is found by setting $l = 1$ in equation (3).

$$l = l(w, t, s) = \begin{cases} 1 & \text{if } w < \bar{w}(t, s) \\ b + \frac{bs}{(1-t)w} & \text{otherwise} \end{cases} \tag{6}$$

An individual with a higher wage rate has a larger budget set than an individual with a lower wage. Hence, the obtained utility level is the same for all individuals with wage rates below $\bar{w}(t, s)$, while for individuals with higher wage rates it is strictly increasing in w. The obtained utility level is given by

$$U(w, t, s) = \begin{cases} a \log s & \text{if } w < \bar{w}(t, s) \\ \gamma + \log\left[(1-t)w + s\right] - b \log\left[(1-t)w\right] & \text{otherwise} \end{cases} , \tag{7}$$

where $\gamma = a \log a + b \log b$.

2.2. With Transfers. In the following we restrict attention to a transfer scheme where individuals receive a (tax free) transfer such that their disposable income never falls below a level T set by the government. More exactly, if the disposable income of an individual is y, then she receives the transfer $\tau(y)$, where

$$\tau(y) = \max\{T - y, 0\} . \tag{8}$$

Thus, the transfer is given only to individuals with disposable income below T, and gives them consumption level T. The consumption level of any individual, with disposable income y, is thus $y + \tau(y) = \max\{T, y\}$. In other words, this transfer scheme induces a marginal tax rate of 100% on income below T while the marginal tax rate for labor income above this level is t.

The decision problem facing an individual with wage rate w under this transfer scheme is:

$$\max_{0 \le h \le 1} a \log c + b \log(1 - h) \tag{9}$$

where

$$c \le \max\{T, (1-t)wh + s\} \quad \text{and} \quad 0 \le h \le 1 . \tag{10}$$

In case $T \le s$, such a transfer scheme has no effect at all. Hence, we assume $T > s$.

Individuals with total endowment $(1-t)\,w + s \le T$ necessarily live in part on the transfer. Their wage earnings have no effect on their consumption level, which is set by government to T. Since work is assumed to give disutility, all these individuals choose not to work at all: $h = 0$. Hence their utility level is $a \log T$. Indeed, this conclusion is valid for any transfer recipient: If an individual optimally chooses working hours h such that her disposable income does not exceed the transfer level T, then she will choose $h = 0$. Accordingly, $c = T$ and the achieved utility level is $a \log T$. By contrast, an individual who optimally chooses h such that her disposable income exceeds T obtains no transfer at all, and therefore her consumption, leisure and work time are given by equations (2-4).

Since each individual chooses to be a transfer recipient if and only if that choice results in higher utility than working (and not receiving any transfer), an individual with wage rate w is a non-working transfer recipient if

$$a \log T > U(w,t,s) \tag{11}$$

while otherwise she works and receives no transfer. As was noted in the preceding subsection, the utility level on the right-hand side is constantly equal to $a \log s < a \log T$ for $w < \bar{w}(t,s)$, and otherwise it is strictly increasing in w. Moreover, it is evident from equation (7) that $U(w,t,s)$ is continuous in w and tends to plus infinity as w tends to plus infinity. Hence, given t, s and T, equality in (11) is obtained for exactly one wage rate w. This defines the critical wage rate $w^*(t,s,T)$ which separates transfer recipients - those with wages below $w^*(t,s,T)$ - from those who work and receive no transfer - those with wages above $w^*(t,s,T)$.

The population share x of transfer recipients is given by the c.d.f. Φ for the wage distribution:

$$x = \Phi\left[w^*(t,s,T)\right] \ . \tag{12}$$

3. A SOCIAL NORM AGAINST LIVING OFF TRANSFERS

Following Lindbeck, Nyberg and Weibull [1] we now extend the above bench-mark model by introducing an additively separable disutility $v(x) \geq 0$ from living off the transfer. We assume that this disutility is non-increasing in the population share x of transfer recipients: $v' \leq 0$.

Even in the presence of a disutility associated with living off the transfer, each individual chooses either (a) to work and receive no transfer or (b) to live off the public transfer and not work at all. Those who choose to live on the public transfer consume $c = T$. Hence, their utility level is $a \log T - v(x)$.

Each individual chooses to live on the transfer if and only if this results in higher utility than working and receiving no transfer, i.e., if and only if

$$a \log T - v(x) \ > U(w,t,s) \tag{13}$$

Again the right-hand side is an increasing and continuous function of the wage w. Solving for the critical wage now also involves a third argument, the equilibrium population share x that lives on transfers. Write $w^*(t,s,T,x)$ for the critical wage rate in the present case. Note, however, that equality in (13) need not be obtained for any wage rate $w \geq 0$ in the present case. This is possible if the non-labor income s is positive and the disutility $v(x)$ of living off the transfer is so large that it is preferable to live off one's own asset s. More exactly, the condition for this to occur is $a \log \frac{T}{s} \leq v(x)$. In this case we simply set $w^*(t,s,T,x) = 0$. Otherwise, $w^*(t,s,T,x) > 0$ is uniquely determined by equality in (13).

Having defined the critical wage rate $w^*(t,s,T,x)$, the population share x of transfer recipients is the solution to the following fix-point equation (cf. eq.(4) in LNW):

$$x = \Phi\left[w^*(t,s,T,x)\right] \ . \tag{14}$$

Since the right-hand side of this equation, for any tax rate t and transfer level T, defines a continuous function of x that maps the closed unit interval into itself, equation (14) has at least one solution.

3.1. Absence of Non-Labor Incomes. Suppose that individuals lack non-labor income, $s = 0$. Indeed, this is the case studied in LNW. By equation (4), all individuals who choose to work then work the same number of hours, $h = a$, independently of their wage rate w. This can be reinterpreted as if individuals were to choose between working full time or not working at all, where full time is a hours. In this sense, the restriction in LNW to a binary choice is not binding when individuals lack non-labor income and have Cobb-Douglas preferences.

Moreover, the above analysis gives $\bar{w}(t,0) = 0$ and $U(w,t,0) = \gamma + a\log(1-t)w$. The critical wage rate can easily be solved for,

$$w^*(t,0,T,x) = \frac{T}{1-t}\exp\left[-\frac{\gamma+v(x)}{a}\right] \ , \tag{15}$$

and the fixed-point equation (14) becomes

$$x = \Phi\left(\frac{T}{1-t}\exp\left[-\frac{\gamma+v(x)}{a}\right]\right) . \tag{16}$$

The analysis in LNW applies.

4. ANOTHER SOCIAL NORM AGAINST LIVING OFF TRANSFERS

An individual receiving public transfers may feel more embarrassed the more she reduces her working hours because of the transfer. This can be modelled in different ways. We here study the possibility that this disutility is increasing in the deviation from the number of hours the individual would have worked in case the transfer hadn't been available.

This need not be due to different interpretations of the social norm against living on others work. Rather the difference may be based in what is seen as acceptable utilization and non-acceptable exploitation of the welfare system. The idea is that an individual taking transfers and at the same time works only suffers disutility to a limited degree. Taking the transfer is just taking what is "rightfully" yours. We interpret "full-time" as the number of hours the individual would have worked in the absence of the transfer system. According to equation (6) this number of work hours is

$$\tilde{h} = \begin{cases} 0 & \text{if } w < \bar{w}(t,s) \\ a - \frac{bs}{(1-t)w} & \text{otherwise} \end{cases} \tag{17}$$

The further away from this norm the individual adjusts her time of work the more the individual feels that she is exploiting the system and the more intensely the stigma is felt. Moreover, this disutility may be larger the less others exploit the system.

From now on, assume that there are no non-labor incomes: $s = 0$. Then the "ideal" number of work hours is the same for all individuals, $\tilde{h} = a$. Denote by $\bar{h}$ the average hours worked in the economy, and let $z = 1 - \bar{h}/\tilde{h}$. This is the average deviation from the work norm in society, normalized so that $z = 0$ means that all individuals work the ideal number of hours and $z = 1$ means that no individual works at all. The indicator z will play a similar role to that of the indicator x in LNW's model and in the preceding section.

Consider an individual's choice of work hours h for herself, given z. Let $g(h, z) \geq 0$ denote her disutility of deviating from the work norm $h = \tilde{h}$, where $g(h, z)$ is non-increasing in h, with $g(h, z) = 0$ for all $h \geq \tilde{h}$ (and all z). She will be subsidized by the transfer if and only if $(1-t)wh < T$. Hence, she chooses $h \in [0, 1]$ so as to maximize her utility,

$$f(h,w) = \begin{cases} a \log T + b \log(1-h) - g(h,z) & \text{if } h < \frac{T}{(1-t)w} \\ a \log\left[(1-t)wh\right] + b \log(1-h) - g(h,z) & \text{otherwise} \end{cases} . \tag{18}$$

For non-transfer recipients it is still optimal to work the ideal number of hours (since a deviation from this ideal just causes additional disutility), so $h = \tilde{h} = a$ whenever $h \geq \frac{T}{(1-t)w}$. For transfer recipients, however, it may now be optimal to do some work. The first-order condition for these individuals is

$$\frac{b}{1-h} + \frac{\partial}{\partial h} g(h,z) = 0 . \tag{19}$$

If this equation has a unique solution $h(z) < a$, then all individuals with wage rates $w < \frac{T}{(1-t)h(z)}$ will chose to live in part on the transfer, and to work $h(z)$ hours, while all individuals with higher wages will receive no transfer and work $\tilde{h}$ hours. In equilibrium, z has to satisfy the equation

$$z = \left(1 - \frac{h(z)}{a}\right) \Phi\left[\frac{T}{(1-t)h(z)}\right] . \tag{20}$$

This fixed-point equation is derived from the definition of $\bar{h}$, the average number of hours worked:

$$\bar{h} = \Phi\left[\frac{T}{(1-t)h(z)}\right] h(z) + \left(1 - \Phi\left[\frac{T}{(1-t)h(z)}\right]\right) \tilde{h}.$$

Division by $\tilde{h} = a$ and using the definition $z = 1 - \bar{h}/\tilde{h}$ results in equation (20).

If the optimal working time for transfer recipients, $h(z)$, is continuous in the societal deviation z from the norm, and $h(z) \leq a$ for all $z \in [0, 1]$, then the right-hand side in equation (20) defines a continuous mapping of the closed unit interval to itself. Hence, the fixed-point equation then has at least one solution z.

The analytical machinery in LNW can be applied, *mutatis mutandis.* The only major difference is the public budget balance equation. Since transfer recipients here may work in equilibrium, but not in the LNW model, part of transfer payments are covered by the transfer recipients themselves.

Example. Let $g(h, z) = -f(z) \log(h/a)$ if $h < a$, otherwise $g(h, z) = 0$, for some function f. Then the first-order equation (19) has the unique solution

$$h(z) = \frac{f(z)}{f(z) + b} \tag{21}$$

If $f(z) < a$ for all z, then $h(z) < a$ for all z, and the fixed-point equation (20) becomes

$$z = \frac{b}{a} \frac{a - f(z)}{b + f(z)} \Phi \left(\frac{T}{1 - t} \frac{f(z) + b}{f(z)} \right). \tag{22}$$

REFERENCES

[1] Lindbeck, A., S. Nyberg, and J.W. Weibull (1996), "Social Norms, the Welfare State, and Voting", IUI WP 453.