SOCIAL INTERACTIONS IN LABOR SUPPLY

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Abstract

Our research provides evidence concerning the effect of interdependence on estimation and interpretation of earnings/labor supply equations. We consider the cases of (1) a positive spillover from others' labor supply and (2) a need for conformity with others' hours worked. Qualitative and quantitative comparative statics results with a Stone-Geary utility function indicate that spillover effects increase labor supply uniformly. Alternatively, conformity effects move labor supplied toward the mean of the reference group so that, in the limit, labor supply becomes perfectly inelastic at the reference group average. When there are un-modeled exogenous social interactions, conventional wage elasticities are still relatively well estimated although structural parameters may not be. Omitting endogenous social interactions may seriously misrepresent the labor supply effects of policy.

1. Introduction

Critics of the economic approach to human behavior sometimes cite models with an atomistic decision maker as an example of excessive abstraction leading to un-informative behavioral implications and inaccurate predictions. One reason economic researchers have avoided models with interdependent agents is complexity and no generally accepted theoretical framework for examining interdependent economic agents Manski 2000, Moffitt 2001, Durlauf and Young 2001). Empirically, researchers would need to construct econometric models confrontable with data for testing, and available data sets are typically short on information concerning economic interactions among persons or firms. Still, economic interactions among persons are a fact of life and both microeconomic models and data become more informative by taking greater account of the individual's social group connections in decision making. Our research examines the potential quantitative labor supply importance of two types of interactions in utility, spillover from others' decisions and conformity with others' decisions.

The broad topic of social interactions is interesting and important, which has made social interactions receive a great deal of recent attention and the literature is growing rapidly (Durlauf and Moffitt 2003). Economic researchers have begun to locate wide-ranging economically meaningful policy relevant social interactions. Anecdotal evidence suggests that it is reasonable to expect that social interactions might play an important role in labor supply decision too. For example, many people retire as soon as they reach age 62 or 65. Some of the timing of retirement will be due to the parameters of Medicare, Social Security, and private pensions. They may also be a role of a social norm that says that there are appropriate ages for people to retire. The consequence is that there will be a conformity of retirement age and labor supply, which is a type of social interactions in labor supply we will examine.

Many studies recognize that to identify social interactions the researcher must account for the fact that the interdependent behavior potentially creates the problem of simultaneity in the data. The social interactions variable may be endogenous so the use of conventional OLS regression yields biased parameter estimates. There are different approaches to identifying interdependent behavior, including finding the correct reference group ex ante (Kelly and Ó Gráda 2000), using a valid instrument for the group membership (Angrist and Lang 2002; Evans, Oates, and Schwab 1992), using experimental data with random group assignment (Marmoros and Sacerdote 2002; Duflo and Saez 2002; Katz, Kling, and Liebman 2001; Sacerdote 2001), or specifying a structural model of group membership (Kremer 1997; Glaeser, Sacerdote, and Scheinkman 1996).

The empirical researcher and policymaker must be cautious, though, when considering evidence of interaction effects because many empirical studies may not be informative concerning the reference group identity and in turn not identify the underlying structure of interactions, such as whether it is endogenous, exogenous, or both (Manski 1993, 2000; Morgan and Ó Gráda 2000; Moffitt 2001). For example, one type of identification problem inherent in models of permanent income inequality is the possible self-selection of families into various neighborhoods. Local community characteristics may reflect constrained choices of individuals, and reference group effects may be difficult to separate econometrically from how individuals' personal characteristics condition their choices (Durlauf 1996; Benabou 1996a, 1996b; Kremer 1997).

There are only a few studies addressing identification of social interactions in basic labor market behavior underlying labor supply differences. Recent evidence suggests that a worker's choice of hours worked can depend on average hours worked social reference group members and that neglecting the interdependence can lead to serious underestimates of the labor supply effects of income taxes or local labor market conditions (Blomquist 1993; Woittiez and Kapteyn 1998; Aronsson, Blomquist, and Sacklén 1999; Weinberg, Reagan, and Yankow 2000).

Social interactions are of much policy relevance for taxation programs or policies directed toward improving the well-being of the unemployed if the social reference group's mean value affects the outcome of interest to the individual (Blomquist 1993). When there is a substantial amount of socially interactive decisions in the form of, say, positive spillovers, then there will be a social multiplier effect to consider in optimal policy design because individuals will react to the actions of others (Becker and Murphy 2000, Glaeser, Sacerdote, and Scheinkman 2003). When evaluating policies based on their predicted outcomes the applied economist may need to consider the existence and size of social interaction effects. For example, if workers care about their relative positions in the income distribution because position is a measure of social status over and above absolute purchasing power, then regulatory policy that does not disturb relative incomes receives too low a benefit in conventional cost-benefit calculations (Frank and Sunstein 2001, Kniesner and Viscusi 2003).

Our research bridges theoretical and econometric considerations in household models where non-ignorable social interactions may be present. We begin with the popular Stone-Geary utility function, which leads to the easily estimable linear earnings function, and demonstrate that even when we introduce a relatively low level of social interaction into the utility function it can cause an economically significant effect on an individual's labor supply and consumption. We in turn show that ignoring social interactions can cause a serious bias on the estimated structural (utility function) parameters of interest. We also identify situations when other economic concepts that depend on combinations of biased structural parameters, labor supply/consumption derivatives and elasticities, may or may not be precisely estimated.

2. Theoretical Framework

Despite their recently expanding popularity, theories of social interactions have a long history in economics. Following Becker (1974), economic theory formally considered many forms of interactions: spillovers (Roback 1982), positional goods (Frank 1985), peer group effects (de Bartolome Charles 1990), fairness (Rabin 1993), conformity effects (Bernheim 1994), neighborhood effects (Durlauf 1996), externalities (Chamley 1999), social norms (Lindbeck, Nyberg, and Weibull 1999), herding (Smith and Sorensen 2000), social capital (Glaeser, Laibson, and Sacerdote 2000, Becker and Murphy 2000), identity (Akerlof and Kranton 2000), and contagion (Rigobon 2001). There is also considerable literature related to the Linear Expenditure System (LES) that closely relates to the parametric specification we adopt (Gaertner 1974; Pollak 1976; Pollak and Wales 1992, pp. 102–128**;** Kapteyn et al. 1997; Soetvent and Kooreman 2002). The basic theoretical setup generally differs across applications, ranging from overlapping generations considerations to Bayesian learning as the feature. All theoretical exercises involving household economic interactions share one common feature: the utility of the individual is somehow affected by either utility or choices made by members of the individual's reference group, which is comprised of persons with whom the individual somehow interacts or relates.

A flexible treatment of social interactions can be formulated by building on the work of Brock and Durlauf (2001a,b), where interactions enter into a model with total utility, $V(\bullet)$, encompassing a social utility term, $S(\bullet)$:

$$V(\omega_i;\alpha,\beta) = V(u(\omega_i;\alpha), S(\omega_i, \mu^e(\underline{\omega}_{-i});\beta)), \quad \textbf{(1)}$$

where ω_i is an action or choice made by an individual i, $\underline{\omega}_{-i}$ is a vector of choices made by all individuals other than the person i, α and β are parameters of individual and social utilities,

$u(\omega_i;\alpha)$ is the private utility associated with choice ω_i, $\mu^e(\underline{\omega}_{-i})$ is the conditional probability measure of choices (expectation/belief) that person *i* places on the choices of others at the time of decision making (such as $\mu^e(\underline{\omega}_{-i}) = \overline{\omega}^e_{-i}$, the average of others), and $S(\omega_i, u^e(\underline{\omega}_{-i}); \beta)$ is the social utility associated with the choice of the individual and his or her expectation of the choices of others.

There can be many forms for how social utility enters a person's total utility, with the most obvious ones being additive or multiplicative (Brock and Durlauf 2001a,b):

$$V(\omega_i;\alpha,\beta) = u(\omega_i;\alpha) + S(\omega_i, \mu^e(\underline{\omega}_{-i}); \beta) \quad \textbf{(2)}$$

and

$$V(\omega_i;\alpha,\beta) = u(\omega_i;\alpha) \times S(\omega_i, \mu^e(\underline{\omega}_{-i}); \beta)\,. \quad \textbf{(3)}$$

In addition to the additively and multiplicatively appended social component of utility possibilities in (2) and (3) we also consider a more general specification where the social utility is embedded inside the person's total utility by making one of the parameters of the individual's utility function depend on the social utility, say $\alpha = \alpha(S(\omega_i, \mu^e(\underline{\omega}_{-i}); \beta))$.

Depending on the form of the social utility term, *S*(•), there are many possible types of interactions (Brock and Durlauf 2001a,b). One obvious specification for social utility is a proportional spillover effect, which is $S(\omega_i, \overline{\omega}^e_{-i}) = J\omega_i\overline{\omega}^e_{-i}$, where *J* is a constant that represents the interaction weight that relates *i*'s choice to the average choice made by other members of the reference group excluding *i*. The proportional spillover case embodies a multiplicative relation between the individual's choice and the average of others' choices. A change in the mean decision in the reference group increases total utility of the individual by a given fraction, *J*, which indexes the positive externality coming from the reference group behavior.

Another possible form of social interaction is a so-called conformity effect, $S(\omega_i, \overline{\omega}^e_{-i}) = -\frac{J}{2}(\omega_i - \overline{\omega}^e_{-i})^2$, which represents the behavior of individuals who want to be as similar as possible to the mean behavior (note that changing the sign creates a nonconformity effect). Here a worker experiences a disutility associated with being different than what is considered typical. One can view a conformity effect as a form of social norm that directly effects one's total utility.

There are many other possibilities for the form of the social utility term, and the specification in (1) is flexible enough to accommodate a vast range of applications involving social interactions. Because they are most intuitive and most often mentioned we will focus on the cases of positive spillover and conformity.

2.1 Baseline Stone-Geary Utility Function

Our focus throughout is on the labor supply function using the Stone-Geary utility function. The Stone-Geary has convenient properties for estimating labor supply and consumption expenditures. Because the earnings function is linear in the wage rate and non-labor income, w and Y, and the associated labor supply function is linear in $1/w$ and Y/w, the social interactions effects we identify carry over to popular other cases discussed (Stern 1986).[1] The Stone-Geary has also been shown recently to be a convenient functional form for studying issues related to intertemporal substitution and risk sharing (Ogaki and Zhang 2001, Low 2002, Low and Maldoom 2004). Important for our purposes is that the Stone-Geary form of utility easily admits social interactions in a theoretically reasonable way through its structural parameters.

We begin with the baseline utility function without interactions:

$$U(h,c) = \theta \ln(\gamma_h - h) + (1-\theta)\ln(c - \gamma_c) \qquad \textbf{(4)}$$

$$st.\ c \leq wh + Y\,,\ 0 < \theta < 1\,,$$

where c is consumption, h is hours worked, θ is the expenditure share on leisure ($l = T - h$, with l being leisure and T being total hours available), γ_h is the level of maximum feasible hours of work, and γ_c is the minimum necessary commodity consumption. An econometric advantage of the Stone-Geary (4) is that after maximizing utility with respect to consumption and labor supplied the optimal hours worked imply earnings linear in both the variables and parameters (Abbott and Ashenfelter 1976):

$$wh = (\theta\gamma_c) + (\gamma_h(1-\theta))w + (-\theta)Y = \beta_0 + \beta_w w + \beta_Y Y \ . \quad \textbf{(5)}$$

The three parameters of the utility function are exactly identified as estimates of ($\beta_0, \beta_w, \beta_Y$) reveal ($\theta, \gamma_h, \gamma_c$). We will refer to the earnings function in (5) as the Stone-Geary without interactions or, more simply, as the baseline model, which is always the point of comparison. The wage effect on labor supply in our benchmark case is

$$\partial h / \partial w = \frac{(1-\theta)\gamma_h - h}{w} \ . \quad \textbf{(6)}$$

Models for studying social interactions quickly become quite complicated, so most theoretical studies involving social interactions use a specific functional form, which can still permit quite general conclusions about social interaction effects (Bernheim 1994, Akerlof 1997, Akerlof and Kranton 2000). The Stone-Geary utility function encompasses much of the previous theoretical research on social interactions and is a convenient objective function for introducing social interactions in a theoretically satisfactory way. We follow the approach known as demographic translating where the demographic characteristics of the individuals reside inside the parameter representing the limit value for hours of work, γ_h (Pollak and Wales 1992).

2.2 Spillover Effects

We embed the social utility (spillover) effect into the parameter γ_h, using the specification suggested by Brock and Durlauf (2001a,b), $\gamma_h(S(\bullet)) = \gamma_h + \alpha_1 h\mu_h$, where μ_h is the expectation (perhaps sample mean) of hours worked by the reference group members. The reference group is any set of individuals in the population (including the entire population) to which the individual refers when making a labor supply decision. The parameter α_1 represents the importance of social utility (spillover) to the individual so that now

$$U(h,c;\mu_h) = \theta \ln(\gamma_h + \alpha_1 \mu_h h - h) + (1-\theta)\ln(c - \gamma_c)\,. \tag{7}$$

The spillover effect can be viewed as a positive externality generated by the labor supplied in the reference group, where a higher mean of hours worked in the reference group decreases the individual's disutility from working. An obvious way to interpret the spillover effect is that one feels less pain from working if one knows others also work.[2]

Maximizing (7) with respect to *c* and *h* yields the augmented earnings function

$$wh = \frac{\{\gamma_c\theta\} + \{\gamma_h(1-\theta)w\} + \{-\theta Y\} - (\gamma_c\theta\alpha_1)\mu_h + (\theta\alpha_1)\mu_h Y}{(1-\alpha_1\mu_h)}, \tag{8}$$

where the curly brackets {} contain terms from the baseline model. Note that the addition of spillover effects adds two variables to the earnings equation, μ_h and $\mu_h Y$, makes the earnings equation nonlinear, and over-identifies the parameters.

When the root utility function is Stone-Geary and there are spillovers from others' work efforts, the wage effect on labor supply is

$$\partial h / \partial w = \frac{\{\gamma_h(1-\theta) - h\} + \alpha_1\mu_h h}{\{w\} - \alpha_1\mu_h w}\,. \tag{9}$$

Note that $\partial^2 h / \partial w \partial \alpha_1 \geq 0$ so that labor supply spillover effects make the individual's response to the wage more positive than in the absence of spillovers.[3]

2.3 Conformity Effects

Conformity in behavior and attitudes is one of the fundamental building blocks that historically contributed to the emergence of the field of social psychology (Sherif 1935). The general idea is that individuals tend to conform to broadly defined social norms and the magnitude of response depends on cohesiveness, group size, and social support.[4] Again, we embed the interdependence via the parameter γ_h of the baseline utility function so that $\gamma_h(S(\bullet)) = \gamma_h - \frac{\alpha_2}{2}(h-\mu_h)^2$. Augmented utility is now

$$U(h,c;\mu_h) = \theta \ln(\gamma_h - \tfrac{\alpha_2}{2}(h-\mu_h)^2 - h) + (1-\theta)\ln(c-\gamma_c)\,. \qquad \textbf{(10)}$$

The practical implication of a conformity effect in utility is that the person feels penalized when working a different amount of hours than what is typical for the reference group. Intuitively, because there is a penalty for being different than the conformity value for *h*, the utility function incorporating conformity in (10) should have a smoothing effect on hours relative to the baseline model. The smoothing effect of conformity should in turn mean that a change in *h* will have a smaller effect on utility than in the baseline case with an accompanying regression toward the group mean.

The augmented earnings function with a conformity effect is

$$wh = \frac{\{\theta\gamma_c\} + \{\gamma_h(1-\theta)w\} + \{-\theta Y\} + \gamma_c\theta\alpha_2(h-\mu_h) - \theta\alpha_2(h-\mu_h)Y + \frac{\alpha_2}{2}(\theta-1)\mu_h^2 w}{(1-\alpha_2\mu_h + (1+\theta)\frac{\alpha_2}{2}h)}\,. \qquad \textbf{(11)}$$

The spillover effect introduced into the earnings function via the presence of μ_h is replaced by $(h-\mu_h)$ in the case of conformity. As in spillover (8), the conformity version of the earning function is non-linear, but now more complicated in that there is not a simple (linear) closed-form solution for either earnings or hours of work. The underlying fundamental parameters are again over-identified, and there are more interaction terms and non-linearity that is due to the presence of both the individual's labor supplied and the reference group's average hours worked.

The wage effect on labor supply when there is a conformity effect is

$$\frac{\partial h}{\partial w} = \frac{\{(1-\theta)\gamma_h - h\} + \frac{\alpha_2}{2}(h-\mu_h)((1+\theta)\mu_h - (1-\theta)h)}{\{w\} + \theta\alpha_2(Y-\gamma_c) + w\alpha_2((1+\theta)h-\mu_h)}\,, \qquad \textbf{(12)}$$

where the terms in curly brackets { } again indicate the basic Stone-Geary model.