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TAXING FAMILY SIZE AND SUBSIDISING CHILD-SPECIFIC COMMODITIES? OPTIMAL FISCAL TREATMENT OF HOUSEHOLDS WITH ENDOGENOUS FERTILITY

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Abstract

The effects and optimal choice of policy instruments affecting the family (child benefits, taxes on child-specific commodities, etc.) are examined within the context of a household economics model with fertility choice. The simultaneous consideration of child benefits and commodity taxes in the presence of endogenous fertility yields some remarkable results. One is that, if the government can distinguish between child-specific and adult-specific commodities, it may then be optimal to tax family size and subsidize child-specific commodities. Under more restrictive conditions, it is also shown that the tax system should be so designed, that children are a net tax liability if households are differentiated for the husband's income, a net tax asset if households are differentiated for the wife's wage rate.

Keywords: Endogenous fertility, optimal indirect taxation, child-specific commodities, child benefits

JEL Classification: D1, H21, J10

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Introduction

The family is the object of a plethora footnote of government policies, ranging from income and commodity taxes to a variety of subsidies and incentives related to child bearing. In the literature, these disparate forms of intervention are usually considered in isolation, and generally under the assumption that parents cannot control fertility. footnote The present paper is concerned with the interaction between child benefits and commodity taxes in a context of endogenous fertility, but we shall compare our results with those that would occur if fertility were exogenous. The underlying household model is based on the assumption that parents are altruistic towards their children as in Becker (1981), not because there are no plausible alternatives, footnote but because this model is the easiest to manipulate, and many of its predictions are efficiency properties common to most endogenous fertility models.

Section 2 sets out the household decision model. Adult members are supposed to maximise a function of domestically produced goods, among which are the quantity (number) and quality (lifetime utility) of children. All domestically produced goods use as inputs the time of adult members, and commodities available on the market. The household production approach gives structure to the model, and will allow us to draw conclusions about the optimal choice of policy instruments with a minimum of *ad hoc* assumptions. For that purpose, we also derive an analogue of the Slutsky equations, appropriate for a model where commodities are not final consumption goods, and the demands for them are thus derived from those for domestically produced goods (as far as we are aware, this has not been done before).

Section 3 sets out the optimal taxation problem. On the assumption that the policy maker cannot generally design or implement personalised lump-sum transfers, we look for an optimal (second-best) system of distortionary taxes and subsidies under the alternative hypotheses that parents can or cannot control fertility. Given the focus of the paper, we find it natural to consider a tax or subsidy on child-specific commodities, a tax or subsidy on adult-specific commodities, and a tax or subsidy on number of children, together with a poll tax or subsidy. A remarkable finding is that, if fertility is endogenous, taxing family size and subsidising child-specific commodities is just as likely to be optimal as subsidising family size and taxing child-specific commodities. In other words, it may be better to help families with children by distorting prices in their favour, than directly subsidising child-bearing. Even more remarkably, but not really surprising in view of broader re-distributive considerations, it may be optimal to design the tax-benefit system in such a way that children are a net tax liability.

The question of whether family size should be taxed or subsidised is not new. Indeed, Mirrlees confronted the issue as long ago as 1972, and concluded that family size must be taxed or subsidised depending on whether the marginal product of labour is smaller or larger than the average product. Cigno (1983) shows that, irrespective of productivity considerations, family size should be subsidised, and parental consumption taxed, if the social planner gives weight to the utilities of future adults. In the present paper, we show that public intervention may be desirable for purely re-distributive reasons, even if the policy maker is only concerned about the wellbeing of current adults (and thus takes into account the welfare of future adults only indirectly, through the effect this has on the welfare of current adults). The nature of the intervention is influenced, in our case, by whether households differ in the husband's or in the wife's earning ability.

A model of the household

We assume that the utility of each household is given by

$$U = U(C,N,Q), \qquad \#$$

where C is the consumption of its adult members ('parents'), N the number ('quantity') of children, and Q the expected lifetime utility ('quality') of each child. The function $U(\bullet)$ is taken to be increasing and strictly quasi-concave. By writing the utility function in this form, we are implicitly assuming away any problem of aggregation of individual utilities. We are also saying that children are and are treated the same.

Following Becker (1981), we postulate that C, N and Q are domestically 'produced' using commodities (market goods) and the time of adult household members as factors, and that they are not transferable to other households. The adult consumption good is produced by means of adult-specific commodities, E, and time, l, footnote using a constant-returns-to-scale production function $C(.)$,

$$C = C(E, l). \qquad \#$$

Each unit of N requires at least x_0 units of child-specific commodities, and at least a_0 units of parental time ("attention"). We may describe (x_0, a_0) as the child subsistence basket, or as the input requirement of a child of quality zero: higher quality children require additional amounts of commodities and attention. Quality is given by

$$Q = Q(x, a), \qquad \#$$

where x and a are commodities and attention expended on each child, over and above the subsistence minimum (x_0, a_0). $Q(.)$ is another constant-returns-to-scale production function.

Each adult is endowed with one unit of time. Time not employed in the production of (C, Q, N) is sold as labour. To simplify matters, we assume that only the mother's time is used for the production of child quality and quantity, and that male labour time is exogenously determined by institutional factors. This is a caricatured, but effective way of capturing the fact that the child-rearing role of fathers is comparatively small, and that the labour supply of married women is substantially more wage-elastic than that of men (or single women). footnote Re-interpreting $(a_0 + a, l)$ as uses of the woman's time, we can then write the time-budget constraint in the form of a non-negativity condition on her labour supply,

$$L \equiv 1 - l - (a_0 + a)N \geq 0. \qquad \#$$

The family budget constraint can be written as

$$pE + [q(x_0 + x)]N = y + wL, \qquad \#$$

where p is the price of adult-specific commodities, q the price of child-specific commodities, w the wife's wage rate, and y the husband's earnings (equal to his wage rate).

Suppose that parents control N. That is to be taken as short-hand for the more reasonable proposition that parents can, by an appropriate choice of fertility controls, condition the probability distribution of births. Given (ref: prodC) and (ref: prodQ), parents then choose (E, l, x, a, N) to maximize (ref: utility), subject to (ref: budget), (ref: labour) and

$$m - N \geq 0, \qquad \#$$

where m is a physiological maximum. Solving this problem generates the final demand functions $J(p, q, y, w)$, $(J = C, N, Q)$, and the indirect utility function $V(p, q, y, w)$.

If the woman works $(L > 0)$, we can write the cost of a unit of the adult consumption good, C, as a function of the prices of the inputs, $c(p, w)$, where $c(.)$ is increasing and concave. If the physiological ceiling on fertility is not binding, we can similarly write the cost of a child of quality Q as $z_0 + z(q, w)Q$, and the total cost of children as $Z \equiv [z_0 + z(q, w)Q]N$, where $z(.)$ is increasing and concave, and $z_0 \equiv x_0 q + a_0 w$. This allows us to put the household decision problem in the more convenient form: choose (C, N, Q) to maximize (ref: utility), subject to $cC + Z = y + w$. The comparative-statics effects of (p, q, z_0, w) on the demand for the final good J can then be written as

$$\frac{\partial J}{\partial p} = c_p(s_{CJ} - C\frac{\partial J}{\partial y}), \quad \#$$
$$\frac{\partial J}{\partial q} = z_q N s_{QJ} + (x_0 + z_q Q)(s_{NJ} - N\frac{\partial J}{\partial y}), \quad \#$$
$$\frac{\partial J}{\partial z_0} = s_{NJ} - N\frac{\partial J}{\partial y}, \quad \#$$
$$\frac{\partial J}{\partial w} = c_w s_{CJ} + z_w N s_{QJ} + (a_0 + z_w Q)(s_{NJ} - N\frac{\partial J}{\partial y}) + (1 - c_w C)\frac{\partial J}{\partial y}, \quad \#$$

where s_{JK} is the Slutsky term representing the effect of the marginal cost of J on the demand for K $(J,K = C,N,Q)$, holding U constant.

Notice that (ref: slut2) includes two substitution-effects. That is because the price of child-specific commodities enters not only the marginal cost of child quality, $Z_Q \equiv z_q N$, but also the marginal cost of child quantity, $Z_N \equiv (z_0 + zQ)$. Thus, an increase in q would trigger a substitution away from N, as well as away from Q. Similarly, (ref: slut4) contains three substitution-effects, because the wage rate enters the marginal costs of all utility-yielding goods. Using (ref: labour)together with the Shephard identities $l \equiv c_w C$ and $a \equiv z_w Q$, we can re-write (ref: slut4), for $J = N$, in the more easily interpretable form

$$\frac{\partial N}{\partial w} = c_w s_{CN} + z_w s_{QN} + (a_0 + a)s_{NN} + L\frac{\partial N}{\partial y}. \quad \#$$

It is thus clear that fertility could be negatively affected by the mother's wage rate. Indeed, there is strong empirical evidence that this is so. footnote

Using (ref: slut1) – (ref: slut3), and exploiting the Shephard identities $E \equiv c_p C$ and $x \equiv z_q Q$, we get the comparative-statics effects of p, q and z_0 on the derived demand for E,

$$\frac{\partial E}{\partial p} = c_{pp}C + c_p^2(s_{CC} - C\frac{\partial C}{\partial y}), \quad \#$$
$$\frac{\partial E}{\partial q} = c_p[N z_q s_{QC} + (x_0 + z_q Q)(s_{NC} - N\frac{\partial C}{\partial y})], \quad \#$$
$$\frac{\partial E}{\partial z_0} = c_p(s_{NC} - N\frac{\partial C}{\partial y}), \quad \#$$

where c_{pp} measures the effect of p on the amount of adult-specific commodities employed in the domestic production of a unit of C (this is a technical-substitution effect). Similarly,

$$\frac{\partial x}{\partial p} = z_q c_p(s_{CQ} - C\frac{\partial Q}{\partial y}), \quad \#$$
$$\frac{\partial x}{\partial q} = z_{qq}Q + z_q[N z_q s_{QQ} + (x_0 + z_q Q)(s_{NQ} - N\frac{\partial Q}{\partial y})], \quad \#$$
$$\frac{\partial x}{\partial z_0} = z_q(s_{NQ} - N\frac{\partial Q}{\partial y}), \quad \#$$

where z_{qq} measures the effect of q on the amount of child-specific commodities employed in the production of a unit of Q.

For our subsequent analysis of the optimal choice of policy instruments, we would like to be able to sign the Slutsky terms s_{JK} $(J,K = C,N,Q)$. But, in the case that most interests us, namely where fertility is endogenous and (ref: fertility) not binding, all we can say in general is that the s_{JJ} terms are negative. In the case where fertility is exogenous, or (ref: fertility) binding, s_{NJ} is zero, and s_{CQ} positive. A little more can be said if we assume strong separability of the utility function.

Household decisions with separable utility

Let $U = f(C) + g(Q) + h(N)$, with $f(.)$, $g(.)$ and $h(.)$ increasing and strictly concave. Recall that the elements of the Slutsky matrix are the price derivatives of the compensated demand functions.

If fertility is endogenous, and (ref: fertility) not binding, we find

$$s_{CN} = \frac{(zg' + \lambda h' g'')f'}{H}, s_{CQ} = \frac{(zh' + \lambda g' h'')f'}{H}, s_{QN} = -\frac{z(f')^2}{H}, \qquad \#$$

where H is the bordered Hessian determinant associated with the minimization of $(cC + Z)$ subject to $f(C) + g(Q) + h(N) = U$, and λ the marginal cost of utility. Since H must be negative for second-order conditions, it is clear that s_{QN} is unambiguously positive, while s_{CN} and s_{CQ} can be positive, negative or zero. That is interesting because, as is well known, *all* the cross-effects would have be unambiguously positive if the minimand were linear in (C, N, Q). footnote

If fertility is exogenous, or (ref: fertility) binding, we get back the general result $s_{JN} = 0$, $s_{CQ} > 0$. Of course, with N constant, the minimand is linear in (C, Q).

Optimal fiscal treatment of families

Suppose that the preferences of the social planner can be represented by a Bergson-type welfare function, $W = W(U^1, ..., U^I)$, where U^i is the utility of the i-th household $(i = 1, .., I)$. By expressing welfare as a function of the utilities of existing members of society, we are implicitly saying that children count only because their parents care about them, and also that society does not question the intergenerational preferences of their parents. That is defensible, because it may be argued that children become members of society in their own right only when their parents decide to put them into the world. footnote

We assume that the policy maker is generally unable to design or implement personalised lump-sum transfers (but we shall examine a very special case where such transfers are feasible), and must thus make do with distortionary taxation. footnote Since the consumption of domestically produced goods is not observable, the government can only tax or subsidize fertility, labour supply and the demand for commodities. Assuming a linear schedule, we denote by t the excise tax on adult-specific commodities, by T the excise tax on child-specific commodities, by b the child benefit rate, and by P the poll-tax (all of which can be positive, negative or zero).Where households are concerned, the relevant prices are then $(p + t)$ for adult-specific commodities, and $(q + T)$ for child-specific commodities. Normalizing the tax on labour to zero, footnote the net cost of a child to household i is $[w(a_0 + a^i) + (q + T)(x_0 + x^i) - b]$.

The policy problem is to choose (t, T, b, P) to maximize

$$W = W(V^1, ..., V^I), \qquad \#$$

where V^i is the indirect utility function of household i, subject to the government budget constraint,

$$b\sum_i N^i = t\sum_i E^i + T\sum_i (x_0 + x^i)N^i + PI. \qquad \#$$

Assuming endogenous fertility, and supposing that (p, q, w^i, y^i) is unaffected by the choice of (t, T, b, P), the first-order conditions for a social optimum are

$$\sum_i \frac{\partial W}{\partial V^i}\frac{\partial V^i}{\partial t} = -\psi \sum_i \left[E^i + t\frac{\partial E^i}{\partial t} + T\left(\frac{\partial x^i}{\partial t}N^i + \frac{\partial N^i}{\partial t}(x_0 + x^i) \right) - b\frac{\partial N^i}{\partial t} \right],$$

$$\sum_i \frac{\partial W}{\partial V^i}\frac{\partial V^i}{\partial T} = -\psi \sum_i \left[t\frac{\partial E^i}{\partial T} + (x_0 + x^i)N^i + T\left(\frac{\partial x^i}{\partial T}N^i + \frac{\partial N^i}{\partial T}(x_0 + x^i) \right) - b\frac{\partial N^i}{\partial T} \right],$$

$$\sum_i \frac{\partial W}{\partial V^i}\frac{\partial V^i}{\partial b} = -\psi \sum_i \left[t\frac{\partial E^i}{\partial b} + T\left(\frac{\partial x^i}{\partial b}N^i + \frac{\partial N^i}{\partial b}(x_0 + x^i) \right) - b\frac{\partial N^i}{\partial b} - N^i \right],$$

$$\sum_i \frac{\partial W}{\partial V^i}\frac{\partial V^i}{\partial P} = -\psi \sum_i \left[t\frac{\partial E^i}{\partial P} + T\left(\frac{\partial x^i}{\partial P}N^i + \frac{\partial N^i}{\partial P}(x_0 + x^i) \right) - b\frac{\partial N^i}{\partial P} - I \right],$$

where ψ is the Lagrange-multiplier associated with the government budget constraint.

Using Roy's identities, denoting by β^i the social marginal utility of income accruing to household i, $\left(\frac{\partial W}{\partial V^i} \right)\left(\frac{\partial V^i}{\partial y^i} \right)$, and since $N^i = -\left(\frac{\partial V^i}{\partial z^i} \right) / \left(\frac{\partial V^i}{\partial y^i} \right) = \left(\frac{\partial V^i}{\partial b^i} \right) / \left(\frac{\partial V^i}{\partial y^i} \right)$, we can re-arrange terms to get

$$\sum_i \beta^i E^i = \psi \sum_i \Big(E^i + t\frac{\partial E^i}{\partial t} + T\frac{\partial x^i}{\partial t}N^i + R^i \frac{\partial N^i}{\partial t}) \Big),$$

$$\sum_i \beta^i (x_0 + x^i) N^i = \psi \sum_i \Big((x_0 + x^i)N^i + t\frac{\partial E^i}{\partial T} + T\frac{\partial x^i}{\partial T}N^i + R^i \frac{\partial N^i}{\partial T}) \Big),$$

$$\sum_i \beta^i N^i = -\psi \sum_i \Big(-N^i + t\frac{\partial E^i}{\partial b} + T\frac{\partial x^i}{\partial b}N^i + R^i \frac{\partial N^i}{\partial b} \Big),$$

$$\sum_i \beta^i = \psi \left[I + \sum_i \Big(t\frac{\partial E^i}{\partial P} + T\frac{\partial x^i}{\partial P}N^i + R^i \frac{\partial N^i}{\partial P} \Big) \right],$$

where $R^i \equiv [T(x_0 + x_i) - b]$ is the net tax revenue (positive or negative) that the government receives for each child in household i.

Define $v^i \equiv \frac{\beta^i}{\psi} + t\frac{\partial E^i}{\partial y^i} + T\frac{\partial x^i}{\partial y^i}N^i + [T(x_0 + x^i) - b]\frac{\partial N^i}{\partial y^i}$ as the net social marginal value, expressed in terms of government revenue, of income accruing to family i. Let $r_j \equiv \frac{1}{I}\left[\Sigma_i \Big(\frac{j^i}{\bar{j}} \Big) \Big(\frac{v^i}{\bar{v}} \Big) \right] \equiv \phi_j + 1$, where ϕ_j is the covariance, taken across households, between social weight and demand for j $(j = E, l, w, a, N)$. footnote Using (ref: slutE1) – (ref: slutx3), we can give the first-order conditions for a social optimum the familiar Ramsey form:

$$\frac{1}{I}\Sigma_i [t(c^i_p s^i_{CC} + C^i c^i_{pp}) + R^i s^i_{CN} c^i_p - TN^i z^i_q c^i_p s^i_{CQ}] = (\bar{v} r_E - 1)\bar{E}, \quad \#$$

$$\frac{1}{I}\Sigma_i (tc^i_p [N^i z^i_q s^i_{QC} + (x_0 + Q^i z^i_q) s^i_{NC}] + R^i [(x_0 + Q^i z^i_q) s^i_{NN} + N^i z^i_q s^i_{QN})]$$
$$+ TN^i \big(Q^i z^i_{qq} + z^i_q [N^i z^i_q s^i_{QQ} + (x_0 + Q^i z^i_q) s^i_{NQ}] \big)) = (\bar{v} r_X - 1)\bar{X} \quad \#$$

$$\frac{1}{I}\Sigma_i \big(tc^i_p s^i_{NC} + TN^i z^i_q s^i_{NQ} + R^i s^i_{NN} \big) = (\bar{v} r_N - 1)\bar{N} \quad \#$$

$$\bar{v} = 1, \quad \#$$

where $X^i \equiv (x_0 + x_i)N_i$ is the total amount of child-specific commodities purchased by household i, and the barred variables are means taken across households.

In view of (ref: ramseyP), the right-hand sides of (ref: ramseyt)- (ref: ramseyb) are proportional to the covariances of social weight with the demand for, respectively, adult-specific commodities (ϕ_E), child-specific commodities (ϕ_X) and number of children (ϕ_N). Clearly, the choice of policy instruments is influenced by the signs of these covariances. It is not obvious, however, what these signs should be. In the literature on indirect taxation, it is usually assumed that such covariances are negative, on the grounds that maximised utility and the consumption of any normal good move in the same direction. The same may be said, in our model, of E, but not necessarily of X or N. If households differ only for their value of y, ϕ_N and ϕ_X will be negative, because richer households have more children and spend more for them. In view of (ref: slutN), however, maximised utility and the number of children may move in opposite directions if households differ for the value of w because, in that case, richer households have fewer children, and spend more for each child, but not necessarily more for children in total. Were that the case, ϕ_N would be positive, while ϕ_X could be positive or negative depending on the relative size of the wage elasticities of N and x.

If fertility is endogenous, as we have assumed, signing the covariances is not enough to establish the signs of the policy instruments, because, in general, the cross-substitution effects on the left-hand sides of (ref: ramseyt)-(ref: ramseyb) can have any sign. More assumptions are needed to get any insight into the optimal tax structure.

If fertility is exogenous (or *all* households are held at the fertility ceiling), the s^i_{NJ} are identically zero. Since(ref: ramseyb) vanishes (child benefits are lump-sum transfers), b is calculated by substituting the optimal (t, T, P) determined by (ref: ramseyt), (ref: ramseyT) and (ref: ramseyP) into the government budget constraint. Using (ref: ramseyP), the conditions on t and T become

$$\frac{1}{I}\Sigma_i[t(c_p^i s_{CC}^i + C^i c_{pp}^i) - TN^i z_q^i c_p^i s_{CQ}^i] = \overline{E}\phi_E, \qquad \#$$

$$\frac{1}{I}\Sigma_i\left[tN^i c_p^i z_q^i s_{QC}^i + TN^i\left(Q^i z_{qq}^i + N^i (z_q^i)^2 s_{QQ}^i\right)\right] = \overline{X}\phi_X. \qquad \#$$

Suppose that the number of children is randomly distributed across households, footnote so that ϕ_X has the same sign as ϕ_x, negative since households with higher y or higher w tend to spend more for each child. If s_{QC}^i happens to be zero for all i, (ref: ramseytexog)-(ref: ramseyTexog) are satisfied choosing t positive, and T negative or "small". In other words, it may be optimal to tax adult-specific commodities, and subsidize child-specific commodities (or to tax them less than adult-specific commodities). If some of the s_{QC}^i are positive, however, (ref: ramseytexog)-(ref: ramseyTexog) are satisfied choosing T positive and "large", and t positive and "small". It may seem strange that napkins and baby food should be taxed more heavily than whisky and cigars when adult consumption is a substitute for child quality, but it has to be remembered that the net cost of a child depends on child benefits, and that b could be chosen large enough to make children a tax asset ($R^i < 0$).

Optimal taxation when utilities are separable

As we saw in sub-section 2.1, if the utility function is additively separable, s_{QN}^i is positive; s_{CQ}^i and s_{CN}^i are positive in the case where fertility is exogenous, can have any sign in the case where fertility is endogenous. Take the endogenous fertility case first.

Suppose that s_{CQ}^i and s_{CN}^i are zero at a social optimum. footnote Using (ref: ramseyP), (ref: ramseyt)-(ref: ramseyb) then simplify to

$$\frac{1}{I}\Sigma_i[t(c_p^i s_{CC}^i + C^i c_{pp}^i)] = \overline{E}\phi_E, \qquad \#$$

$$\frac{1}{I}\Sigma_i(R^i[(x_0 + Q^i z_q^i)s_{NN}^i + N^i z_q^i s_{QN}^i)] + \qquad \#$$

$$TN^i\left(Q^i z_{qq}^i + z_q^i[N^i z_q^i s_{QQ}^i + (x_0 + Q^i z_q^i)s_{NQ}^i]\right)) = \overline{X}\phi_X, \qquad \#$$

$$\frac{1}{I}\Sigma_i\left(TN^i z_q^i s_{NQ}^i + R^i s_{NN}^i\right) = \overline{N}\phi_N. \qquad \#$$

Since $[t(c_p^i s_{CC}^i + C^i c_{pp}^i)]$ and ϕ_E are negative, (ref: simp1) tells us that the tax on adult-specific commodities, t, must be chosen positive. Signing the tax on child-specific commodities, T, and the child benefit rate, b, is not so easy.

If households differ for the husband's income, ϕ_N and ϕ_X are negative. Then, (ref: simp3) can be satisfied choosing T and b negative, with b large enough in absolute terms to make $\Sigma_i R^i s_{NN}^i$ non-positive. In other words, it may be optimal to subsidize child-specific commodities, while at the same time taxing the number of children at a rate sufficiently high to make a child, "on average", a tax liability). The left-hand side of (ref: simp2) is the sum of two terms. One, $\frac{1}{I}\Sigma_i Q^i z_q^i\left(TN^i z_q^i s_{NQ}^i + R^i s_{NN}^i\right)$, is proportional to the left-hand side of (ref: simp3), and thus negative. The sign of the other term,

$$\frac{1}{I}\Sigma_i\left[R^i x_0 s_{NN}^i + TN^i(Q^i z_{qq}^i + N^i z_q^i s_{QQ}^i) + (R^i + Tx_0)N^i z_q^i s_{QN}^i\right],$$

is ambiguous whatever signs are assigned to T and b. Therefore, (ref: simp2) takes us no further than (ref: simp3).

If differences across households are due mainly to the mother's earning ability (w^i), ϕ_N is likely to be positive, because, in view of (ref: slutN), the poor are likely to have more children. Assuming that the wage elasticity of N is greater than that of x, ϕ_X also is positive. Then, (ref: simp3) can be satisfied by choosing T nonnegative, and b positive (or negative, but small enough in absolute terms to make children a tax asset "on average").

Therefore, if fertility is endogenous *and* it so happens that $s_{CQ}^i = s_{CN}^i = 0$ for all i, the tax system should tend to make children a tax liability ($R^i > 0$) if disparities across households reflect differences in the husband's wage rate, a tax asset ($R^i < 0$) if such disparities reflect differences in the wife's wage rate. The intuition is that, in the first case, the rich have more children and spend more for them, while in the second they have fewer children and spend less for them in total (although, per child, they typically spend more). But, of course, there is no *a priori* reason why the s^i_{CQ} or the s^i_{CN} should be zero.

If fertility is exogenous, the s^i_{CQ} and the s^i_{CN} are positive. As in the general case, T must then be positive, but smaller than t.

Some simulation results

In order to obtain analytical results for the case where fertility is endogenous, we had to assume that utility is separable, and that $s^i_{CQ} = s^i_{CN} = 0$ for all i. To see what happens when the second of these restrictions is not imposed, we simulate the model using the functional forms

$$U = \alpha \ln C + \beta \ln Q + \gamma \ln N,$$
$$C = E^{\varepsilon} l^{1-\varepsilon}, \qquad \#$$
$$Q = x^{\eta} a^{1-\eta}.$$

The utility function is thus additive, but the adult consumption good can be either a net substitute or a net complement for the quantity or quality of children, depending on parameter configuration.

To keep things simple, we assume that there are only two households or household types ($i = 1,2$), that the welfare function is Benthamite, footnote

$$W = V_1 + V_2, \qquad \#$$

and that households are differentiated by y and w only. We show the socially optimal choice of (t,T,b,P) for a number of parameter configurations $(y_i, w_i, \alpha, \beta, \gamma, \varepsilon, \eta)$ yielding real-valued, nonnegative demands $(E_i, l_i, x_i, a_i, N_i)$. This number is actually quite small. Table 1shows what happens when households differ for the husband's income only, or for the wife's wage rate only. The tax on adult-specific commodities is generally positive. In simulation (vii), however, it is negative. This may seem to contradict the analytical result that t must be positive, but that result is obtained assuming that $s^i_{CQ} = s^i_{CN} = 0$, for all i. Here, by contrast, that it is not true. Family size is usually taxed ($b < 0$), and children are usually a tax liability ($R_i > 0$). This is in apparent contradiction with the analytical result that children should be a tax asset when households are differenciated by the husband's income only. But, again, that result presupposes that $s^i_{CQ} = s^i_{CN} = 0$, for all i, while here they are not. Children are a tax asset only in the case (vi) where the income of one of the husbands is zero.With these parameter configurations, child-specific commodities are usually taxed ($T > 0$), and redistributions is achieved by the use of a poll subsidy ($P < 0$). In simulation (vii), family size is taxed and child specific commodities subsidised, but not enough to make children a tax asset. While quality of children is always a net substitute for quantity, as the theory predicts (see subsection 2.1), the adult consumption good is often, at the optimum, a net complement for child quality and quantity. Where it is a net substitute (simulation vi), adult-specific commodities are subsidised. footnote

Table 2 illustrates the role of the poll tax. Imposing $P = 0$, we find that the optimal sign pattern of policy instruments changes: we get two possible solutions, one (b.1) with taxes on commodities and a subsidy on family size, the other (b.2) with subsidies on adult-specific commodities and family size, and a tax on child specific commodities. Notice that in this last case the adult consumption good is a net substitute for quality and quantity of children, as in simulation (vi), where adult-specific commodities are subsidised too.

These simulations alert us to the dangers of relying on analytical results obtained under very restrictive conditions.

[B]

t	T	b	P	E_1,E_2	x_1,x_2	N_1,N_2	L_1,L_2	R_1,R_2	s^i_{QN}	s^i_{CQ}	s^i_{CN}
			(i) $w_1 = 2,\ w_2 = 1;\ y_1 = y_2 = .5, a_0 = .1, x_0 = .1$								
.12	.12	-.02	-.11	.47,.29	1.2,.77	.39,.38	.28,.17	.15,.12	+,+	-,-	-,-
			(ii) $w_1 = 2,\ w_2 = 5;\ y_1 = y_2 = .5,\ a_0 = .1, x_0 = .1$								
.26	.26	-.13	-.45	.47,.95	1.2,2.4	.39,.39	.21,.32	.65,.78	+,+	-,-	-,-
			(iii) $w_1 = w_2 = 2;\ y_1 = .5,\ y_2 = 1, a_0 = .1, x_0 = .1$								
.02	.02	-.02	-.03	.5,.6	1.3,1.3	.38,.46	.3,.2	.02,.02	+,+	-,-	-,-
			(vi) $w_1 = w_2 = 2, y_1 = .5, y_2 = 1.5, a_0 = .1, x_0 = .1$								
.07	.07	-.07	-.12	.49,.68	1.3,1.3	.38,.52	.29,.018	.07,.1	+,+	-,-	-,-
			(v) $w_1 = w_2 = 4;\ y_1 = 2,\ y_2 = 1, a_0 = .1,\ x_0 = .1$								
.02	.02	-.01	-.67	1.19,.994	.5,.5	2.37,1.98	.157,.296	.02,.02	+,+	-,-	-,-
			(vi) $w_1 = w_2 = 2, y_1 = 1, y_2 = 0, a_0 = .1, x_0 = .1$								
-.65	309	93.1	2.54	1.06,.74	.001,.001	5.0,3.3	0,0	-.45,-.3	+,+	+,+	+,+
			(vii) $w_1 = w_2 = 20;\ y_1 = 20,\ y_2 = 10,\ a_0 = .2,\ x_0 = 10$								
.01	-.05	-1.7	-.64	2.46,3.69	16.1,3.5	.32,1.14	55,.02	.15,.12	+,+	-,-	-,-
			(viii) $w_1 = 20, w_2 = 40;\ y_1 = 10,\ y_2 = 20, a_0 = .2,\ x_0 = 10$								
.24	24	-.86	-5.77	3.61,6.64	14,17.2	.52,.77	.23,.23	6.6,7.36	+,+	-,-	-,-

[caption]

[B]

t	T	b	P	E_1,E_2	x_1,x_2	N_1,N_2	L_1,L_2	R_1,R_2	s^i_{QN}	s^i_{CQ}	s^i_{CN}
					(a) P unresticted						
.139	.141	-.055	-.253	.35,.25	.0002,.17	2.9,1.4	.18,.47	.12,.12	+,+	-,-	-,+
					(b.1) $P = 0$						
.0004	.0008	.0004	-	.37,.31	.175,.17	2.1,1.8	.19,.33	-.001,-.001	+,+	-,-	-,-
					(b.2) $P = 0$						
-.166	727	218	-	.45,.37	.0004,.0004	1.5,1.2	.36,.47	0,0	+,+	+,+	+,+

Conclusion

We set out to examine the properties of an optimal system of (commodity and poll) taxes and (child) benefits, under the assumption that households can choose how many children to have. The Ramsey-like formulae we derived do not yield general prescriptions. Even if we specialise by assuming separability in the utility functions, we find that, depending on parameter configurations (including the joint distribution of male and female wage rates), it may be optimal to tax different groups of commodities at the same or at different rates, to tax or subsidise family size, or even to subsidise everything (commodities and family size) and rely on a poll tax to balance the government budget. That is a result of a kind: when fertility is endogenous, none of the familiar certainties survives. In the exogenous fertility case, if parents regard their own consumption as a substitute for the quality of children, it is optimal to tax adult-specific commodities at a higher rate than child-specific commodities.

Additional analytical results obtain if we assume that compensated changes in the marginal costs of the quantity and quality of children have no effect on the demand for adult consumption (that is only possible if fertility is endogenous, otherwise these cross-effects are unambiguously positive). If households differ *only* for the husband's wage rate, we find that child-specific commodities should be subsidised, but that the number of children should be taxed at a sufficiently high rate to make children a tax liability. By contrast, if households differ *only* for the wife's wage rate, child-specific commodities should be taxed, and the number of children subsidised at a sufficiently high rate to make children a tax asset.

Simulation experiments carried out without *a priori* restrictions on the signs of compensated cross-effects show that, when fertility is endogenous, imposing a tax on the number of children (negative child benefits) is more likely to be optimal than providing a subsidy (positive child benefits). Interestingly, when it is optimal to tax the number of children, it is sometimes optimal to subsidise child-specific commodities, but children are in most cases a tax liability nonetheless (matters could be different, of course, if children generated some positive externality, or if society assigned a positive welfare weight to children in their own right, independently of how much utility they give to their parents).

In conclusion, examining general taxation and family policies within a unified framework may radically change the policy prescriptions one might otherwise make. In particular, a tax on number of children, an aberration if policies towards the family are considered in isolation, becomes a real possibility if a fuller range of re-distributive considerations is brought into the picture, and commodity taxes can be used to distort prices in favour of children.

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