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Introduction

In industrialized countries, it is common for the public sector to provide private goods at heavily subsidized prices. Indeed many governments spend more money on provision of private goods than on public goods. In Sweden, public expenditures on health care, education, daycare, and care of elderly people constitute approximately 30% of GNP. It is interesting to notice that provision of each of these four categories of publicly provided private goods is closely related to labor supply and hence to government tax revenue. This connection is especially strong in the case of publicly provided day care services. A mother's[1] decision about whether to join the labor force depends critically on a comparison of her after tax earnings with the out-of-pocket cost of day care. As we will demonstrate, it can happen that public subsidies of day care will "pay for themselves" by inducing higher labor force participation of mothers who then pay taxes that are more than sufficient to pay for the cost of the subsidies. Similar considerations may arise in care of the sick and the elderly. As Blomquist (1982) points out, public expenditures on education also have a strong effect on earnings of the population and hence on tax revenue.

Our approach to the *political economy* of day care is to analyze the preferred level of day care subsidies for various specific interest groups in the economy. We examine the interests of purely selfish individuals without children in day care, purely selfish individuals with children in day care, and of people who have some willingness to pay for the well being of other people's children. Only a small minority of any country's population will have children in day care.[2] Therefore if day

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[1] For purposes of this discussion, parents who stay home with their children will be called "mothers", regardless of their sex.

[2] In Sweden, approximately 10% of all families have children in day care.

care subsidies are going to achieve widespread political support, some support must come from people with no children in day care. People without small children may support day care programs because they care about the well-being of other families, or because they anticipate having their own children in day care in the future. But even selfish individuals with no plans to send children to day care will favor day care subsidies if these subsidies result in *lower* tax rates. We also examine the working of day care subsidies in a multilayered federal system of government. We demonstrate that if income is taxed both by federal and by local governments and if day care is subsidized by local governments with subsidy levels chosen in local elections, they will support lower subsidy levels than they would if day care subsidies were paid for by the federal government and chosen by national elections.

This paper is intended to be a contribution to the theory of public provision of private goods as well as to the theory of optimal taxation. There exists a small literature on public provision of private goods, which includes interesting contributions by Blackorby and Donaldson (1988), Boadway and Marchand (1990), Besley (1991), Besley and Coate (1991), Ireland (1990) and Munro (1989, 1991). These studies present plausible arguments for the use of public provision of certain kinds of private goods to achieve income distributional goals. While there no doubt are voters whose concerns for the welfare of others leads them to support public provision of some private goods, we think that at least in the case of day care, broad political support for public subsidy is more likely to be based on the positive effect that day care subsidies have on labor force participation and hence on total tax revenue.

The observation that government subsidies to day care will influence labor supply is not new. Heckman (1974) wrote the pioneering article on day care and female labor supply. The *Journal of Human Resources* has a special issue on child care (vol. 27, number 1). This issue contains articles by Ribar (1992), Michalopoulos (1992) and Gustaffson and Stafford (1992), who study the relationship between child care and labor supply. The observation that tax-financed *public* goods might increase rather than decrease total labor supply was suggested and analyzed by Atkinson

and Stern (1974). As we will show, the interaction between tax rates, day care subsidies and labor supply is sufficiently complicated that an explicit formal model is needed to give one a confident grasp of the effects of this interaction. Using such a model, we have been able to find relatively simple expressions that describe preferred subsidy levels for different types of voters. These expressions depend on parameters that can be estimated empirically. Therefore we are able to make some plausible quantitative guesses about preferred levels of subsidies for specific types of taxpayers.

1. A Model of Day Care Subsidies and Labor Force Participation

Assume that day care is produced at a constant unit cost of b per child and that the government selects a subsidy rate of γ per child. Parents must pay the amount $b-\gamma$ to send the child to day care. Let wage income be taxed at a proportional rate τ. Assume that families have at most one child of day care age. Parents will send their child to day care only if the amount of money that the mother can earn, net of taxes and day care costs, exceeds some reservation value v. A mother who could earn y (before taxes) outside of the home will send her child to day care and take a job if and only if $y(1-\tau)-(b-\gamma)\geq v$. Potential earnings of mothers vary across the population, as described by a density function $f(y)$. Define $G(y)=\int_y^\infty f(\eta)d\eta$ to be the number of mothers who could earn at least y and let $H(y)=\int_y^\infty \eta f(\eta)d\eta$ be the total income of mothers who earn at least y. If the income tax rate is τ and the subsidy rate for day care is γ, then mothers will put their children in day care and join the labor force[3] if and only if they can earn $y>y(\tau,\gamma)$ where

$$y(\tau,\gamma)=\frac{v+b-\gamma}{1-\tau}. \tag{1}$$

If the tax rate on income is τ and the subsidy to a child in day care is γ, then the number of mothers who choose to work outside the home is $G(y(\tau,\gamma))$, and the total income of employed mothers is $H(y(\tau,\gamma))$. Total taxable income of non-mothers is assumed to be determined by the

[3] In this paper, we make the simplifying assumption that mothers either work full time or not at all.

tax rate according to a function, $E(\tau)$. Therefore total tax revenue, net of the cost of subsidizing day care, is given by the function:

$$R(\tau,\gamma) = \tau E(\tau) + \tau H(y(\tau,\gamma)) - \gamma G(y(\tau,\gamma)). \tag{2}$$

The Effect of Day Care Subsidies on Net Government Revenue

Suppose that the government must raise a fixed amount of revenue, $\bar{R}$, to meet its obligations other than the cost of day care subsidies. Then all admissible choices of tax rates τ and subsidy rates γ must satisfy $R(\tau,\gamma) = \bar{R}$. Assuming that over the relevant range, $R_\tau(\tau,\gamma) > 0$, there is a uniquely defined implicit function $\tau(\gamma,\bar{R})$ such that $R(\tau(\gamma,\bar{R}),\gamma) = \bar{R}$. The derivative of $\tau(\gamma,\bar{R})$ is seen to be:

$$\tau_\gamma(\gamma,\bar{R}) = \frac{-R_\gamma(\tau,\gamma)}{R_\tau(\tau,\gamma)}. \tag{3}$$

Differentiating Equation 2, one finds that:

$$R_\gamma(\tau,\gamma) = -G(y(\tau,\gamma)) - \gamma G'(y(\tau,\gamma))\frac{dy(\tau,\gamma)}{d\gamma} + \tau H'(y(\tau,\gamma))\frac{dy(\tau,\gamma)}{d\gamma}. \tag{4}$$

Equation 4 decomposes the effect of an increased day care subsidy into three parts. There is the direct cost, $-G(y(\tau,\gamma))$, of paying the increased subsidy to all families with children currently in day care, and there are two effects caused by the increased number of mothers who put their children in day care and go to work. These are the cost, $-\gamma G'(y(\tau,\gamma))dy(\tau,\gamma)/d\gamma$, of paying a subsidy to a larger number of families and the gain, $\tau H'(y(\tau,\gamma))dy(\tau,\gamma)/d\gamma$, in the government's net revenue as more mothers are induced to earn taxable income.

From Equation 1 it follows that $dy(\tau,\gamma)/d\gamma = -1/(1-\tau)$. Therefore, since for all y, $G'(y) = -f(y)$ and $H'(y) = -yf(y)$, Equation (4) is equivalent to:

$$R_\gamma(\tau,\gamma) = -G(y(\tau,\gamma)) + \frac{(\tau y(\tau,\gamma) - \gamma)f(y(\tau,\gamma))}{1-\tau} \tag{5}$$

2. Subsidies Preferred by Selfish Taxpayers without Children

Given the level of government spending on other activities, selfish taxpayers without children in day care will prefer the day care subsidy γ^* that minimizes the tax rate on income. Then it must be that $\tau_\gamma(\gamma^*,\bar{R}) = 0$. Let $\tau^* = \tau(\gamma^*,\bar{R})$ and $y^* = y(\tau^*,\gamma^*)$. Let us define $\alpha(y) = yf(y)/G(y)$ and $\alpha^* = \alpha(y^*)$. Then from Equation (5) it follows that

$$R_\gamma(\tau^*,\gamma^*) = G(y^*)\left[\frac{\alpha^*(\tau^*y^* - \gamma^*)}{(1-\tau^*)y^*} - 1\right] = 0 \tag{6}$$

Since $G(y^*)$ is positive, $R_\gamma(\tau^*,\gamma^*)$ will be of the same sign as the bracketed expression in Equation 6. Since $R_\tau(\tau^*,\gamma^*)$ is assumed to be positive, it follows from Equation 3 that an increase in the per child subsidy, γ, will increase or decrease the tax rate, $\tau(\gamma,\bar{R})$, depending on whether the bracketed expression is positive or negative. The first order necessary condition for γ^* to be the tax minimizing per child subsidy is therefore:

$$\frac{\alpha^*(\tau^*y^* - \gamma^*)}{(1-\tau^*)y^*} = 1 \tag{7}$$

From Equation (1) it follows that $y^* = (v + b - \gamma^*)/(1-\tau^*)$. Substituting this expression into Equation (7) and manipulating terms, we find that:

$$\gamma^* = \frac{\alpha^*\tau^* + \tau^* - 1}{\alpha^* + \tau^* - 1}(v+b). \tag{8}$$

It will also be convenient to define an optimal subsidy rate which expresses the optimal per child subsidy as a fraction of the total per child costs $b+v$ (including reservation values of staying at home as well as out-of-pocket costs.) Then $s^* = \gamma^*/(b+v)$ and $\gamma^* = s^*(b+v)$. From Equation (8), it is immediate that:

$$s^* = \frac{\alpha^*\tau^* + \tau^* - 1}{\alpha^* + \tau^* - 1}. \tag{9}$$

Numerical Illustrations for Sweden and the United States

In general, the optimal subsidy rate is defined only implicitly by Equation (9), since $\alpha^* = \alpha(y(\tau, \gamma^*))$ depends on γ^*. But if wages are assumed to vary according to the *Pareto distribution*, then $\alpha(y) = yf(y)/G(y)$ is a constant, independent of y. In this case, one sees from Equation 8 that s^* is determined by the tax rate τ and the parameter α^*. Thus there is a simple closed form solution for the subsidy rate s^* and the corresponding per child subsidy γ^*.

Colin Clark (1951) claimed that for industrial economies, the value of α is relatively constant, taking values between 1.9 and 2.1. For purposes of illustration, we assume that $\alpha = 2$. In Sweden, the proportional tax rate paid by working mothers is about .60.[4] Applying these parameter values to Equation 8, we have $s(\tau, \gamma) = 1/2$. Then, according to Equation 7, the subsidy per child would be $\gamma = (b + v)/2$. If the reservation value of staying at home is zero, this would suggest a subsidy rate of 50% of the cost of day care and if the reservation price is as large as the out-of-pocket cost per child, then the subsidy rate would be 100% of the out-of-pocket cost. The actual subsidy rate in Sweden is approximately 90% of this cost.

In the United States, the tax rate on wage income of those working mothers who do not receive any kind of welfare payments is approximately 40%. (For those receiving welfare payments, the marginal rate is often much higher, since the amount of welfare payments diminishes as wage income increases.) If we assume that $\alpha = 2$ and substitute $\tau = .4$ in Equation 8, we find that $s(\tau, \gamma) = 1/7$. Therefore if the reservation wage v were zero, the subsidy rate that minimizes the income tax rate for the U.S. would be only about 15 per cent, while if the reservation wage were equal to the cost of day care, this subsidy rate would be about 30 per cent.

Even if the aggregate income distributions are distributed according to a Pareto distribution with $\alpha = 2$, it might be that the distribution of *women's* wages does not have this property. It would be useful and interesting to study these distributions for several countries. We have conducted some preliminary investigation, using a sample of Swedish women. The data source

[4] This tax consists of a payroll tax of approximately 29% of gross pay, an income tax of 21% of income, and a value added tax on consumption of 12%.

is the Level of Living Survey, which is described by Blomquist and Hansson-Brusewitz (1990). We used the actual distribution of hourly wage rates for the subsample of working women who had no small children as an estimate of the distribution of earnings for women with small children if they worked full time. For this empirical distribution, $\alpha(y)$ is not constant as in the Pareto distribution, but is an increasing function of y. Assuming that the income tax rate τ is .62, we found a numerical solution for the net revenue maximizing day care subsidy and the corresponding labor force participation rates. The subsidy rate found was approximately 40% of $b + v$. This corresponds to a labor force participation rate of about 85% for Swedish women, which is very close to the actual participation rate. At the calculated threshold value of y^*, $\alpha(y^*)$ is about 1.1.[5]

These calculations are intended only to be illustrative. Definitive estimates of net revenue maximizing subsidies for day care will have to await much more careful empirical work. As Equation (8) shows, the subsidy rate s^* that maximizes net tax revenue from mothers depends on $\alpha(y*)$, which in turn depends on shape of the income distribution function. When τ is high, the net revenue maximizing subsidy rate, s^*, is monotone increasing in α and changes only slightly over the relevant range of possible values of α. On the other hand, for smaller tax rates, the value of s^* is quite sensitive to the value of α and hence depends in an important way on the shape of the income distribution. These facts are illustrated by Figure 1, in which Equation (9) is used to plot the net revenue-maximizing subsidy rate s^* as a function of α as α ranges from .5 to 8.

3. Neutral Subsidies and Tax-deductability of Day Care Costs

Suppose that the subsidy per child is $\gamma = \tau(v + b)$. Then a mother will put her children in day care if and only if $(1 - \tau)y \geq v + b - \tau(v + b)$ or equivalently if $y \geq v + b$. This is exactly the condition that would obtain in the absence of income taxes and day care subsidies. Thus, taxes and subsidies will be ''neutral'' with respect to the labor supply of mothers if $\gamma = \tau(v + b)$.

Since $y(\tau, \tau(v + b)) = v + b$, it follows from Equation (4) that if $\gamma = \tau(v + b)$, then $R_\gamma(\tau, \gamma) = -G(y^*) < 0$ and hence net tax revenue from parents of children in day care could

[5] Calculation shows that these numbers are consistent with Equation 9.

be increased by a reduction in the subsidy rate. Therefore selfish voters without children in day care would never favor subsidies to day care that are large enough to neutralize the full effect of income taxes.

Suppose that working mothers are allowed to deduct their out-of-pocket day care expenses from their taxable incomes, but there is no further subsidy. In our model, this is equivalent to a subsidy of $\gamma = \tau b$ per child. If the reservation value v is zero, then by the argument of the previous paragraph, labor force participation would be the same as if there were no tax on income and no subsidies to day care. If the reservation value v of staying at home is positive, then tax-deductability of market payments b for day care is not sufficient to induce as large a female labor force as there would be if there were no income tax and no subsidy. If a woman stays at home, she not only saves the cost of day care, but enjoys a nontaxable benefit worth v from whatever it is that she does when she stays home.

4. Subsidies Preferred by Other Types of Voters

Subsidies Preferred by Selfish Parents of Children in Day Care

Selfish persons, whether or not they have children in day care, will agree that the per child subsidy γ should not be smaller than the subsidy γ^* that minimizes the tax rate on income. As recipients of the subsidy, parents can be expected to favor a subsidy of more than γ^* per child. Selfish parents of children in day care will favor the subsidy that minimizes their payments to the government, net of subsidies. If the tax rate on income is τ, a parent's net payments to the government are $\tau(\gamma, \bar{R})y - \gamma$. Therefore a selfish parent favors an increase in γ, if and only if $y\tau_\gamma(\gamma, \bar{R}) - 1$ is negative. Since $\tau_\gamma(\gamma^*, \bar{R}) = 0$, it follows selfish parents would prefer a subsidy γ that exceeds γ^*. For a selfish parent with income y, the preferred tax rate γ satisfies the equation $\tau_\gamma(\gamma, R) = 1/y$. Selfish parents with higher incomes, although preferring higher subsidies than persons without children would favor lower subsidies than selfish parents with lower incomes.

Subsidy Programs Preferred by Persons who Care About the Welfare of Other People's Children

Some political support for day care subsidies may come from consumers who favor subsidies because they are interested in the welfare of other people's children. For these individuals, we must compare day care subsidies with alternative instruments such as child support payments paid to children whether or not they are in day care. If income redistribution is targeted toward helping the least fortunate families, then an increase in day care subsidies will not reach those families in which the mother's wage is not high enough to make it worth her while to put her children in day care. Furthermore, day care subsidies will not help families with older children who are not in day care. On the other hand, a case for day care subsidies as a method of income distribution can be made on the basis that at least for low levels of day care subsidy, subsidization of day care is relatively "cheap" compared to child support payments, because it has the side effect of inducing greater labor force participation by mothers.

Suppose that the government offers child support payments as well as day care subsidies. Let parents of each of the N children in the community receive child support payments of κ per child. The government's net revenue after paying for day care subsidies and child support payments is

$$R(\tau, \gamma, \kappa) = \tau E(\tau) + \tau H(y(\tau, \gamma)) - \gamma G(y(\tau, \gamma)) - \kappa N. \tag{10}$$

Recall that $\tau_\gamma(\gamma^*, \bar{R}) = 0$. Therefore if the current subsidy per child is γ^*, then the marginal cost to taxpayers of an increase in this subsidy is zero. Therefore every person who has a positive interest in the welfare of families with children in day care will favor some increase in the per child subsidy γ. In contrast, if we totally differentiate Equation (10), we find that the derivative of the income tax rate with respect to the child support payment κ is $-R_\kappa(\tau, \gamma, \kappa)/R_\tau(\tau, \gamma, \kappa) = N/R_\tau(\tau, \gamma, \kappa)$, which is strictly positive. Therefore consumers who place positive but relatively small valuations on the income of poor mothers may oppose any positive amount of child support payments.

If day care subsidies were set as high as the level $\gamma = \tau(b + v)$ that neutralizes the effects of taxes on labor supply, then it is likely that persons who care about the welfare of poor people will prefer an increase in child support payments to an increase in the day care subsidy. In this case, $R_\gamma(\tau,\gamma,\kappa) = -G(y^*)$ and $R_\kappa(\tau,\gamma,\kappa) = -N$. The effect of day care subsidies on tax revenue due to changes in labor force participation are exactly offset by the extra costs from enrolling the children of the new workers in day care. Therefore the cost of increasing day care subsidies by one unit is exactly the number of families who receive that subsidy. The cost of increasing child support payments by one unit is the number of families with children. The marginal choice faced in transferring funds between day care and child payment subsidies is then simply that if per child day care subsidies are reduced by Δ for each of the $G(y^*)$ families who receive day care subsidies, then child support payments can be increased by $\Delta G(y^*)/N$ for each of the N families who have children. If families whose children are not in day care tend to be poorer than those whose children are in day care, then the net effect of this transfer is to equalize income. In this case, any taxpayer will favor such a change if her preferences over income distributions are described by a utility function with diminishing marginal utility to the income of others.

If γ lies in between these two benchmark cases, the answer to whether a voter will favor a reduction in day care subsidy to increase child support payments depends on how strongly she is concerned about equality of income. Of course, if people prefer to get the children of low wage mothers out of the care of these mothers and into day care centers in order to give them a richer environment, then there are additional reasons to favor subsidized day care that have not been accounted for in this discussion.

5. Extensions of the Basic Model

Families With More Than One Child In Day Care

The analysis extends in a straightforward way to the case where some families have more than one child of day care age. Suppose that the government can make the subsidy rate per child dependent on the number of children in a family. Let the cost of day care be b per child, and suppose that a mother of n children receives a subsidy of γ_n per child in day care. Let v_n be the money value of staying at home with her children for a mother of n small children. A mother will

choose to put her children in day care and go to work if $(1-\tau)y > n(b-\gamma_n) + v_n$.

Net revenue from mothers who have exactly n children of day care age will be $\tau H_n(y_n^*) - \gamma_n G_n(y_n^*)$, where $y^* = (n(b-\gamma_n)+v_n)/(1-\tau)$ and $H_n(y^*)$ and $G_n(y^*)$ are respectively total earnings and total number of mothers of n children who earn more than y^*. If potential earnings of mothers of n children are Pareto distributed, with parameter α_n, we can calculate the subsidy rate per child that maximizes net tax revenue from families with n children of day care age. This amount turns out to be

$$\gamma_n^* = \frac{\alpha_n\tau + \tau - 1}{\alpha_n + \tau - 1}(b + (v_n/n)). \tag{11}$$

If $v_n = v$ and $\alpha_n = \alpha$ are constant as n varies, then according to Equation 12, an employed mother with n children in day care will receive a total subsidy $\gamma_n n$ that is a constant plus fixed amount per child. If $v_n = 0$ for all n, there would be a constant subsidy of γ per child, regardless of the size of family. This may seem surprising, since a mother who has many children of day care age will impose larger costs on the day care system than a mother who has only one child. But so long as $\gamma < b$, it will also be true that the more children a mother has, the greater her income will have to be before she chooses to enter the labor force. Given this effect, it works out that a fixed subsidy per child for families of all sizes provides optimal incentives from the point of view of taxpayers without children.

Variations in the Value of Staying at Home

A useful contribution to realism would be to allow the possibility that the reservation value v of staying at home varies over the population. Then the critical wage income above which women will choose to participate in the labor force should be written as a function of v as well as of τ and γ. Thus we have:

$$y(\tau,\gamma,v) = \frac{v+b-\gamma}{1-\tau}. \tag{1'}$$

Let us assume that v is distributed independently of wages and has a density function $\eta(v)$. Then Equation (2) which determines the government's net revenue must be replaced by an expression that integrates net revenue over individuals of all possible reservation values. This expression is:

$$R(\tau,\gamma) = \tau E(\tau) + \int_v \tau H(y(\tau,\gamma,v))\eta(v)dv - \int_v \gamma G(y(\tau,\gamma,v))\eta(v)dv. \qquad (2')$$

We have not succeeded in finding a simple and general analytical characterization of the net revenue maximizing subsidy when v is variable.[6]

Lacking a general characterization of the effect of variable reservation prices, we have done numerical calculations for a hypothetical population in which income is distributed according to the Pareto distribution and the reservation values are distributed according to an independent normal distribution. (Details of the procedure used are found in the Appendix.) The results of these calculations suggest that mean preserving spreads in the distribution of v are likely to have only a small effect on the optimal subsidy rate.

We calculated the net revenue maximizing subsidy rate for a population in which it is assumed that wage income is distributed according to the Pareto distribution with parameter $\alpha = 2$ and the tax rate on wage income is $\tau = .60$. We assumed that the money cost of a year of day care is $b = 80,000$ Swedish crowns and that the population average reservation value of staying at home is $\bar{v} = 40,000$ Swedish crowns per year. Then if everyone has $v = \bar{v}$, the net revenue maximizing subsidy per child is $\gamma^* = .5(b+\bar{v})$. If v is normally distributed with mean $\bar{v}$ and with a standard deviation of 10,000 Swedish crowns, then $\gamma^* = .48(b+\bar{v})$, and if v is normally distributed with mean $\bar{v}$ and a standard deviation of 20,000 Swedish crowns, then $\gamma^* = .41(b+\bar{v})$.

6. Multiple layers of government

In some countries, day care subsidies are set by local governments and paid for out of local tax revenue. Both local government and federal government expenditures are paid for with an income tax. In a federal system with several local governments, voters in local elections will favor day care subsidies if the extra tax revenue generated by more mothers working increases tax revenue

[6] We are able to show that if the income distribution is Pareto and if the range of v is such that for every possible v some women do not choose to work, then the net revenue maximizing subsidy is made lower by a mean preserving spread of the distribution of v. A proof is available from the authors on request.

of the municipality by more than the cost of the subsidy. But they will not take account of the effect of the local tax policy on federal tax revenue, since the benefits from the extra federal tax revenue are dispersed to a large number of people who are not voters in the municipality. Municipalities are caught in a "prisoners' dilemma situation", where, although all voters would benefit if municipalities universally adopted higher subsidies, voters in each municipality will find it in their own interest to "free-ride" by selecting local subsidies which optimize local net revenue rather than net revenue for federal plus local government.

The qualitative result that local choice of subsidies will lead to subsidies that are "too small" is not hard to see, even without an explicit solution for the preferred γ. But it is useful to develop an explicit expression so that we can make a crude estimate of the quantitative effect. Let τ_k be the income tax rate assessed on its citizens by a single municipality, let τ_s be the income tax rate set by the federal government, and let $\tau = \tau_k + \tau_s$. Then net revenue of community k is given by the following expression:

$$R^k(\tau_k,\tau_s,\gamma) = \tau_k(E_k(\tau_k+\tau_s) + H_k(y^*)) - \gamma G_k(y^*), \qquad (12)$$

where the functions $E_k(\cdot)$, $H_k(\cdot)$, and $G_k(\cdot)$ correspond to the earlier defined $E(\cdot)$, $H(\cdot)$, and $G(\cdot)$, except that they apply just to the population of community k and where $y^* = (b+v-\gamma)/(1-\tau)$. If we assume that the distribution of mothers' potential wages is a Pareto distribution with parameter, α, then with a bit of calculation, we find that $R^k_\gamma(\tau_k,\tau_s,\gamma) = 0$ if

$$\gamma = \frac{\alpha\tau + \tau - 1 - \alpha\tau_s}{\alpha + \tau - 1 - \alpha\tau_s}(b+v). \qquad (13)$$

Where municipalities are small relative to the federal government, this is the largest γ that will be supported in municipal elections by selfish voters without children in day care. If the distribution of mothers' potential wages in a community is a Pareto distribution with the same parameter α as the country at large, then comparing Equation 11 to Equation 7, we see that the largest subsidy level that will be supported by selfish voters in municipal elections is smaller than what they would support in federal elections for a centrally chosen subsidy rate. For example, suppose that $\tau_s = \tau_k = 1/4$ and $\alpha = 2$. Then voters in a federal election would favor $\gamma = (b+v)/3$. But voters in a municipal election would prefer $\gamma = 0$ to any positive subsidy.[7] If $\tau_s = .35$, $\tau_k = .30$, and $\alpha = 2$, then in a federal election, selfish voters without children in day care would choose $\gamma = .58(b+v)$, while in a local election, the same voters would choose $\gamma = .25(b+v)$.

It is interesting to notice that if the federal government were to "support" day care subsidies by giving lump sum grants to local governments and if the subsidy levels offered by local governments are determined locally, then the net effect of the government grants is likely to *reduce* rather than increase local subsidies. The reason is that the net effect of the federal subsidy will be to increase τ_s, and decrease τ_k, while leaving $\tau = \tau_s + \tau_k$ roughly constant. We see from Equation 11 that an increase in τ_s with τ held constant results in a reduction in voters' preferred subsidy level, γ.

Conclusion

In a simple model of day care enrollment and labor force participation, we have shown that in countries like Sweden where female labor income is taxed at about 60%, the government's tax revenue, net of day care subsidies, is likely to be maximized with subsidies covering more than half of day care costs. In contrast, in countries where the marginal tax rate on wages is about 40%, the subsidy rate that maximizes net government revenue is likely to be between 15% and 30%.

We also studied the workings of day care subsidies in a federal system. If both federal and local governments collect income taxes and if day care subsidies are set locally, then the subsidy rates chosen by selfish voters in local elections would be lower than the rates they would choose for federal subsidies. In this model all voters are better off if day care subsidy rates are set by the federal government, with voters simultaneously deciding the rate for the entire federation.

[7] In fact, it would be in the interest of the local authority to tax rather than subsidize day care.

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Appendix

Fortran Pseudocode for Calculating s^* with Variable v.

First we set up random variables for the population. Let PAR(ALFA) be a routine that selects random variables from a Pareto distribution and let NORM(μ,σ) be a routine that selects random variables from a normal distribution with mean μ and standard deviation σ.

```
      DO 100 I=1,N
  100 Y(I)=PAR(ALFA)
      DO 200 J=1,K
  200 V(J)=NORM(E(V),SIGMA2)
```

The core of the algorithm is the following subroutine which calculates net revenue for given values of the parameters.

```
      SUBROUTINE REV(Y,V,TAU,GAMMA,R)
      R=0.0
      DO 100 I=1,N
      DO 100 J=1,K
      IF(Y(I)*(1-TAU*Y(I)>(B-GAMMA+V(J)) THEN
      R= R+ TAU*Y(I)-GAMMA
      END IF
  100 CONTINUE
      RETURN
```

The main program is as follows:

```
      PERC=-.01
      MAXR= 0.0
      DO 400 K=1,100
      PERC=PERC+.01
      GAMMA=PERC*(B+E(V))
      CALL REV(Y,V,TAU,GAMMA,R)
      IF(R> MAXR) THEN
      MAXR=R
      S=PERC
      END IF
  400 CONTINUE
      WRITE S
      STOP
```


Figure 1--Optimal Subsidy Rate and α