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**DAYCARE SUBSIDIES AND LABOR
SUPPLY IN SWEDEN**

by

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DAYCARE SUBSIDIES AND LABOR SUPPLY IN SWEDEN

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DAYCARE SUBSIDIES AND LABOR SUPPLY IN SWEDEN

Abstract: This paper utilizes data from a Swedish household survey for 1984 (The HUS data) in combination with data on public daycare fees and spaces per child by community. We argue that the subsidy rate and availability of spaces determined by the political leaders of the community is to a large extent exogenous to the household. The joint out-of-home childcare and labor supply decision is analyzed by logit choice models. We find that the high quality public daycare in Sweden encourages labor market activity of women with preschoolers even when spouse's income is high and that when spaces are not rationed a lower price encourages use.

NON TECHNICAL SUMMARY

A subsidy to child care should encourage labor market participation. In this paper we utilize data on Swedish households collected in a national survey for 1984 in combination with data on public day care fees and spaces available for each of the 285 communities collected by the Swedish Association of Local Authorities and Statistics Sweden respectively. We argue that to a large extent the subsidy rate is exogenous to the household. Two identical families may be in communities which have different daycare policies. These differences will influence the costs and benefits for a mother of a young child of working in the labor market.

In the first section of our paper we develop a model of the household choice of labor supply and childcare as a function of variations in the price and quality of childcare. The model identifies reasons to expect childcare subsidies and quality improvements to lead to increased use of out-of-home childcare and market work. While high quality out-of-home care may lead to a smaller production of child well-being in the home it need not lead to reduced total child well-being.

After having considered household choices we analyze policy choices and local child care markets. There are wide variations among the 285 communities in availability of subsidized childcare and the size of the subsidy. To illustrate, in 1984 for a family with a middle income the parental fee for one preschooler in Stockholm was 685 Skr whereas in the nearby university city of Uppsala it was 1240 Skr. Moreover, there was substantial rationing of spaces for preschoolers in Uppsala. In our empirical work we pay close attention to the number of public

spaces per preschooler in the different communities since only when rationing is not significant will additional reductions in the parental fees increase the number of mothers who choose the joint option of out-of-home childcare and market work.

The first part of the empirical analysis investigates the variation in childcare costs and number of spaces across communities and over time. The number of spaces was about 15 percent of children 0-6 in 1975, and in 1986 it was 45 percent. The percent of the total costs which is paid by the family has varied between 12 and 8 percent and has recently stabilized at 10 percent. The remainder is covered by community taxes and central government (state) childcare subsidies, which over time has varied between 38 and 50 percent of total costs. In 1987 the costs were partitioned as 10 percent parental fee, 43 percent community fee and 47percent central government. A regression analysis of spaces per 100 children by community on community characteristics reveals that the number of spaces increases in more densely populated type of communities and is greatest in Stockholm and Malmö.

Availability of spaces is only somewhat greater in communities controlled by Social Democrats than in communities with another political majority in spite of the fact that the Social Democratic party is most in favor of promoting childcare for all children. We believe that this is explained by the median voter model which predicts that competing parties must offer daycare as well if these programs are preferred by the median voter and that the goal of the Social Democrats of a space for all children is not supported by the median voter in most communities. Factors which have a stronger influence on the availability of childcare is the proportion female among elected community of officials and tax revenue per inhabitant.

The empirical analysis of household choice employs logit choice models. The dependent variable is whether the mother works substantially and uses of public childcare. We observe a large effect of spaces per capita on the probability of substantial market work combined with use of public childcare. This is consistent with our model. Moreover, when the price of childcare paid by the parents is interacted with a variable for the absence of rationing, we see that a lower public price increases significantly the probability of working in the market and use of public daycare.

INTRODUCTION

Widespread interest in women's employment and the well-being of children in industrialized societies has led to policy proposals for some form of subsidies for out-of-home childcare for preschool children. In the United States, for example, there has been rapid growth of single-parent families, particularly among low income teenagers. Research based on the Panel Study of Income Dynamics shows that in the United States the completed schooling and early career attainment appear to be significantly lower for children raised in single-parent families (Duncan and Rodgers, 1987). It is possible that better child care would reduce this adverse effect directly by training the child and indirectly by allowing the single parent (typically female) to earn more by working more hours and realizing greater income growth from a job with greater skill acquisition.¹

For middle income families a subsidy to childcare could encourage labor market participation. A rationale for such a policy is the education benefits to the children which the parents may not purchase on their own. As well, the offset to the subsidy from current and future tax revenues could be substantial, particularly if there is employee financed investment in general on-the-job training. Without a subsidy the training (and work) may not occur because future earnings usually cannot be the basis for current borrowing. The Swedish daycare

¹ Research indicates a significant role for family income on the school performance and educational attainment of children (Hill and Duncan (1986) and Stafford (1987)).

system reduces the price of high quality out-of-home daycare. The program is not limited to low income families and is in fact more extensively used by more educated women.

In this paper we utilize data on Swedish households collected in a national survey for 1984 (Klevmarken and Olovsson, 1986) in combination with data on public daycare fees from a circular published by the Svenska kommunförbundet and other information from the National Central Bureau of Statistics on spaces per preschooler to examine some of the issues relating to childcare. Specifically, we consider the effect of subsidized childcare on the joint decision to use such care and to participate in the labor market. We find that the high quality public daycare in Sweden encourages labor market activity of women with preschoolers even when the spouse's income is high, and that when spaces are not rationed a lower price is very important in encouraging use.

Public daycare in Sweden is very expensive per child, over 60,000 Swedish crowns (Skr) per year in 1987 or about twice the cost of early gradeschool (Svenska Kommunförbundet, 1988). There are several attractive features of the Swedish system from the perspective of research on the topic. First, because the system has been in place since the mid-1960's, responses should represent long-run adjustment. Second, the system is specifically designed to accommodate market work by the parent: centers provide a hot lunch for the children, are open until 6:00 P.M., and in some communities with manufacturing facilities such as Hofors, Kiruna and Göteborg the schedules have been very recently extended to cover evening work by the parents (Landsorganisationen, 1988). Third, The standards for such

centers apply nationally, so that the common problem of unmeasured quality differences in the service markets is of less concern (Newhouse and Phelps, 1976). Fourth, there are substantial variations in the price facing households of similar income potential and number of children because the structure of the subsidy and number of spaces is set by the local government of 285 separate communities.

The initial empirical part of our paper is in fact devoted to analyzing the political and other variables which are important in determining the level and form of the childcare subsidy in the communities. We find that the party which has won control of the local government has a small but statistically significant influence on availability of spaces relative to the population of preschoolers and that tax revenue per inhabitant also increases the number of spaces. We argue that to a large extent the subsidy rate is exogenous to the individual household. Two identical families may be in communities which have different daycare policies, and this will influence their childcare and labor supply choice set. From these variations we intend to learn how the public policy variables influence the joint out-of-home childcare and labor supply decision.

Our paper is organized as follows: in the first section we begin by developing a model of the household choice of labor supply and childcare as a function of variations in the price and quality of childcare. The first section concludes with a discussion of public finance-voting issues arising with community choice of such public services. The second section begins with an empirical analysis of the childcare system characteristics of the 285 communities as a function of region, city characteristics, political majority, percent female of the leading policymakers and tax revenue per inhabitant. We then turn

to an analysis of the response of households to the childcare options available in the communities. The third section offers an illustration of the predictions of the empirical model, a conclusion, and remarks on the limitations of the analysis.

I. Conceptual Framework

A. Household Choices

We begin by analyzing household choices with a simple per hour subsidy for child care of different quality levels. In the next section we turn to the issue of the factors which determine the size of the subsidy, rationing of spaces, and the need to analyze separately households which are or are not rationed. Consider a framework based on a synthesis of the Gronau model of household production and the Willis model of fertility (Gustafsson and Willis, 1986). The utility function for the decision-maker (for simplicity assumed to be the woman) is:

$$(1) \quad U=U(C,S)$$

where C is total child well-being for a number of children, which we will treat as given, and S is a composite of all other goods or standard of living. Production of C and S is given by:

$$(2) \quad C=f(t_c, X_c)$$

$$(3) \quad S=g(t_s, X_s).$$

Total time available, T , can be divided between market work, t_m , childcare time, t_c , other goods time, t_s , and home goods time, t_h :

$$(4) \quad T = t_m + t_c + t_s + t_h.$$

Income can be spent on c-goods, x_c , or s-goods, x_s :

$$(5) \quad A + t_m(w - z) = p_1 x_c + p_2 x_s,$$

where A is non-labor income, w is the wage rate after taxes, z is hourly child care costs, and p_1 and p_2 are the prices of c-goods and s-goods, respectively. The assumption here is that an hour of market time requires an hour of out-of-home (or at least non-parental) childcare.

A model with a fixed link between market work and childcare makes sense for at least two reasons. First, as has been argued in several recent papers (Connelly, 1987; Leibowitz, Waite and Witzberger, 1987), there is a virtual requirement that market work be matched with a child care arrangement for young children, and in Sweden use of publicly subsidized daycare also implies the converse: eligibility for community daycare requires market work or full-time study by the mother.

Home produced intermediate goods are a decreasing function of home goods time:

$$(6) \quad x_h = h(t_h),$$

and can be used as input to the production of C and S just as can market purchased goods. Thus, $X_C = x_C + (1 - r) x_h$ and $X_S = x_S + r x_h$, where r is the share of home produced goods going to the composite, other goods.

We can modify (2) by postulating that, unlike our initial model where out-of-home childcare is merely custodial, there is some child well-being payoff to these required hours. Specifically, (2) is modified to be:

$$(7) \quad C = f(t_C, X_C) + m(t_m),$$

where $m(t_m)$ is the added payoff to out-of-home childcare in terms of child well-being, C. Improved out-of-home childcare can be represented by a change to a new $m(\cdot)$ function which dominates the original. Under these conditions we can note that the first-order conditions include:

$$(8) \quad (w - z) L_S + m' \partial U / \partial C = \partial U / \partial C \partial C / \partial t_C,$$

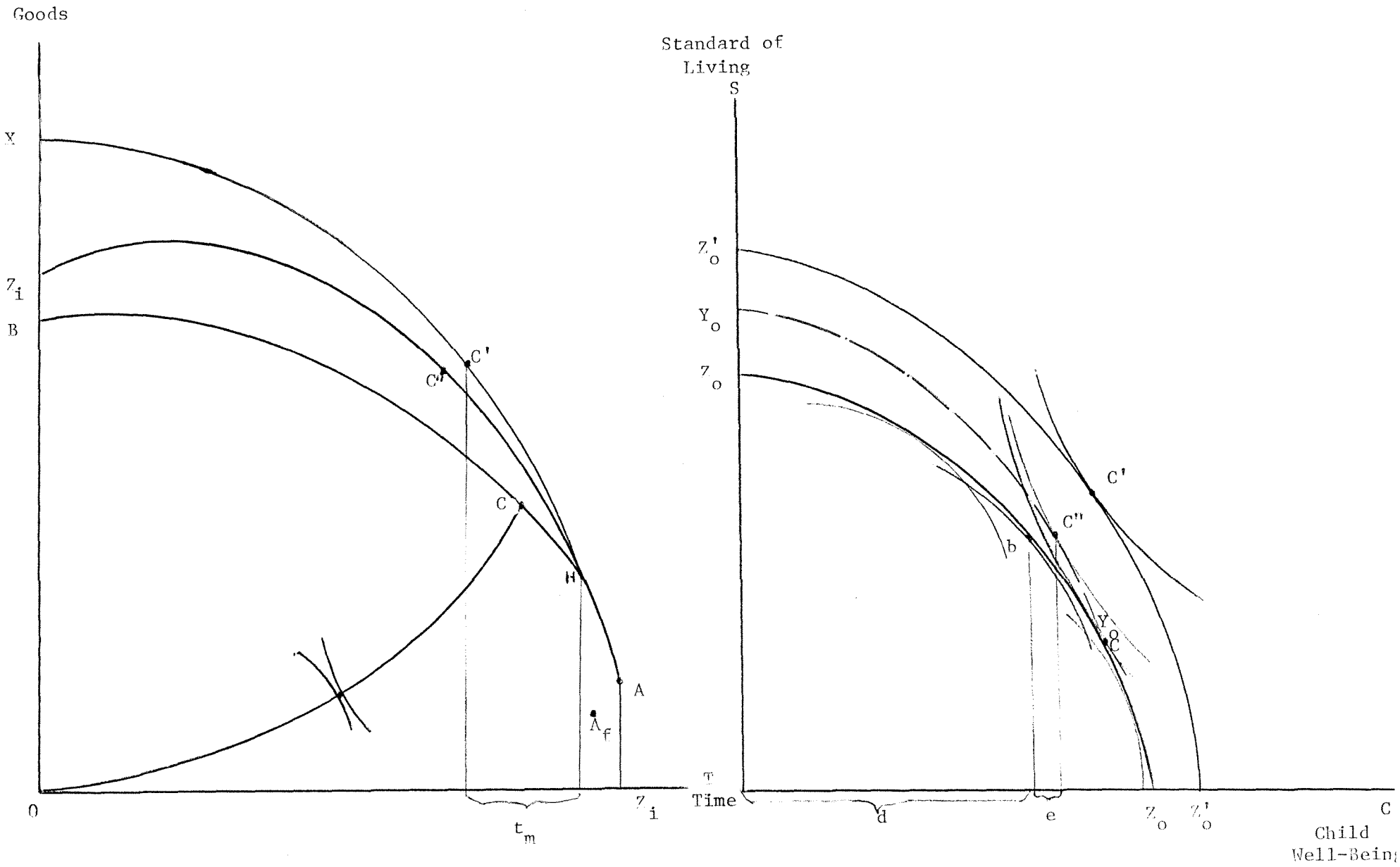
which implies that market time be set so that the joint marginal payoff to market work, the hourly wage net of childcare costs times the marginal utility of money income (L_S) plus the added childcare benefit (m' times $\partial U / \partial C$), equal the marginal payoff from home child time.

The model can be represented as in Figure 1. The input possibility set for a woman with $Z_i A$ of non-labor income is $Z_i A H Z_i$ in Figure 1A. The function for home goods is $A H B$. In Sweden taxes on earnings of a spouse are independent of the other's income ($Z_i A$) (Gustafsson, 1988), are first negligible,

then rapidly become progressive and then become proportional (Blomquist, 1983). On the assumption that there are both fixed money and time costs of childcare (Killingsworth, 1983, p.24-25) there would be a discontinuity such as A_f . The downward curvature to the leftward portion of Z_iAHZ_i reflects the fact that childcare is not tax deductible, and therefore marginal after tax wages could easily be exceeded by the marginal hourly cost of unsubsidized childcare. The line Z_iAX represents the opportunity set for another person facing a proportionately lower tax rate or a lower hourly cost of childcare.

Given the time intensity of childcare, the after tax and childcare cost wage, and preferences, the point chosen is point c in output space. This corresponds to no market work and out-of-home childcare on Z_0Z_0 and to point c in input space. For a given point on the input possibility frontier, there is a division of goods and time for the production of S and C , and efficient points in input space are on a contract curve such as $0c$.

Childcare subsidies are actually for discrete blocks of childcare time (20 or 35 hours per week, say). For the moment let us ignore this or assume that the person would happen to select just the specified number of hours with an equally generous per hour subsidy. Suppose an hourly childcare subsidy were large enough to alter the opportunity set to $Z_0'Z_0'$. This could induce market work, t_m , as at point c' in input space (corresponding to c' in output space), and could lead to more or less child well-being, depending on specifics of preferences and technology. Alternatively, an increase in out-of-home childcare quality to move it from the assumed custodial care in (2) to that assumed in (7) can be represented by a partial rotation on the Z_0Z_0 frontier



CHILDCARE AND STANDARD OF LIVING
EFFECTS OF CHILDCARE SUBSIDY AND QUALITY OF CHILDCARE

Figure 1A
INPUT

Figure 1B
OUTPUT

as indicated by the dashed segment Y_0Y_0 . Here the improved quality of out-of-home childcare leads to market work (point c'') and more or less child well-being, depending on the specifics of preferences and technology.

Either childcare subsidies or quality improvements beyond custodial care could have a substantial effect on hours of work in the market by drawing in those who would otherwise be non-participants; additional subsidies can lead to fewer hours of work just as a higher wage can induce fewer hours for those already working; and the net cost of such a system could be small. Taxes paid could be larger than the childcare subsidy received. Over some range childcare subsidies could be regarded as a mechanism for effecting "tax discrimination" in which a lower rate is offered to a group with an elastic labor supply. In Sweden where users currently pay for only about one-tenth the public childcare costs (Table 1, below), the government costs net of tax revenues are presumably positive in the short run but might be recovered by the incremental tax revenues arising from the higher lifetime income afforded by earnings growth from full time market work. To summarize, there are reasons to expect childcare subsidies and quality improvements to lead to increased use of out-of-home childcare and market work. While higher quality out-of-home childcare may lead to a smaller production of child well-being in the home it need not lead to reduced child well-being, defined as the sum of d plus e in Figure 1B.

Families in different communities face different subsidy rates and, as well, different availability or rationing. What factors influence the extent to which families are offered lower prices for childcare? In the next subsection we turn to a

discussion of the role of community election results and the effect of the resulting policy choices on the local market for out-of-home childcare.

B. Policy Choices and Local Childcare Markets

In Sweden people from our household model are in communities which differ in both the extent to which public care is subsidized and the number of spaces available per preschooler, either in a daycare center or in a community approved home. To illustrate, in 1984, for a family with a combined income of 17,000 Skr per month Stockholm had a fulltime rate of 685 Skr per month and spaces for almost all preschoolers, whereas Uppsala had a rate of 1,240 Skr per month and a limited number of spaces. What factors explain these wide differences? Can people easily move to take advantage of better bargains? How does the public policy shape the entire out-of-home childcare market in a community? How must we reassess our model from IA if rationing is present?

In this paper we assume that the political parties have different views about numerous policies, including childcare subsidies. These policies are shaped on a national basis but are partly tailored by each party to the median voter in each community as would be predicted in, for example, the Downs model of issue matching by parties (Anthony Downs, 1956). While public daycare has long standing sponsorship by the Social Democrats, the issue matching model predicts that other parties must offer

such programs as well if they are preferred by the median voter. In addition we assume that parties and voters choose their candidates based on policy offered and personal qualifications but not gender. Yet gender of the elected officials influences their interest in expanding the scale of publicly provided out-of-home childcare. The scale of public programs will be greater in wealthy communities is simply by virtue of income effects.

We do not want to assume close to uniformity of voter preferences in a community. Otherwise community choices would then be good indicators of individual labor supply and childcare preferences. A large correlation between individual preferences and community policy would imply a substantial correlation between the error term in a statistical choice equation and the policy variables (assuming that such preferences are not described by observed variables in our analysis). This would exaggerate the apparent effect of the policy variables and in our empirical we utilize instrumental variables, techniques to reduce the correlation between the choices and policy variables.

A form of the same problem of correlation between policy and preferences would arise under a Tiebout type regime wherein those who would most benefit from a favorable childcare policy would move into the communities with the most generous childcare subsidies, and those with less interest would move to communities with a smaller scale program. This is less likely in Sweden where residential mobility is not particularly high, partly because of regulations on housing rents.

Another dimension to policy is the extent to which the subsidy is reduced as the family's market income rises. There are

some communities in which the daycare charge is independent of family income (such as Danderyd, a suburb north of Stockholm) and others where the rate is reduced for lower income (such as Helsingborg, a town near Malmö). This implies a slight variation from our model in Section A in that the after tax and childcare line would be more progressive when income is considered in the pricing of public childcare. We should also note that households are required to buy minimum lots of childcare, sometimes 20 hours per week and sometimes 40 hours. This latter case arises when there is no price difference between fulltime and parttime childcare. Thus, points like c' in Figure 1B may not be part of a continuous frontier, but can be sufficient to induce a choice of market work and out-of-home childcare.

How will a policy to subsidize public childcare and increase the number of spaces affect the choices facing the typical family with preschoolers? Consider Figure 2 where we have the supply of private childcare, assumed to slope upward. The private supply is combined with the number of spaces (G) at the subsidized price (p_G) to create the local market supply curve. What is equilibrium in this market? This depends on how the public spaces are rationed. If resale of spaces by those who got them were possible then equilibrium would be at E where a plus b spaces are supplied in the private market. Those rationed out of the public spaces would pay p_P . Spaces in public daycare are not resellable. For this reason we need to consider the rationing process.

In Figure 2 some of those who obtain public spaces at p_G may value them at just a bit more than this. This situation can be represented by a leftward shift in S_T as indicated by the dashed

line. The loss here is that persons valuing the service at p_p+ are displaced by persons who value the service at only p_g+ , and it is claimed that this gap is as large as 30,000 Skr per year in some communities.

Rationing to those who place a value on the service of only p_g+ also may explain why, when there is rationing in a community, the price can rise so dramatically. (Think of the dashed leftward shift of S_T as large in Figure 2.) For this reason it can be argued that for a given community expenditure on childcare subsidies, it would be better to provide more spaces with a lower subsidy per space and a higher price for the parents so as to eliminate rationing at the subsidized price (i.e. increase spaces and raise p_g so that $p_p = p_g$). A special case of this is where $p_p = p_g = 0$ because free spaces are available to all who want them, a recently offered proposal (Landsorganisation i Sverige, 1988).

In our empirical section we offer some evidence suggesting that those who value the service most are those more likely to clear the rationing hurdle. If no households valuing the service at less than p_p are using it, this can be termed efficient rationing. To simplify the following discussion let us assume this to be the case. The needed qualifications to the discussion for departures from efficient rationing are fairly straightforward.

Suppose the number of spaces is increased to G' . Now the private market people pay p_p' , and the total number of new users is less than the incremental number of new spaces in public childcare, $G' - G$. As long as the public price is well below the private market price an increase in the number of spaces will be

utilized, the private market price will fall, and the net increase in the number working and using either public or private childcare will be less than the number of new spaces. Here we have a form of partial fiscal substitution in which part of the added public provision is absorbed in reduced private provision. In this case the net impact for the daycare system will be less than the apparent or gross impact, a result we explore in our empirical work.

An important point is that so long as there is excess demand for public childcare, the extent to which the subsidized price is below the market clearing price will not influence the total number of public and private users, just the consumer surplus of those with a space. (Consider p_G' , a rate below p_G but with the same number of spaces, G .) For this reason, in our empirical work we pay close attention to the number of public places per preschooler in the different communities in predicting the response of the typical household. Only when rationing is not significant will additional reductions in the public price increase the number of users, and this is by moving along the demand curve. For this reason we investigate the effect of an interaction variable between public price and slots per capita on labor supply and childcare choices.

With rationing the variables to predict use are less those suggested in Section 1A and more those of a model of who can best cope with rationing. Some existing research on this question indicates that it is those who have a stronger market commitment and who are better educated. One study indicates that 71 percent

of the preschoolers whose parents are members of SACO/SR (Swedish Confederation of Professional Associations) are enrolled in community daycare. In contrast only 37 percent of the children whose parents are members of the blue collar union, LO (Swedish Trade Union Confederation), are enrolled in community daycare (Landsorgaisation i Sverige, 1988).

II. Empirical Analysis

A. Community Daycare Policy

The system of public daycare has grown quite steadily over the last 20 years. As can be seen in Table 1, the number of spaces in community child care centers or community sponsored homes was about 13.5 percent of the children age 0-6 and has risen quite steadily to 45 percent in 1986. For the year of our study, 1984, there were spaces available to serve 42 percent of the preschoolers. The cost in 1986 Skr has remained quite stable after an initial rise during 1975-1980. The percent paid for by the families has fallen from 12 percent in 1975 to 8 percent in 1981 and has risen since and stabilized at about 10 percent.

It is likely that the 1977 shift toward central matched funding explains the upward drift in spaces available per child. Up to 1984 the state funding was a form of matching grant covering 35 percent of the cost plus a per space subsidy which represented approximately another 15 percent of the cost. From 1984 on the matching formula was changed somewhat with a subsidy

per fulltime child of 22000 Skr per year (11000 Skr per parttime child) and a per daycare worker subsidy of 30000 Skr.²

An important question which arises is whether there are any communities in which there is not substantial rationing. For example, Stockholm has .65 spaces in public childcare per preschooler. This, we believe, represents a non-binding constraint on the number of spaces because some will choose not to work, particularly when the children are very small, and some may find very low-cost spaces in the private market (including relatives or grey market suppliers which do not report income to the tax authorities).

In Figure 3 are presented the frequency distributions of spaces per child age 0-6 for communities in 1974 and 1984. For our subsequent analysis the 1984 distribution is of particular interest. As noted in Section IB, the influence of the public care price on use is likely to be important only if there is no rationing of spaces. Otherwise, public price variations may simply reflect user benefit variations and not differences in equilibrium price or overall usage.

² In 1977 the central government (referred to as the state in Sweden) initiated a plan to build 100,000 new spaces over a five year period and encouraged the communities to participate by increasing the state subsidy from 7,000 Skr to 14,000 Skr only for these new created spaces (Regeringens Proposition, 1975).

Table 1
 Characteristics of Public Childcare
 in Swedish Communities, 1974-1987

Year State	Ratio of Spaces to Children	Cost per Space(Skr) (1986 Skr)	Percent of	Cost Paid by Family	Community
1975	.15	20675 (54566)	12	50	38
1976	.18	23540 (56289)	10	56	34
1977	.20	26960 (57902)	10	38	52
1978	.23	31460 (61373)	10	40	50
1979	.27	34505 (62812)	10	38	52
1980	.31	39590 (63436)	9	40	51
1981	.34	42700 (61026)	8	42	50
1982	.37	44200 (58196)	9	41	50
1983	.40	47800 (57770)	10	40	50
1984	.42	54100 (60539)	10	38	52
1985	.45	58100 (60557)	10	41	49
1986	.45	62050 (62050)	10	44	46
1987		62400	10	43	47

Source: Arbete och Löner, Siv Gustafsson and Petra Lantz, Industrial Institute for Economic and Social Research and Arbetslivscentrum, Stockholm (1985) (updated).

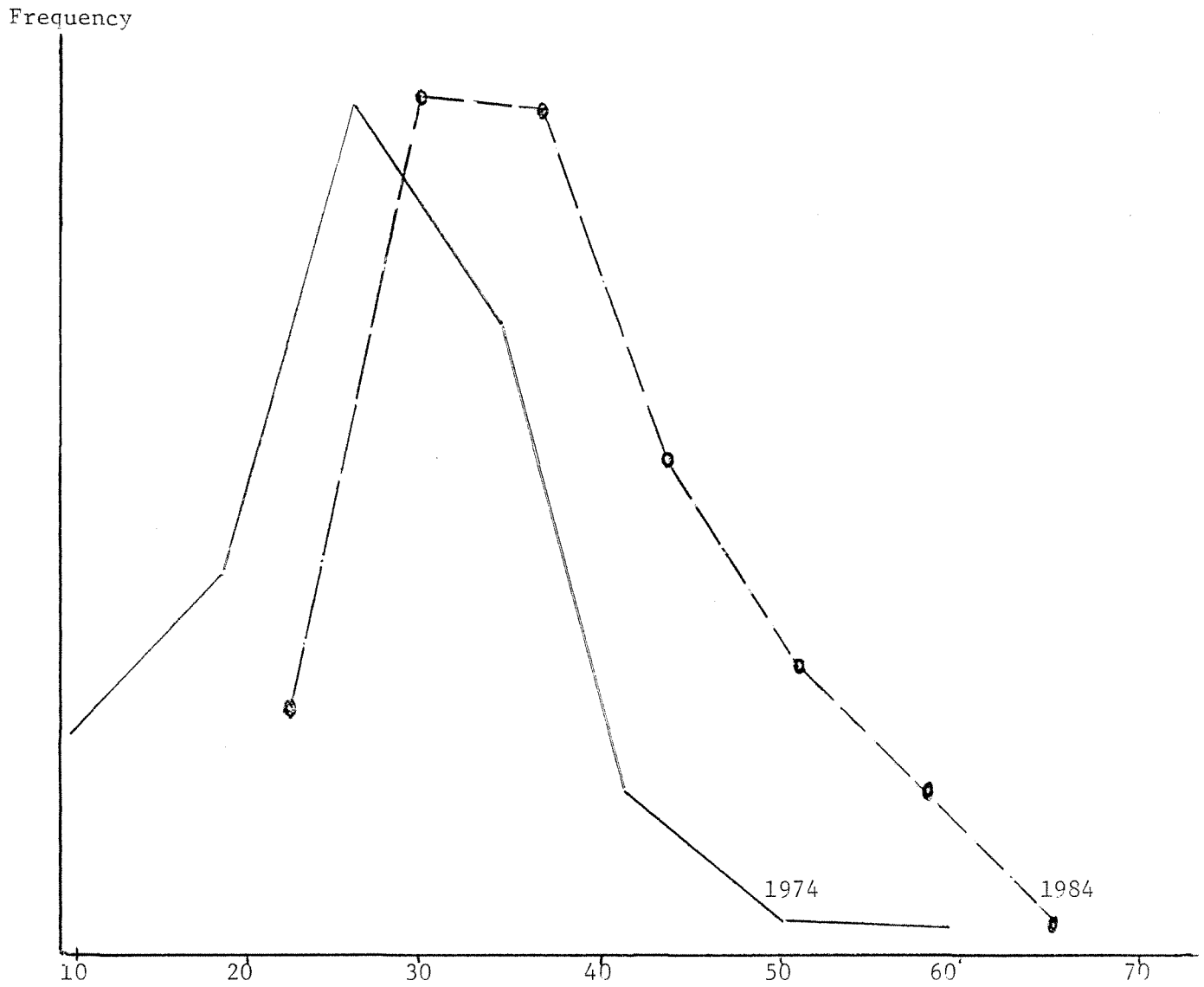


Figure 3
 Spaces per 100 Preschoolers
 In Swedish Communities, 1974 and 1984

Data from a report from Svenska kommunförbundet on the 1984 fee structure for daycare in the different communities and from the National Central Bureau of Statistics (1985) on spaces per 100 preschoolers by community were used to create variables characterizing the public daycare market for each community. Communities differ in the price of childcare for a family with a given combined income of the spouses, the extent to which the payment is income conditioned (sometimes there is no income conditioning, but commonly the payment increases, up to a limit, by as much as 10 percent of additional family income), the extent to which there is a different price for full and part time use and the spaces per child. A simple regression of spaces per preschooler on price per month for 1984 shows that communities with a more comprehensive program in terms of spaces also have somewhat lower fees for the parents.

In Table 2a are presented regressions of a number of spaces per preschooler on five predictors: region/city type³, whether the community government is controlled by the Social Democrats, percent female of elected local officials, tax revenue per inhabitant and personal/demographic variables. The same equations are presented in Table 2b for all 281 communities whether or not they provided an observation from our HUS sample. For this reason personal characteristics are deleted. In Table 2b the added variable, female labor force participation, has a large impact on spaces. However, it is close to being an outcome of the daycare system and labor supply decision and for this

3 Communities are classified into region/city type according to a cluster analysis involving industry and population density characteristics (Fredlund and Holm 1984)

reason is not included as a predictor in our models of household choices (Tables 3 and 4).

In both 2a and 2b the provision of public daycare is greatest in Malmö and Stockholm (the excluded category), and, consistent with issue-matching by parties to attract the median voter, is only somewhat greater in communities with the local government controlled by the Social Democrats, and this occurs only in 2b. Coverage is substantially greater the higher the percent female of the elected community officials.⁴ The extent to which the payment for public childcare is income conditioned (not reported here) is largely independent of any of the region-city or political variables. The typical price paid (not reported here) is lowest in Stockholm, Malmö, Göteborg and in industrial areas with a central city. People in these cities can be thought of as facing the most comprehensive public daycare system, since spaces are relatively available as well. The next question is how do individual families respond to the publicly provided childcare?

Table 2a
 Characteristics of Community Daycare Systems, 1984
 (Spaces/100 Preschoolers)

Variable (Standard error in parentheses)	(1)	(2)	(3)	Mean (4)
Region/City				
Agricultural				
048	-3.9 (4.0)	-3.9 (3.9)	-4.3 (4.0)	.048
Forest	2.5 (5.2)	2.5 (5.2.)	2.0 (5.3)	.018
Industrial area, no central city	-1.1 (3.4)	-1.13 (3.4)	-1.16 (3.4)	.054
Industrial area, central city	.975 (4.1)	.917 (4.1)	1.14 (4.1)	.030
Middle sized city	-.082 (3.1)	-.012 (3.1)	.102 (3.1)	.090
Large city	-2.1 (2.3)	2.0 (2.4)	-2.0 (2.4)	.289
Malmö	6.14 (2.9)	6.12 (3.0)	6.12 (3.0)	.060
Göteborg	-11.6 (2.7)	11.6 (2.7)	-11.6 (2.7)	.090
Stockholm	-	-	-	
Other places	-6.8 (3.1)	-6.7 (3.2)	-6.7 (3.2)	.205
Social Democrat (1982 election)	-.17 (1.4)	-.15 (1.4)	-.046 (1.45)	.373
Female Percent Officials (1985 election)	.149 (.101)	.152 (.103)	.146 (.103)	33.3
Tax Revenue/Inhab.	.101 (.017)	.101 (.017)	.100 (.018)	379.6
Education		-.033 (.186)	-.017 (.186)	31.8
Age	.095 (.099)	.098 (.102)	.106 (.102)	
Children under 18			.512 (.477)	
Constant	-3.62 (9.1)	-3.47 (9.2)	-3.86 (9.1)	
R-square (adjusted)	.588	.585	.586	
n	166	166	166	

Table 2b
 Characteristics of Community Daycare Systems, 1984
 (Spaces/100 Preschoolers)

Variable (Standard error in parentheses)	(1)	(2)	(3)	Mean (4)
Region/City				
Agricultural	-18.6 (2.1)	-7.0 (2.6)	-2.7 (2.5)	.146
Forest	20.4 (2.2)	-10.7 (2.5)	-3.1 (2.5)	.089
Industrial area, no central city	-15.2 (1.9)	-6.1 (2.1)	-1.4 (2.0)	.207
Industrial area, central city	-15.7 (2.3)	-6.3 (2.5)	-2.2 (2.4)	.100
Middle sized city	-12.3 (2.5)	-5.5 (2.5)	-4.4 (2.3)	.050
Large city	-8.5 (2.2)	-3.1 (2.2)	-0.7 (2.0)	.068
Malmö	-1.3 (3.0)	3.4 (2.9)	2.8 (2.6)	.029
Göteborg	-16.8 (2.8)	-10.5 (2.7)	-5.5 (2.5)	.036
Stockholm	-	-	-	
Other places	-15.4 (2.0)	-6.5 (2.3)	-2.5 (2.2)	.192
Social Democrat (1982 election)	2.2 (.98)	1.9 (.91)	2.3 (.83)	.457
Female Percentage Officials (1985 election)	.254 (.073)	.138 (.069)	.057 (.064)	29.8
Tax Revenue/Inhab.	-	.092 (.013)	.063 (.013)	352.4
Female Labor Force Part.(1980)	-	-	.729 (.096)	61.6
Constant	41.7	4.5 (6.4)	-31.6 (7.5)	
R-square (adjusted)	.478	.551	.631	
n	281	281	280	

B. Responses to Public Daycare

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In this section household response to public daycare is analyzed through use of a representative national sample of Swedish households, known as the Hushållens Ekonomiska Levnadsförhållanden, or HUS study for short. This study provided information on numerous household characteristics and choices in 1984. Using information on community of residence, we were able to assign to each household characteristics of the public daycare system in the community (National Statistical Central Bureau, 1985; Svenska Kommunförbundet, 1984). To reduce diversity in the households, only those with one preschooler and two parents present were included. In Sweden over 90 percent of preschoolers were in households with both parents present in 1984 (Gustafsson, 1987).

Characteristics of the private daycare system for each community were not available, although it is commonly believed and publicized that households rationed out of the public daycare system are faced with much higher cost alternatives in the private sector. In some communities such as Malmö and Stockholm, the public system shapes the entire local market; rationing is believed to be minor or non-existent. In a recent study it was claimed that the non-rationed communities in 1985 included Stockholm, Lidingö, Kristinehamn, and Umeå (Landsorganisation, 1988). These same communities were so characterized by the simpler rationing measure which we used,

defined as a gap of 15 percent or smaller between number of spaces and percent of mothers with preschoolers either working or enrolled in school fulltime.

Our primary method of analysis is the use of logit choice models. For logit analysis we examine individual households to determine the characteristics of a household which chooses certain states of interest, such as substantial market work and either parttime or fulltime public childcare. We also experimented with conditional logit or random utility models in which one seeks knowledge of how characteristics of different states influence choices made by individual households (Boskin, 1974). In applying the random utility model there were both many states, and it was difficult to assign accurately characteristics of the non-chosen states.

In Table 3 are presented the results of logit analyses of the household and public daycare characteristics influencing the decision to work substantially (defined as more than 15 hours per week)⁵ and participate in the public daycare system by enrolling the child either part time or full time. The price variable reflects the dependence of price on family income (and therefore market work of the woman) for those in communities with an income adjustment to the public daycare fee. The results conform to both the expectations of standard labor supply analysis and the predictions of our daycare model set out in Section I. Specifically, we observe a positive effect of predicted spaces

4 The percent female of community elected officials was not available until 1985.

5 It has also been proposed that the paid parental leave policy be extended from the current 9 months to 18 months. This would allow full time child care by the mother for very young children on the grounds that the families could then choose between public daycare or some other arrangement.

per capita on the probability of substantial market work combined with use of public daycare (Column 1).

As predicted by the market model, the price of public daycare does not influence use, since for most communities there is rationing of spaces (Column 1). Only for non-rationed communities would a clear effect of price be expected. In Column 2 where price is interacted with a variable for the absence of rationing (defined above), we see that a lower public price increases significantly the probability of the work and public childcare state. The relationship for rate of change in probability for a change in the exogenous variables for a logit relationship is (Aldrich and Nelson, 1984):

$$(9) \quad dP(Y=1)/dX_k = [\exp(Z) / (1 + \exp(Z)^2)] b_k,$$

where $Z = \sum b_k X_{ik} + u_i$ and b_k is the coefficient on the variable of interest.

Specifically, using (9) and the method of sample enumeration (Train, 1986) we find a substantial price elasticity (-.689). To indicate the extent to which this could overstate the net elasticity, we have the impact of price on the decision to work in the market substantially in column 3. Here the resulting elasticity is much smaller (-.046) suggesting substantial scope for fiscal substitution as discussed in section IB.

As in usual labor supply analysis the net after tax gain from full time work (essentially an after tax wage rate calculated from a tax program for the Swedish tax system and

noted as "Change in after tax income") strongly influences the probability of work. Spouse's income has a modest positive effect on participation which is not commonly observed, but perhaps it reflects positive matching in which people with similar market (and non-market) preferences form households (Hill and Juster, 1985). Finally, it is worth noting that the point estimate of the effect of having younger preschoolers is large (Columns 1 and 2), though the standard error is high also.

Table 3

Household Choices of Market Work
and Out-of-Home Childcare
(Full Sample)

Variable (Standard error)	Market Work and Public Daycare		Work Substantially	Mean
	(1)	(2)	(3)	(4)
<u>Public Price</u> (100 Skr/mo)	-.105 (.101)	.134 (.130)	.084 (.091)	9.04
Predicted Spaces per 100*	.034 (.026)	.008 (.028)	-.0027 (.24)	39.9
Change in after tax income (1000 Skr/yr)	.070 (.025)	.080 (.030)	.025 (.020)	53.8
Spouse's Income	.022 (0.13)	.025 (.014)	.002 (1.008)	49.8
Child 0-2	-.772 (.548)	-.774 (.570)	-.257 (.38)	.30
<u>Not Rationed</u>	-	-5.2 (1.8)	-.141 (.131)	.32
NR x PP		-.507 (.194)	-.141 (.131)	2.70
Constant	-6.86 (1.78)	-9.2 (2.2)	-.819 (1.4)	
Log Likelihood	-67.0	-62.4	-95.6	
n	166	166	166	
Mean Elasticity		-.689	-.046	

*Based on Table 2, equation (3).

Other results (not presented here) included an analysis of which households do not use public childcare, yet where the mother works significantly in the market. Here two variables seemed to matter: having a lower wage, and spaces per capita. There is also a weak relation to age of child 0-2. These results are consistent with the discussion of rationing of spaces. In particular, it is claimed that less affluent women are those more likely to be rationed; that preference in the queue is given to those with older children; and that the probability of being rationed is dependent on the per capita spaces in the community.

The evidence in Table 3 is also consistent with the quality of public daycare in Sweden. As emphasized in Section I, high quality daycare will add to the attractiveness of market work, and if the demand for childcare is income elastic, the income effects of spouse's earnings and own earning capacity, which could otherwise induce less market work, will be attenuated. Possibly this explains the positive effect of spouse's income on the work/public daycare choice or why such families would devote more effort to securing a space even when there is rationing in the community. These results are consistent with the hypothesis of a income elastic demand for child quality (Becker and Lewis, 1973).

In Table 4 is an analysis of only the subsample of families in communities with no rationing of spaces in 1984. As can be seen in Column 1, the effect of spaces per family is negligible and statistically insignificant as should be the case if there are sufficient spaces. In Column 2 we have reestimated the equation deleting the spaces per preschooler variable. As in the earlier results there is a substantial response in terms of use to the monthly price charged the parents.

Table 4
Household Choices of Market Work
and Out-of Home Childcare
(Non-Rationed Sample)

Variable Standard error)	Market Work and Public Daycare		Mean
	(1)	(2)	(3)
Public Price (100 skr/mo)	-688 (.290)	-.536 (.228)	8.30
Spaces (predicted) per 100	-.095 (0.91)	—	42.3
Change in after tax. income (1000 Skr/yr)	.162 (.090)	.110 (.059)	54.6
Spouse's Income	.051 (.027)	.040 (1.024)	51.4
Child 0-2	-1.08 (.945)	1.29 (.922)	.30
Constant	-3.51	-7.55 (4.9)	
Log likelihood	-23.4	-23.9	
n	54	54	54
Lambda	.996 (6.9)	5.16 (5.9)	.550

Note: The sample selection equation variables were region, Social Democrat, percent female elected, education of mother, age of mother, and number of children under 18.

One perspective on the Swedish system of daycare is to think of it as extending the public school system back to an earlier age of the child. Consistent with this view, there have been proposals to end the rationing of spaces for all children older than 18 months and to make public daycare free to all families (Landsorganisation i Sverige, 1988). In another sense the school analogy is not quite appropriate for Sweden since the regulated conditions have been in the direction of providing a family environment with few children per adult supervisor.

A limitation on our analysis is that there are very diverse family situations. This diversity leads to out-of-home childcare choice for reasons other than wage, income and subsidy rate. Age of child and composition of siblings may lead to different elasticities. For policy makers in other countries, another limitation of the applicability of the Swedish experience may be differences in the family. Therefore, the form and role of effective policy might be much different in the U.S., where a higher percent of preschoolers are in a true single parent environment.

A main finding is that there is a substantial price responsiveness to use so that the extent to which the system is subsidized will influence participation. This also implies that for the budget levels prevailing in 1984, communities could have avoided rationing of spaces by simultaneously increasing the percent covered by parents' fees and by making more spaces available. We also find that the net impact of the system on labor supply is much smaller than the gross effect: much of the

responses appears to be the substitution of public for private daycare as the subsidy to public daycare increases.

Other Scandinavian countries have daycare programs, which, while extensive by U.S. standards, have a cost per child averaging about one-half that in Sweden. There do appear to be quality differences which explain much of the cost difference: Sweden has more staff per child, more educated staff, longer open hours, more children under three, more building space per child, and better food (Statskontoret, 1987a). These quality differences combined with a higher share of the costs born by parents (in 1983 Danish parents paid 22 per cent, Finnish parents 14 percent, and Norwegian parents 24 percent) (Statskontoret, 1978b) imply that there was less pressure for spaces in the other Scandinavian countries, assuming our finding of a price response for a given quality of public daycare.

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