

WORKING PAPERS

COST BENEFIT ANALYSIS
OF EARLY CHILDHOOD
CARE AND EDUCATION

BY SIV GUSTAFSSON

MFB 78:260

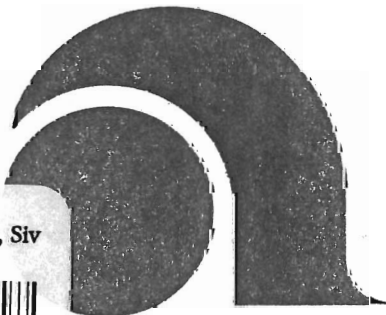
S P P B

Gustafsson, Siv

Cost benefit analysis of early chi



38065001686376



slivscentrum

Swedish Center for Working Life

COST BENEFIT ANALYSIS
OF EARLY CHILDHOOD
CARE AND EDUCATION

BY SIV GUSTAFSSON

STATENS
PSYKOLOGISKA PEDAGOGISKA
BIBLIOTEK
STOCKHOLM

A WORKING PAPER PREPARED FOR THE OECD
MAY 1978.

I. IDENTIFICATION OF SOCIAL COSTS AND BENEFITS

Purpose of the study

This paper focuses on the relevant factors to be included in a cost-benefit analysis of early childhood care and education.

There is no definite answer to the question; What is the social profitability of educating and giving good care to small children? The answer must be: it depends. The intention of this paper is to try and answer on what it depends and why.

The study will include the following three topics:

- I. Problems and issues related to a cost benefit analysis.
- II. Review of relevant empirical material and cases.
- III. Possible future options and policy implications.

Relevant material and cases will be taken from my home country, Sweden. Sweden has some reputation for egalitarian family policy and institutions. Female labor force participation rates have been increasing rapidly. The demand for increased extra-family day-care for children has paralleled this increase in the amount of working mothers.

Extra-family day-care centers are built and run by local governments with extensive central state guiding and state subsidies. The financing of day-care is, however, a separate question from the social profitability of it. The financing may affect the extent to which resources will be allocated to the building and running of the centers and is therefore important. If private day-care centers are not profitable in spite of social profitability this is a classical reason for subsidizing day-care. Before

we make up our minds as to the question of subsidizing day-care centers or not we would like to know if this is profitable.

The crucial concept in a cost benefit analysis is alternative cost. In order to be able to estimate an alternative cost one must decide upon: What is the alternative? It is always the case that one can say nothing about the profitability of a project without having some norm of comparison. Mostly when considering a project the alternative is to refrain from carrying out the project and use funds for another project or keeping them on a bank account. Before we can say anything about the profitability of extra-family day-care we must decide upon the alternative. Traditionally small children have been taken care of by their mothers at home. It is therefore a natural thing to have this traditional pattern as the norm of comparison. The alternative that will be used throughout this study is a situation where mothers take care of their children. We will not compare different types of extra-family day-care but compare extra-family day-care to intra-family day-care. The comparison is not day-care centers to family day-care, i.e. a woman taking care of another child in addition to her own child or the employment of a house-maid for taking care of the children.

What is a cost benefit analysis?

Cost benefit analysis means calculating profitability of a project for society as a whole rather than for one single corporation, day-care center or family. The concept of social profitability would mean that one takes into consideration everything that is affected by the project. However, such a definition of social profitability will be very vague. We have to draw some line as to what we will include in the calculation. Following Leif Johansen [1977] factors that may be included into a calculus may be divided into three separate kinds of factors:

- I. Effects on several corporations instead of only one corporation.
- II. Effects on persons, households and government bodies which do not normally perform profit calculations and where effects are possible to measure.
- III. Effects which are not quantitatively identifiable by the market system. There is no way of getting an objective price and the value of the effect has to be subjectively defined.

Calculations of the social profitability of day-care obviously must consider Johansens first point. We are not considering the profitability of a separate center, no matter whether it is privately financed, whether it is financed by local governments or whether it is financed by the central government. We are rather trying to net out costs and benefits to all the institutions and persons involved to see under what circumstances there is a positive over all net.

Private profit maximizing firms are not involved in the day-care business in Sweden. The second point consequently does motivate a cost benefit analysis. You may often hear parents compare the market earnings of the mother to their costs of day-care for a child. As we will show later, this family calculus does not very often take long-run considerations into account. The decision of whether to use extra-family day-care or not affects market earnings of mothers during their full life-time and not only during those maybe 7 years when extra-family day-care is actually being used.

Expansions of day-care has not been motivated by economic efficiency. Rather decision makers have tended to look at day-care as something which has only costs and no returns. There is a very good case for performing a cost benefit analysis if only to identify and make clear what the benefits are. If decision makers underestimate the returns to an investment, the investment will be smaller than the social optimum.

Some of the effects of day-care are very difficult to measure. Many people are afraid of collective day-care not only for their own children but for society as a whole. It may be of help in the analysis to divide the effects of extra-family day-care into effects on the parent generation and effects on the child generation.

Effects on the next generation are the difficult ones. Economic effects of day-care are in principle measurable by market earnings of the next generation. Suppose one could show that children from day-care centers have higher frequencies of drop-outs from school, have a higher rate of unemployment and earn less when employed than children who have been cared for at home by their own mothers. If this were the case, extra-

family day-care would be shown to have a negative economic effect on the next generation. However, it does not to my knowledge exist data giving answers to these questions. The Swedish experience of day-care centers is too short to give us the possibility of measuring these effects on the next generation.

Effects which are not quantitatively identifiable by the market system do not give the opportunity of an objective price. One way of solving this problem is by subjective evaluation. If a subjective value is given to an effect, the outcome of the analysis will be of no meaning for those who do not share this particular subjective valuation, which is a serious objection to such a method.

The attitude I will take on this point following L Johansen [1977] is to exclude factors which need subjective valuation. Therefore one can argue that my analysis does not include everything that is affected. One way to come around this is to say that the social profitability of day-care centers should be compared to the not measured effects. The subjective evaluation of these other effects then has to guide the decision as to whether one wants to invest in public day-care for children or not.

Profitability and income distribution

It is quite clear that an extensive use of extra-family day-care will set free many women to pursue a career of market work, thus making for a more even income distribution when comparing earnings of men to earnings of women. In discussions of women's liberation extra-family day-care is often looked upon as if it were only a question of an income redistribution. Benefits and costs would be netted out between different members of the society and there would be no net gain to society. On the other hand, there will be a greater social product and not just a redistribution of resources if another resource allocation than the present one is more effective.

The allocation of female labor in the case with day-care is more effective if women can produce more in market work than they can in home work. One of our first tasks is thus to evaluate home-work. One part of home-work is child-care. The value of child-care has a market value since there exists day-care centers the costs of which are computable.

Other home-work production cannot easily be evaluated by market prices. We would be justified in concluding that the value of home-work equals the value of child-care if the reason why the woman works at home is that she wants to take care of her child. By this simplification market production of mothers only has to exceed costs of day-care in order for day-care to be socially profitable.

One may argue that if leisure is decreased this is a cost of the day-care alternative. We do not actually know if leisure is decreased for women who go from home-work to market work. A working mother may feel that time spent together with her children is leisure time, whereas a home-working mother may feel that this is her job. Lacking empirical evidence there is no good argument for assuming neither decreases nor increases in leisure as an effect of market work of the mother. I will assume that leisure is unchanged in both alternatives.

Identifying costs and benefits to be included

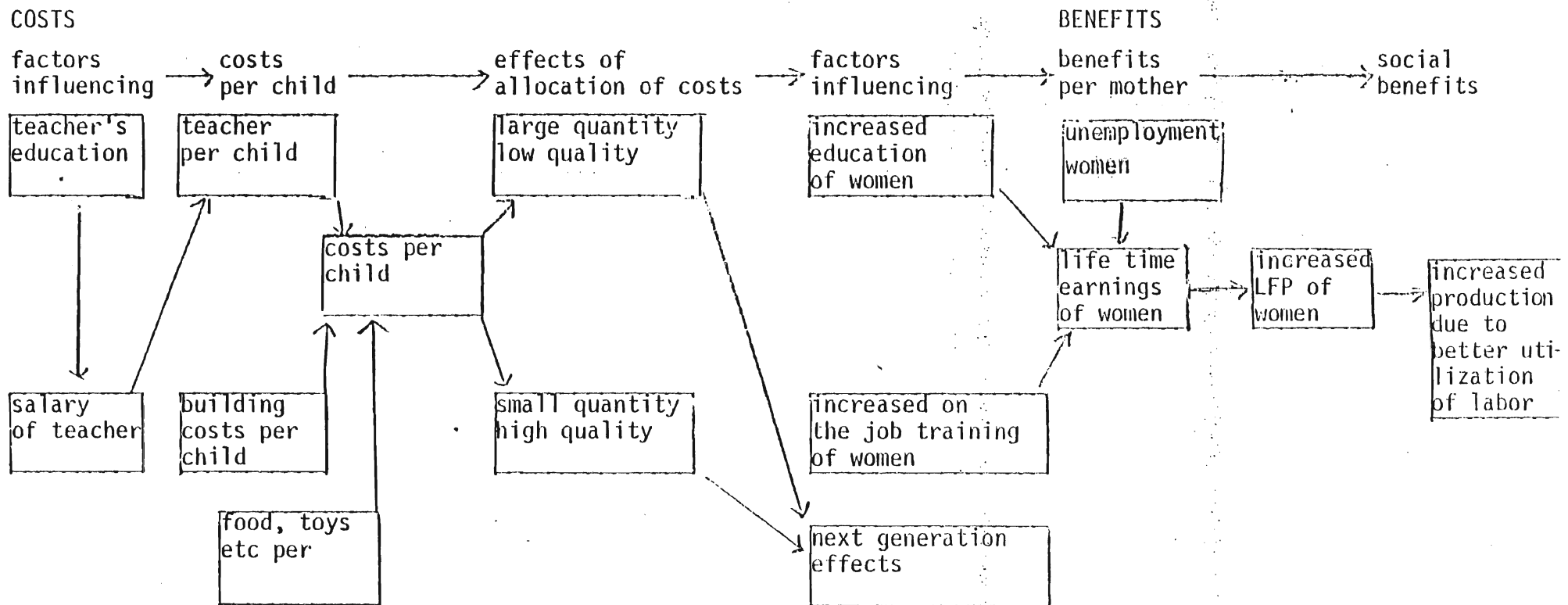
Costs and benefits that will be considered in this study are summarized in Figure 1. The decision problem is to compare the benefits of an additional place at a day-care center to the costs of building and running centers.

Salary of the teacher determines the per child teacher cost when divided by the number of children taken care of by one teacher. The rental costs of the building of the day-care center may be calculated per child by first calculating all costs of the building on a square meter basis, then calculating the number of square meters of the building allocated to each child and multiplying this figure by the per square meter cost. Other costs of the day-care center are toys and equipment and food. These costs are easily calculated per child. Adding these three elements would make up the total per child cost of extra-family day-care.

A given sum allocated to the building and running of a day-care center may be allocated to supply a large number of places or a smaller number of places. A smaller number of places will be supplied if one teacher has to take care of a large number of children, if many children have to play in a small building and if the equipment otherwise is poor. There is a quantity-quality trade-off in the allocation of costs of day-care.

Figure 1. Cost-benefit analysis of extra-family day-care.

Alternative of comparison: Mothers take care of their children at home



This trade-off comes about because next generation effects are not evaluated. This is motivated by the fact that those effects are not measurable. It is likely, however, that good quality day-care will increase benefits for the next generation while low quality will decrease those benefits. In Sweden standards of quality have been set by political decisions. Thus, day-care centers have to have a certain teacher/child ratio, a certain building area per child, places at a center must not exceed a certain number etc.

When comparing costs and benefits of day-care several aggregation problems arise. We have to compare costs per child with benefits per mother. The number of children and spacing of the children's birth is one complication. Another one is to what extent would women choose to work on the market if extra-family day-care were available? Would labor force participation of women equal the labor force participation for men? Would this lead to increased unemployment and depressed market earnings of women?

This last issue has to do with the question? What happens if we leave the marginal case and turn to the intramarginal problem? Suppose all mothers were working mothers and all children were at a day-care center for part of the day. The question then is: What would the new equilibrium solution look like? How many hours would fathers and mothers work? What would be the earnings of men and women?

Previous Swedish studies have only considered the marginal case that is a case where one can assume that market earnings, unemployment etc are unchanged. Furthermore, previous studies have only considered short-run one-year effects. After a critical review of three previous cost benefit studies of day-care I will try to extend the analysis in these two respects.

II. PREVIOUS STUDIES

Purposes of earlier studies

In this section three studies which have tried to evaluate costs and benefits involved in extra-family day-care will be reviewed. They are Jönsson [1970], Rosengren & Svensson [1975] and Holmgren & Lantz [1975]. All of them analyze one period marginal changes in the supply of day-care.

Jönsson separates the calculus into different types and carries out financial analyses as well as cost benefit analyses. The analyses are carried out separately for the different parties involved and then netted out to a total. The parties involved in the day-care system in Sweden are:

- (a) The family with a small child who gets a place at the center.
- (b) The local community government who builds and runs the day-care center. There are 278 local communities in Sweden.
- (c) The county councils (23 in Sweden) get increased tax receipts.
- (d) The state government of Sweden pays state subsidies and receives income taxes.

Jönsson clearly points out that a financial calculus is something different from a cost benefit analysis.

The aim of the study of Rosengren & Svensson is to see how persons not in the labor force may be activated. Their investigation shows that most "inactive" persons are women whose main reason for not being in the labor force is inadequate day-care for their children. In this connection Rosengren & Svensson calculate the costs and benefits of "activating" these mothers by supplying day-care for their children.

Holmgren & Lantz focus on a decision model for the local governments. They do not make a distinction between the financial calculus and the cost/benefit analysis. This confusion may lead people to think that a cost/benefit analysis is equivalent to a financial calculus. Unfortunately, their planning model for the communities may lead communities to base their planning on financial short-run effects instead of the long-run costs and benefits for the community.

All three studies consider a marginal place at a day-care center. The computations of Jönsson refer to the year 1970 and for the other two studies the figures refer to 1974.

Main conclusions.

Jönsson concludes that day-care is socially profitable. Families gain by getting a place at the day-care center because this makes possible

for both parents to engage in market work increasing family disposable income. The sum of additional tax payments to the state, the local communities and the county councils is larger than the sum of costs per place of day-care. This is true if family income is 45 000 Sw Cr which was mean family income in Sweden in 1970 or if income is larger than the mean income.

These observations lead Jönsson to the following conclusion: The state and the local communities receive higher incomes for every new place at the day-care center than they pay for it. If we also were to include the long-run effects on labor force participation and incomes for women and the decrease in social security benefits it is quite clear that an increase in the amount of day-care can come about without increasing the total tax burden or decreasing other sorts of public expenditures. If mothers of small children want to work and have the opportunity of doing so there is no financial reason not to make this possible by building day-care centers. The financial space is created by themselves because they go from home-work, which is not taxed, to work in the market, which is taxed. By building more day-care centers we can improve the situation for a group of people, i.e. families where both parents want to work on the market without worsening the situation for other people. This is a reasonable criterium for concluding that an increase in the building of day-care centers is socially profitable.

If the situation is improved for families with small children and no other party is made worse off, day-care centres are socially profitable. It does not even have to be improved by as much as the net addition in disposable incomes. Also if leisure of the families is decreased so that the welfare gain of the families is smaller than the net increase in disposable income day-care is socially profitable as long as the decrease in leisure is less valuable than the increase in disposable incomes.

Rosengren & Svensson perform different analyses for families with different numbers of children. They show that day-care is profitable for all one-child families whereas the costs of day-care are higher than the returns for families with more than one child at a day-care center. These dramatic changes when more than one child is cared for come about

because one income must pay the costs for two or three children and because fees for parents also decrease per child when more than one child is at the center. However, 60 % of the mothers have only one preschool child. By this observation they conclude that the marginal place may be expected to be socially profitable. The social net benefit of day-care would be very high if it were possible to discriminate in favor of one-child families.

The conclusion by Holmgren & Lantz is that the local communities incur a loss when expanding day-care. Also the state incurs a loss when communities expand day-care. Families, however, gain substantially by the expansion of day-care since their family incomes are increased by the net additional income of the mother of the child. This conclusion is reached because they count 100 % of the income increase to the family while counting zero benefits to the community.

Cost calculations

Jönsson gives average costs per place at the day-care center. Teacher costs amount to 70 % of total costs. Other cost items are rents of the building, food, toys, administration and miscellaneous. Rosengren & Svensson elaborate the cost calculations by considering financial consequences not taken care of by Jönsson. One example of this is the decrease in social security payments that results if single mothers may begin to work as a result of a place at the day-care center for their child. Payments for housing subsidies which are dependent on family income will also decrease when family income increases.

The most interesting cost calculation is carried out by Holmgren & Lantz. They have constructed a model which can be used for simulating what would happen to costs and benefits if the assumptions are changed. Different communities have different proportions of female labor force, different levels and distributions of income, different building costs, different systems for parent's fees. They may also decide on different teacher/child ratios. All these different decisions may be analyzed by means of the planning model presented by Holmgren & Lantz. Also their planning model summarizes the intricate financing of the Swedish day-care system. Their model is replicated in appendix A.

Personnel costs are arrived at by adding costs of the different kinds of persons that work at a center. First there is a head of the center,

second there are nursery school teachers, third there are children's nurses and fourth there is cooking personnel. Children's nurses have a shorter education than nursery school teachers. Holmgren & Lantz also include the costs of a physician's visits to the day-care centers.

The rent of the building is computed from information about construction costs, the length of the depreciation period and the rate of discount of future housing services of the building. Some years there has been a state subsidy for the construction costs of a new day-care center. Fixed equipments like furniture are computed by a similar formula. The depreciation period is assumed to be 33 years for the building and 10 years for the fixed equipment, and the rate of discount is assumed to be 6.5 % per year.

Communities also have services for caring for sick children in their homes. These costs depend on the proportion of sick children that may be helped in this way by the community. Some communities have very little if any of this kind of service. According to the model this cost depends on the number of days that children are ill minus 10. The cost is reduced by 10 days since parents get paid by the ordinary sick security system to take care of their sick children for 10 days during a calendar year.¹ In a cost calculation for society as a whole also payments from the sick security system should be considered.

Costs of day-care finally include other current costs like food, toys, heating and administration. Holmgren & Lantz do not bother to compute these costs split into the component parts.

Benefit calculations

A crucial assumption of Jönsson is that every place at a day-care center sets free one mother for market work. Family income increases for a marginal place at a center by mean income of women. The ra-

¹ Communities have interpreted this rule to mean that they will not supply aid to sick children before parents have taken care themselves of their children for 10 days. However, the aid for sick children was meant to help parents avoid unplanned absence from work. The 10 days are to be regarded as an opportunity to parents and not as a demand. The number of days parents can stay home for sick children is now (1978) 12 days a year.

tional for this assumption is that the mean of children per family in preschool age is 1.20. If communities have an "over-inscription" of 20 % this would mean that one place at a center makes market work possible for one additional woman. Rosengren & Svensson perform separate calculations for different numbers of children. The assumption of number of children per mother is very important for the conclusions of short-run social profitability.

Holmgren & Lantz have a different view on benefits from day-care. They count increases in disposable income for 100 % of the mothers, costs of day-care for 100 % of the mothers but tax benefits are only counted for 1/4 of the mothers. Furthermore, Holmgren & Lantz calculate benefits for poor communities instead of an average community. One effect of the Swedish tax income is that poor communities lose state subsidies when their tax incomes increase. These assumptions are clearly inconsistent. The cost/benefit calculation according to Holmgren & Lantz is summarized in Table 1.

The reason why Holmgren and Lantz only count one fourth of tax incomes is that they have concluded that only one fourth of the mothers who get a place at the day-care center for their children switch directly from home-work or studies to market work.¹

It may well be true that only 25 % of the mothers were net additions to the labor force but this does not allow us to calculate incomes for only one fourth of the women. We must ask ourselves two questions:

1. How did the 75 % of the mothers arrange their day-care before they got a place at the center?
2. What would these 75 % mothers do, had they not got a place at the day-care center?

¹ This conclusion is based on a survey questionnaire carried out by the authors to the 278 local governments. Only 144 communities answered to the question which was formulated: "How many mothers do you think turn directly from home-work or studies to market work?" The result was that 74 % of the local governments that did answer this question thought that not more than 20 % of the mothers were net additions to the labor force. This is the base for concluding that only 25 % of the mothers who get a place at a new day-care center make any contributions to the tax receipts of the local community. (a in the expression for tax incomes is set equal .25.)

Table 1. Cost/benefit analysis of day-care for a community in 1974
according to Holmgren & Lantz

Costs		Benefits	
A	12 700	E	0
B	600	F	600
C	400	G	100
D	700	H	2 500
I	2 100	J	6 500
	16 500		9 700

$9\ 700 - 16\ 500 = - 6\ 200$, which is the net cost to the community

A = personnel cost, B = rent, C = fixed equipment cost,
D = care for sick children, E = tax incomes, F = social security benefits
G = housing subsidies, H = parent's fees, I = other current costs,
J = state subsidy per place.

See appendix A for the component parts of the different titles in the table.

There must have been resources used for the care of these children also before the opening of the new day-care center. Only if these resources become idle it would be correct to conclude that 75 % of the mothers do not make additions to tax receipts. If private day-care was formerly arranged for these children, new children could be cared for by this private day-care and new mothers would be net additions to the labor force and pay net additional tax receipts to the community.

Probably all young Swedish women today either work or study before they get children. When a child arrives they get a maternity leave of 7-8 months and sometimes longer. Since 1974 Swedish fathers are entitled to paternity leave. For a newly born child parents get 7 months which they can share among themselves as they please.¹ After the maternity leave many women want to continue their labor market work if good care for their child can be arranged. If it cannot be arranged they will be forced to give up market work. Another fact which decreases the additional tax income in Holmgren & Lantz is that they put the mother/child ratio = .83 instead of 1 as does Jönsson.²

There are several different types of state subsidies to the local communities. There is a particular subsidy that has the purpose to average out tax incomes between the different communities. It is based on taxable income per inhabitant called tax power. Poor communities have low tax power. For these communities there is a state subsidy that fills out the difference between 95 % of mean tax power in all of Sweden and the actual tax power of the poor community. Thus, if poor communities succeed in increasing their taxable income per inhabitant this subsidy is reduced. In Sweden a majority of the 278 communities are small and poor while the larger communities like Stockholm have tax power on the mean or above it. The marginal place at a center is on this ground concluded to appear in a poor community.

The assumptions made on the benefit side are not consistent with the assumptions made on the cost side. There are mean building costs, mean teacher/child ratios, mean gross income of men and women etc.

¹ It has been suggested that if all the leave is taken out by the mother it is only 7 months instead of 8.

² This is seen by the fact that HH in the expression for tax income is set = 35 while P = 42. That is the mother/child ratio = $35/42 = .83$.

Conclusions about previous studies

Holmgren & Lantz are pretending to give a planning model for the local government. It is very important to point out that they present a short-run financial calculus. A local government should not plan according to short-run financial considerations. Rather it should plan according to social long-run considerations. Their model is, however, a good planning instrument if assumptions are changes so as to be in line with long-run social considerations.

The first important change that should be made is to use consistent assumptions. The second change is to count costs and benefits in the long run. Mothers use day-care for their children not more than 7 years of their life-times. The potential working life of the mother is, however, much longer. If the start of working life is at age 20 and the retirement age at 65, working life will be 45 years.

Both Jönsson and Rosengren & Svensson mention long-run effects on the working situation of mothers. Labor market interruptions may affect future earnings both by decreasing the possibility of ever getting a market job and by decreasing skills. It will be the aim of the next few sections to try and give some information on long-run benefits.

III. COST AND BENEFITS OF DAY-CARE IN A LIFE-TIME HORIZON

Human capital theory and life-time earnings

In the earlier studies benefits of day-care have been assumed to be equal to mean earnings of women. But suppose that lack of extra-family day-care would make impossible for fathers instead of mothers to maintain their market work. In this case benefits would be calculated as mean income of men. In 1974 mean earnings of men were 38 400 Sw Crs, which is more than two times the cost of a place at a day-care center. A marginal place at the day-care center would be very profitable since social benefits, i.e. production by fathers, are more than double the size of social costs. Also the financial short-run net deficit to the local community will be much smaller since tax revenues from the father amount to 5 100 Sw Crs reducing the short run net from - 6 200 to - 1 100 Sw Crs (see Table 1 above).

It is true that for most families the alternative would not be that fathers quit market work but it would be that mothers quit market work. However, from this it does not follow that we should use mean earnings of women as the alternative production lost. The correct comparison is: What would happen to earnings of the mother if she does not leave the labor market in relation to what happens to her earnings if she does leave the labor market. Since men very seldom leave the labor market, this most naturally leads to the question: Why do women on the average earn less than men? To answer this question we must have a theory of the determinants of earnings.

In Mincer [1974] such a theory is developed. The main conclusions of this theory is that earnings are determined by investments in human capital of the individual. Earnings capacity of the individual is increased by efforts from the individual himself to increase his own capacity. These investments in human capital may be divided into two different kinds of investments: investments in schooling and investments in on the job training. Based on this theory we may hypothesize that women earn less than men because they have invested less than men in their human capital.

Human capital of an individual may be approximated by years of schooling and years of experience. A testable hypothesis of this theory is that women earn less than men because they have shorter education and fewer years of experience on the labor market. This hypothesis has been tested on Swedish earnings data by analyzing earnings differentials between men and women. It has been found that earnings differentials in the government sector decrease from 18 % to 11 % when standardizing for differences in age and education. The figures for private sector earnings decrease from 43 % to 26 % when standardizing for differences in age and education between the sexes. (See Gustafsson, Siv, [1976].)

However, according to our theory the reason why younger persons earn less than older ones on the average is that they have worked more years on the labor market. One may expect that in comparing earnings of two persons of the same age and education but where one of them has a labor market experience of only two years and the other one has a labor market experience of ten years one may expect that the latter has

acquired more labor market skill and thus reached a higher position and consequently earns more. This hypothesis has been tested on Swedish earnings data (see Gustafsson, Siv [1977a] and [1977b]). The main conclusion of these studies is that labor force interruptions decrease earnings in the future. This is true both for men and women. The alternative with no day-care and labor force interruptions has a long-run cost. This long-run cost of the alternative should be added to the benefits of the day-care project.

Table 2 shows gross annual incomes of white collar workers in 1974. The figures are taken from a one in ten representative sample of white collar workers in private industry in Sweden, which has been collected for the purpose of econometric analyses of earnings differentials by this author. The sample includes 32 000 individuals. This sample will be used to calculate long-run benefits of day-care. For each individual there is information on whether the individual was in the labor market or not for each separate year of the 15 years period 1960-74. It is thus possible to compare earnings of individuals who have worked different numbers of years but are of the same age. The full sample includes 23 000 men and 8 000 women. Since it is a random sample, the proportion of women in the sample coincides with the proportion of women in the population of white collar private sector workers in 1974. In Table 2 only salaries of persons of age 35 or more are included because younger persons must be sub-divided according to education in order to give meaningful aggregates across years of experience.

STATENS
PSYKOLOGISK - PEDAGOGISKA
BIBLIOTEK
STOCKHOLM

The average income of women who had been absent from the labor market for 10 years is substantially less than the average income of women who had worked all 15 years. Women who had been absent for 10 years earned 30 % less than women who had worked for all 15 years. Women who had worked all 15 years still earned only 2/3 of the mean income of men. This last observation tells us that differences in years of experience does not by far tell the whole story of income differentials between men and women. (See Gustafsson, Siv [1978] forthcoming.)

Timing of costs and benefits

Women may choose different life-time participation in the labor market. The benefits of day-care will depend on which life-time labor

Table 2. Annual Gross Income of Private Sector White Collar
Workers in 1974

Age	Men	Women	
		worked all years	absent 10 years
35-39	59 400	39 200	23 800
40-44	61 200	40 000	32 000
45-49	62 400	40 600	23 900
50-54	62 300	41 100	27 100
55-59	59 700	40 800	18 700
60-64	56 400	38 100	
all 35-64	60 600	40 300	26 200
all 16-64	55 900	39 800	
number of individ- uals			
35-64	15 189	2 028	134
16-64	23 171	2 277	

Source: Sample of combined salary statistics (Swedish Confederation of Employers) and pension statistics (Swedish Social Security Board).

force participation that is a realistic alternative. Different alternatives are illustrated in Figure 2.

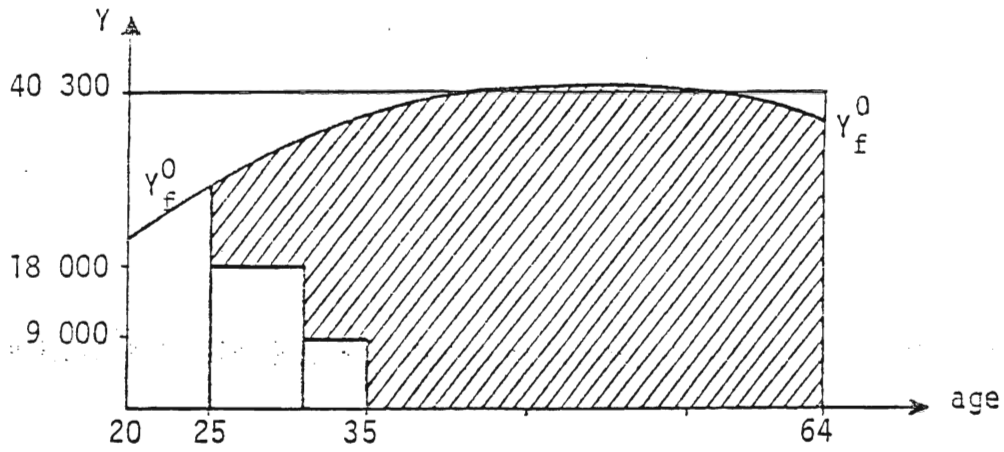
Life-time earnings of full-time working women with no labor market interruptions, $Y_{\bar{f}}^0 Y_{\bar{f}}^0$, make the norm of comparison in calculating benefits of day-care in the different life-time participation alternatives. Benefits and costs associated with different patterns of labor force participation are drawn in panels A through D. For all panels we assume that young women go to school, start their working life at age 20, and get a child at age 25. We assume that care for full days is needed during 6 years till the child starts school and for half a day is needed for young school children till they reach the age of 10. The caring of young school children is thus assumed to use resources in addition to what a full-time working mother can supply. These resources may be assumed to be not more than half the size of the amount used by pre-school children, since children are at school during a major part of the working day.

Panel A represents the case where the woman works only before she gets a child. The alternative of paying for day-care 6 years at a day-care center at a cost per year of 18 000 Sw Crs is of course socially much cheaper than losing all life-time production from this woman. The little unfilled box in the diagram represents total costs of day-care at 18 000 Sw Crs per year during 6 years and at 9 000 Sw Crs per year during 4 years.¹

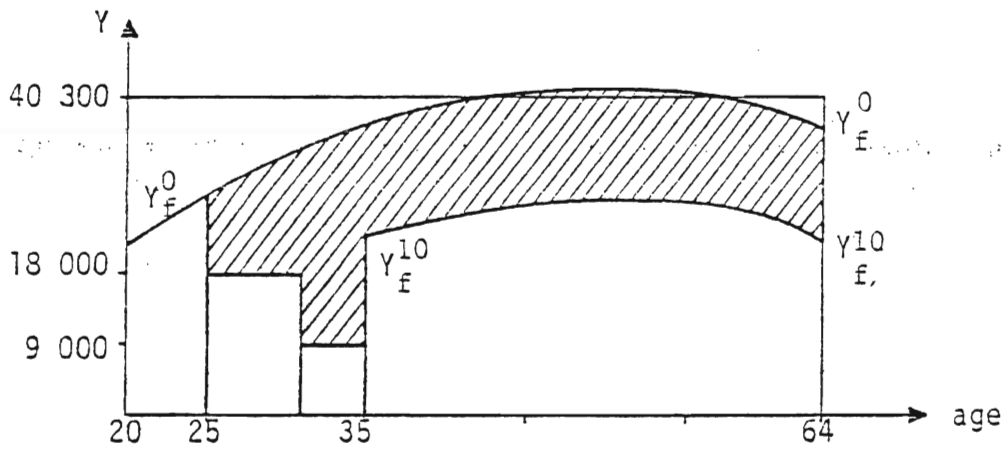
If a woman feels she must stay at home with her child till the child reaches the age of ten, costs and benefits of day-care are illustrated by panel B. She works on the labor market five years till she gets her child, then her career is interrupted for 10 years and then she starts to work again at the age of 35. Since market earnings of the individual are determined by the amount of human capital accumulated by the individual, this woman will earn much less than she would, had she worked without interruption. Table 4 indicates that this woman earns on the average for the rest of her working life only

¹ It may be argued that also panel A represents an underestimate of the benefits of day-care compared to the traditional case. In the traditional case the woman would not work even before the arrival of her child and benefits of day-care would be the total area under the $y_{\bar{f}}^0 y_{\bar{f}}^0$ -curve.

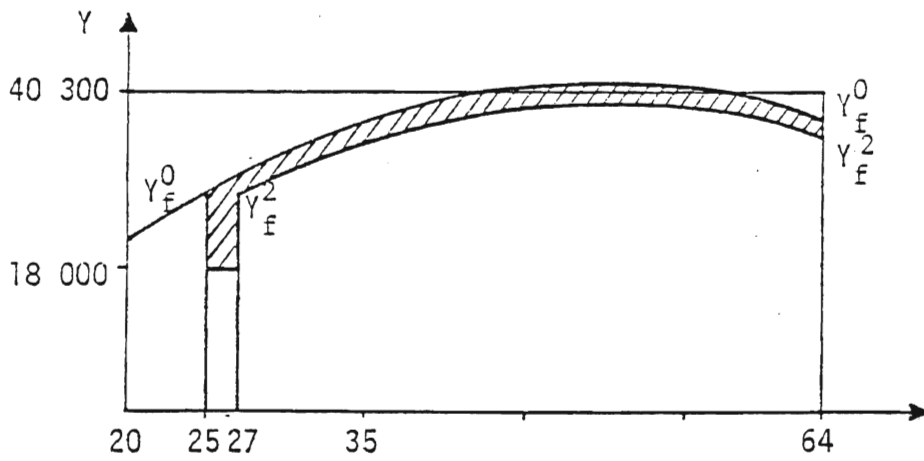
Figure 2. Benefits of day-care



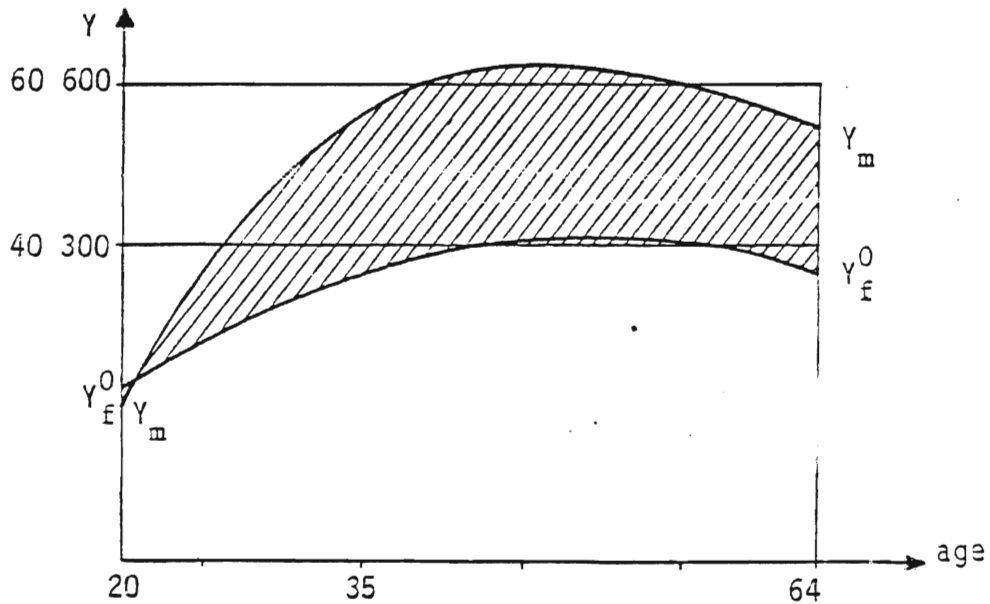
A



B



C



D

65 % of what a woman with uninterrupted labor market experience earns in the same age interval.¹

Panel C shows a woman who stays home with her child for two years and then gets a place at the day-care center for her child. Market production lost by career interruptions depend on the number of years of interruption not only because the direct loss is greater the more years the mother stays at home but also because of alternative investments in human capital not carried out. A short interruption is more likely to be offset by benefits in the next generation than is a long one.

One of the results of the analysis of earnings for private sector white collar workers in Sweden is that there is a substantial earnings differential in favor of men also when comparing earnings of men and women who worked all 15 years in the sample. In Table 2 and Panel D of Figure 2 this differential is 33 %. When the salary differential is standardized for proportion of parttime workers, education and age, there is a differential of 22.6 % between men and women who have worked all 15 years. (See Gustafsson [1978].) This differential may be hypothesized to consist of two different parts. Women may have invested less in their human capital than men, also if they have worked without labor market interruption. They may have chosen easier jobs, may have worked less per day also at the same stipulated number of hours a week, may have refused overtime, travel and whatever. The reason why women have invested less may be because of their own choice or because of discrimination by employers. They may simply not have been offered the more difficult jobs that would also carry with them more investments in human capital.

¹ Effects of non-experience years have been estimated by econometric methods in Gustafsson [1977a] for separate educational groups. For women with secondary schooling the effect of non-experience years is 2.4 % per year of non-experience. The simple cross tabulation of earnings make the reduction larger than the econometric estimate. First there has been hypothesized in the econometric study a linear relation between years of non-experience and earnings. This might be wrong. Second this cross tabulation does not compare persons of the same education. Third, it does include parttime workers which is not the case in the econometric estimation.

The earnings differential shown in panel D is the social gain that might be added if women had the same incentives to invest in human capital as men and/or if employers had the same incentives to offer the more difficult jobs to women as they nowadays have to offer them to men. The theory of different incentives has been discussed in Polachek [1975]. Given that we can arrange a society where there were no differences in post-school investments carried out by men and women it would be correct also to include the area between the curves Y_m and Y_f^0 in panel D. This last observation leads us back to where we started this section. The correct calculation of the benefits of day-care would be based on mean male earnings. This would be correct if in a society of day-care for all children mean earnings of women would be equal to mean earnings of men.

Cost benefit analysis considering long run effects

Benefits in a social calculus will depend entirely on what production is generated by the mother in her alternative allocation of time. Costs and benefits of child-care have been formulated as areas in Figure 2. The excess of life-time earnings in the alternative with day-care over life-time earnings in the alternative without day-care are the benefits of day-care. Life-time earnings depend on the number of years worked over the life-time. Costs of day-care will depend on how many years day-care is used by the family. This in turn will depend on the number of children. The spacing of children will influence the computation of present values since costs borne at a later date will carry a lower weight in the present value.

Rough estimates of benefits and costs in the four cases illustrated in panels A through D in Figure 2 are given in Table 5. The computations are based on the figures of Table 4, i.e. mean earnings of different age groups are used. Costs of day-care are assumed to be 18 000 Sw Crs per place for children aged 1-6 and half the size of this for young school children. All figures are given in 1974 prices and discounted at a rate of 6.5 % per year back to the age of 25 of the mother.

If the alternative when day-care for children is not organized is that the woman never gets a job on the market (case A) the society earns 3.4 times the costs of day-care for one child according to

Table 3. If there are two children and they were born simultaneously the social benefit would be reduced to 2.2 times the cost of day-care for those two children.¹

If the alternative is that the mother starts to work after a ten years interruption benefits over the life-time is still almost double the size of costs (case B). Two children in this case would not quite cover the costs of day-care. If the children were spaced e g 3 years a comparison to 13 years of no market earnings would be appropriate. If the lack of day-care is not greater than two years per child, it would still be profitable to extend day-care for those two years according to case C.

In case D the cost of underinvestment in human capital by women is calculated. Underinvestment in human capital may result because women are discriminated against or because their own taste for investment in human capital is smaller than the case is for men. If this underinvestment in on the job training for women would disappear when there is adequate and safe day-care for all children we would be allowed to add the sum calculated in case D to benefits in all the three cases.² The social profitability of day-care would be consequently increased. In order to be justified in adding the incentive gain to the benefits of day-care we must claim that day-care for children is not only a necessary condition for equality between men and women in the labor market but also that it is a sufficient condition.

IV. POLICY IMPLICATIONS

The intramarginal case

By the analysis carried out by Holmgren & Lantz it is clear that the costs of a marginal place at a day-care center will differ according to geographical areas and the quality of day-care offered. It was shown in the preceding section that the benefits of a marginal place will differ according to what the labor force participation pattern of women will be in the case when day-care exists as compared to the case when day-care does not exist. If we have information on

¹ $546/124 = 3.4$; $546/(2 \cdot 124) = 2.2$

² It is seen in panel D of Figure 2 that male earnings start at a lower level than female earnings at age 20. Since we discount back to age 25 we do not use earnings before this age.

Table 3. Rough estimates of dynamic costs and benefits of day-care
Thousands of Swedish Crowns, 1974 value

	Present value discounted by 6.5 %
<u>Costs of day-care</u>	
7 years à 18 000	104
4 years à 9 000	<u>20</u>
	124
<u>A. No market work</u>	
+ Alternative earnings 25-64	+546
- costs	<u>-124</u>
net	+422
<u>B. Interrupted labor force participation 10 years</u>	
+ Alternative earnings 25-34	280
+ alternative earnings 35-64	+79
- costs	<u>-124</u>
net	235
<u>C. Interrupted labor force participation 2 years</u>	
+ Alternative earnings 25-26	67
+ alternative earnings 27-64	8
- costs	<u>-32</u>
net	43
<u>D. Incentive gain</u>	
Male earnings 25-64	703
-female earnings 25-64	<u>-546</u>
	157

the actual pattern of labor force participation over life-time for women we may arrive at an estimate of the maximum possible benefit.

The maximum benefit of day-care is arrived at if the following assumptions are fulfilled:

1. All women would work without labor force interruptions (except for 7-8 months in the year of birth of the child).
2. All women would work full-time.
3. Women would work in all occupations in the same proportions as do men.
4. Men would not change their labor force behavior.
5. Full employment.

By the first assumption we would be entitled to add the difference in market earnings over life-time between the case where all women work without interruption and the actual number of years that women work. Tor Eriksen at the Swedish Social Insurance Board has, using the pension data previously mentioned, computed how many years women have worked. A summary of his results are given in Table 4.

The proportion of women who never worked during the 14 year period covered by the data increases by the age of women. Almost half of the women aged 60-65 have never worked on the labor market whereas only 10 % of women 25-34 have never worked on the labor market. The proportion of women who look upon themselves as only mothers and wives over their entire life is apparently decreasing. The number of women who have worked all 14 years is still only a small proportion of the women. It does not exceed 18.6 %. The majority of women have worked at least three years. The proportion of women having worked at least three years is decreasing with age. The observations of Table 4 lead to the conclusion that there is a higher probability that the marginal place of a day-care center would be used by a mother who could increase her labor force participation from a case like B in Figure 2. than it would be for a mother increasing her labor force from a case like panel A. The expression for benefits of day-care in the intramarginal case given the assumption that labor force interruptions will disappear is given in Appendix C.

In 1977 only 55 % of the female labor force worked full-time whereas 45 % worked part-time. Mothers with children 0-7 years of age had a

Table 4. The Swedish Female Population in 1973 according to number of years worked in the period 1960-1973.

Per cent of corresponding age group

Age	Never worked	Worked at least 3 years	Worked maximum no. of years
25-29	10.2	76.3	7.8
30-34	10.5	77.9	6.7
35-39	16.9	69.5	11.5
40-44	21.0	67.6	15.0
45-49	24.7	65.8	17.4
50-54	29.8	56.0	18.6
55-59	37.7	54.9	18.0
60-65	48.8	44.1	12.1
35	14.3	72.9	10.3

According to Tor Eriksen, The Swedish Social Insurance Board. Unweighted five-year means calculated from Eriksen's one-year specific percentages. Notice the third column is a subset of the second column.

Table 5. Women in the Swedish Labor Force in 1977.

Per cent of corresponding age group in the population

Age	<u>All women</u>		<u>Mothers with children 0-7 years</u>	
	all	full-time workers ¹	all	full-time workers
16-19	56.1	37.0	53.4	24.2
20-24	77.1	56.3	66.0	32.3
25-34	75.0	41.8	67.4	27.9
35-44	79.9	40.1	62.8	23.0
45-54	78.4	40.0	63.0	25.0
55-64	51.7	23.6	55.6	-
16.64	70.6	38.7	66.2	27.7

¹ Of all women only $38.7/70.6 = 54.8$ are full-time workers. Consequently, 46.2 % of the female labor force are part-time workers. The proportion of full-time workers among working mothers is 41.8 %. Of all Swedish women 61.9 % are married and 61.2 % of the Swedish female labor force are married women and 15.7 % are married mothers with children 0-7 years.

still larger proportion of part-time workers; 58 % of working mothers were part-time workers. (See Table 5.) A more realistic assumption would be that some women who are part-time workers to-day would increase their labor force participation to full-time work and some women who do not work at all to-day would begin to work part-time.

If assumptions 3 and 4 were fulfilled in addition to assumptions 1 and 2 we would be entitled to add also the area in panel D of Figure 2 into the benefit calculation. We can do this because the reason why women have lower earnings than men also if they have worked without interruption is that they have invested less in their human capital. This underinvestment in comparison to men comes about either because women do not have incentives to invest as much as men or because employers do not have incentives to offer the opportunity of investing to the same degree for women as for men. These differentials in incentives may disappear if labor force interruptions and part-time work disappear.

Needless to say, this calculation assumes that we can organize our production in such a way that full employment of all people is achieved. The problem of achieving full employment is the topic of a vast literature in economics and will not be treated here. It is certainly a very crucial assumption.

The quality-quantity trade-off

It has been pointed out above that the type of analysis carried out here where only this generation costs and benefits are considered will give higher net benefits the smaller the resources used per child in the extra-family day-care are. The calculations carried out above are carried out on the basis of actual existing costs in Sweden.

The quality of day-care is secured by a system of state subsidies given to the local governments. There is a state subsidy to cover part of current costs per place. This subsidy is paid per place at the center. The number of places at a center is decided upon by the central government on the basis of the size of the building. The subsidy is not depending on the teacher/child ratio. Teacher/child ratios vary between communities. Unions of day-care teachers are strong pressure groups for decreasing the number of children per teacher. The sub-

sidy is paid to the local community for a place at a center that is open at least 7 hours a day if at least two thirds of the places are being used for at least 5 hours per child and day. Most centers are open more than 7 hours. In 1975 95 % of the day-care centers were open more than 10.5 hours a day.

There are government recommendations as to how day-care centers should be planned. These recommendations include the size of a center and the teacher/child ratios. A day-care center is recommended to be organized in two different departments:

1. Small-children group which cares for children 6 months through 3 years old. A small children group should never have more than 10-12 children.
2. "Siblings"-group. For children who are 3-7 years of age care is organized in siblings groups. The label siblings group is given because the extended age distribution allows brothers and sisters to be cared for in the same group. A siblings group can have 10-20 children.

The recommended teacher/child ratio in the small-children department is 2 per 5 children. In the siblings group the teacher per children group is recommended to be not smaller than 1 per 5 children.

One day-care center can have several groups. However, the number of children in one center should not be more than 50. If there is common space for the children more than 40 children should not have daily contacts with each other.

The cost of personnel amounts to about 70 % of the total cost of day-care. The most important variable in determination of the cost of day-care thus is the teacher child ratio. The teacher child ratio has decreased over the years. The mean teacher/child ratio was 1:4.6 in 1976 and the recommended ratio is one teacher per four children.¹Total costs

¹ Teacher child ratios were:

1972	1:5.2
1973	1:5.1
1974	1:5.0
1975	1:4.7
1976	1:4.6

of day-care have been calculated to increase by 7 % when the teacher child ratio decreases from 1:4.5 to 1:4.¹

ratios are probably very low. According to Strober [1975] day-care centers in San Francisco Bay Area in USA had teacher child ratios of 1:10.

Primary schools of the compulsory school system have teacher child ratios of 1:25. Day-care for small children have extremely low teacher child ratios.

The first three years of primary schools of the compulsory school system have teacher child ratios of 1:25. Day-care for small children have extremely low teacher child ratios in comparison to compulsory schools. The Swedish teacher/child ratios are probably low in international comparison. Strober [1975] reports teacher/child ratios of 1:10 in San Francisco Bay Area in USA.

It has been estimated that there were in 1976 321 000 children 0-6 years of age who had working mothers and had to be cared for in one way or other. (See Socialstyrelsen [1977].) There were only 82 300 places at day-care centers. Of all children regardless of the labor force status of their mother only 10 % had a place at a day-care center. The local communities have as an alternative to day-care centers also family day-care homes. The local communities pay these women and parents pay fees to the community. Adding these places at family day-homes means that 57 500 children more are cared for by public care. But there are 181 000 children of working mothers for whom the care is organized one way or another outside this system.

Financing day-care

Day-care centers in Sweden are financed by parents' fees, state subsidies and short-run net costs for the local community. There has been a reallocation of the financing increasing the part paid by the state

¹ The Swedish Association of Local Authorities. Estimated costs for 1977:

teacher/child	cost
1:4.9	25 355
1:4.5	26 655
1:4	28 635

and decreasing the proportions paid by the parents and the local community. In 1976 state subsidies covered more than half of the cost and parents did not pay more than 11.3 % of the cost. Parents' fees are made dependent on family income. Low income families pay only a few crowns per day for their place at the day-care center. It has also been a policy to give low income families priority in the queue for day-care. This policy has lowered the proportion of day-care costs paid by the parents.¹

There are almost no private day-care centers in Sweden (1 %). Since 1975 private institutions cannot get state subsidies. A private organization can run a day-care center only after approval from the local government. One reason why parents would be unwilling to pay total costs of day-care is that they have to be paid out of taxed money, while home-work is not taxed. This could be remedied if day-care costs were made deductible before income taxation. Also with deductible fees for day-care there may result a situation where the lack of day-care results in underinvestment in human capital of women and/or underutilization of school investments in women.

In addition to tax considerations another reason why private day-care centers would not be established to the extent that would be socially desirable is the difference between the short-run calculus and the long-run calculus. If women were mothers of small children for most of their grown-up lives there would be no difference of this kind. This was true in earlier generations before the widespread use of family control devices. However, to-day women are mothers of small children only for a limited part of their lives. Thus, the question of paying for a place at a day-care center is a question of paying during a few years while market earnings of the women are affected for full life-times.

¹ Cost of day-care centers in Sweden

	1970		1976	
	Sw Crs	%	Sw Crs	%
Total cost	10 500		26 700	
paid by				
the state	3 200	30.5	14 700	55.1
the parents	2 600	24.8	3 000	11.3
the local government	4 700	44.8	8 955	33.6

If women were aware of these long-run effects on their earnings they would be more willing to pay the full costs of day-care for children. If the long-run effects are large a situation arises where it would be profitable to pay more than full earnings in a year to have the opportunity of investing in human capital. This situation describes the case when mothers who perform full-time studies pay for a place at the day-care center for their children.

If a woman knew that her possibilities of ever getting a market job would be very much worsened by quitting the labor market for child caring she might consider paying a major part of her earnings for a place at the day-care center for her child. She might even be willing to borrow in order to finance her investment in market oriented human capital. However, there are no markets for this kind of borrowing. This is the same type of argument which has led to special student's loans to facilitate the financing of university studies.

Apparently one alternative is for the state or local governments to subsidize day-care and get the returns back in the form of taxation of the earnings of mothers.

In Sweden day-care for children is a public business. This decision has not been motivated by the economic profitability of day-care, however. Decision makers have tended to look at day-care as something which has only costs and no returns. There is a very good case for performing a cost benefit analysis if only to identify and make clear what the benefits are. If decision makers underestimate the returns to an investment the investment will be smaller than the social optimum.

Appendix A.Planning model for day-care according to Holmgren & Lantz

$$\text{A Personnel cost: } \frac{12}{p} (C \cdot L_C \cdot s_C + F \cdot L_F \cdot s_F + B \cdot L_B \cdot s_B + E \cdot L_E \cdot s_E + T_D \cdot L_D)$$

$$\text{B Rent: } (K_{LO} - AB) \left(\frac{1}{AM_{LO}} + r_{LO} \right)$$

$$\text{C Fixed equipment rent: } K_{IN} \left(\frac{1}{AM_{IN}} + r_{IN} \right)$$

$$\text{D Care for sick children: } t(FR_S - T_0)(1 - VB)(L_V \cdot S_V \cdot T_V - G)$$

$$\text{E Tax incomes: } \frac{1}{p}(KS - SUB_1 + SUB_2)$$

where $KS = a \cdot u \cdot i \cdot 12 \cdot I_m \cdot HH$

$$\text{F Social security: } \frac{12 \cdot HH \cdot a}{p} [e_h \cdot e(SH_{e1} - SH_{e2}) + g_h \cdot g(SH_{g1} - SH_{g2})]$$

$$\text{G Housing subsidy: } \frac{12 \cdot HH \cdot a}{p} [e(BT_{e1} - BT_{e2}) + g(BT_{g1} - BT_{g2})]$$

$$\text{H Parent's fees: } e[11 \cdot FA_e + A_e(\sigma - FR_S - FR_0)] + g[11 \cdot FA_g + A_g(\sigma - FR_S - FR_0)]$$

I = Other current costs, i e food, toys, heating, administration

J = State subsidy per place

List of symbols

P = number of places at the centre
 F = number of nursery school teachers
 E = cooking personnel
 S_C, S_F, S_B, S_E = social security cost additions for personnel with corresponding subscripts
 L_D = wage per hour of the physician

C = head of the centre
 B = number of children's nurses
 L_C, L_F, L_B, L_E = salaries per month of personnel with corresponding subscripts
 T_D = hours of visits to the centre per month by a physician

K_L = building cost
 $\frac{1}{AM_L}$ = rate of depreciation

AB = state subsidy for building cost
 r_{LO} = rate of discount

K_{IN} = initial outlay purchase cost for fixed equipment
 r_{IN} = rate of discount
 FR_S-10 = number of days per child absent from the centre due to illness minus 10 which are paid to the parents by the ordinary sickness security system

$\frac{1}{AM_{IN}}$ = rate of depreciation
 t = per cent of sick children cared for by the local community
 VB = state subsidy for care for sick children
 L_V = salary for personnel
 G = parent's fee

KS = increase in tax payments
 SUB₁ = state subsidy to poor communities before increase in day-care
 $SUB_1 = u \cdot M(n \cdot SK_R - SK_K)$
 M = population of the community
 n = norm for receiving subsidy per cent of SK_R
 SK_R = ability to pay taxes for Sweden as a whole, tax power
 SK_K = ability to pay taxes for the community under consideration, tax power
 $SUB_2 = u \cdot M(n \cdot SK_R - SK_K - \frac{1}{M} \cdot a \cdot i \cdot 12 \cdot I_m \cdot HH)$

$KS = a \cdot u \cdot i \cdot 12 \cdot I_m \cdot HH$
 where
 a = proportion mothers going directly from home work or studies to market work
 u = tax rate
 i = taxable income as per cent of gross income
 I_m = gross income per month of the mother
 SUB₂ = subsidy for poor communities after increasing day-care
 HH = number of households (less than number of places at the centre P=42, HH=35)

e = proportion single parent's households

SH_{e1} = social security benefit per month for single parent before a place at the day-care centre

SH_{e2} = social security benefit per month after a place at the day-care centre

SHg_1 and SHg_2 analogous to SHe_1 and SHe_2 but for married mothers

e_h = proportion of the single parent's households that go directly from home-work or studies when a place at a day-care centre is received and who got social security benefits before

g_h = proportion married that go directly from household work to market work when receiving a place at the centre and who received social security benefit before

BT = housing subsidy paid by the local community

FA_e = fixed per month fee for single parents

FR_S = children's number of days absent due to illness

A_e = per day fee for singles

\ddot{O} = number of days open at the centre

FR_0 = children's number of days absent for other reasons than illness

A. Theoretical valuesBenefits

$$\int_{25}^{64} Y_t \cdot e^{-rt} dt$$

where

Y_t = annual earnings of the mother in year t

e = natural base

r = rate of discount

Costs:

$$\sum_t (Ch_t \cdot D_t) (1+r)^{-t}$$

where

Ch = number of children

D_t = total costs of day-care at year t

B. Actual calculations for table 3.

There are 10 age groups $i = 1 \dots 10$ namely -19, 20-24, 25-29, 30-34, 35-39, 40-44, 45-49, 50-54, 55-59, 60-64.

\bar{Y}_i = mean salary in age group i .

$j = 2, 7, 12, 17, 22, 27, 30, \infty,$

for $i = 3, 4, 5, 6, 7, 8, 9, 10,$.

subscript f = female, subscript m = male, superscript 0 = zero interruption, superscript 10 = 10 years' interruption, superscript 2 = years' interruption, $r = 0.065$.

Case A

$$\sum_{i=3}^{10} 5 \cdot \bar{Y}_{if}^0 (1+r)^{-t_j} - \sum_{t=1}^6 D_t (1+r)^{-t} + \sum_{t=7}^{10} \frac{D_t}{2} (1+r)^{-t}$$

Case B

$$\sum_{i=3}^4 5 \cdot \bar{Y}_{if}^0 (1+r)^{-t_j} + \sum_{i=5}^{10} 5 \cdot (\bar{Y}_{if}^0 - \bar{Y}_{if}^{10}) (1+r)^{-t_j} - \sum_{t=1}^6 D_t (1+r)^{-t} + \sum_{t=7}^{10} \frac{D_t}{2} (1+r)^{-t}$$

Case C

$$2 \cdot \bar{Y}_{3f}^0 (1+r)^{-2} + 3(\bar{Y}_{3f}^0 - \bar{Y}_{3f}^2) (1+r)^{-2} + \sum_{i=4}^{10} 5(\bar{Y}_{if}^0 - \bar{Y}_{if}^2) (1+r)^{-t_j} - \sum_{t=1}^2 D_t (1+r)^{-t}$$

Case D

$$\sum_{i=3}^{10} 5(\bar{Y}_{im} - \bar{Y}_{if}^0) (1+r)^{-t_j}$$

Appendix C.Benefits of day-care in the intramarginal case:

define present value of life-time earning for a woman with zero years of labor force interruption:

$$I^0 = PV = \int_{25}^{64} Y_t^0 \cdot e^{-rt} dt .$$

Similarly present value of life-time earnings for a woman with one year of labor force interruption:

$$I^1 = PV = \int_{25}^{64} Y_t^1 \cdot e^{-rt} dt .$$

Benefits of day-care are given by:

$$N_f \cdot I_f^0 - \sum_i n_{if} I_f^i, \quad i=0, \dots, 39$$

where

N_f = female population

n_{if} = population of women with i years of labor force interruption

I^i = present value of life-time earnings of women with i years of labor force interruption.

Appendix D. Public day-care and female labor force participation rates in Sweden

Year	Children, 0-7 years at day-care centers		Labor force participation rates of women ages 16-64	
	number of places	per cent of all children	all	mothers with children 0-7 years
1968	19 195		56.4	42.1
1969	25 244		57.6	45.8
1970	29 347		59.3	49.7
1971	36 761	4.3	60.9	52.1
1972	48 200	5.5	62.0	53.7
1973	50 709	6.3	62.7	53.5
1974	56 170	7.2	65.2	56.7
1975	63 085	7.8	67.9	60.5
1976	75 640	9.9	69.1	62.8
1977			70.4	66.2

LIST OF REFERENCES

- Bohm, P, 1972, Samhällseconomisk effektivitet, SNS. (Social Efficiency.)
- Gustafsson, S, 1976, Lönebildning och lönestruktur inom den statliga sektorn, IUI, Stockholm (Determination and Structure of Salaries in the Governmental Sector. With a Summary in English.)
- , 1977a, Rates of Depreciation of Human Capital Due to Nonuse. Working paper, IUI.
 - , 1977b, Förvärvsfrånvarons kostnader, Ekonomisk Debatt nr 8. Long-run Costs of Labor Market Interruptions.)
 - , 1978, Löneskillnader mellan män och kvinnor - en ekonometrisk analys, Statistisk Tidskrift. (Salary Differentials between Men and Women - an Econometric Analysis.), Forthcoming.
- Holmgren, B, och Lantz, K-Å, 1975, Daghem och kommunal planering, Studentlitteratur, Lund. (Day-care and local government planning.)
- Jönsson, Bengt, 1970, Daghem och samhällsekonomi, Prisma in cooperation with LO. (Day-care and social economy.)
- Johansen, L, 1977, Samfunnsøkonomisk lønnsomhet, Industriøkonomisk Institutt.
- Layard, R, 1972, Cost Benefit Analysis, Selected Readings edited by Richard Layard, Penguin Education.
- Mattsson, B, 1970, Samhällseconomiska kalkyler, en introduktion till "cost-benefit"-analysen, Akademiförlaget. (Introduction to cost-benefit analysis.)
- Mincer, J, 1974, Schooling, Experience and Earnings, NBER.
- Mishan, E J, 1971, Cost-Benefit Analysis, Unwin University Books.
- Niklasson, H, 1976, Cost-Benefit-analys i teori och praktik, ekonomi och arbetsmarknad. (Theoretical and empirical cost-benefit analysis in labor economies.)
- Polachek, S, 1975, Differences in Expected Post-School Investment as a Determinant of Market Wage Differentials, International Economic Review, June, 1975.
- Rosengren, B, och Svensson, G.R, 1975, Potentiell Arbetskraft. Utbud och efterfrågan samt ekonomiska effekter av aktivering. Memorandum nr 48. Department of Economics. University of Gothenburg. (Potential labor force. Supply and demand and economic effects of activating.)
- Socialstyrelsen, 1975, Planering av lokaler och utemiljö, Stockholm. (Planning of day-care localities.)

Socialstyrelsen, 1977, Barnomsorgen i siffror 1977-1981, Stockholm.
(Day-care in digits 1977-1981.)

Statistiska Meddelanden, serie S, Förskolor, fritidshem och familjedaghem
årlig från 1973. (Statistical Report Series S, Childcare yearly.)

Strober, M, H, 1975, Formal Extra-family Child Care - Some Economic Obser-
varions ur Lloyd, C, (ed), 1975, Sex, Discrimination and the Division
of Labor, Columbia University Press.

Svenska Kommunförbundet PM 1977-10-18, Driftkalkyler för barnomsorg per
1978-01-01. (The Swedish Association of Local Authorities Costs of
day-care.)

STATENS
PSYKOLOGISK - PEDAGOGISKA
BIBLIOTEK
STOCKHOLM