

Child care in the Netherlands between government, firms and parents. Is the deadweight loss smaller than in the public daycare system of Sweden?

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Abstract

The Dutch labor force participation of women with young children has increased very rapidly in the 1990s, when the Dutch economy has shown a remarkably good economic performance (often attributed to the 'Polder' model). This rapid increase has put child care at the forefront of political discussion. Dutch politicians have deliberately pushed forward parttime work as a good solution to the combination of work and family and have created policy incentives for this outcome. In this paper we analyze the recent developments in female labor supply and the Dutch market for child care. The Netherlands has chosen for subsidized child care but a much lower subsidy rate than is the case for Sweden. The Swedish child care system has been criticized for causing large dead weight losses. In this paper we estimate the determinants of Dutch women's decisions to participate in the labor market and use paid care. Further we analyze whether the route which is taken by the Netherlands leads to smaller dead weight losses.

April 2000

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1. Introduction

For several years, the Netherlands had one of the lowest labour force participation rates for women in Europe and in the OECD. In the beginning of the 1970s, not even 30 per cent of Dutch women participated, while in countries like France and Germany about 50 per cent of women worked in the labor force, and in Sweden and Denmark even more than 60% (OECD, 1995). However, labor force participation of Dutch women has increased very much during the 1990s. While the labor force participation rate of women aged 25-49 was still only 38.2 per cent in 1984, it has increased to 61.9 per cent in 1996 (Visser 1999), which is about the average of European OECD-countries. Particularly women with young children have increased their labor force participation.

All of this employment growth has occurred in parttime jobs and temporary jobs. In fact there was according to one estimate (Hartog 1999) from 1987 to 1995 a net decrease of 2 thousand regular full time jobs while the total job growth was 647 thousand. The net job growth consisted of 435 thousand parttime jobs of which 327 thousand were for women. Further 214 thousand flexible jobs were created including temporary fulltime and parttime jobs, jobs on call and , jobs at temporary help agencies.

With the growth of employment of women with young children, child care has become a hot political issue. The Dutch child care 'market' consists of daycare centers created and run by private initiatives, but the available spaces are supplied and subsidized in three different ways. First, spaces in daycare centres can be bought by local communities, second they can be bought by firms, who supply them to parents, and third they can be bought directly by parents themselves. Parents who get access to child care according to the first option, namely spaces provided by local communities, mostly pay a parental fee based on family income according to a recommended national fee scale. Parents who get access to daycare in their capacity of employee often pay a parental fee according to the same national fee scale, while the remainder of the daycare costs are covered by the firm. The daycare costs of the firm are subsidized by the state by allowing firms to subtract 30 per cent of their daycare costs from their payroll taxes. Parents who make use of the third option and buy their spaces directly from the individual daycare center are also subsidized to some extent, because they can deduct a fraction of the daycare costs from their personal taxable income. This third option comes closest to a market price. In addition to formal daycare there is much use made of informal care, either unpaid or paid of which a rather large fraction is not reported and no taxes or social premiums are paid for the work performed. Such daycare is often referred to as black market daycare. This informal care is often free of charge to the parent, like when supplied by the grand mother. Formal daycare is rationed both the substantially subsidized spaces and the less subsidized spaces.

In this way the Dutch solution is between state and market, or between the Swedish government solution and the US market solution. Also in the fact that, different from in Sweden, Dutch child care is organized and run by private entrepreneurs, it is between public and private. In addition to analyzing the Dutch child care market we analyze whether the Dutch situation between public and private makes it less vulnerable to criticism for causing dead weight losses than the Swedish system (Rosen 1995, 1996; van der Laan 1996). Also as has been pointed out by Sandmo (1990) modern welfare states have to weigh welfare

losses against gains in equality. In this particular case child care provision aims at equalizing the situation of men and women. A relevant question to ask is therefore: does the Dutch child care policy achieve the goals of gender equality at a lower social cost than Sweden.

The organization of the paper is the following. In section 2, the historical development of Dutch child care and of female labor force participation is discussed. In section 3 the Dutch child care market, i.e. the distribution of costs between the government, employers and parents is explained and the development of number of child care spaces per child described. In section 4 evidence from the literature on the effect of child care subsidies on female labor supply is discussed. In section 5 rationing in the child care market and its effects for estimating child care price effects on female labor supply is analyzed. In section 6 econometric analyses are carried out trying to identify wage and price of child care effects on women's labor force participation. In section 7 we use our results to discuss the social costs of child care using Rosen's (1995) model. In section 8 concluding remarks are presented.

2. Historical background of low female labor force participation: pillarization and subsidiarity.

In 1989, only 4.4 per cent of Dutch preschool children had a space in a child care center; in 1995 the figure had increased to 12.8 per cent (Statistics Netherlands, 1997). In the same period, female labor force participation in the Netherlands has increased to the mean of the European Union. However, since parttime work is so extensive in the Netherlands, Visser (1999) shows that if recomputed into fulltime equivalents there are only two EU countries that have lower female labor force participation than the Netherlands, namely Italy and Spain. This is very different from Sweden, where the massive increase in female labor force participation started in the 1960s and 1970s concurrent with an extensive increase in public child care spaces, which by 1989 had reached a level of supplying fulltime equivalents for 50 per cent of all preschool children in Sweden (Gustafsson and Stafford, 1992, 1994). To understand Dutch history in this field, it is important to emphasize the role of the church and its battle against state institutions: Esping-Andersen (1990:27) observes:

“But the corporatist regimes are also typically shaped by the Church, and hence strongly committed to the preservation of traditional familyhood. Social insurance typically excludes nonworking wives, and family benefits encourage motherhood. Daycare and similar family services are conspicuously underdeveloped; the principle of ‘subsidiarity’ serves to emphasize that the state will only interfere when the family’s capacity to service its members is exhausted.”

Until the 1960s the Dutch society was organized into confessional pillars, with catholics and two protestant confessions as separate pillars. Therborn (1989) explains that the subsidiarity principle means that the state should be subsidiary not only to the family but also to the confessional pillars. This is typically visible in primary education, which is organized along confessional lines. Parochial and public schools have received equal state funding since the confessionals won ‘a complete triumph’ (Therborn, 1989:204) in the great school battle of 1917. In the pillarized society there was no room for child care

except as poverty relief, and then organized along confessional lines (Rijswijk-Clerkx, 1981).

Until 1965 child care was regulated by the Poor Laws (Pott-Buter, 1993: chapter 9). From the 1960s until the oil crisis of 1973 was a period of tight labour markets. Firms, competing for the scarce labor force, installed daycare for their employees. Thus employers have been involved in supplying daycare, different from Sweden, where that never has been the case. Public opinion was against the working mother and against daycare, so firms never openly advertised their daycare centers. As the labor shortage disappeared, firms lost interest in providing child care and closed their daycare centers. The percentage of child care spaces fell to 1 per cent in 1977. Mothers who wanted to continue to work turned to confessional centers. In response to the increased demand for their services the centers modified their rules, accepting only women who had to work out of economic necessity (Tijdens and Lieon, 1993: 13 citing Rijswijk-Clerkx).

Mothers in the Dutch society had 'a duty of presence' 24 hours a day if they were to be considered good mothers. Women demanding some freedom for themselves began to question this 'duty of presence'. Part of this demand was met by shops supplying hourly-based daycare for children while mothers were shopping (Tijdens and Lieon, 1993:13). The most important form of daycare before the 1990s were the part-day playschools ("peuterspeelzalen"), which still play an important role involving about 30 per cent of potential users.

One of the reasons for the failure to obtain jobs and full-time daycare lies in the logic of the types of welfare states. As extensively discussed by Esping-Andersen (1990:153) the conservative, corporatist welfare states reacted to the rise in unemployment resulting from the oil crisis by trying to decrease labour supply (see also Hartog and Theeuwes, 1993), whereas the social democratic welfare state attempted to increase labour demand. The means of reducing labor supply have been early retirement, repatriating foreign workers, and encouraging women to remain at home. Such policies have been extensively used in the Netherlands during the decades from the 1950s through the 1980s.

Policies of encouraging women to remain at home or even more actively to forbid them to be employed have been vigorous and have continued until recently in the Netherlands. The history of women's work in the Netherlands is a lasting story of outright legal discrimination against women. Of course the discriminatory legislation was justified as protecting women from the evils of the labor market; for example forbidding women to work at night or under ground.

The Depression of the 1930s in the Netherlands strengthened earlier breadwinner arguments for excluding women from the labour market. In 1924 married women were forbidden to hold civil servants' jobs, which was most important for teachers (Kessel et al., 1986; Pott-Buter, 1993; Blok, 1978). Female teachers were dismissed on their wedding day because it was unlawful for the employer to keep them, no matter how good they were. Only in 1973 did Dutch women gain the same protection as Swedish women secured in 1939, namely legislation making it unlawful for employers to dismiss a woman because of pregnancy, childbirth or marriage (Pott-Buter, 1993).

There was a policy shift in the Netherlands which can be dated to 1990. In the 1980s increasingly the Dutch welfare state has had to tackle the problem of financing a growing number of beneficiaries by a relatively smaller number of taxpayers. This has led to policies of trying to increase labor supply rather than decrease it. The report of the

Scientific Council of the Dutch government *A Working Perspective* (WRR, 1991) has been an important contribution to this change. The new rules promoting child care are part of these policies to stimulate greater labor force participation. The Dutch economic political scene of the 1990s has been dominated by its great successes in jobs growth, growth of private consumption, decrease of unemployment, and good relations between unions and employers (Visser and Hemerijck, 1997; Hartog, 1999).

As a result of the policy shift, the Dutch government has created a child care policy. The Child care Stimulation Act of 1990 was the first government action which explicitly caters to the needs of the working mother rather than assigning priority to educational considerations. Previously the debate pitied the needs of the child against the needs of the mother. The Dutch child care policy aims at sharing costs between the government, employers and parents and it also aims at redistributing paid and unpaid work between fathers and mothers and actively propagates parttime work for both parents as a good solution to the combination of work and family.

3. The child care market in the Netherlands.

In 1996 there are about 85 thousand fulltime and full year equivalents¹ of *formal child care* supplied in the Netherlands; about 62 thousand for children 0-3 years old, and 23 thousand for children 4-13 years old in after school care (Confederation of Dutch Communities, 1999). The waiting list is about 31 thousand spaces². Parents who are on the waiting list for a formal child care space, or who do not want to use formal child care, have to find other solutions to their problem. One solution is to use informal child care from relatives, friends, or neighbours. According to estimates in Graafland (1999) *informally paid child care* supplies another 50 thousand fulltime full year equivalents of preschool care and 75 thousand fulltime equivalents of after school care. In addition to this there is *unpaid child care* by others than the parents amounting to 68 thousand full time equivalents for preschool children and 64 thousand for after school care for school age children. This implies that formal care accounts for only 34 percent of the preschool spaces and 14 percent of after school spaces. Graafland also shows that the labor force participation rate is highest amongst users of formal child care. In the following, we will concentrate only on the formal part of the child care sector in the Netherlands.

In the United States there is a market for child care. Any parents, who can pay for good quality child care can also get good care, without having to confront any extensive waiting list. In Sweden parents today also can expect to get a child care space because the Swedish communities are obliged by law to supply child care to all its children. Dutch politicians have wanted to find a solution between state and market, a solution to which parents, employers and the government contribute. Dutch formal child care is organized by private initiatives, private daycare entrepreneurs, that provide various categories of

¹ A full time space for children 0-3 year amounts to at least 2160 and maximal 3240 hours per year. A full time space for children 4-13 year amounts to at least 1050 and maximal 1300 hours per year.

² It is difficult to obtain a good estimate of the number of spaces on the waiting list. Many parents subscribe to waiting lists of various daycare centres and are therefore counted more than once. On the other hand, some parents think the probability of obtaining a space is so small, that they do not bother to get listed.

spaces: child care spaces bought by the community (45%), child care spaces bought by firms (43%), and child care spaces bought by parents (12%).

The full cost of a Dutch child care space (for children 0-4 year) is estimated at 18,000 Dutch guilders (= NLG) per year and the average paid by the household sector in 1996 is 42 percent according to the Confederation of Dutch Communities (1997a). For parents, financially, it often does not make a big difference if they have a space supplied to them by the community or a space supplied to them by their employer. They will in most cases pay according to the national schedule.³ According to this schedule parents have to pay for a fulltime full year space for the first child a minimum of 1,550 NLG plus 25 percent of the difference between total net household income and the social minimum income, up to the maximum parental fee of 13,600 NLG. The social minimum income per year, for 1996, determined politically, is 20,000 NLG per year. The maximum of 75 per cent of full cost is paid by parents, who have a net income per year of 60,000 NLG or more. Firms get a subsidy from the government because they can deduct about 30 percent⁴ of the child care costs from their payroll taxes

Also, parents who use daycare centers that are not subsidized (private in Table 1 below) can deduct some of their daycare costs from their income taxation. This is worth between 3 and 6 thousand NLG per year, with the smaller figure for high income parents and the larger figure for low income parents. Table 1 presents an overview of how the costs of child care are divided between households, firms and government, for different levels of household income and for various kinds of space providers. Note that since most firms apply the national schedule to determine the parental fee that the employee should pay, the costs for firms of a child care space are higher for employees with low family incomes than for employees with high family incomes.

The number of available spaces in Dutch child care has increased considerably in recent years. This is mainly due to policy changes since 1990. The first Child care Stimulation Act was introduced in 1990 to increase the capacity in child care with 49 thousand spaces, of which about one third should be spaces provided by firms. In 1994 a second Stimulation Act was enacted, especially to increase spaces provided by firms. Both policy measures have caused considerable increase in child care capacity (see Table 1). The number of formal child care spaces and the number of children served by these spaces have tripled between 1989 and 1995. The largest part of this growth in capacity has taken place before 1994 (i.e. before the second Child care Stimulation Act).

The average number of children per space has increased from 1.7 in 1989 to 1.9 in 1995. The figures show that the average 'daycare-child' goes part-time to the daycare center. Although the number of children going to daycare or after school care has increased considerably in recent years, only a minority of Dutch children are enrolled. In 1995 only 1 per cent of all 5-12 year-olds used after school-care and about 13 per cent of 0-4 year-olds visited daycare centers. These figures can be compared to 47 per cent of children

³ This schedule has been set up in cooperation between the Dutch Ministry of Health, Welfare, and Sport (Dutch acronym VWS) and the Confederation of Dutch Municipalities (Dutch acronym VNG).

⁴ Up to January 1999 they could deduct only 20 percent of their child care costs.

Table 1: Child care in the Netherlands

A: Availability of formal child care spaces and number of children served by these spaces						
	1989			1995		
	number of spaces ^{a)}	number of children ^{a)}	% of potential users participating ^{a)}	number of spaces ^{a)}	number of children ^{a)}	% of potential users participating ^{a)}
Daycare centers	18700	32000	4.4	53200	101200	12.8
Child minders	1100	1200	n.a.	12900	13900	n.a.
After school care	2400	3100	0.2	12000	18900	1.1

B: Financing of day care centers in 1996, Yearly costs per full-time child care space.

Thousands of NLG^{b)}

Supplier	Family income	Costs paid by			Total
		Households	Firms	Government	
Local community government	Minimum	2		16	18
	Modal	10		8	18
	Maximum	14		4	18
Firm	Minimum	2	13	3	18
	Modal	10	7	1	18
	Maximum	14	3	1	18
Private	Minimum	12		6	18
	Modal	14		4	18
	Maximum	15		3	18
Percent Distribution over all daycare centers ^{c)} subsidized and nonsubsidized.		42	25	33	100
Costs of subsidized daycare 1989		22	5	73	100 133 mln NLG
Costs of subsidized daycare 1996		37	22	41	100 850 mln NLG

Source: Graafland, J.J. (1999), Macroeconomic impact of child care subsidies, CPB Report, Quarterly Review of CPB Netherlands Bureau for Economic Policy Analysis, pp. 34-38. Primary sources: ^{a)} Statistics Netherlands 1997, ^{b)} Dutch policy report MDW 1998, ^{c)} Confederation of Dutch Communities 1997a,b.

aged 0-6 in Sweden already in 1987 (Gustafsson & Stafford 1994). By 1994 the figure was 50 per cent (Kjullin, 1995, table 1, chapter 2)⁵

In addition to the capacity growth that has been realized in the 1990s, the effort to increase the involvement of firms into the child care 'market' has also been successful as shown in Table 1. However, the figures do not take into account that firms are allowed to deduct daycare costs from their payroll taxes, so that about 20% of firms' costs should shift to the government for 1996. The Confederation of Dutch municipalities makes the distinction between subsidised daycare centers that receive direct subsidies for spaces bought by local communities, and non-subsidized daycare centers that only sell spaces to private households or firms. Reports on child care to the confederation are based on information provided by the communities, and they only have direct relations with subsidized daycare centers. Therefore the figures on the subsidized formal child care are more reliable than the figures for non-subsidized child care.

The two last lines of Table 1 show that child care costs have shifted from government towards firms and households in the early 1990s. More recently, the Dutch government in the 1998 coalition agreement has announced additional measures to further increase the capacity of child care. A budget of 400 million guilders in the year 2002 will be invested to create 71,000 additional spaces, which is more than a doubling of the number of spaces compared to 1995 (see Table 1). This will be realized by an increase in the number of spaces provided by communities (250 million NLG) as well as by an extension of fiscal rules to stimulate investments in child care by employers and households (150 million NLG). Moreover, the government has planned to formulate a law 'Basic child care provision' before the end of 2000, which clearly regulates the structure of child care, the division of responsibilities, the quality and supervision of quality in child care, and the finances, a.o. the parental fees. Simultaneously, it will be investigated whether a uniform financing model can be developed for spaces provided by firms and spaces provided by communities. Different from in Sweden, where firms are not involved in child care, the Dutch government has as a goal that costs should be distributed equally with one third paid respectively by government, households and firms.

4. Child care subsidies and female labor supply

If women are unable to work in the labor market even if they would like to, because of the lack of suitable child care, there is an economic rationale for subsidizing child care. Based on the human capital theory, one can argue, that the opportunity cost of not working includes not only the current forgone earnings of the mother but also her lost opportunity for on the job investment in market related human capital. This theory of the interrupted labor force career originates in an article by Mincer and Polachek (1974). The human capital theory has been used by Gustafsson (1994) to argue for subsidized child care in Sweden. In the United States child care subsidies have been seen as an option for increasing the market potential of single mothers in order to decrease their dependence on welfare payments and their income vulnerability. In the Netherlands the recent Child care

⁵ Note that Swedish parents have a one year paid parental leave, which means that children in their first year of life do not appear in the nominator but they do in the denominator.

Stimulation Act, was partly motivated by the intention of the Dutch government to stimulate female labor supply.

It is not so easy to estimate whether child care subsidies do increase labor supply or if those using child care would have worked anyway, paying the market rate for child care. Comparing prices faced by parents with subsidies with those faced by parents without subsidies may result in comparing child care services of vastly different quality. This is particularly true in the US, but on the other hand researchers have been able to make use of the local program character of child care subsidies, finding a control town where there are no subsidies to compare with a town where there are subsidies.

A number of articles are collected in a special issue of the *Journal of Human Resources* (1992). Gustafsson and Stafford (1992) find that child care subsidies increase labor supply in Sweden. They argue that Sweden has a uniform quality child care where the price paid by parents varies because communities supply different subsidy rates. The Swedish 1984 setting is therefore one of a standardized service with differing prices, which is a rare experimental situation for estimating the price elasticity of child care on labor supply of mothers with pre-school children. Also the availability of child care varies among communities. Using information on number of child care spaces in each community and the number of children living in the community, whose mother works or studies full-time at least 20 hours per week, a variable for rationing of child care was constructed. Only for nonrationed communities an effect was found from price of child care on labor force participation of the mothers. Groot and Maassen van den Brink (1992) estimate the effect of price of child care on child care use and female labor supply in the Netherlands. They conclude that the wage elasticity of labor supply is much higher than the elasticity of labor supply with respect to the price of child care. A possible conclusion from this finding is that if the government wants to stimulate female labor supply it should subsidize net wages by, for example, admitting tax deductions for child care costs as in the United States rather than by subsidizing child care. As we have seen above such a policy measure is included in recent Dutch governmental child care policies.

The results of the American studies are mixed. Hofferth and Wissoker (1992) conclude that parents are very sensitive to the costs of child care and that policies reducing the price of a space at a child care center increase their use, whereas policies that increase the quality of centers do not. Leibowitz, Klerman and Waite (1992) find that women with higher wages and lower levels of other family income are more likely to have returned to work already when their child is three months old. Women who face a higher subsidy for child care are far more likely to return early. Having one's own mother live nearby significantly increases early return to work. Michalopoulos, Robins and Garfinkel (1992) find that the primary benefit of more generous subsidies is to allow users of high quality care to purchase slightly higher quality market care.

For Canada, Powell (1994) found no significant effect of child care costs on labor force participation of married women, but a significant negative effect on the number of hours worked conditioned on being employed.

In section 6 we will try to estimate the effect of the price of child care on Dutch women's labor force participation using a data set which we will call the AVO data (for Aanvullende Voorzieningen Onderzoek). The AVO data set is a cross section of 6,241 Dutch households, of which 911 women have given birth to a child between 1991 and

1995 and therefore have a child five years old or younger. But first we will discuss the problem of rationing in the child care market in section 5.

5. Rationing in the child care market

Rationing of the child care market can be discussed by the help of Figure 1. Suppose we have a conventional downward sloping demand for child care schedule DD and a conventional upward sloping private sector supply of child care S_{pvt} . The government supplies a limited number of child care spaces ab in Figure 1 at the subsidized price P_g . The total supply of child care spaces is then the supply on the private market plus the subsidized spaces so that S_T^0 is a parallel rightward shift adding the ab subsidized spaces to the privately supplied spaces. If this market were a real market, those people, who had gotten a subsidized space at the price P_g , could sell their space to people who are willing to pay more than the public price and the market price would be established at p_p^0 .

One example of a regulated market where the permits have been traded in The Netherlands has been the monopoly rights for taxi business in Amsterdam. In the recently deregulated Amsterdam taxi market, drivers had invested as much as 300,000 guilders for the right to set up a business and drive a taxi. These permits have suddenly become worthless, when the market was deregulated and some drivers, who had seen their highly valued taxi permit as a retirement pension, find themselves without an old age security. A similar market has emerged in the right to produce milk. This market is regulated because of the common European Union agricultural policy, which subsidizes milk production, so that an oversupply of milk results, which has to be cut back by quotas. However, trading of subsidized child care spaces probably does not exist, because they are assigned to particular children whose parents have waited on the waiting list.

At the price p_g^0 in figure 1 the number of public spaces ab at the waiting list will be bg. Suppose now the government wants to eliminate the waiting list and supplies bg new spaces at the same p_g^0 price. Some of the new spaces will then be taken by people, who previously bought spaces in the private market at p_p . Therefore the net addition of child care users will be smaller than the increase in subsidized child care spaces, namely fg instead of bg. As a stimulation to labor supply of mothers the policy may therefore show a smaller result than would have been expected. Suppose now that the government now wants to stimulate labor supply of mothers by decreasing the price paid by parents from p_g^0 to p_g^1 . If no new government subsidized spaces are added the waiting list will again increase to ch because some private suppliers who were willing to supply spaces at the price of p_g^0 now withdraw from the market. Actually there are fewer total spaces of child care supplied than there were before the increase in subsidy. The decrease in number of spaces amounts to cg¹.

Suppose now that an econometrician attempts to analyze the effect of the price decrease on the number of spaces used and consequently on the labor supply of mothers. Because there is rationing she will observe that c spaces are being used instead of h spaces, as it would have been in the absence of rationing. Gustafsson and Stafford (1992) were able to identify a significant price effect on the Swedish regulated daycare market mainly because of two characteristics that are lacking on the Dutch scene. First, Swedish communities enjoy sovereignty in taxing the inhabitants of their own community, which in the child care case resulted in widely different decisions on the price paid by parents

for the same quality service, since quality standards are nationally determined. Second, by 1984, the year under study by Gustafsson and Stafford (1992) a fair number of the 284 communities had no waiting lists any more. For these non-rationed communities a significant price effect was found with mean elasticity of $-.872$ for the joint decision to use public child care and work at least 30 hours per week when all communities were included and an elasticity of -2.68 of only mothers living in nonrationed communities were included. Today in the year 2000 there are no sizable waiting lists in Sweden anymore, because since 1996 communities are obliged by law to supply child care to parents who wish to make use of it.

The Dutch AVO 1995 data to be analyzed below has information on the total amount of money that the family spends on child care per month, but the amount is not partitioned according to type of child care used, or divided according to which child costs how much, in the case there is more than one preschool child in the family. If it had been possible to divide the child care costs among the siblings we could have used the information as noted above that the family pays only 30 per cent for the second child of the costs it pays for the first child. There is a quantity rebate for families with more than one child. The Swedish system has a similar construction, but different for each of the 285 communities, therefore the analysis in Gustafsson and Stafford (1992) was delimited to include only families with exactly one preschool child for whom we knew the individual price schedules per community that parents with a certain family income would have to pay if they made use of a community provided public child care space.

Kimmel (1998) suggests measuring child care costs per worked hour of the mother. Such a measure has the advantage of being measured on the same dimension as mother's wage per hour and theoretically one can see child care costs as a reduction of the net wage per hour that the mother receives. As pointed out by Hank and Keyenfeld (2000) this view on the possibly labour supply reducing effect of child care costs has dominated since Heckman (1974) and for nonrationed situations we think this is a good approach. However similar to Hank and Kreyenfeld, who study the German child care market we argue that rationing has to be dealt with. Tijdens, Van der Lippe and Ruijter (2000) who also analyze the Dutch AVO 1995 data, the same data as is analysed in this paper, note that one out of eleven parents, who say they make use of external child care get this child care free of charge. In most cases the child care provider will be the child's grandmother, which is an opportunity only because the majority of the current generation of Dutch grandmothers spent their lives as full time home makers for the most part of their live. In the Netherlands, if parents work and use paid child care they make use of a combination of different kinds of child care. Tijdens, Van der Lippe and Ruijter (2000:65) distinguish between child care users according to work patterns of the mother and her partner and according to type of child care used. For the 216 families where both husband and wife work during regular daytime hours, 16 per cent use more than one type of child care and 18 per cent do not use external child care. Only 33 per cent of the 216 families use a daycare center. In Table 1 above it was noted that users of daycare centers only amount to 12.8 per cent of potential users. Dutch parents use a patchwork of different child care arrangements and the expensive daycare centers are generally used part time, since there are almost two children on every daycare center space as noted in Table 1 above.

6. Econometric analysis of the effects of child care subsidies on women's employment in the Netherlands

In Table 2 employment of mothers by age of youngest child and hours of work per week is presented from analyses of the OSA 1988 and the AVO 1995 data for the Netherlands. For comparison similar data are presented for Sweden computed from the 1984 and 1996 waves of the HUS household panel data. It is clear that the proportion Dutch mothers who are not employed has decreased during the 6 years from 1988 to 1995 from almost three quarters to half of the mothers with preschool children. Short part time work of 1-19 hours per week is as popular among Dutch mothers with preschool children in the mid 1990s as it was in the mid 1980s i.e. around 20 per cent. The majority of Dutch mothers working in the labor market worked less than 20 hours per week in 1988. This picture has changed completely in 1995 showing that the majority of Dutch employed mothers work more than 20 hours per week. Full time work, 35 hours of work or more per week, is rather common among Dutch mothers of newborn infants in 1995, about 12 per cent, but becomes less common when the child is older than one. We think that this reflects having an employment contract for full-time work and being on maternity leave rather than actually being at work full time. Another explanation can be that these women try to combine full-time work with caring for their newborn child but after a while find that they cannot cope with it as has been found by Groot and Maassen van den Brink (1997). The work pattern among mothers with preschool children in Sweden differs substantially from the Dutch work pattern. Swedish mothers rarely work in the first year of their child's life. Instead they stay at home enjoying paid parental leave and care full-time for their newborn. After the child's first year the Swedish mother makes use of the subsidized child care system and works either long part-time or full-time. Short part time work or full-time housewife have become less common in Sweden in the mid 1990s than it used to be in the mid 1980s. Since 1996 Swedish communities are obliged by law to supply child care center spaces to all children whose parents wish so and the rationing of child care has consequently essentially disappeared.

In the remainder of this section, we will analyse econometrically the AVO 1995 data and ask the question, whether we can find evidence that the policy initiatives of the Dutch government have been essential in the increased employment of Dutch mothers with preschoolers. The AVO 1995 data set in common with most U.S. studies on the effect of child care subsidies on female labor supply, only has information on child care costs for parents who actually use child care. The child care costs per hour of mother's work which is our variable of interest is only known for those women who work in the labor market and use child care. We follow a procedure used in a number of U.S. studies i.e. Conelly (1992) and Kimmel (1998). Since the cost of child care per hour worked is only known for workers and users of child care we have to predict, what other women, who are currently not working and who are currently not using child care would have to pay if they were to change their behavior and adopt a strategy of working and using child care. Furthermore even if we were able to get a reasonable estimate of cost of child care per hour worked we would have to worry about rationing in the Dutch child care market.

Table 2: Employment of mothers with preschool children

	Age of youngest child	Hours of paid work per week				
		None	1-19	20-34	35+	Total
The Netherlands						
OSA 1988	0	74.4	18.2	4.0	3.5	100.0
	1	78.0	16.1	4.3	2.6	100.0
	2-3	73.2	21.2	1.4	4.2	100.0
	4-5	62.1	28.1	2.9	6.8	100.0
	0-5	72.6	20.3	3.2	5.8	100.0
AVO 1995	0	48.2	14.0	24.8	13.0	100.0
	1	46.0	20.9	28.6	4.5	100.0
	2	57.2	19.5	19.6	3.6	100.0
	3	55.5	19.5	20.7	4.3	100.0
	4	62.3	14.8	17.8	5.1	100.0
	5	57.9	18.0	21.0	3.1	100.0
	0-5	53.8	17.9	22.4	5.8	100.0
Sweden						
HUS 1984	0	58.8	1.5	17.7	22.1	100.0
	1	20.4	26.5	42.9	10.2	100.0
	2-3	23.9	19.5	39.9	16.8	100.0
	4-5	25.0	13.3	35.0	26.7	100.0
	0-5	31.7	15.4	34.2	18.7	100.0
HUS 1996	0	88.3	5.0	6.7	5.0	100.0
	1	30.3	5.8	38.5	25.0	100.0
	2	29.8	0.0	36.2	34.0	100.0
	3	23.8	0.0	38.1	38.1	100.0
	4	12.8	2.6	35.9	48.7	100.0
	5	14.3	5.7	45.7	34.3	100.0
	0-5	36.4	3.3	31.6	28.7	100.0

Data: OSA 1988 n=566; AVO 1995: n=984; HUS 1984 n=379; HUS 1996 n=275.

A: Method

We assume that women's decision to participate in the formal labor force can be described by a behavioral model as applied in Connelly (1992) and Ribar (1992). They model the decision to participate as the outcome of maximizing mothers' utility over leisure time, market goods, and child care quality. The outcome has to satisfy constraints on mother's and children's time, a money budget constraint, and a production function for child quality.

Using the same notation as Connelly (1992), the labor supply function can than be specified as:

$$(1) \quad t_m = \delta_0 + \delta_1 \ln W + \delta_2 P_{cc} + \delta_3 G + \eta$$

where t_m is mother's time in market work, W is mother's market wage, P_{cc} is the hourly expenditure on child care, and G is a vector of characteristics that affect either the production function of child quality or the marginal rate of substitution between goods and time. We estimate this equation using a probit model, assuming η is normally distributed, concentrating on $I=1$ if $t_m > 0$ and $I=0$ otherwise.

Unfortunately, straightforward estimation of this probit is hampered by incomplete data on wages and cost of child care: hourly wages are missing for mothers that do not currently work, and price of child care is missing for mothers that do not use paid care. The estimation procedure we use, following Connelly (1992) and Kimmel (1998), corrects for both types of censoring in our data. We first calculate predicted wages for all women in our sample, using a Heckman (full Maximum Likelihood) selection model. Our Heckman selection model first determines the probability that the hourly wage is observed as a function of various characteristics Z , i.e. $\text{Prob}(W \text{ is observed}) = \alpha'Z$, estimating α by a probit model. Next, for all observations with wage information the selection term $\lambda = \varphi(\alpha'Z)/\Phi(\alpha'Z)$ is computed using the estimated α , and included in an OLS-regression for observed wages: $W = \beta'X + \theta.\lambda$. Finally, predicted wages are calculated for all women in our sample using $W_p = \beta'X$.

Next, we predict child care prices for all women, correcting for the fact that child care is only used by women currently participating in the labor force, and moreover, that the majority of mothers participating in the labor force is not paying for child care. We therefore first estimate a bivariate probit to determine the joint probability of participating *and* paying for child care. We then create a selection term for all mothers reporting positive child care expenditures, based on the joint probability of participation and paid use of child care, and include it in an OLS-regression of child care expenditures on various characteristics.

In formulas: the reduced form participation decision is:

$$(2) \quad \begin{aligned} I^* &= Z\theta + U_1 \\ P_{cc}^* &= X\beta + U_2 && \text{if } U_2 > -X\beta \\ P_{cc}^* &= 0 && \text{otherwise,} \end{aligned}$$

where P_{cc}^* is the optimal child care expenditure following from utility maximization, X are various household characteristics, and U_2 is assumed to be normally distributed. Then,

$$(3) \quad E\{P_{cc}^* | P_{cc} > 0\} = X\beta + E\{U_2 | U_1 > -Z\theta \ \& \ U_2 > -X\beta\}.$$

The last term is the mean of a truncated bivariate normal distribution and equals $\sigma_2\mu$.⁶ We fill in our predicted values for $\ln W$ and P_{cc} in equation (1) and estimate a structural probit on the labor force participation decision. This provides estimates of the elasticity of labor supply with regard to hourly wage and child care costs.

B. Results

The first step of our analysis is in Table 3. In this first step all women under age 55 are included in the AVO data, which results in a sample of 1,501 women, 486 of which have observed wages. We find that education, age, and experience increase the probability of having observed wage information in the expected manner although only the linear term and not the squared term is significant for experience. Married or cohabiting women are more likely to have an observed wage than single women, which coincides with other results for the Netherlands (i.e. McFate 1995). Dutch single mothers until recently received a substantial government social benefit, without having to search for a job until the child was 12 years old, which was lowered to 5 years old in 1998, and the current political discussion proposes a job search obligation also for mothers of very young children. Husband's income has no effect on the participation choice. Mothers of many children are less likely to work in the market and have an observed wage, but if the child is 0-1 years old the probability is higher like we saw in Table 2. This is an effect of the 16 weeks of maternity wages paid to the mother of a newborn.⁷ Further, if the regional unemployment rate is higher, the probability of having an observed wage decreases. None of the regional or urbanization variables explain labor force participation and consequently observed wages. The probit on wage information available is used to create the variable lambda as described above in order to control for selection bias in the wage regression. However lambda is not significant. We find that high education, the linear experience term and the regional unemployment rate have a significant effect on earned women's wages.⁸

⁶ This selection term μ is equal to:

$$\mu = \frac{\varphi\left(\frac{X\beta}{\sigma_2}\right)\Phi\left(\frac{\left(\frac{Z\theta}{\sigma_1}\right) - \rho\left(\frac{X\beta}{\sigma_2}\right)}{(1-\rho^2)^{1/2}}\right)}{F(X\beta, Z\theta, \rho)} + \frac{\rho\varphi\left(\frac{Z\theta}{\sigma_1}\right)\Phi\left(\frac{\left(\frac{X\beta}{\sigma_2}\right) - \rho\left(\frac{Z\theta}{\sigma_1}\right)}{(1-\rho^2)^{1/2}}\right)}{F(X\beta, Z\theta, \rho)},$$

where $F(X\beta, Z\theta, \rho)$ is the joint probability of participation *and* using paid care, $\varphi(\cdot)$ is the standard normal density function, $\Phi(\cdot)$ is the standard normal cumulative distribution function, and ρ is the correlation between U_1 and U_2 .

⁷ In 1990 maternity leave was extended from 12 to 16 weeks (100% of earnings) and employees became eligible to parental leave of 6 months part time from 1991 onwards (only in the government sector 75% of earnings).

⁸ The explanatory variables in our wage regression in line with most other studies. E.g. Conelly (1992), Kimmel (1998). Kimmel (1998) finds that age, metro and number of kids has a significant effect on wage. In our case the significant effect of age is overtaken by experience.

The second step of the analysis is the bivariate probit on labor force participation and use of paid care to control for selectivity in price of child care regression. In this step we only include the 870 women with children aged 0-5, 180 of whom pay for child care. The labor force participation basically repeats the results from the probit on wage information available. In the probit on use of paid care we find that more educated mothers, older mothers and mothers whose husbands earn more are more likely to pay for child care. They are less likely to do so if they have many children, and more likely to pay for child care if the children are young. The probit for use of paid care is the only part of our analysis where the urbanization variables play a role. The more urbanized the more likely are the parents to pay for child care. This result is in line with macro statistics that show that availability of child care increases with the number of inhabitants in The Netherlands (Confederation of Dutch Communities (1999), Dobbelsteen and Meijnen (2000)). Dobbelsteen and Meijnen (2000) shows that use of formal child care spaces increases if parents live in a more densely populated area. Use of formal child care spaces is generally more expensive than informal care, which means that increasing supply of child care spaces, and therefore more use of formal child care spaces result in a higher price of formal child care spaces. This indicates the problem of rationing in the Dutch child care market.

The two probits on labor force participation and use of paid care are dependent. Our estimations show a positive significant correlation between labour force participation and use of paid care.⁹ It is in The Netherlands a simultaneous decision to pay for child care and to participate in the labor force if you have a preschool child.

In Table 4 the price of child care regression is presented. Following Kimmel (1998) we choose for analyzing the cost of child care per hour worked rather than the cost per hour used per child. In principle given the Dutch system the price paid in formal daycare should depend on family income as shown in Table 1 above and it should be a bit higher if more than one child is cared for but not multiplied by the number of children since there are quantity rebates. We find that husband's income increases the price paid per hour worked of the wife but the variables included for wife's income, education and age are not significant. This result is logical if we bear in mind that price of formal child care depends on household income, and most men are employed and earn more than their wives, and therefore earn most of the household income. The number of children of age 0-3 increase the child care cost per hour worked as expected. None of the region or urbanization variables show any influence, which they also should not have since there is a national recommended scale.

The third and last step according to our methodology is to estimate the structural labor force probability by a probit analysis using predicted wage and predicted price of child care. We find that the predicted wage is large and highly significant. The predicted price of child care is not significant and has a positive sign. This is in contrast with results by Kimmel (1998) and Conelly (1992) for the United States. In the Dutch situation a positive sign could however be defended. E.g. Graafland (1999:40) mentions: "The subsidy of the

⁹ The likelihood ratio test of $\rho=0$ is rejected. We also expect a significant positive correlation between the decision to participate in the labor market and the decision to use unpaid child care. However this is not the research aim of this paper.

government might reduce the impact of child care costs on labor supply.”. Given the difficulties in measuring the price that potential users of paid child care would have to pay our insignificant outcome is hardly surprising. Furthermore, as we explained in section 5 above when there is rationing with a large supply of informal care in a regulated market one is more likely to observe switches from private market use into subsidized supply and vice versa, rather than movements along the labor demand curve.

7. The social efficiency cost of child care subsidies

Rosen (1995) develops a static model by which he computes the short-run deadweight loss caused by Swedish child care subsidies or equivalently the social efficiency cost. The term deadweight loss sounds as if nothing was gained by paying this cost, which of course is not true. Goals like equality between women and men and in early childhood education can be the gains to be weighed against the costs. In the long run such costs are likely to be much smaller because of lifetime income effects and state dependency in labor force participation of time spent at home when children are small. Women who do not combine work and family when they are young may be little likely to be working in the market later when children have left home. An estimate for the Netherlands (Dankmeijer, 1996) shows that low educated women with children only earn 13% of the lifetime incomes of similar women without children. It means that if good child care can induce women to combine work and family the gains could be 87 per cent of lifetime earnings of such women, to be offset against the child care costs which only apply when the child is young. However these estimates of lifetime earnings have been based on one cross section comparing labor force participation of younger and older women. A panel data estimation might show different results. Similar gains in lifetime earnings can possibly be realized with different financial structures. In the United States parents use child care and work although child care subsidies if available, are only available to ‘needy’ people. The great majority of US parents pay market fees for child care. In the Netherlands as we have seen there are extensive waiting lists also for parents who want to pay for private formal child care, which is only 12 per cent of all spaces at child care centers.

In Rosen’s (1995) model consumers maximize a utility function

$$(4) \quad U = U(X,Z)$$

where X is material goods consumption and Z is household goods consumption. X includes cars and all other material goods that parents value. Z can in principle include all household production like a clean and cosy home, pleasant meals, clean and nice looking clothes, but for simplicity we are going to assume that only children and child care enter into Z , like Willis (1973) in his seminal article on economics of fertility. ‘Child services’ to use Willis term is the consumption good that parents enjoy from well educated, healthy and loving children or in other words from the quality of each of their children. The elasticity of substitution in consumption, or the easiness with which cars and other material goods can be substituted for children when the latter become more expensive, plays an important role. How much more expensive do children have to become before

couples choose for another car rather than another child? This is called the substitution elasticity of consumption or σ_c below.

The second important aspect of Rosen's model is that child services (Z) can be produced using own time (h) or purchased time (M) so that the production function for child services becomes:

$$(5) \quad Z = g(h, M)$$

It is important for the size of social efficiency costs how large the elasticity of production (σ_p) is, that is to what extent do we to substitute own time (h) for purchased time (M) when the price is decreased by child care subsidies.¹⁰

The third important aspect of Rosen's model is to disentangle effects of income taxation and subsidies on the size of the social efficiency cost. Income taxation works as a subsidy for using own time (h) in the production of child services rather than supplying this time to market work ($1-h$). Household work is not taxed, i.e. using h in the production of Z is not taxed but using M is. Labor supply time ($1-h$) is subject to income taxation. Child care subsidies therefore compensate for the implicit subsidy on household work (h).

The consumer's budget constraint taking care of taxes and subsidies becomes

$$(6) \quad (w-\tau)(1-h) = X + (p+\rho) M$$

where $(1-h)$ is labor supply. In the model it is assumed that time can only be used either for own child care (h) or for labor supply. Further w is the wage rate, τ is the income tax rate, p is the market price of daycare or price of M and ρ is the tax (or subsidy if negative) on M . This means that the parent must achieve equality between her net wage and material goods (X) and child care (M) bought. The private price of child care is p and the public price of child care is the private price minus the subsidies like in figure 1 above. In the model the price of material goods is taken to be the numerator so that the public price of daycare ($p+\rho$) is relative to the price of material goods.

The social efficiency cost, in Rosen's terminology the dead weight loss (DWL) becomes:

$$(7) \quad DWL = qZ*1/2\{\theta (1-\theta)\sigma_p[\tau+\rho]^2 + (1-\phi)\sigma_c[\theta\tau-(1-\theta)\rho]^2 \}$$

where Z are child services produced, q is price of child services so that qZ becomes the cost of child services produced.

The substitution elasticity of consumption σ_c is an expression of a potential parent's willingness to rather buy another car or other material goods (X) than have more child services by having another child or spending more on existing children, when Z becomes more expensive.

¹⁰ Calculation of the elasticity of production (σ_p):
(delta (Prob lfp=1) / delta (price of child care)) multiplied by (mean(price of child care) / mean(lfp))
Since we do not find a significant coefficient of price of child care in our analysis we put this elasticity to be zero.

In addition to the elasticity of substitution in production (σ_p), the income tax rate (τ), the subsidy rate ($-\rho$), the elasticity of substitution in consumption (σ_c) also the parameters (θ) and (ϕ) play an important role in computing the size of the social efficiency cost. These two parameters are respectively (θ) the cost share of own time (h) in the production of child services.

$$(8) \quad \theta = wh/(wh+(p+\rho)M)+X_c$$

where X_c is material goods used for children. But Rosen's model neglects that material goods also are needed for production of Z . This is evident from expression (5). Therefore $X_c=0$, in this model, which allows concentrating on the choice between h and M .

The budget share of child services (Z) in total consumption of material goods (X) in addition to child services i.e.

$$(9) \quad \phi = qZ/(qZ+X)$$

where q is the average and marginal cost of Z .

The change in social efficiency cost as an effect of a change of the subsidy given government budget balance (δD) is as follows:

$$(10a) \quad \delta D = (\delta DWL/\delta \rho) (\rho/DWL)$$

Following Rosen (1995: equation 13):

$$(10b) \quad (\delta DWL/\delta \rho) = qZ^{1/2} \{ \theta (1-\theta) \sigma_p^2 [\tau+\rho] (\delta [\tau+\rho]/\delta \rho) + \\ (1-\theta) \sigma_c^2 [\theta \tau - (1-\theta)\rho] (\delta [\theta \tau - (1-\theta)\rho]/\delta \rho) \}$$

Making use of Rosen (1995: equation 15) we arrive at:

$$(10c) \quad (\delta DWL/\delta \rho) = \{ \theta (1-\theta) \sigma_p^2 [\tau+\rho] [((1-\theta)/(1-\theta\phi))+1] + \\ (1-\phi) \sigma_c^2 [\theta \tau - (1-\theta)\rho] [(\theta (1-\theta)/(1-\theta\phi)) - (1-\theta)] \} qZ^{1/2}$$

In the following we will discuss the size of the social efficiency cost for The Netherlands by using our own estimates and those of others and compare them to the dead weight loss calculations performed by Rosen (1995) for Sweden. We claim that σ_p corresponds very closely to the price elasticity of day care on women's labor supply as estimated by Kimmel (1998) for the USA, Gustafsson and Stafford (1992) for Sweden and ourselves for the Netherlands above. The elasticity of substitution in consumption σ_c in expression (7) can not be estimated by the information we have. Such an estimation could in principle be done along the ideas of economics of fertility, where the demand for Z is the product of quantity and quality of children and the price of child services could be identified by changes in policies that make children more or less costly in comparison to

other non-child related consumption (Becker 1981, Gustafsson 2000). However Rosen (1995) supplies the connection between σ_p and σ_c by means of the wage elasticity of labor supply (η_{tw}):

$$(11) \quad [(1-h)/h] \eta_{tw} = (1-\theta) \sigma_p + \theta (1-\phi) \sigma_c - (1-\theta \phi) \eta_{zi}.$$

While, we have estimated η_{tw} above¹¹, equation (10) introduces another unknown elasticity, namely the income elasticity of child services (η_{zi}). Again, an estimate of this income elasticity would be possible to obtain from economics of fertility estimates. The question whether people have more children of better quality when they become richer has been on the economics research agenda since Malthus (1798) but estimating price and income elasticities on the product of quantity and quality of children such as (Z) in this model has not been done. Rosen (1995) in his own calculation solves this problem by putting $\eta_{zi}=1$.

In Table 6 we summarize information available on the different parameters necessary to compute the efficiency cost of child care subsidies according to Rosen's (1995) model. The values used for Sweden by Rosen in his original article are presented as well as values assigned to the Netherlands by Plantenga (1998), who discusses how the reasoning of Rosen would apply to the Netherlands. Plantenga (1998) first repeats Rosen's model, using the same parameters for the Sweden and finds that social efficiency cost increases if the subsidy rate increases. This is in line with Rosen. Plantenga uses smaller values for tax and subsidy rates and larger share of home time $[h/(1-h)]$ and larger θ cost share of own labor in the production of child services for The Netherlands. She shows by using Rosen's model that the social efficiency costs are smaller in The Netherlands than in Sweden. She concludes that subsidizing child care is economically efficient in the Netherlands, as she finds the marginal social efficient cost to be negative. It is somewhat unclear, however, how she derives her parameter values.

In Table 6 we show estimations for the parameter values and give comments on values used. The larger θ , cost share of own labor in the production of child services in The Netherlands used by Plantenga, of 0.8 seems plausible if it is compared to the estimates for the Netherlands ranging from 0.75 to 0.91 in Table 6. These later estimates are values for the proportion of time spent on own child care by employed mothers compared to the time spent on own child care by full time housewives, based on two sources of time use data in The Netherlands. A tax rate τ of 0.50 in the analyses of The Netherlands seems in our view a bit high. The majority of Dutch women will earn an income that is taxed at 0.38 and partly at 0.50. The subsidy rate in the Netherlands is considerably smaller than in Sweden particularly because some of the financing of child care comes as in the pay roll tax of the firms rather than in the government budget. As Tjeldens, van der Lippe and Ruijter (2000) note child care has become one of the most important non wage costs of the employer in The Netherlands. The decision of the individual mother of whether to work in the market and use child care is however determined by the parent's fee as

¹¹ The Predicted wage elasticity η_{tw} is calculated = $(\Delta(\text{Prob lfp}=1) / \Delta(\text{predicted wage}))$ multiplied by $(\text{mean}(\text{predicted wage}) / \text{mean}(\text{lfp}))$.

compared to her net wage and Rosen's model does not handle the decision problem of the firm. Plantenga (1998) uses the government cost as the subsidy rate. If we like Rosen (1995) were interested in possible excess use of subsidized child care we might argue that the difference between the full cost and what parents pay is the relevant measure i.e. $1 - 0.42 = 0.58$, but on the other hand the firm's child care costs are likely to be discounted in the wages that workers receive. Perhaps, workers, who do not have children and make use of child care carry some of the cost.

In the lower panel of Table 6 the results on the elasticity of substitution in consumption (σ_c), the social efficiency cost (DWL) and the change in social efficiency cost as an effect of a change of the subsidy given government budget balance (δD) (see equation 10). Higher wage elasticity of labor supply η_{tw} increases both the social efficiency cost (DWL) and the sensitivity of this cost for changes in the child care subsidy rate φ . Further, higher wage elasticity of labor supply increase the substitution elasticity in consumption σ_c which in turn increases the social efficiency cost. The wage elasticity of labor supply is important. However as noted by Theeuwes (1988), Maassen van den Brink (1994) and Graafland (1999) there is a wide range of estimates of female labor supply elasticity. Generally, we may expect that mothers of young children have rather high wage elasticity because they substitute market work for household work rather than substitute market work for leisure and there are more readily available market substitutes part of which is child care.

Higher elasticity of substitution in production (σ_p) on the other hand decreases σ_c and social efficiency cost. In equation (7) if the tax rate equals the subsidy rate there will be no influence from the substitution elasticity of production at all because the first term will be multiplied by zero.

We may conclude that decreasing subsidies on child care perhaps will lead to a decrease in the social efficiency cost in Sweden. In contrast a decrease in social efficiency cost will be achieved in the Netherlands by increasing subsidies on child care.

Concluding Remarks

In this paper we analyze the Dutch child care system and attempt to answer the question whether Dutch child care has achieved its goals with a smaller social efficiency cost than the Swedish child care system. It is clear that the Dutch government pays a much smaller share of total costs of formal child care 33 per cent in 1996 as against 85 per cent of total costs in Sweden. Dutch parents pay around 42 per cent of child care costs in the form of parental fees and the remaining 22 per cent are paid by firms for the child care of their employees. Child care costs born by firms does not exist in Sweden, and the incidence of such non wage labor costs should in principal fall on workers in the form of smaller wages. The Dutch collective labor agreements provisions do not carry lower wages for parents so that the incidence of child care costs falls on all workers. Formal child care is a much smaller share of all child care in The Netherlands, where only 12,8 per cent of potential users of child care participate as against 50 per cent in Sweden. Also, those children who do participate in formal child care usually use only half a space per child since the number of children per space in 1995 is 1,9 as compared to 1 child per space in Sweden.

On the other hand Dutch mothers are much less likely to participate in the labor force than Swedish mothers, and if they participate, they are more likely to work short part time and less likely to work full time than Swedish mothers. We analyze the labor force decision of Dutch mothers using the AVO 1995 data. We get a strongly significant own wage effect on the probability of participation in the labor force, however the cost of child care per hour worked of the mother does not show a significant effect on labor force participation. Our analyses presented follow the approach of studies by Kimmel (1998), Conelly (1992) and Ribar (1992). Other studies for the Netherlands also did not reveal a significant effect of child care on labor force participation. In the Dutch situation with different types of child care and informal care as a widely chosen option, it is plausible that the costs of child care have an effect of turning from formal (expensive) care to informal (cheaper) care, but not on labor force participation of the mother.

A possible next step in our analysis would be to estimate the probability that a woman chooses for 'no external care', formal child care or informal child care. For each of these options the price of child care could be estimated and thereafter the effect on labor force participation.

Another explanation of the non-significant effect of the price of child care on mother's labor force participation might be measurement error. Formal child care is set according to a national recommended schedule based on family income. The price per hour used therefore depends entirely and only on family income except for those suppliers of child care, firms and communities that do not follow the recommended schedules which according to a government proposal will be made compulsory in the near future. But even if we were able to get a good estimate of price of formal child care per hour used, we would have difficulties in identifying points on the demand schedule due to the fact that formal childcare is rationed. The waiting list in 1996 was about 50 per cent of the available spaces. A decrease in the price of the rationed child care might than result in withdrawal of private formal child care supplied and results in less total formal child care rather than more being used at a lower price. If the problem of no effects of rationing of formal spaces could be solved the true exogenous variation in the child care cost per hour worked would depend on the mother's access to cheap informal child care. It would depend on the husband's willingness to decrease market work hours in order to care for his child and on the access to grandparents' care, which is a big thing for the current generation of small Dutch children, since the grandmothers to a very large extent were never labor force participants and the grand fathers have retired from the labor force at a younger age than ever before. Many children may have four grandparents who are fit and willing to share caring tasks. Using Rosen's model to discuss the social efficiency cost of child care in The Netherlands we conclude that these costs are much smaller in The Netherlands than in Sweden, because subsidies per hour worked of the mother is simply much smaller. However, the wide range of estimates of the wage elasticity of labor supply and the measurement difficulties of the price of child care and all other parameters entering an estimate of the social efficiency cost, we are not willing to arrive at a conclusion of the optimal size of the child care subsidy.

Table 3: Prediction of hourly wages for Dutch women

	Probit on wage information available	Ln (Wage) regression
Education		
High	.927 (6.85)	.244 (3.33)
Medium	.660 (5.65)	.045 (0.73)
Short	.099 (1.21)	-.019 (-0.34)
Basic (reference)		
Age	.227 (3.49)	.047 (1.67)
Age squared	-.0032 (-3.53)	-.0006 (-1.53)
Experience		.014 (2.28)
Experience squared		0.00009 (-0.37)
Husband present	.297 (1.83)	
Husband's income+nonlabor income	-.001 (-0.77)	
Number of children aged 0-11	-.265 (-5.12)	-.021 (-.889)
If youngest child age 0-1	.289 (3.12)	
If youngest child age 2-3	-.108 (-1.24)	
If lives in the West	.044 (0.55)	.014 (0.474)
Urbanization		
Very high	.069 (0.47)	-.006 (-0.113)
High	.156 (1.34)	-.042 (-0.97)
Moderate	.052 (0.48)	-.017 (-0.42)
Low	.098 (0.93)	-.006 (-0.14)
Very low (reference)		
If born abroad	-.101 (-0.82)	.0075 (0.160)
Regional unemployment rate	-.060 (-1.99)	-.025 (-2.13)
Constant	-4.287 (-3.71)	1.905 (3.73)
Lambda		-.172 (0.15)
N	1501	486

AVO 1995

Table 4: Prediction of cost of child care per hour of mothers work

	Bivariate probit on		Price of child care regression
	Labor force participation	Use of paid care	
Education			
High	1.045 (5.60)	1.295 (5.76)	2.184 (0.79)
Medium	.749 (4.62)	.637 (3.03)	1.531 (0.69)
Short	.253 (1.52)	.391 (1.81)	.186 (0.09)
Basic (reference)			
Age	.303 (3.07)	.274 (2.36)	.115 (1.58)
Age squared	-.004 (-2.91)	-.004 (-2.07)	
Husband present	.568 (2.36)	-.325 (-1.33)	-1.021 (-1.06)
Husband's income+nonlabor income	.000 (0.25)	.006 (2.46)	0.039 (3.86)
Number of children aged 0-11	-.404 (-6.26)	-.419 (-5.68)	-1.938 (-1.34)
Number of children aged 0-3			2.042 (3.09)
If youngest child age 0-1	.232 (2.21)	.421 (3.54)	
If youngest child age 2-3	-.154 (-1.51)	.373 (3.18)	
Region			
North			.810 (0.97)
If lives in the West	.022 (0.11)	-.017 (-0.08)	-.019 (-0.02)
South			.698 (1.26)
East (reference)			
Urbanization			
Very high	-.006 (-0.03)	.629 (3.03)	-.590 (-0.57)
High	-.004 (-0.03)	.326 (1.92)	0.253 (0.34)
Moderate	-.008 (-0.06)	.284 (1.80)	.041 (0.90)
Low	-.074 (-0.55)	.136 (0.87)	-.142 (-0.21)
Very low (reference)			
If born abroad	-.244 (-1.51)	-.101 (-0.55)	-.654 (0.81)
If child care available in community of residence	.059 (0.53)	.170 (1.35)	
Rationing	.006 (0.12)	-.011 (-0.20)	.376 (1.66)
Regional unemployment rate	-.063 (-1.74)	-.016 (-0.39)	
Lambda			1.946

Constant	-6.048 (-3.15)	-5.227 (-3.24)	(0.99) -7.471 (1.27)
N	870	870	180

AVO 1995

Table 5 Probit on labor force participation with predicted wage and predicted price of child care

Predicted hourly wage	4.585 (9.08)
Predicted price of child care	.119 (1.68)
Age	.076 (0.70)
Age squared	-.002 (-1.29)
Husband present	0.507 (2.05)
Husband's income+nonlabor income	-.504 (-1.25)
Number of children aged 0-11	-.226 (-3.23)
If youngest child age 0-1	-.064 (-0.44)
If youngest child age 2-3	-.403 (-2.62)
Region	
North	-.218 (0.87)
West	-.084 (-0.53)
South	.037 (0.26)
East (reference)	
Urbanization	
Very high	.109 (0.48)
High	.202 (1.29)
Moderate	-.145 (-1.04)
Low	-.067 (-0.49)
Very low (reference)	
If born abroad	-.174 (-1.05)
Regional unemployment rate	.028 (0.45)
Constant	-12.999 (-7.08)
N	865

AVO 1995

Table 6 Parameters for the estimation of social efficiency costs of daycare subsidies

Parameter	Rosen (1995) Sweden	Plantenga (1998) The Netherlands	Empirical observations
A: EXOGENOUS			
θ cost share of own labor in production of child services (Z)	0.5	0.8	Estimated by Gustafsson & Kjulin (1992) from time use and expenditure data for couples with and without children to be 0.7 if child 0-2; 0.53 if child 3-7 (Swedish HUS data); NL: OSA (1997): own child care hours of employed mothers as a proportion of own child care of full time housewives. If there is 1 child of age ≤ 3 : 44/53=0.83; If the youngest child ≤ 3 : 48/53=0.91; If youngest 4-5: 37/45=0.82. Time use studies (SCP:TBO 1995) similar method as OSA; if youngest child ≤ 5 : 16.8/22.4=0.75
σ_p elasticity of substitution in production between own time (h) and purchased child care (M)	Alternative values 0,1,2,3	Alternative values 0,1,2,3	i.e. change in labor supply when parents price of child care increases. Kimmel U.S.: -0.923; Gustafsson & Stafford (1992) (Swedish HUS data 1984: -.872; NL: estimated above not significant; Maassen van den Brink (1994) ≈ 0
τ marginal tax rate	0.7	0.5	NL 1999 tax schedule (for y is yearly income in NGL) 0.36 for (8,800 < y < 23,800); 0.37 for (23,800 < y < 57,000); 0.5 for (57,000 < y < 115,000); 0.6 for (y > 115,000)
ρ subsidy rate	0.9	0.33	NL 1996 parents paid 0.42 of child care costs (see Table 1) firms paid 0.25 and government 0.33
ϕ budget share of z in consumption	0.25	0.25	NL 1997 household expenditures for children as percent of household income for minimum income: (NLG 22,430) is .186 (Dutch Family council (1997:33) reporting on consumer budget statistics of Statistics Netherlands);
η_{tw} wage elasticity	Alternative values 1/3, 1/2, 1	Alternative values 1/3, 1/2, 1	NL estimated above: 3.1 (for hourly wage). Kimmel, (1998) US 3.249 Theeuwes (1988), Maassen van den Brink (1994), Graafland (1999) wide range
$h/(1-h)$ share of home time	0.5	1	
η_{zi} income elasticity of demand for z	1	1	
B: ENDOGENOUS			
σ_c elasticity of substitution in consumption	.56-5.0	0.47-1.75	$\sigma_p \uparrow \Rightarrow \sigma_c \downarrow$; $\eta_{tw} \uparrow \Rightarrow \sigma_c \uparrow$ Rosen (1995: Table 3)
DWL social efficiency cost	.14-1.20	0.05-0.14	$\sigma_p \uparrow \Rightarrow DWL \downarrow$; $\eta_{tw} \uparrow \Rightarrow DWL \uparrow$; $\sigma_c \uparrow \Rightarrow DWL \uparrow$
δD change in social efficiency cost as an effect of change in p at budget balance	About -1 for most values ¹	-0.74-0.0	$\sigma_p \uparrow \Rightarrow \delta D \uparrow$; $\eta_{tw} \uparrow \Rightarrow \delta D \uparrow$; $\sigma_c \uparrow \Rightarrow \delta D \downarrow$ ¹ = In the repetition of Rosen's (1995) model by Plantenga (1998) these values vary from -0.48-1.46 and an outlier of 5.16. Plantenga notes that Rosen's values of δD contains some errors due to a series of miscalculations. Plantenga arrives for Sweden similar to Rosen at positive values for the marginal dead weight loss. However Rosen's argument is based on a negative value of the marginal dead weight loss. The mistake is made in the confusion of absolute and relative changes: an increase in the subsidy does indeed mean that dp is negative, the relative change of p is positive.

Appendix Table A1: Summary Statistics for mothers with children 0-5 years

N=870	n	mean	St.d.	Min.	Max.
Labor force participation		0.464			
Education					
High		.182			
Medium		.395			
Short		.299			
Basic (reference)		.124			
Age		32.2	4.7	17	52
Years of experience	865	7.4	5.4	0	32
Tenure	743	7.0	4.6	1	23
Hours of work per week		23.3	14.1	0	80
Wage per hour (NLG)=w	296	16.96	5.5	4.1	53.8
Ln(w)	296	2.783	.317	1.424	3.986
Price of child care per hour used (NLG)	457	2.42	3.9	0	30.8
Price of child care per hour worked (NLG)	377	2.21	2.9	0	15.4
Child care hours per week		7.3	11.1	0	80
Child care cost per month		99.9	221	0	1800
Husband present		.949			
Husband's income+nonlabor income/1000 NLG		32.86	23.9	0	150
Number of children aged 0-11		1.88		1	6
Number of children aged 0-3		0.723		0	2
If youngest child age 0-1		.437			
If youngest child age 2-3		.536			
Region					
If lives in North		.108			
If lives in West		.402			
If lives in South		.262			
If lives in East		.228			
Urbanization					
Very high		.117			
High		.192			
Moderate		.233			
Low		.245			
Very low		.213			
If born abroad		.115			
If child care available in community of residence		.787			
Per cent child care available in community		.832			
Regional unemployment rate		7.0	1.27	5.4	11.8

AVO 1995; Only for variables where n is not 870 the number of observations is noted in the table. For dummy variables the minimum and maximum is 0 and 1 respectively and the standard deviation has no meaning. Therefore these numbers are not reported in this Table.

REFERENCES

- Becker G.S. (1981), *A Treatise on the Family*, Harvard University Press, Cambridge, Mass.
- Blok, E. (1978). *Loonarbeid van vrouwen in Nederland 1945-1955*. Nijmegen: Socialistische Uitgeverij.
- Conelly, Rachel (1992) The effect of child care costs on married women's labor force participation, *The review of Economics and Statistics*, vol.74, February, pp 83-90.
- Confederation of Dutch Communities SGBO (1997a). *Kinderopvang in gemeenten. Na de stimuleringsmaatregel, de stand per eind 1996*. Den Haag: Vereniging van Nederlandse Gemeenten.
- Confederation of Dutch Communities SGBO (1997b). *Kinderopvang in gemeenten in de periode 1989-1995*. Den Haag: Vereniging van Nederlandse Gemeenten.
- Confederation of Dutch Communities SGBO (1999). *Kinderopvang in gemeenten. De monitor over 1997*. Den Haag: Vereniging van Nederlandse Gemeenten.
- Dankmeijer, Ben (1996) Long run opportunity costs of children according to education of the mother in The Netherlands, *Journal of Population Economics* 9, no3: 349-361.
- Dobbelsteen S.H.A.M. and G. W. Meijnen (2000), Child care use in The Netherlands: the influence of economic, demographic and institutional factors. SCHOLAR working paper.
- Dutch Family Counsel (Nederlandse Gezinsraad) (1997), *Families and Social Security, Alternative policies*, The Hague.
- Esping-Andersen (1990). *The three worlds of welfare capitalism*. Princeton, N.J.: Princeton University Press.
- Freeman R. (2000, forthcoming). 'The feminization of work in the US. A new era for (man) kind?' In: Gustafsson, S.S. and D. Meulders, *Gender and the labor market. Econometric evidence on obstacles in achieving gender equality*, London: MacMillan.
- Graafland, J.J. (1999). *Analyzing the macro economic impact of child care subsidies: an AGE approach*. Research Memorandum no. 147, Den Haag: CPB Netherlands Bureau for Economic Policy Analysis.
- Groot, W., and H. Maassen van den Brink (1996). *Monitoring Kinderopvang. Veranderingen in het gebruik van kinderopvang, 1991-1995*. Rijswijk: Ministerie van Volksgezondheid, Welzijn en Sport.
- Groot, W., and H. Maassen van den Brink (1997) *Verlate uittreding. Oorzaken van uittreding uit het arbeidsproces ruim na de geboorte van het eerste kind. Onderzoek in opdracht van het ministerie van sociale Zaken en werkgelegenheid, augustus*, VUGA, The Hague.
- Gustafsson Bjorn and Kjullin, Urban (1994) Time use in child care and household work and the total costs of children, *Journal of Population Economics* 7 (3):287-306.
- Gustafsson, S.S. (1994). 'Child care and types of welfare states.' In: Sainsbury, D. (ed.), *Gendering Welfare States*, London: Sage Publications.

- Gustafsson, S.S. (2000). *Optimal age at giving birth. Theoretical and empirical considerations on postponement of maternity in Europe*. Presidential Address 13th ESPE-Meeting, Torino. Forthcoming in *Journal of Population Economics*.
- Gustafsson, S.S., and F.P. Stafford (1992). 'Daycare subsidies and labor supply in Sweden.' *Journal of Human Resources*, 27, pp. 204-230.
- Gustafsson, S.S., and F.P. Stafford (1994). 'Three Regimes of child care: the U.S., the Netherlands, and Sweden.' In: R. Blank (ed.) *Social Protection versus Economic Flexibility: Is there a Tradeoff?* NBER, Chicago: University of Chicago Press.
- Gustafsson, S.S., and F.P. Stafford (1998). 'Equity – efficiency tradeoffs and government policy in the US, the Netherlands, and Sweden.' In: Barnett, W.S., and S. Spence Boocock, *Early care and education for children in poverty. Promises, programs and long-term results*. Albany, NY: State University of New York Press.
- Hank, Kerstin and Kreyenfeld Michaela (2000), Does the availability of child care influence the employment of mothers? Findings from Western Germany, MPIDR Working paper WP 2000-003, Rostock, Germany.
- Hartog, Joop (1999). *So, what's so special about the Dutch model*. Geneva: ILO.
- Hartog, Joop, and Jules Theeuwes (1993). 'Post-war unemployment in the Netherlands.' *European Journal of Political Economy*, 9, pp. 73-112.
- Heckman, James (1974) Effects of child care programs on women's work effort, *Journal of Political Economy* vol 82, pp 136-169.
- Hofferth, Sandra, L. and Wissoker, Douglas A. (1992) Price, quality and income in child care choice *Journal of Human Resources*, vol 27, no 1, pp 70-111.
- Kessel, E. van, M. Kuperus, and H. Pott-Buter (1986). 'Hoezo, gelijk belast?' In: *Invloed van arbeid, belasting en premieheffing op het leven van vrouwen*. Amsterdam: De Populier/Amazone.
- Kimmel Jean (1998), Child care costs as a barrier to employment for single mothers, *The review of economics and statistics*, vol. X, no y, pp 287-299.
- Kjullin, Urban (1995). *Economic perspectives on child care*. Dissertation publications of economics, no. 56. University of Göteborg, Sweden.
- Kunnen R, W.C.M. Praat, A.M. de Voogd-Hamelink and C.M.M.P. Wetzels (1997), *Trendrapport Aanbod van Arbeid, 1997*, OSA Report nr. 25, mei, The Hague.
- Laan, Lambert van der (1996). 'De dure nationalisering van het gezin.' *Economisch Statistische Berichten*, 13 november, p. 938.
- Leibowitz, Klerman and Linda Waite (1992), Employment of new mothers and child care choice. Differences of children's age, *Journal of Human Resources*, vol 27, no 1, pp 112-133.
- Maassen van den Brink (1994) dissertation: female labour supply, marital conflict and child care. Amsterdam: Amsterdam University Press.
- Malthus, T.R.(1798) *An essay on the principle of population, as it affects the future improvement of society with remarks on the speculations of Mr. Godwin, M. Condorcet and other writers*. London: Printed for J. Johnson, in St Paul's church yard.
- McFate, Katherine, Roger Lawson and William Wilson eds.(1995) *Poverty, inequality and the future of social policy. Western states in the new world order*, Russel Sage Foundation, New York.

- MDW (1998). (=Marktwerking, Deregulering en Wetgevingskwaliteit; translated in English: functioning of markets, deregulation and quality of legislation), Report MDW Taskgroup Childcare,
- Michalopoulos, Charles, Robins, Philip K. and Garfinkel Irwin (1992), A structural model of labor supply and child care demand, *Journal of Human Resources*, vol 27, no 1, pp 166-203.
- Mincer J. and s. Polacheck (1974), Family investments in human capital: earnings of women, *Journal of Political Economy*, 82(2): 76-108.
- Nijfer (1998). *Arbeid en zorg*. (Work and Care) Breukelen, December.
- OECD (1995). *Employment Outlook 1995*. Parijs.
- Plantenga Janneke (1998), The economics of a female friendly welfare state, the case of child care services in Sweden and the Netherlands, paper presented at the Out of the Margin 2/IAFFE Conference 1998, 2-6 June Amsterdam.
- Pott-Buter (1993). *Facts and fairy tales about female labor, family and fertility. A seven-country comparison, 1850-1890*. Amsterdam: Amsterdam University Press.
- Powel L.M.(1997). 'The impact of child care costs on the labour supply of married mothers: evidence for Canada. *Canadian Journal of Economics*, vol. 30 nr. 3 pp. 577-594.
- Ribar D.C. (1992), Child care and labor supply of married women, reduced form estimations, *Journal of human Resources*, vol 27, pp.135-65.
- Rijswijk-Clercks, L. van (1981). *Moeders, kinderen en kinderopvang. Veranderingen in de kinderopvang in Nederland*. Nijmegen: Socialistische Uitgeverij.
- Rosen, Sherwin (1995). *Public employment, taxes and the welfare state in Sweden*. NBER/SNS Occasional Papers, Stockholm.
- Rosen, Sherwin (1996). 'Public employment and the welfare state in Sweden.' *Journal of Economic Literature*, 34, pp. 729-740.
- Sandmo, A. (1990). 'Tax distortions and household production.' *Oxford Economic Papers*, 42 (January), pp. 78-90.
- Spieß, Katharina C. (1995), American and German Mothers' child care choice. Does policy matter? Working paper Ruhr Universität Bochum
- Statistics Netherlands (1997). *Kindercentra 1995*. Voorburg/Heerlen: Centraal Bureau voor de Statistiek.
- Theeuwes J.J.M. (1988) 'Arbeid en Belastingen' in: Pre adviezen van de Koninklijke Vereniging voor de Staathuishoudkunde, Belastingheffing en Belastinghervorming, Stenfert Kroese, Leiden., pp 65-110.
- Therborn, G. (1989). 'Welfare states and capitalist markets.' *Acta Sociologica*, 30(3/4), pp. 237-254.
- Tijdens, Kea, and Saskia Lieon (1993). *Kinderopvang in Nederland, organisatie en financiering*. Utrecht: Jan van Arkel.
- Tijdens, Kea, Van der Lippe Tanja, De Ruijter Esther (2000), Huishoudelijk werk en de zorg voor kinderen. Herverdelen of uitbesteden? Hoofdstuk 6. Serie wetenschappelijke publicaties, van de Burcht, Elsevier, Amsterdam , pp.71-83.
- Visser, Jelle (1999). *The first part-time economy in the world. Does it work?* Mimeo University of Amsterdam, department of PSCW.
- Visser, Jelle and Hemerijck (1997). *A Dutch miracle. Job growth, welfare reform and corporatism in the Netherlands*. Amsterdam: Amsterdam University Press.

- Willis, Robert (1973) A new approach to the economic theory of fertility behavior.
Journal of Political Economy 81 (2) Part II: s14-64.
- WRR (1991). *Een werkend perspectief: arbeidsparticipatie in de jaren 90*. Den Haag:
Wetenschappelijke Raad voor het Regeringsbeleid (= Scientific Council of the
Dutch Government).

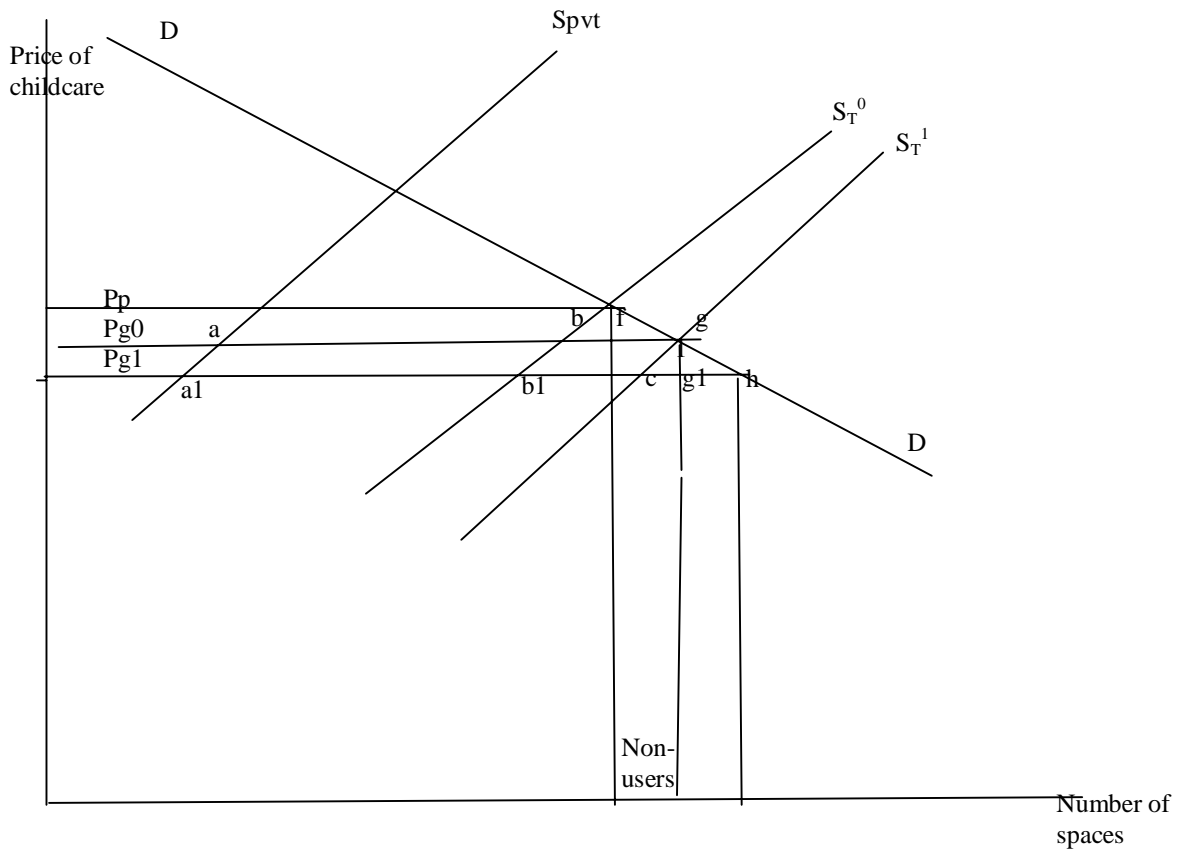


Figure 1. Rationing in the child care market

