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Changes in quantity and quality of time for children: United States, 1981-1997*

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Abstract

This paper tries to analyze changes in the allocation of time decided by mothers and how their characteristics influence that allocation across the period 1981-1997 in the United States. Data reveals that there exists an increase on the quantity and quality of time devoted to children by some types of mothers. Shift-share analysis shows that behind the increase there is a change in maternal behaviour. Then, it seems reasonable to model the decisions of the mothers and try to explain which are the determinants. Estimations suggest that working time is a substitute of quantity, but not quality, of time with children. Being single reduces not only time but also

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its quality. Mother's earnings and level of education have changed their influence on time with children across time.

JEL: J12, J13, J20.

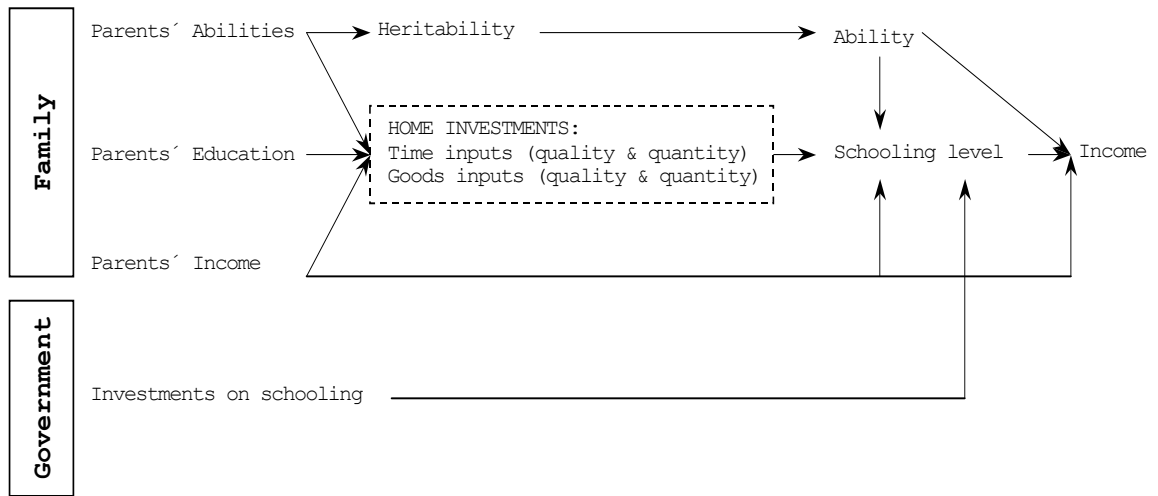
Key words: Time-use, quantity and quality of time with children, family economics, simultaneous equation system, and three-stage least squares.

1 Introduction

In modern societies, the commitment to children's healthy development is strong, reflected in a huge level of a nation's investment in children. As documented in US. Census Bureau, in the United States expenditures on schooling represent from the GDP an increasing proportion across time (from 6,6% in 1992 to 7,0% in 2003) and a large proportion of total government expenditure (in 2001 education represents the 17,1% of total government expenditure). In addition, parents spend hundreds of billions of dollars for housing, feeding, and clothing children, for transporting them, for providing non parental care and health services. However, the largest of all costs could be the implicit value of the time that parents spend nurturing, monitoring, teaching and caring for their children.

There exists a big interest of social science research on the possible explanations of why some children achieve success in young adulthood while others do not. In related literature "success" is normally identified by schooling attainments, occupation, earnings levels, and the choice of certain behaviors (e.g. teen non marital motherhood). It is well documented, see e.g. Keane and Wolpin (1997) and Cameron and Heckman (1998) among others, that scores on cognitive tests taken during adolescent years are correlated with adult labor market outcomes. Currie and Thomas (1999) or Todd and Wolpin (2004) show that there is a correlation of test scores measured at younger ages with labour market success, as early as age seven.

Economists have viewed the process of child attainment as an aspect of the theory of family behaviour. The literature¹ has focused the analysis on the role of parental characteristics and decisions. The positive association between one's school attainment and that of one's parents has been tried to be explained by means of heritability of traits. This literature also considers how the parent's decisions about the amount, the nature and the timing of the distribution of resources allocated to children, influences the attainments of children. There are other choices made by parents that also affect children, such things as the neighbourhood, the type of school, the number of siblings, etc... Finally, there are some other types of factors that influence the children attainment, but there are not directly controlled by parents, such as the school characteristics. Todd and Wolpin (2004) find that home inputs are significant determinants of achievement, while the effects of school inputs (measured as pupil-teacher ratios and teacher salaries) are imprecisely measured in specifications that allow for unobserved child endowments. All these factors that influence children development are summarized in Figure 1.



Home Investment in Children

Adapted from Leibowitz (1994) and Haveman and Wolfe (1995)

Related perspectives from other disciplines, such as sociology and psychology, have been incorporated to complete the economic explanation of the child attainment². Taking some hypothesis from them, economic studies examine how the shifts in family structure and maternal employment status contribute to the time children spent with mothers or to fertility rate or marital dissolution rate, among others. In most of them they find a negative and significant effect on the child's educational attainment of the extent of mother's full-time employment or singled headed households. They suppose that time allocated to children is reduced when mother is working or single. They also suggest that a higher full family income increases the educational attainment of children, and given full family income, a higher mother's or father's wage reduces their children's educational attainment.

However, there exists some other studies, Bianchi and Robison (1997), Bianchi (2000), Hofferth and Sandberg (2001) for example, that find different results. In particular, Hofferth and Sandberg (2001) conclude that American children spent no less time with parents in 1997 than in 1981. In two-parent families, time with parents actually increases over that period. Behind these changes they find out that there exist structural effects but also behavioural effects, as important as the former ones. Bianchi (2000) presents some possible explanations of why the increase in women's labour participation or the rate of divorce has occurred with less reallocation of time away from children rearing. First, it is possible that we tend to overestimate maternal time with children, exaggerating time in the home that is actually available for investment in children. Second, the amazing upward trends of women's participation in the labour market and rate of divorce make us fail to appreciate how much mothers do to protect investment in children. Third,

childhood is not fixed and unchanging. We observe that, regardless of mother's employment status, more preschool-age children spend time outside the home in school-like settings. But also, since older children go to college, they need time and monetary investment for an extended number of years. These changes in children's lives tend to minimize differences in maternal time with children, as mothers are affected by changing notions of "what children need." Fourth, and perhaps most controversial, women's status probably has changed men. The increase in women's market work has facilitated the increase in men's involvement in child rearing, at least within marriage. However this last possible answer is not supported by data. We will come back to father's time later on.

All these findings have lead many researchers to assign a large role to "pre-market factors" in explaining the "success" in the market, where pre-market factors are broadly interpreted to represent endowed ability, the influence of family and the influence of schools³. In any case, there have been debates over which inputs increase children's achievement and to what extent. In this paper we will focus our attention on the time that mothers spend with children and how it is determined. In particular, the purpose of this paper is to analyze how the allocation of time with children has evolved from 1981 to 1997 in the United States and how the economic incentives determine mothers' allocation of time to their children, taking the interdependence between market work, child time and leisure into account. This paper is related to Hofferth and Sandberg (2001) and Hallberg and Klevmarken (2003). But, the new issues incorporated are, first, consider not only total time with children (quantity) but also type of time devoted (quality); and second include different types of children, the ones that are younger than six years, assumed to be time-intensive in their production and the ones that are older than six years, assumed to be good-intensive.

The analysis of the data reveals first, that working mothers reduce quantity, but not quality, of time that spend with children⁴. Secondly, singled mothers reduce quality, increasing quantity if children are young and decreasing if children are old. Finally educated mothers increase quantity and quality of the time that devote to children. The performance of a shift-share analysis gives us the insight that behind these changes there exists a behavioural or non-structural effect larger than the demographic or structural effect. Therefore, it seems to us reasonable to model the decisions of the mothers and try to explain which the determinants are. We estimate a simultaneous equation system.

The estimations show that the more hours a mother works, the less quantity of time devotes to children, but she subtracts time from activities included in non-quality time, not the quality time. Being single reduces time with children, but having more young children increases time with them. An interesting find-

ing is that there are some differences when estimating by year. The larger the opportunity cost of working that a mother faces, the more time with children in 1981, while in 1997 the reverse is true. The effect in both years comes from the indirect time. This could imply that mothers value differently the time for leisure enjoyed by her. In 1981, education makes mothers to decrease total time (quantity and quality), while in 1997, education leads to increase time with children. Finally, data also displays the fact that young children are intensive on time; this is more evident in 1997. Finally, data also displays the fact that young children are intensive on time; this is more evident in 1997.

The rest of the paper is organized as follows. In Section 2, we present the data available on allocation or uses of time. We carry on the shift-share analysis. In Section 3, we develop a simple model of allocation of time, obtaining some theoretical implications. In Section 4, we estimate the model and explain the results. Finally, Section 5 concludes. Codes for activities and tables are confined to Appendices 1 and 2.

2 Analysis of the Data

2.1 Data

Data of uses of time are collected from Time Use Longitudinal Panel Study, 1975-1981 (ICPSR 9054)⁵ and Family Interaction, Social Capital, and Trends in Time use (ICPSR 3191)⁶. Both projects collected a 24-hour "yesterday" time diary to set how Americans spend time. The classification of activities, that individuals interviewed can report, is enumerated into the appendix. There are some important points to consider. First, we only consider mothers' time since the analysis of our data set reveals that the percentage of hours devoted by fathers to children is small enough compared to mothers' time. Secondly, in the survey they are asked about activities as primary activities and secondary activities. In Hofferd and Sandberg (2001) they use primary and secondary activities and we include only primary activities. A third point to consider is that there exists a question where respondents were queried about who they were with. We consider the observations with the answer alone or with children (independently if the spouse is also during the activity).

Taking this information into account⁷, we redefine the type of activities in four categories. We sum the time devoted to each of the one hundred activities during the week, we subtract the time sleeping and define time devoted to work, housework and leisure as in the survey, with a peculiarity, which is, only include the time spent in those activities when nobody is present. We define total time

with children as the sum of direct time with children (called child-care in the survey) and indirect time (time devoted to the other activities if they are done with children). We report time not in hours per week, but in percentage of the total week time subtracting sleeping time.

Some other properties of the data collected are the demographic features. It is believed that the changing structure of American families and the increase in female labour force participation have decreased children's time with parents. One premise of their argument is indisputable: in the past 20 years, the structure of American families has changed greatly. Today it is estimated that two-thirds of first marriages will end in divorce, more than twice as many as two decades ago (Martin and Bumpass 1989). In addition, almost one-quarter of white children and more than half of black children are currently born to unmarried mothers. The consequences of these changes are evident in cross-sectional family statistics. In 1980, 22% of children lived with one parent; today almost 27% do so (U.S. Bureau of the Census 1999). The cumulative experience of divorce and single parenthood is even higher than these statistics suggest. According to recent estimates, 60% of children will spend at least part of their childhood with only one parent (Hernandez 1993). At the same time, the proportion of women in the paid labour force has increased dramatically. Single women have always worked in large proportions, but married mothers have not. One of the more important elements of this change is the increase in the proportion of married mothers with young children who are employed outside the home. In 1998, 64% of U.S. married mothers with a preschool child were in the work force (U.S. Bureau of the Census 1999), compared with 42% in 1981 (U.S. Bureau of the Census 1981). Our data set reproduces these figures, see Table 0 into Appendix⁸.

2.2 Changes of Children's Time with Mothers (1981-1997)

To examine how children's time may have changed over the period, we control for some maternal features, e.g. marital status, employment status, or education that have been also included in Hofferth and Sandberg (2001). The new issues included in this paper are first, the consideration of two types of time devoted to children. By the nature of the activities reported in the group 20-29 (the list of activities is into the appendix) we define those activities as "quality" or direct time. "Non quality" or indirect time consists of the rest of activities reported to be done with children. Besides, we assume that direct care is better for the children's development than indirect time. Finally, "quantity" of time is defined as the sum of both times, that is total time. We include the ratio direct to indirect time as a measure of the distribution of total time. Secondly, we also include the age of children as a determinant of the allocation of time. The consideration of

different ages of children tries to capture the idea of that there are two types of children, the ones that are intensive on time (those that are younger than 6 years old), and the ones that are good-intensive (those that are among 6 and 18 years old). From now on we denote them young and old respectively.

The analysis plan of this section is the following. We start checking whether the total time and the distribution of time with children have changed, taking the relevance of different characteristic of the mothers and ages of the children into account. That is, we check if the two main differences with the previous cited paper are relevant in our data. After this analysis, we will try to clarify which part of the changes, if they exist, are structural changes or behavioural changes or both types.

2.2.1 Total time with children and its distribution.

Regardless the age of children and the status of the mother, Table 1 reveals that, first, there is an increase, of about 7%, on the total time (quantity) that mothers, devote to children, from 1981 to 1997. This increase consists of an increase on direct time, of about 4%, and on indirect time, of about 3%. Secondly, the distribution of total time is skewed to indirect time (non-quality time), and the degree of skewness decreases across time.

Considering the two types of children defined above, we observe first, that in both years total, direct and indirect time devoted to young children are about two times larger than time allocated to older children, being more pronounced in the case of direct time. This also happens when considering the ratio direct to indirect time. This is not surprisingly since this type of children is considered to be time-intensive. Secondly, across time, we observe that total time increase for both types of children. However note that direct time is the time which has increased for younger children, while indirect time is behind the increase in the case of older children. The distribution of time is less skewed to the indirect time in the case of young children and less across time. Summarizing, mothers increase the quantity of time allocated to children by means of quality time (non-quality) if they are young (old) children.

The alternative uses of time evolves as follows, there is an increase of working time, of about 4%, together with a decrease on leisure, about 7% and on housework, about 5%. It could be interpreted as if mothers substitute leisure to children's time, and housework to working time. Age of children implies that mothers with young children devote less time to all alternative uses of time, while mothers with older children, work much more than before, reducing leisure and housework.

Employment Status. The allocations of time with children, controlling for different characteristics of the mother, are reported in Table 2. It happens that non-working mothers spend more total time with children than working mother, for all ages of children and both periods, especially in 1981. Across time, working and non-working mothers increase time with children, being a larger increase for non working mothers and for mothers of young children. Those facts could reinforce the idea of a negative effect of women's participation in the labour market on the allocation of time to children. However this is not true when considering the distribution of total time. In both years, the ratio direct to indirect time is larger for working mothers, and across time the increase is larger for working mothers. Moreover, the working mothers with young children are the only ones with a distribution skewed to quality time.

What do they assign the rest of time to?. If we compare the distribution of the free-time⁹, we conclude that both types of mothers, working or non working, have the same distribution among housework, children and leisure¹⁰. Since working mothers keep almost constant the time devoted to work across time, we can assure that the increase on children's time is due to the decrease on leisure. These types of conclusions can be also obtained controlling for the age of children.

Marital Status. Conversely to the idea of the negative influence of single-parent household on the time allocated to children, it is found, first, that in 1981 single mothers spent around 7% more time with children, while in 1997 they spend almost the same. Secondly, the evolution of allocation of time to children presents the following characteristics. Single-mother does not increase the time with children while mothers in a two-parent family has increased time, same as in Hofferth and Sandberg (2001). However the apparently no change on the allocation of time of single mother is the result of different and offsetting changes. On one hand, there has been an increase in direct time and a decrease of the indirect time. On the other hand, singled-mothers of young children have increased time with children, while mothers of older children have decrease. Thirdly, the increase of time with children experimented by married women is basically made by mothers of younger children.

There is, however, a finding that reveals a possible negative effect of single household on children. Singled mothers present a lower ratio direct to indirect time compared to married in 1981. Although both types of mothers increase the ratio, the married mothers increase more, making differences larger in 1997. This also happens when controlling for ages of children, although it is interesting to note that, in 1981, singled mothers of young children distributed total time between direct and indirect in the same way as the married mothers, making the

differences in 1997 being smaller. Then it could be that singled mothers devote no less or more quantity of time to children, but devote less quality of time.

What do they assign the rest of time to?. The singled mother of young children increases time to children in exchange of work time, while mothers of older children use the liberated time with children to work more. The increase on time with children experimented by married mothers of young children is in exchange of leisure. In the case of married mothers of older children, they work more but in exchange of leisure and housework, not children time.

Education Attainment. We find the usual result, that is, the college mother spends more time with children. Both types of mothers, college and non-college, increase time with children, in both years. Across time, there is an increase of this use of time, which is larger for the case of college mother, making differences to be larger. Behind this changes, we observe that non-college mothers of young children, have decreased time with children, which makes more deep the difference with college ones. It is also interesting to note that changes in both types of mothers, non-college and college, are due to changes in direct time, leading to a divergence in the ratio of direct time to indirect time, amplifying differences among levels of education.

The alternative uses of time have the expected changes. The more educated mother does not change the working time, devoting less to leisure and housework in order to increase time with children. Again this behaviour is the results of some other processes that arise when controlling for age of children. College mothers of young children do decrease working time to take care about children, while college mothers of older children do keep time with children but they work more in exchange of leisure and housework. The non-college women do increase less the time with children, since they work much more hours¹¹.

Summarizing, the non working mothers devote more quantity of time to children, but it is non-quality time, while working mothers devote more quality time. This is more evident in the case of young children and across time. Then it could be that singled mothers devote no less quantity of time to children, but devote less quality of time. When children are younger less quality is offsetting with more quantity. The more educated mother devotes more total time to children and more direct time, that is quantity and quality.

2.2.2 Shift-Share Analysis

The changes on the allocation of time could be produced by demographic changes or by changes on behaviour or both. There exists a common standardization

procedure, called shift-share analysis, in which changes are decomposed into parts that are attributable to changes in the structural composition of the population, parts that are attributable to behavioural change, and parts attributable to the interaction of the two. The decomposition equation, the shift-share analysis is based on, is

$$t_2 - t_1 = \sum_i P_{i1} (t_{i2} - t_{i1}) + \sum_i t_{i1} (P_{i2} - P_{i1}) + \sum_i (P_{i2} - P_{i1}) (t_{i2} - t_{i1})$$

where t is the estimated mean time with parents, P is the estimated proportion of the population in the category i , and the numeric subscripts indicate the year.

Table 3 presents changes across time in children's time spent with mother decomposed into structural elements attributable to each of the characteristics of the mother and to non-structural (potentially behavioural) elements, and to the interaction between the two. Year 1997 is used as the base year¹². The decomposition for the rest of uses of the time is reported in Table 3.a.

As obtained in Hofferth and Sandberg (2001), the independent structural effect of women's increasing labour force participation on children's time is negative. However, the behavioural or non-structural effect is positive and larger than the structural one, making the total effect positive. For example, regardless of the age of children, mothers spend about 2% less with children in 1997 than in 1981 by structural effect and 9% more by behavioural effect. The fact that the negative structural effect is lower than the positive non-structural one, leading to a total positive effect still hold when controlling for the age of children and for the type of time. In the rest of uses of time, the increase in labour force participation has the following effects: (i) structural and behavioural effect imply less time to leisure and housework (larger the effect on leisure) and (ii) structural effect implies more working time for any type of children, while behavioural effect implies less working time if children is young, although it is small enough to offset the structural. When children are older behavioural effect reinforces the structural effect.

The increase in the proportion of single-parent families in the population between the two years exerts a positive independent structural effect overall on children's time with their mothers. That increase over period is reinforced by the non-structural increase. These results hold for any other type of time or age of children with an important exception. The direct time does not behave like that moreover in the case of young children, since in this case the structural effect is negative, although smaller than behavioural one. In the rest of uses of time, the increase in single-parent families has the following effects: (i) not only the struc-

tural but the behavioural effect decrease time for leisure and housework, with the particularity that in leisure time the interaction effect offset part of the change, (ii) the structural and behavioural effects imply more working time for singled mothers.

Education has almost zero structural effects on all uses of time; therefore the final effect is almost all behavioural effect. The more educated the mother, the more time with children, both direct and indirect, the larger the time working, and the fewer time of housework and leisure.

The performance of a shift-share analysis gives us the insight that the reason for these changes is a non-structural or behavioural effect instead of a structural or demographic effect. Note that in all cases the magnitude of the behavioural changes are larger than the structural ones, sometimes reinforcing and sometimes offsetting this structural effect. Therefore, it seems to us reasonable to model the decisions of the mothers and try to explain which the determinants of these changes are.

3 A model

We consider a two-parent household in which the mother takes the decisions¹³. Assume that the mother obtains utility from consumption, C , from leisure, t_l , and from the quantity, n , and quality, Q , of children.

$$U = U(C, Q, t_l)$$

The utility function is maximized subject to the following constraints, a budget constraint, a time constraint and a technology of children,

$$\begin{aligned} C &= wt_h + R - ns \\ T &= t_h + t_c + t_l \\ t_c &= t_{ci} + t_{cd} \\ Q &= nq(t_{ci}, t_{cd}, s) \end{aligned}$$

where w is the wage per hour of the mother, R correspond to the non-labour women income in the household (for example the husband income when there exists), s is the consumption for children, t_h is the work-time of mother; t_c denotes total time devoted to children, that we will consider of two types, t_{cd} as direct time and t_{ci} as indirect time, n is the number of children and q is quality function of each child. The first order conditions for an optimal interior solution are

$$wU_c = nU_Qq_{t_{ci}} = nU_Qq_{t_{cd}} = U_{t_l} \quad (1)$$

The difference with the model presented in Hallberg and Klewmarken (2003), is that in our case the uses of time do not provide utility by themselves, but they indirectly provide utility by means of consumption of quality of children. In this case, there is no a "benefit process" as in the cited paper.

The equation (1) implies that the higher is the marginal utility of an activity, the more time will be used for it. The result of a change in an exogenous variable, such as wage rate or marginal product of time with children, will depend on changes in the marginal utilities (second-order derivatives of the utility function) and also in the marginal productivity of both types of time in terms of quality (second-order derivatives of the quality function). An increase on wage rate will lead to a decrease in market time, if the income effect dominates the substitution effect in the utility function of consumption and if some conditions on the quality function are satisfied. A decrease in market time will increase the time with the children (both types) and/or leisure time and the marginal utility of children and leisure will then decrease. . If the marginal utility of children, together with some properties of quality function, decreases less than the marginal utility of leisure for a given change in time-use, relatively more time will become allocated to the children. An increase in non-labour income will display similar effects, since it generates only an income effect on consumption goods.

If the marginal product of rearing children increases exogenously, more time will be allocated to children while market time and leisure time will be reduced. If the productivity of raising children with direct time is related to the parents' schooling, then well-educated parents are likely to produce more child quality than less educated parents. Whether well-educated parents will then also devote more time to their children depends on how quickly the marginal utility of child quality levels of with increasing quality. The difference in marginal utility of child quality might compensate for the difference in productivity. Education is also positively related to the wage rate, and well-educated parents might have jobs which give them a relatively high process benefit from working. In the end, it is not at all obvious that there will be a positive relation between schooling and the time spent with one's children. This depends on how highly well-educated parents value children relative to other sources of well-being. The productivity of indirect time can be also related to education, but this time is less sensitive to education.

Summarizing, since the effects described before depends on assumptions on utility and quality function, an empirical analysis is required to get some insight about sign and magnitude of changes.

4 Empirical analysis

4.1 An econometric model of differences in time allocated to children

The analysis in previous section suggests ways in which differences in wage rates, incomes, schooling and all the characteristics than can influence the type of time that mothers decide to allocate to children, but an empirical analysis is needed for something more specific about signs and magnitudes. Our strategy is not to estimate a full structural model using specific assumptions about the functional forms of utility functions, but still to use a model recognizing the joint dependence of time allocated to work and children. As pointed out in Section 2, we omit the data of time that fathers spend with children, since the figures are negligible. By doing so, we are conscious that we omit the effect of interaction of spouses' time on mother's decisions of allocation of time. We assume that out-home child care happens when mothers are working.

Consider the following interdependent system

$$t_{ci}^* = \alpha_0 + \alpha_1 t_h + \alpha_2 t_{cd} + \alpha_3 w + \alpha_4 R + \alpha_5 \mathbf{X}_1 + \alpha_6 \mathbf{X}_2 + \varepsilon_{ci} \quad (2)$$

$$t_{cd}^* = \beta_0 + \beta_1 t_h + \beta_2 t_{ci} + \beta_3 w + \beta_4 R + \beta_5 \mathbf{X}_1 + \beta_6 \mathbf{X}_2 + \varepsilon_{cd} \quad (3)$$

Time-use, wages or income variables have been defined in previous section. \mathbf{X}_1 and \mathbf{X}_2 are vectors of gender-specific exogenous variables such as schooling, age and three dummies. One of the dummies represents the marital status (taking value 1 if non-married) to reflect that it is likely that single mothers differs in their behavior from married mothers. We also include a dummy to reflect the fact that children that are younger than six years old are time intensive while children older than 6 years are good intensive. This dummy is built to take value 1 if there is no child younger than six years old in the household. Finally as we explain later, we also include a dummy for the year. The corresponding α :s and β :s are unknown parameters.

One can consider equations (2) and (3) as a set of behavioural equations originating from the first-order conditions of the optimization problem of a household¹⁴. More specifically, we have the following motives for this specification. Considering the general accepted hypothesis that working or singled mothers devote less time to children, there has been a policy debate about reducing hours of work for parents in order to free time for their children. We find interesting to get a direct measure of the effect of differences in market time on the time with children and on the type of time devoted, direct versus indirect. This is a motive for including total market time as an explanatory variable. The argument to include

direct (indirect) time with children into the explanation of indirect (direct) time is that when mother is working indirect time is a substitute for direct time with the children to make longer working hours possible. Hours of market work is also a decision variable, which suggests that it should be treated as an endogenous variable¹⁵.

Wage rate and income variables are included to check if these variables have any effect on the time with the children in addition to the indirect effect through hours of work. That is, the positive effect of more household income on children could offset the more hours devoted to work. Also we find in related literature the suggestion that higher full family income increases the educational attainment of children, and given full family income, a higher mother's or father's wage reduces the time allocated to children. A high wage rate indicates high productivity in the labour market and therefore high opportunity cost for mothers to devote time to other activities. If there would be a positive correlation between productivity in the labour market and in care of children, wage rate might catch this effect. However it is possible that preferences of mothers are such that substitution effect more than offset the income effect and therefore low (high) wage mothers increases (decreases) time with children. The reverse can be also possible. the income variable is also included to see if it affects the decision of obtaining more free time since income allow people to buy cleaning, cooking and laundry services in favour of children's time. If the effect of wage rate and income are not significantly different from zero, then the set of equations estimated can be view as conditional demand functions.

At this point it is important to note that a change in an exogenous variable can display two different effects on mother's allocation of time with children. One of them, the selection effect, might imply that mother could decide not to work. The other effect might imply changes in the amount of hours devoted to work. The selection effect would not appear if women participation in the labour market would be a completely random and independent of the time with children. Then the set of equations can be estimated from the sub sample of working mothers with no compensation for selectivity. However, in literature of women participation in labour market there is a lot of evidence of the presence of selectivity¹⁶. Therefore, such estimates would be conditional on the selection that has actually taken place in the sample and they would, in general, not become robust to changes in the exogenous variables. We do not make selection in the case of single or married, since the marital status does not present this double process so obviously. Thus, we compensate for selectivity using the following reduced form model for the

decision to work

$$\begin{aligned}
t_j &= t_j^* \text{ if } L^* > 0 \\
L^* &= \gamma' \mathbf{Z} + \eta \\
L &= 0 \text{ if } L^* \leq 0, L_j = 1 \text{ otherwise}
\end{aligned}$$

where $j \in \{cc, w\}$, L is a dummy indicator for employment status, Z is a vector of gender-specific and common exogenous variables explaining the work decision, γ an unknown parameter vector. This model thus determines the selection into our sample. All random errors are assumed to be multivariate normal. There is no a priori assumption of zero correlation. In our empirical work, the job status is determined by the main interview, while the hours of work come from the time-use interview.

If the mother's time in care of their children and work are substitutes, we would expect negative working time coefficients. Moreover, if direct and indirect time are substitutes we could expect direct and indirect time coefficients, when are explanatory variables, to be negative. The sign of these two parameters might well be reversed. The income effect of changes (differences) in wage rates and non-labor income should primarily give positive coefficients, reflecting the determine people's propensity to buy household services and packages of services and goods, such as ready-made food, which could free time for activities with children or leisure. However, in the case of wages there exists another effect, the substitution effect, reflecting the opportunity cost of time when non working, that displays a negative effect on children time whenever the wage rate is larger. Depending on which effect dominates the corresponding coefficients should be positive or negative.

4.2 Estimation and Empirical Results

The time-use variables, referred to children, are endogenous choice variables. The wage rate variables entering the household budget constraint are the net after tax wage rates. Since the tax rate is a function of income, the net wage rate will depend on choices about working hours and thus become endogenous too. However since our primary objective is not the earnings equation, we use a linear specification of the wages equation, being conscience that it does not capture the log-linearity of the earnings function, and considering it as an instrument. The model can be estimated by a two-step procedure: First, estimate the probit specification for the participation in the labour market, and the expressions for the conditional expectation up to a finite number of unknown parameters and obtain the conditional expectations of error terms. Then estimate the interde-

pendent system by, for instance, three stage least squares (3SLS). For each of the endogenous variables we will need at least one unique identifying instrument. To avoid identification by functional form, we should also have at least one unique Z-variable in the probit step.

We first estimate the allocation of total time with children, then the determinants of direct and indirect time with children and finally we report estimations for the ratio direct/indirect time. The model specifications for the different independent variables are estimated for the pooled data set with only and additional intercept dummy for 1997 and also for each year separately. Results are reported in Tables 4-6. Before starting with the comments on parameter estimates in the time-use variables, note that the results on the selection equation are the expected, such as, the more educated the mother or the older the mother is or the more children younger (among others), the more likely she works.

Starting with the determinants of the quantity of time that mothers devote to children (reported in Table 4), we find that some variables affect in the same manner when the estimations consider pooled data or data by year, while others differ. The effects that remain whether the year considered are the following. First, mothers consider market activities and children's time to be substitutes (in any case this effect is significantly different from zero). Secondly, mothers allocate more proportion of their time to children whenever the number of children younger than six years old is larger. Thirdly, mothers that work devote less time to children, since the coefficient corresponding to Mills ratio is, in any case, significant and negative. Fourthly, the higher the other sources of income in the household the less time devoted to children; however this effect is not significant. This could imply that the variable income does not reflect the fact that more income allows parents to be able to afford cleaning, cooking and laundry services that free their own time in favour of children. This can happen but the free time might be devoted to leisure.

There are some other variables that change their effects across time. First, in 1981 mothers' preferences are such that substitution effect is small enough, then even if the opportunity cost increases mothers devote more time to children. However in 1997, the opportunity cost makes mothers who earn more to devote less time to children. In the case of pooled data the effect of 1981 dominates. Secondly, the influence of education on the decisions of allocation of time is negative in 1981 that could reflect that more educated devote more time to work. In 1997 the more educated the mother is, the larger the time devoted to children. This reflects some ideas pointed out in the related literature, in the sense that more educated parents could have preferences for more educated children. Again in pooled data, the effect of 1981 dominates. It also can reflect that across time the concept of children as

pointed in Bianchi (2000).

Considering the two types of time, quality or direct and non-quality or indirect time, that mother can devote to children, we again observe that some variables display the same effect independent of whether the estimation correspond to pooled data or data by year. First, mothers substitute working time with indirect time and not direct time. Secondly, both types of time increases with number of young children, and indirect time increases with number of older children. Thirdly, to be single and to work decrease again both types of time with children. Among the variables that changes their effects by changing the year of estimation, we find, first, that direct and indirect time are complementary in 1981 while they are substitutes in 1997, although the effect of indirect over direct time is the only one significant different from zero. Secondly, that mother with higher wage rate decrease the direct time and increase the indirect time with children in 1981, that is, the substitution effect dominates when deciding the direct time, while the reverse is true for indirect time. This could imply that when mothers have a large opportunity cost, they value so much the time, that they enjoy leisure with children instead of enjoying by themselves to compensate the more working hours. In 1997, the opposite effect arises, although it is not significantly different from zero. When pooled data, the effects in 1981 dominate. Thirdly the effect of other sources of income is positive on direct time, while negative on indirect time in 1981 and pooled data. There is no significant effect, although negative, in 1997. Thirdly, more education obtained by mothers implies less time with children of both kinds in 1981, while in 1997 implies more time. Pooled data reflect the dominance of the effects of 1981. Fourthly, not having young children implies reducing direct time in 1981, and increasing in 1997. When considering the distribution of time between direct and indirect time, that is the ratio direct to indirect time for example in the pooled data reported in Table 6, we observe that the fact that mother works increases the ratio, the number of hours they work decreases ratio, education, age of mother, age of children also decreases ratio.

Summarizing, in all the specification, pooled data or data by year, we find that, the more hours a mother works, the less quantity of time devotes to children, but she subtracts time from activities included in non-quality time, not the quality time. Being single reduce time with children, but having more young children increases time with them. There are some differences when estimating by year. The larger the opportunity cost of working that a mother faces, the more time with children in 1981, while in 1997 the reverse is true. The effect in both years comes from the indirect time. This could imply that mothers values differently the time for leisure enjoyed by her. In 1981, education makes mothers to decrease total time (quantity and quality), while in 1997, education leads to increase time with children. Finally, data also displays the fact that young children are intensive

on time; this is more evident in 1997.

5 Conclusions

In modern societies, the commitment to children's healthy development is strong, reflecting in a huge level of a nation's investment in children. There is also a big interest of social science research on the possible explanations of why some children achieve success in young adulthood while others do not. In related literature "success" is normally identified by schooling attainments, occupation or earnings levels, and the choice of certain behaviors (e.g. teen non marital motherhood). From the point of view of the economists the process of child attainment has been viewed as an aspect of the theory of family behavior. Related perspectives from other disciplines (sociology and psychology) have been incorporated to complete the economic explanation of the child attainment.

These findings have led many researchers to assign a large role to "pre-market factors" in explaining the "success" in the market, where pre-market factors are broadly interpreted to represent endowed ability, the influence of family and the influence of schools. In this paper we focus our attention to the time that parents spent with children. Some studies point out that modern societies present some features that affect this time with children, the mothers' increased extra familial market activity, the fathers decreased levels of commitment to traditional family structures, the increased rate of divorce and therefore the single mother households, etc...The time children spend with parents is thought to be important not only for emotional development but also for cognitive and social development. Moreover, the implicit value of the time that parents spend nurturing, monitoring, teaching and caring for their children could be considered the largest cost of children's development.

The purpose of this paper is to analyze how the allocation of time with children has changed, if it has done, from 1981 to 1997 in the United States and how the economic incentives determine parents' allocation of time to their children, taking the interdependence between market work, child time and leisure into account. The new issues will be to consider not only total time with children (quantity) but also type of time devoted (quality) and to distinguish different types of children, the ones that are younger than six years and the ones that are older than six years. The analysis of the data reveals first, that working mothers reduce quantity but not quality of time that spend with children. Secondly, singled mothers reduce quality, increasing quantity if children are young and decreasing if children are old. Finally educated mothers increase quantity and quality of the time that devote to children.

The performance of a shift-share analysis gives us the insight that the reason for these changes is a non-structural or behavioral effect instead of a structural or demographic effect. We will show that the behavioral effect is important in explaining the changes of allocation of time. Therefore, it seems to us reasonable to model the decisions of the mothers and try to explain which the determinants are. We estimate a simultaneous equation system. The results show that if a mother works, she reduces time with children, not only quantity but also quality. Once the mother works, if she decide to work more hours, then she subtracts time from children, but indirect time, not the direct time (quality). Therefore working time and time with children are substitutes. Being single reduce time with children, but having more young children increases time with them. There are some differences when estimating by year. The larger the opportunity cost of working (measured by wage rate) that a mother faces, the more time with children in 1981, while in 1997 the reverse is true. The effect in both years comes from the indirect time. This could imply that mothers values differently the time for leisure enjoyed by her. In 1981, education makes mothers to decrease total time (quantity and quality), while in 1997, education leads to increase time with children. Finally, data also displays the fact that young children are intensive on time; this is more evident in 1997.

Notes

¹The most known papers are Becker (1964, 1981) and Becker and Tomes (1979, 1986).

²See the explanations provided by those disciplines in Haveman and Wolf (1995).

³For a more detailed summary of empirical studies see Haveman and Wolf (1995).

⁴In data section, the precise definition of quantity and quality of time with children will be provided.

⁵The data utilized in this paper were made available by the Inter-university Consortium for Political and Social Research. The data for TIME USE LONGITUDINAL PANEL STUDY, 1975-1981 were originally collected by F. Thomas Juster, Martha S. Hill, Frank P. Stafford, and Jacquelynne Eccles Parsons of the Survey Research Center, Institute for Social Research, The University of Michigan. Neither the collector of the original data nor the Consortium bear any responsibility for the analyses or interpretations presented here.

⁶Robinson, John P., Suzanne M. Bianchi, and Stanley Presser. FAMILY INTERACTION, SOCIAL CAPITAL, AND TRENDS IN TIME USE (FISCT), 1998-1999: ICPSR version (3191). College Park, MD: University of Maryland Survey Research Center, 1999. Ann Arbor, MI: Inter-university Consortium for Political and Social Research, 2001.

⁷In 1981 the number of observations fulfilling all the criteria is 424 while in 1997 are 212.

⁸Considering all women, the percentage of married women and married mothers decrease around 31% and 33% respectively. The age of children does not influence these numbers. The percentage of women that work increases around 14%, and working mothers rises about 9%. The age of children does influence these numbers a little bit whenever the children are under 6 years old. The percentage of college women increases about 22%, and college mothers increases about 17%. The age of children does influence these numbers whenever the children are under 6 years old.

⁹This means that in the case of working mothers, these percentages are calculated subtracting the working time. The absolute terms are always higher for non working women.

¹⁰In 1981 around 23% is devoted to housework, 32% to children, and 44% to leisure, while in 1997 the time for children are higher in percentage, 42% for children, 38% to leisure and 19% to housework.

¹¹It could be explained by the wage premium and its evolution of increments of education.

¹²In Hofferth and Sandberg (2001) they also report the decomposition with 1981 as a base years. Results neither change in that case nor in this case, then we do not report that figures to avoid making the table more cumbersome. We only report in this table total time and direct effect, since indirect time is the difference of both.

¹³This is assumed to avoid the bargaining problem inside the household and to incorporated the fact that fathers do not allocate time to their children, in the sense that the amount of time they devote is negligible compared to mothers' time.

¹⁴As noted in Hallberg and Klevmarken (2003) these equations are neither Marshallian demand functions (which do not condition on market work) nor conditional demand functions (which do not include wage rate and income variables as defined by Pollack (1971)).

¹⁵We will include wage rate as an endogenous variable to capture the idea of endogeneity of working hours and earnings

¹⁶See for example, Caucutt, Guner and Kowles (2002), Da Rocha and Fuster (2002) among a lot of them.

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7 Appendix A: Data Set (from Code Guide of the Data Description)

ACTIVITY CODES SUMMARY*

| 00-49 NON-FREE TIME | 50-99 FREE TIME |
|-----------------------|-------------------------------|
| 00-09 PAID WORK | 50-59 EDUCATION/TRAINING |
| 10-19 HOUSEHOLD WORK | 60-69 ORGANIZATIONAL |
| 20-29 CHILD CARE | 70-79 ENTERTAINMENT/SOCIAL |
| 30-39 OBTAINING GOODS | 80-89 RECREATION SERVICES |
| 40-49 PERSONAL NEEDS | 90-99 COMMUNICATIONS AND CARE |
| | |
| 20-29 CHILD CARE | |
| 20 Baby care | 25 Outdoor playing |
| 21 Child care | 26 Medical care-child |
| 22 Helping/teaching | 27 Other child care |
| 23 Talking/reading | 28 (not used) |
| 24 Indoor playing | 29 Travel, child care |

* For more detail see Code Guide in the Data Set

8 Appendix B: Tables

Table 0: Demographic Changes (1981-1997)

| in % | ALL CHILDREN | | UNDER 6 | | UNDER13 | |
|-----------------|--------------|------|---------|------|---------|------|
| | 1981 | 1997 | 1981 | 1997 | 1981 | 1997 |
| Married Mothers | 93 | 64 | 94 | 69 | 92 | 59 |
| Working Mothers | 42 | 52 | 39 | 45 | 42 | 60 |
| College Mothers | 41 | 60 | 51 | 58 | 37 | 61 |

Table 1: Mothers' Allocation of time (% of week time^(*))

| | Time with children | | | | Other uses of time | | |
|-------------------------------|--------------------|--------|----------|-------|--------------------|-------|---------|
| | Total | Direct | Indirect | Ratio | Work | House | Leisure |
| All children | | | | | | | |
| 1981 | 24.7 | 8.3 | 16.5 | 0.50 | 22.0 | 18.4 | 34.9 |
| 1997 | 31.5 | 12.0 | 19.5 | 0.62 | 26.1 | 13.9 | 28.6 |
| Young children ^(a) | | | | | | | |
| 1981 | 35.2 | 14.0 | 21.2 | 0.66 | 22.2 | 14.1 | 28.5 |
| 1997 | 40.7 | 18.3 | 22.4 | 0.82 | 19.2 | 13.6 | 26.6 |
| Old children ^(b) | | | | | | | |
| 1981 | 20.6 | 6.0 | 14.6 | 0.41 | 21.9 | 20.0 | 37.4 |
| 1997 | 22.3 | 5.7 | 16.6 | 0.34 | 33.0 | 14.1 | 30.5 |

(*) Subtracting sleeping time. (a) Younger than 6 years. (b) Among 6 and 18 years old

Table 2: Mothers' Allocation of time

| | Working | | | | Non-Working | | | |
|----------------|---------|--------|----------|-------|-------------|--------|----------|-------|
| | Total | Direct | Indirect | Ratio | Total | Direct | Indirect | Ratio |
| All children | | | | | | | | |
| 1981 | 15.8 | 5.9 | 10.0 | 0.59 | 31.1 | 9.9 | 21.1 | 0.47 |
| 1997 | 21.3 | 9.4 | 11.9 | 0.79 | 42.6 | 14.7 | 27.8 | 0.53 |
| Young children | | | | | | | | |
| 1981 | 21.8 | 10.9 | 10.9 | 1.00 | 43.9 | 16.0 | 27.8 | 0.58 |
| 1997 | 27.0 | 15.1 | 11.9 | 1.27 | 51.7 | 20.8 | 30.8 | 0.68 |
| Old children | | | | | | | | |
| 1981 | 13.7 | 4.1 | 9.6 | 0.43 | 25.7 | 7.4 | 18.3 | 0.40 |
| 1997 | 17.0 | 5.2 | 11.8 | 0.44 | 30.1 | 6.3 | 23.7 | 0.27 |
| | | | | | | | | |
| | Married | | | | Non-Married | | | |
| | Total | Direct | Indirect | Ratio | Total | Direct | Indirect | Ratio |
| All children | | | | | | | | |
| 1981 | 24.2 | 8.3 | 15.9 | 0.52 | 30.9 | 7.6 | 23.4 | 0.32 |
| 1997 | 32.3 | 13.9 | 18.5 | 0.75 | 30.0 | 8.6 | 21.4 | 0.40 |
| Young children | | | | | | | | |
| 1981 | 35.6 | 14.2 | 21.4 | 0.66 | 29.3 | 11.1 | 18.2 | 0.61 |
| 1997 | 42.2 | 19.9 | 22.3 | 0.89 | 37.2 | 14.6 | 22.6 | 0.65 |
| Old children | | | | | | | | |
| 1981 | 19.7 | 5.9 | 13.7 | 0.43 | 31.4 | 6.5 | 24.9 | 0.26 |
| 1997 | 20.7 | 6.8 | 13.9 | 0.49 | 24.6 | 4.0 | 20.6 | 0.19 |
| | | | | | | | | |
| | College | | | | Non-college | | | |
| | Total | Direct | Indirect | Ratio | Total | Direct | Indirect | Ratio |
| All children | | | | | | | | |
| 1981 | 25.6 | 9.0 | 16.6 | 0.54 | 24.1 | 7.7 | 16.4 | 0.47 |
| 1997 | 34.2 | 13.8 | 20.4 | 0.68 | 27.5 | 9.2 | 18.2 | 0.51 |
| Young children | | | | | | | | |
| 1981 | 31.3 | 12.8 | 18.5 | 0.69 | 39.3 | 15.3 | 24.1 | 0.63 |
| 1997 | 44.5 | 22.1 | 22.5 | 0.98 | 35.3 | 13.0 | 22.3 | 0.58 |
| Old children | | | | | | | | |
| 1981 | 22.5 | 6.9 | 15.6 | 0.44 | 19.5 | 5.4 | 14.0 | 0.39 |
| 1997 | 24.3 | 5.9 | 18.4 | 0.32 | 19.1 | 5.2 | 13.9 | 0.37 |

Indirect time is the difference of total and direct time. Ratio is direct to indirect time.

Table 2: Mothers' Allocation of time

| | Working | | | Non-Working | | |
|----------------|---------|-------|---------|-------------|-------|---------|
| | Work | House | Leisure | Work | House | Leisure |
| All children | | | | | | |
| 1981 | 53.0 | 10.4 | 20.7 | 0.0 | 24.0 | 45.0 |
| 1997 | 50.2 | 9.1 | 19.4 | 0.0 | 29.0 | 38.4 |
| Young children | | | | | | |
| 1981 | 55.6 | 8.5 | 13.2 | 0.0 | 17.7 | 38.4 |
| 1997 | 43.0 | 10.4 | 19.6 | 0.0 | 16.2 | 32.1 |
| Old children | | | | | | |
| 1981 | 51.7 | 11.1 | 23.5 | 0.0 | 26.6 | 47.7 |
| 1997 | 55.5 | 8.2 | 19.3 | 0.0 | 22.8 | 47.1 |
| | Married | | | Non-Married | | |
| | Work | House | Leisure | Work | House | Leisure |
| All children | | | | | | |
| 1981 | 21.0 | 19.1 | 35.7 | 35.0 | 8.6 | 25.4 |
| 1997 | 24.1 | 16.6 | 27.0 | 29.6 | 9.1 | 31.3 |
| Young children | | | | | | |
| 1981 | 20.1 | 14.5 | 29.8 | 55.9 | 8.2 | 6.6 |
| 1997 | 17.6 | 15.1 | 25.1 | 22.8 | 10.1 | 29.9 |
| Old children | | | | | | |
| 1981 | 21.3 | 21.0 | 38.0 | 28.9 | 8.80 | 30.9 |
| 1997 | 31.8 | 18.2 | 29.3 | 34.8 | 8.20 | 32.3 |
| | College | | | Non-college | | |
| | Work | House | Leisure | Work | House | Leisure |
| All children | | | | | | |
| 1981 | 24.7 | 16.9 | 32.8 | 20.2 | 19.3 | 36.4 |
| 1997 | 24.9 | 13.0 | 27.9 | 27.9 | 15.1 | 29.6 |
| Young children | | | | | | |
| 1981 | 29.4 | 12.8 | 26.5 | 14.6 | 15.5 | 30.5 |
| 1997 | 16.1 | 13.4 | 25.9 | 23.4 | 13.9 | 27.5 |
| Old children | | | | | | |
| 1981 | 22.1 | 19.2 | 36.2 | 21.9 | 20.5 | 38.1 |
| 1997 | 33.3 | 12.7 | 29.7 | 32.7 | 16.3 | 31.8 |

Table 3: Decomposition Allocation of Time with children ^(*)

| All Children | Employ. Status | | Marital Status | | Education Level | |
|--------------|----------------|-----------------------|----------------|--------|-----------------|--------|
| | Total | Direct ^(*) | Total | Direct | Total | Direct |
| Behavioral | 8.99 | 4.27 | 7.41 | 5.21 | 5.46 | 2.84 |
| Structural | -1.60 | -0.43 | 1.91 | -0.22 | 0.28 | 0.24 |
| Interaction | -0.64 | -1.18 | -2.58 | -1.30 | 1.00 | 0.63 |
| Total | 6.74 | 3.71 | 6.74 | 3.71 | 6.74 | 3.71 |

| Young Children | Employ. Status | | Marital Status | | Education Level | |
|----------------|----------------|--------|----------------|--------|-----------------|--------|
| | Total | Direct | Total | Direct | Total | Direct |
| Behavioral | 6.76 | 4.56 | 6.70 | 5.57 | 4.75 | 3.57 |
| Structural | -1.18 | -0.28 | -1.58 | -0.78 | -0.60 | -0.18 |
| Interaction | -0.14 | -0.03 | 0.31 | -0.55 | 1.28 | 0.86 |
| Total | 5.44 | 4.25 | 5.44 | 4.25 | 5.44 | 4.25 |

| Old Children | Employ. Status | | Marital Status | | Education Level | |
|--------------|----------------|--------|----------------|--------|-----------------|--------|
| | Total | Direct | Total | Direct | Total | Direct |
| Behavioral | 3.94 | -0.13 | 0.39 | 0.59 | 0.41 | -0.49 |
| Structural | -2.06 | -0.57 | 3.90 | 0.20 | 0.75 | 0.36 |
| Interaction | -0.18 | 0.38 | -2.59 | -1.11 | 0.54 | -0.19 |
| Total | 1.70 | -0.32 | 1.70 | -0.32 | 1.70 | -0.32 |

^(*) measured in % with base year 1997; ^(*) Indirect time is the difference of total time and direct time

Table 3.a.: Decomposition of alternatives uses of time

| All Children | Employment Status | | | Marital Status | | | Education Level | | |
|--------------|-------------------|-------|---------|----------------|-------|---------|-----------------|-------|---------|
| | Work | House | Leisure | Work | House | Leisure | Work | House | Leisure |
| Behavioral | -1.19 | -3.45 | -4.34 | 2.52 | -2.35 | -7.58 | 4.68 | -4.11 | -6.02 |
| Structural | 5.59 | -1.43 | -2.55 | 4.03 | -3.00 | -2.94 | 0.85 | -0.45 | -0.68 |
| Interaction | -0.30 | 0.39 | 0.55 | -2.45 | 0.86 | 4.17 | -1.43 | 0.07 | 0.36 |
| Total | 4.10 | -4.50 | -6.35 | 4.10 | -4.50 | -6.35 | 4.10 | -4.50 | -6.35 |

| Young Children | Employment Status | | | Marital Status | | | Education Level | | |
|----------------|-------------------|-------|---------|----------------|-------|---------|-----------------|-------|---------|
| | Work | House | Leisure | Work | House | Leisure | Work | House | Leisure |
| Behavioral | -5.29 | -0.21 | -1.26 | -4.28 | 0.73 | -3.15 | -2.45 | -0.49 | -1.81 |
| Structural | 3.03 | -0.49 | -1.35 | 8.97 | -1.58 | -5.80 | 1.09 | -0.20 | -0.30 |
| Interaction | -0.72 | 0.18 | 0.68 | -7.67 | 0.33 | 7.02 | -1.63 | 0.17 | 0.18 |
| Total | -2.99 | -0.52 | -1.93 | -2.99 | -0.52 | -1.93 | -2.99 | -0.52 | -1.93 |

| Old children | Employment Status | | | Marital Status | | | Education Level | | |
|--------------|-------------------|-------|---------|----------------|-------|---------|-----------------|-------|---------|
| | Work | House | Leisure | Work | House | Leisure | Work | House | Leisure |
| Behavioral | 1.59 | -3.40 | -2.12 | 10.11 | -2.60 | -7.90 | 10.97 | -5.01 | -6.37 |
| Structural | 8.87 | -2.66 | -4.15 | 2.52 | -4.50 | -2.36 | 0.04 | -0.31 | -0.47 |
| Interaction | 0.64 | 0.15 | -0.62 | -1.53 | 0.75 | 3.38 | 0.09 | -0.59 | -0.05 |
| Total | 11.10 | -5.91 | -6.89 | 11.10 | -5.91 | -6.89 | 11.10 | -5.91 | -6.89 |

Table 4: 3SLS estimates of total time with children

| | Pooled Data 1981-1997 | | |
|----------------|-----------------------|----------------------|----------------------|
| | Selec.eqn. | Total Time | Wagerate |
| Working Time | | -0.260*** (0.047) | |
| Total Time | | | -0.085*** (0.034) |
| Wagerate | | 3.291** (1.701) | |
| Other Income | | -0.687 (0.579) | |
| Education | 0.032*** (0.012) | -1.939*** (0.777) | 0.259** (0.119) |
| Young Child | -0.209* (0.132) | 1.480 (6.329) | |
| Mother's Age | -0.007 (0.007) | | -0.073** (0.033) |
| Marital Status | | 8.964 (7.266) | |
| Whether Kids | 0.287** (0.128) | -9.383** (5.524) | |
| Dummy 1997 | -0.020 (0.213) | 4.528*** (1.862) | 7.733*** (3.049) |
| Mills Ratio | | -5.202*** (1.978) | -4.422** (2.268) |
| Constant term | -0.072 (0.311) | | |

Table 4 (Cont.): 3SLS estimates of total time with children

| | 1981 | | | 1997 | | |
|----------------|----------------------|----------------------|----------------------|--------------------|----------------------|-----------------------|
| | Selec.eqn. | Total Time | Wagerate | Selec.eqn. | Total Time | Wagerate |
| Working Time | | -0.042*** (0.007) | | | -0.026*** (0.005) | |
| Total Time | | | -0.696*** (0.212) | | | -0.004*** (0.0007) |
| Wagerate | | 0.529** (0.248) | | | -0.922*** (0.104) | |
| Other Income | | -0.063 (0.083) | | | -0.059 (0.071) | |
| Education | 0.086** (0.039) | -1.102*** (0.220) | 0.421*** (0.142) | -0.027 (0.035) | 0.409*** (0.107) | 0.002*** (0.0005) |
| Young Child | -0.785*** (0.259) | 8.393** (3.980) | | 0.099 (0.168) | 0.071 (0.367) | |
| Mother's Age | -0.002 (0.010) | | -0.093*** (0.035) | -0.008 (0.009) | | -0.003*** (0.001) |
| Marital Status | 0.670*** (0.242) | -4.464* (0.654) | | 0.122 (0.163) | -0.589 (0.414) | |
| Whether Kids | -0.898** (0.365) | 7.992* (4.632) | | 0.577** (0.287) | -2.848** (1.346) | |
| Mills Ratio | | -13.87** (6.740) | -0.803 (0.985) | | -9.652*** (3.701) | -0.018** (0.008) |
| Constant term | 0.187 (0.561) | 14.96*** (4.576) | 4.265* (2.379) | 0.321 (0.581) | 8.203*** (2.798) | 0.022*** (0.007) |

Table 5: Three-sate least square estimates of the model of direct and indirect time with children

| Pooled Data 1981-1997 | | | | |
|-----------------------|---------------------|-----------------------|----------------------|---------------------|
| | Selec.eqn. | DirectTime | Indirect | Wagerate |
| Working Time | | 0.003 (0.004) | -0.029*** (0.005) | 0.018*** (0.007) |
| Direct Time | | | -0.491 (0.508) | |
| Indirect Time | | 0.149 (0.1263) | | |
| Wagerate | | -0.429*** (0.0781) | 0.124 (0.134) | |
| Other income | | 0.053** (0.028) | -0.002 (0.053) | |
| Education | 0.028 (0.039) | -0.039 (0.057) | 0.033 (0.353) | 0.309*** (0.113) |
| Young Kids | -0.233** (0.259) | 1.037*** (0.355) | 1.158*** (0.457) | |
| Old Kids | | | 0.329*** (0.084) | |
| Mother's age | -0.009 (0.006) | | | -0.034 (0.029) |
| Marital Status | 0.670*** (0.242) | -1.724*** (0.405) | | |
| Whether Kids | -0.017 (0.212) | 0.339 (0.274) | -0.703 (0.488) | |
| Dummy 1997 | -0.130 (0.201) | 9.912*** (2.332) | 9.125*** (2.148) | |
| Mills Ratio | | -10.17*** (2.248) | -6.202*** (1.894) | -4.297** (2.185) |
| Constant term | 0.199 (0.428) | | | 4.108* (2.847) |

Table 5:(Cont) 1981

| | Selec.eqn. | Direct Time | Indirect Time | Wagerate |
|----------------|----------------------|----------------------|----------------------|---------------------|
| Working Time | | 0.007 (0.004) | -0.029*** (0.005) | 0.019*** (0.007) |
| Direct Time | | | 0.121 (0.346) | |
| Indirect Time | | 0.319*** (0.128) | | |
| Wagerate | | -0.079 (0.088) | 0.368** (0.162) | |
| Other income | | 0.016 (0.030) | -0.027 (0.055) | |
| Education | 0.086** (0.039) | -0.632*** (0.153) | -0.364*** (0.095) | 0.463*** (0.138) |
| Young Kids | -0.785*** (0.259) | 0.735*** (0.149) | 0.158*** (0.054) | |
| Old Kids | | | 0.304*** (0.078) | |
| Mother's age | -0.002 (0.010) | | | -0.029 (0.029) |
| Marital Status | 0.670*** (0.242) | -0.525*** (0.104) | | |
| Whether Kids | -0.898** (0.365) | 0.799*** (0.173) | 0.936 (0.665) | |
| Mills Ratio | | -1.216*** (0.253) | -0.250*** (0.077) | -0.648 (0.973) |
| Intercept term | 0.187 (0.561) | 0.800*** (0.182) | -0.483*** (0.106) | -0.665 (2.080) |

| Table 5:(Cont) 1997 | | Selec.eqn. | DirectTime | IndirectTime | Wagerate |
|---------------------|--------------------|---------------------|--------------------|----------------------|----------------------|
| Working Time | | | -0.012 (0.014) | -0.039*** (0.006) | 0.022*** (0.002) |
| Direct Time | | | | -0.836* (0.488) | |
| Indirect Time | | | -0.108 (0.425) | | |
| Wagerate | | | 0.026 (0.087) | -0.082 (0.124) | |
| Other income | | | -0.004 (0.068) | -0.102 (0.087) | |
| Education | -0.027 (0.035) | 0.216*** (0.062) | 0.181* (0.110) | | 0.153*** (0.038) |
| Young Kids | 0.099 (0.168) | 0.088*** (0.402) | 0.814** (0.408) | | |
| Old Kids | | | 0.141 (0.154) | | |
| Mother's age | -0.008 (0.009) | | | | -0.015* (0.009) |
| Marital Status | 0.122 (0.163) | -0.869** (0.421) | | | |
| Whether Kids | 0.577** (0.287) | -2.426** (1.070) | -0.566 (1.186) | | |
| Mills Ratio | | -5.879** (2.540) | -1.883 (2.9066) | | -2.905*** (0.566) |
| Intercept term | 0.321 (0.581) | 4.746*** (1.679) | 2.859 (2.134) | | 0.977* (0.621) |

Table 6: Three-sate least square estimates of the model of the ratio direct-indirect time with children.

| | Pooled Data (1981-1997) | | 1981 | | 1997 | |
|----------------|-------------------------|----------------------|----------------------|----------------------|--------------------|----------------------|
| | Selec.eqn. | Ratio | Selec.eqn. | Ratio | Selec.eqn. | Ratio |
| Working Time | | -0.002 (0.001) | | -0.002** (0.001) | | 0.0001 (0.002) |
| Wagerate | | -0.007 (0.002) | | 0.007*** (0.002) | | 0.061 (0.078) |
| Other Income | | 0.018 (0.045) | | 0.055*** (0.011) | | -0.072 (0.142) |
| Education | -0.125*** (0.020) | -0.090*** (0.032) | 0.081*** (0.023) | 0.076** (0.033) | -0.027 (0.035) | 0.007 (0.041) |
| Young Child | -0.815*** (0.238) | | -0.804*** (0.232) | | 0.099 (0.168) | |
| Mother's Age | -0.005 (0.009) | -0.034*** (0.012) | -0.004* (0.002) | -0.031*** (0.008) | -0.008 (0.009) | -0.027*** (0.011) |
| Marital Status | 0.183 (0.184) | 0.400** (0.192) | 0.733*** (0.239) | 0.941*** (0.258) | 0.122 (0.163) | -0.565 (0.387) |
| Whether Kids | -0.939*** (0.328) | -0.046 (0.171) | -1.002*** (0.262) | -0.165 (0.133) | 0.577** (0.287) | 0.079 (0.196) |
| Mills Ratio | | 8.026 (4.974) | | 1.156 (1.831) | | 1.229 (1.831) |
| Intercept term | 1.550*** (0.464) | 1.392*** (0.528) | 0.313 (0.292) | 0.735*** (0.149) | 0.321 (0.581) | 0.680** (0.356) |