

**Allocation of Time: An Empirical Study
of the Case of the Portuguese Families
(Allocation of Time)**

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ALLOCATION OF TIME: AN EMPIRICAL STUDY OF THE CASE OF THE
PORTUGUESE FAMILIES¹

(Allocation of Time)

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Abstract:

In this paper we estimate a model of allocation of time within the household using data on 359 married women with children with ages below 15 (data from Portugal 1988 - Direcção Geral da Família).

In our sample 65% of the women allocated more than 24 hours per day. This can show that women consider the possibility of joint production of some of activities.

Children influence differently the allocation of time of the parents. As expected, the allocation of time of the mother is more affected than that of the father.

The age of children is one of the explanations of the different allocation of time among parents. In the case of women children "destroy" some of the possibilities of joint production.

I - Introduction

There is an extensive population economics literature on the allocation of time within the household. This paper is an attempt to provide an empirical view of the allocation of time within the portuguese families.

Allocation of time refers not only to the distinction between time at home and in the labor market, but also to other activities, as child care, household activities, sleep, personal care, watching T.V., religious activities, sports, social activities and transportation.

We present new results of the influence of children in their parents decisions. This paper supports the idea that there is joint production in the above activities; meaning that the person can allocate the same period of time to more than one activity⁴.

This fact explains that 65% of the women in our sample allocated more than 24 hours per day to the total of the activities considered.

In this paper we specify and estimate a model for the probability of the woman to work and the decision of the family to

⁴As in Pollak & Wachter (1975).

allocate their time. Data from the survey "Tempo para o trabalho, tempo para a família"⁵ was used.

The results show that the existence of children and their age destroy some of the possibilities of joint production and therefore act as if the day's length has changed.

⁵(in english) - "Time to work, time to the family".

II - Model Specification

We specify a probit model for the probability that the woman i works. We specify tobit and grouped data models for the allocation of time among the different uses by both members of the couple.

The empirical model has the functional form:

a) for the decision to work

$$z = \beta x + \epsilon$$

and we observe

$$y = 1 \text{ (woman works) if } z > 0 ,$$

$$y = 0 \text{ (woman does not work) if } z \leq 0$$

b) for the allocation of time among different activities we used the two following specifications.

b.1) Tobit model (censored model) ⁶

$$z = \beta x + \epsilon$$

and we observe

$y = z$ if $z > 0$ (number of hours allocated to activity)

$y = 0$ if $z \leq 0$ (person does not execute activity)

b.2) Grouped data model

$$z = \beta x + \epsilon$$

and we observe

$y = 1$ if $z < \text{limit } 1$

$y = 2$ if $\text{limit } 1 \leq z < \text{limit } 2$

$y = 3$ if $\text{limit } 2 \leq z < \text{limit } 3$

...

$y = i$ if $z \geq \text{limit } (i-1)$

(results for grouped data are available from authors upon request)

x is the vector of explanatory variables. These consist of a woman's age and education, her husband's age and education, region and dimension of place where the family lives, number of children

in the following age ranges - less than 3, 3 to 5, 6 to 9, 10 to 15 -, the existence of a female older than 12 living with the family and the existence of someone (older than 13) other than the couple contributing with money to the family.

The allocation of time varies systematically with the ages of woman and husband for cohort reasons. We expect younger persons to have different behavior from older persons, so ages account for all age-dependent variables.

A second group of explanatory variables is the education levels. Education influences wages and shadow wages ⁷ and therefore they influence the decision about how to allocate time. We would expect the probability to work by the women to increase with her education and the same happening with the number of hours worked.

The influence of the education of the husband does not seem to us straightforward because higher education mean higher wages and there is a substitution and income effect going in different directions in the case of the male.

As we use Portuguese data (see map 1) we expect there is a behavioral difference between people living in the coastal region and the interior region⁸. The demographic concentration and

⁷Becker (1965), Gronau (1973), Heckman (1974), Heckman and McCurdy(1980), Moffit (1984).

⁸this behavioral differences can result from differences in the

urbanization are lower and there are less industries in the interior.

The dimension of the place of residence influences the allocation of time because the number of alternatives to use the time varies, social institutions are different and there are differences in the fixed time costs⁹.

The number and the ages of the children influence the allocation of time in the family. The value of time at home depends on these variables¹⁰ and we expect the time spent in household activities and child care to increase with the number and the younger the children are¹¹.

At the same time we expect the age and number of children to influence the possibility of joint production. For instance, very young children do not allow their mothers to do as much joint production as they used to, and, therefore the existence of young children are going to decrease the expected total amount of time allocated by the women.

wage equations as shown by Moffit (1984).

⁹Cogan (1981)

¹⁰Gronau (1973), Heckman (1974), Heckman and MaCurdy (1980), Moffitt (1984).

¹¹as in Kooreman and Kapteyn (1987).

We think the woman's work at home can be done by other females living at the household. We assume sex roles are still very strong in Portugal as can be seen in the data section that follows.

The allocation of time depends on other sources of income that are not those of working in the labor market. To take care of this we used as explanatory variable the fact that someone other than the couple gives money to the household budget.

III - Data and Estimation Procedures

The data used in this study is the result of a survey ordered by the Direcção Geral da Família (State Department for Families).

This survey was carried out in 1987.

725 families with both parents present were interviewed. All the families have children with less than 15 years of age and are resident in the mainland of Portugal.

The sample was selected randomly by "random route" for choice of households.

From this survey we were able to obtain information for each family in a number of variables that influence the allocation of time.

From the sample we selected the cases of women who answered in a correct way to all the questions concerning the allocation of time (for instance, we deleted the women who answered they worked in the labor market more than 24 hours per day).

The remaining sample has 359 families and all the results of this paper concern to this sample.

After the selection, 234 women (65% of the sample) allocated more than 24 hours per day. This can result from the fact that those women consider the possibility of joint production in some

variables used.

We used the Hausman exogeneity test¹², excluding the husband's information from the equation that explains the decision to work by the female and concluded that the number of children can be considered as an exogenous variable in the decision to work by the female. Based in this result we considered the number of children in each bracket to be exogenous on the allocation of time decisions.

As explained in the specification section we use Probit and Tobit estimation for the decision to work and number of hours worked and Tobit and Grouped Data estimation for the allocation of time in other activities¹³. We use the method of maximum likelihood and the algorithm is that of Davidon/Fletcher/Power.

¹²Hausman (1978).

¹³Maddala (1983).

IV - Estimation results

The estimates for the all sample are given in tables 2 and 3.

In what follows we discuss each type of allocation of time separately, starting with the decision to work by the female.

1) Decision to work by the female.

The decision to work in the labor market by the female is influenced significantly by her own education, the dimension of place of residence, the number and age of children and having another female living in the household.

The education of the female influences positively the probability of the female working. As we do not have any information on wages we can not test if education increases more the actual wage than the shadow wage, but we presume that this may be one of the explanations.

The dimension of the place of residence influences positively the probability to work by the female. As shown in the survey the main reason for the female to work is that their wages are needed to face family expenses. We presume that these expenses are higher as bigger is the dimension of the place of residence. Another explanation is the increase of jobs opportunities in the larger urban centers.

Having another female (older than 12) living in the household increases the probability to work by the female. Other females time can substitute the female time at home, decreasing her shadow wage and as a consequence increasing the probability to work.

Children decrease the probability to work by the female. This decrease is significantly different from zero (absolute t value greater than 1) for younger (less than 3 years old), primary school age (6 to 9) children and for the older ones (10 to 15).

Children increase shadow wage of the female and particularly on those ages.

2) Time dedicated to the labor market

Children influence negatively the time allocated to the labor market by both parents.

In the female's case the number of hours of work decreases with the number of younger children. A child less than 3 years old implies a decrease of more than 2 hours per day in the labor supply of the mother.

Female's labor supply increases (t value greater than 1 in absolute value) with the education of the female, the dimension of the place of residence and the existence of another woman living in the household.

Female's labor supply decreases (t value greater than 1 in absolute value) with the age of the husband.

Male's labor supply increases significantly (10% level) with the age of the wife and the presence of another person contributing to the family budget. The number of children older than 10 increases (t value greater than 1 in absolute value) the male's labor supply what can have two kinds of explanation: first children older than 10 can substitute their father in some of the household activities and second children at these ages cost more to the family (for instance, education costs).

Male's labor supply decreases with the number of children younger than 3 (t value greater than 1 in absolute value). The number of children ages 3 to 5, his age and the presence of another female living in the household decreases significantly (10% level) male's labor supply.

3) Time allocated to household activities (cooking, washing, cleaning, ironing, shoe shining, shopping) - data available only for females.

Children of all ages influence positively the time allocated by the females to the household activities (significantly at 10% level for children aged less than 10). The increase of time allocated decreases as the children are older for children less

household activities by the mother (46 minutes per day and per child with ages 6 to 9).

The time allocated to the household activities decreases with the education of the female, the dimension of the place of residence and the existence of another female living in the household (t value greater than 1 in absolute value).

4) Time allocated to child care.

The time allocated by females to child care increases with the number of children aged less than 3 and aged 6 to 9 years old (significantly different from zero at 10% level).

Each child less than 3 increases the time allocated to childcare by 80 minutes, while children 6 to 9 increases it by 51 minutes. Age and education of the male increase the time they spend taking care of their children. Female's age decreases the time allocated to child care by the male.

Children with ages less than 3 increase the time allocated by the father to child care (± 17 minutes per day).

5) Time allocated to sleep.

People in the interior region allocate more time to sleep.

6) Time allocated to personal care.

As expected none of the coefficients is significantly different from zero (10% level).

7) Time allocated to watch T.V.

In the case of the females the only coefficient that is significantly (10% level) different from zero (negative) is the one of the dimension of the place of residence for females who work.

In the case of the males the only coefficient that is significantly (10% level) different (negative) from zero is the one of the children ages 6 to 9.

8) Time allocated to religious activities.

As we expected the time allocated to religious activities varies with the region. Religiosity is greater in the interior of the country what justify a greater time dedicated to religious activities there (significantly different from zero at 10% level).

Time allocated by the couple to religious activities increases significantly (10% level) with the age of the female.

9) Time allocated to sports.

Young children (less than 3) decrease the time the female allocates to sports while the education of the male increases it (coefficients significantly different from zero (10% level)).

Children decrease the time allocate by the male to sports (t value greater than 1 in absolute value).

Time allocated to sports by the male increases with his education and decreases with his age.

10) Time allocated to social activities (visiting family and friends, cultural activities).

Again region influences the allocation of time by the female. Women in the interior regions dedicate less time to social activities.

11) Time allocated to transportation

The education and the place of residence influence positively the time spent in transportation by the female.

In the case of the male the place of residence influences positively the time spent in transportation.

Children influence negatively the time spent in

transportation by the father. This can be the result of using own transportation to go to work and to leave the children at a child center.

12) Total allocation of time (we consider only the coefficients that are significantly different from zero at the 10% level)

A child less than 3 years old decreases the day's length of her mother by approximately 21 minutes. This can happen because 1) there are some possibilities of joint production that the child eliminates and 2) child care is an intensive and exclusive occupation for the mother and therefore does not allow to be performed at the same time with another activity.

A child 3 to 5 years old has a opposite effect in the day's length of her mother, increasing it around 19 minutes.

These ages are the only ones that have this positive effect and therefore rearing children of 3 to 5 implies less exclusivity.

As we have no information about the time spent by the father in household activities there is nothing we can conclude about the total allocation of time by the father.

V - Concluding Remarks.

From the results above we conclude that children and their age influence differently the behavior of the mother and of the father; children influencing more the behavior of the mother.

For the women, children influence their behavior in the labor market mainly when they are very young (less than 3 years old) or in primary school ages (6 to 10 years old).

The main conclusion of this paper is to point the possibility of the existence of joint production as we disaggregate the allocation of time. The more disaggregate data is, the more possibility of women allocating the same amount of time to different activities and therefore to break the 24 hours per day time constraint.

This is a warning for people planning or working with surveys in the household allocation of time and an incentive to develop theories of household joint production.

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MAP I
PORTUGAL REGIONS

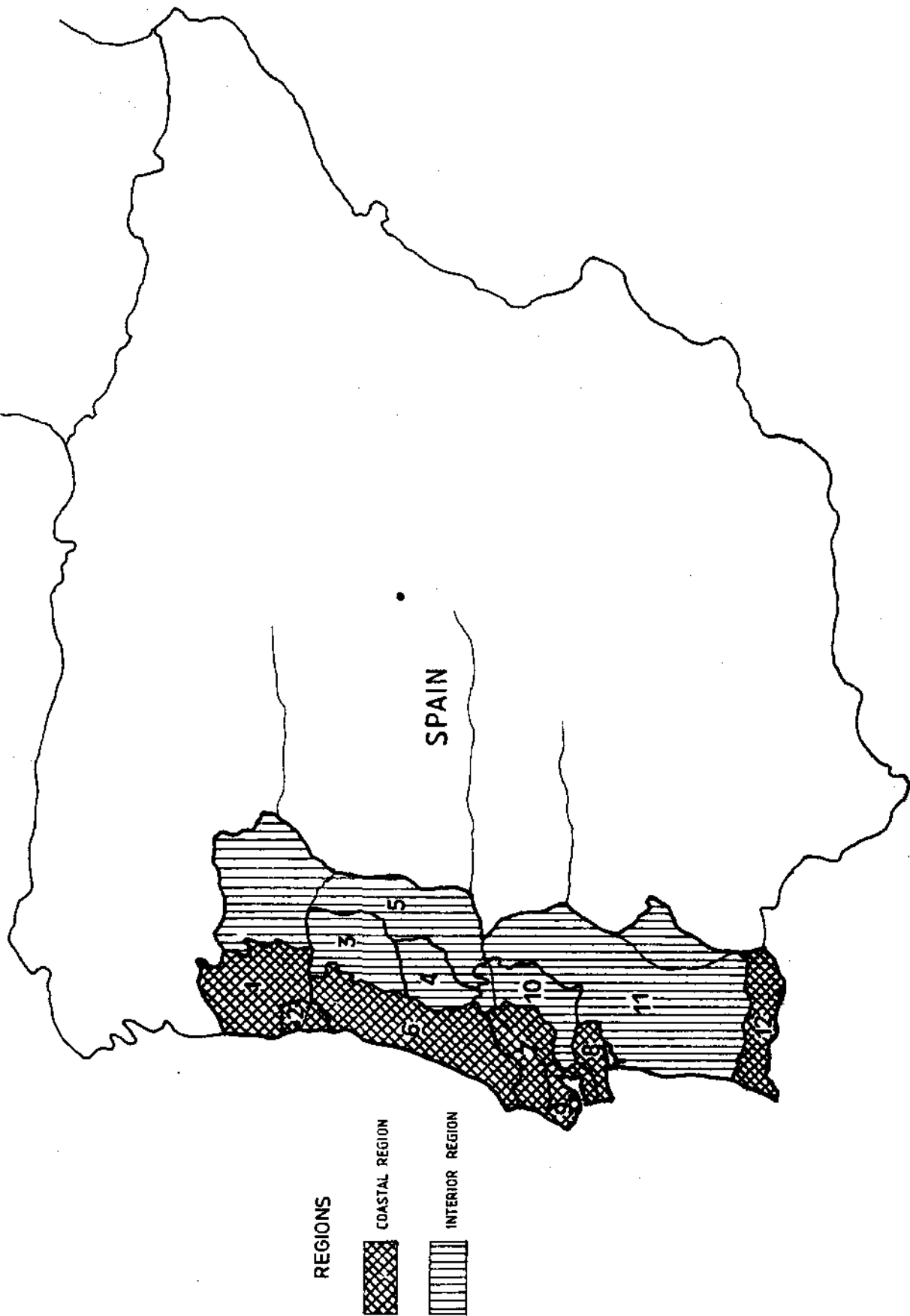


Table 1
Variables Used

Variable	Description	Mean	Std. Dev.
Endogenous - Female			
WLMF	= 1 if female works labor market = 0 otherwise	.55432	.49773
TWLMF (minutes per day)	time spent in labor market	253.05	246.80
THAF (hours per day)	time spent household activ.	5.7967	3.0809
TOCF (hours per day)	time spent child care	4.8552	3.0883
TSF (hours per day)	time spent sleep	7.4401	1.0629
TCPF (minutes per day)	time spent personal care	29.295	17.263
TTVF (hours per day)	time spent watch T.V.	2.0446	1.5972
TRAF (hours per week)	time spent religious activ.	.68524	1.1402
TSFF (hours per week)	time spent sports	.32312	1.0812
TSAF (hours per week)	time spent social activ.	3.2953	3.4523
TTF (minutes per day)	time spent transportation	15.719	22.709
Endogenous - Male			
TWLMM (minutes per day)	time spent in labor market	495.92	133.67
TCOM (hours per day)	time spent child care	1.3565	1.7659
TSM (hours per day)	time spent sleep	7.4624	1.1738

TCPM (minutes per day)	time spent personal care	29.006	16.694
TTVM (hours per day)	time spent watch T.V.	1.8969	1.2295
TRAM (hours per week)	time spent religious activ.	.41226	.89534
TSFM (hours per week)	time spent sports	1.7242	.44752
TSAM (hours per week)	time spent social activ.	4.0919	4.1177
TTM (minutes per day)	time spent transportation	30.710	26.744
Exogenous			
EDF	education of female = 1 does not know how to read or write = 2 no formal education but reads and write = 3 primary school not completed = 4 complete primary school = 5 primary school + 2 years = 6 primary school + 5 years = 7 primary school + 7 years = 8 primary school + 8 years = 9 professional degree = 10 undergraduate degree (3 years) = 11 undergraduate degree (5 years) or more	5.4178	1.9869
EDM	education of male (same classes as for female)	5.5905	2.0529
AGEF	age of female	31.568	6.3131
AGEM	age of male	34.763	6.5478
DIM	dimension of place of residence	6.0306	2.1211
REGION	region of residence = 1 interior = 0 coast	.47911	.50026
CH<3	number of children with less than 3 years	.33148	.48985
CH3-5	number of children aged 3 to 5	.40390	.54526

CH6-9	number of children aged 6 to 9	.52889	.88838
CH10-15	number of children aged 10 to 15	.47075	.63738
OF	other female (age >= 13) living at home = 1 yes = 0 no	.14286	.34888
OSI	other people gives money to the family budget = 1 yes = 0 no	.06407	.24521

Table 2
Estimation results for the decision to work and allocation of time

Parameter	works labor market (LWLF)	work in labor market (TWLM)	Hous. activ. (THA)	Child care (TCC)	Sleep (TS)	Person. care (TPC)	Watch T.V. (TTV)	Religious activ. (TRA)	Sports (TSP)	Social activ. (TSA)	Transp. (TT)
Female											
CONST	-8818 (-1.45)	174.7	6.691 (4.60)	6.866 (4.97)	7.716 (15.4)	21.79 (2.79)	3.040 (3.43)	-1.026	-2.136	6.331 (3.06)	-22.92 (-1.49)
EDF	1546 (2.37)	31.65 (1.62)	-3205 (-2.35)	-2937 (-2.36)	.0292	.3562	.0263	-1770 (-1.54)	.0748	.1803 (1.09)	5.321 (3.29)
EDM	-0256	-5.491	-0592	.1046	-0367	.5548	.0691 (1.22)	.0293	.6502 (2.13)	.1136	-1.494 (-1.07)
AGEF	.0164	.8769	.0009	-.0410 (-1.04)	-.0059	-.2269	-.0294	.0677 (2.11)	-.0529	-.0377	.0362
AGEM	-0266	-6.271 (-1.08)	.0248	-.0174	.0108	.1789	.0052	-.0222	-.1451	-.0551	-.2805
DIM	.0635 (1.67)	15.86 (1.20)	-.0991 (-1.13)	-.0112	-.0132	.7263 (1.48)	-.1149 (-1.97)	-.0756 (-1.21)	.3681 (1.42)	-.1638 (-1.25)	3.145 (3.01)
REGION	-.0199	-19.96	-.3435	.2942	.1807 (1.51)	-.9627	.0184	.8380 (2.94)	-1.609 (-1.28)	-.9362 (-1.80)	-.9071
CH<3	-.2841 (-1.31)	-125.3 (-2.02)	1.139 (2.78)	1.335 (3.60)	-.2495 (-1.96)	-.7630	-.1735	.1506	-3.378 (-2.15)	-.1303	-7.691 (-1.54)
CH3-5	.0710	9.295	.6126 (2.06)	.2104	-.2957 (-2.63)	.7805	-.1827	-.2119	-1.563 (-1.26)	-.5767 (-1.34)	.4256
CH6-9	-.2410 (-2.03)	-101.3 (-2.35)	.7626 (3.02)	.8516 (3.19)	-.0534	-1.610	.0853	.0770	-.8168	-.1396	-3.555 (-1.02)
CH10-15	-.2110 (-1.40)	-14.05	.3762 (1.17)	-.1109	-.3487 (-2.55)	-.7348	-.2313	.2524 (1.01)	-1.031	-.2257	.3014
OF	.4702 (1.80)	107.6 (1.18)	-1.107 (-1.79)	-.8507 (-1.08)	-.0085	3.303	.1934	.0435	-.9886	-.4046	10.01 (1.39)
OSI	.0898	52.98	-.0090	.3420	-.4584 (-1.64)	2.342	-.4181	.1594	1.368	.2621	-4.708
F stat.	3.40	2.12	4.50	4.70	1.96	1.29	1.29	2.43	2.91	1.98	4.30
Signific. F	.000	.016	.000	.000	.027	.219	.223	.005	.001	.025	.000

Note: t-values are in parentheses if they are greater than 1.0 in absolute value.

Table 3
Estimation Results for the Allocation of Time

Parameter	Work in labor market (TWLM)	Child care (TCC)	Sleep (TS)	Personal care (TPC)	Watch T.V. (TTV)	Religious activ. (TRA)	Sports (TSP)	Social activ. (TSA)	Transp. (TT)
Male									
CONST	505.9 (3.55)	1.521 (1.46)	7.554 (12.8)	16.24 (2.11)	2.694 (3.84)	-1.597 (-1.24)	6.088 (1.39)	8.462 (3.16)	29.24 (2.51)
EDF	4.365	-.0576	-.0263	.0969	.0165	-.0846	.2702	.1416	-.0143
EDM	-5.036	.0891 (1.07)	-.0259	.1015	-.0633 (-1.21)	-.0346	.3938 (1.22)	.0162	.4874
AGEF	3.669 (2.07)	-.0491 (-1.59)	-.0107	.0249	-.0106	.0804 (1.94)	-.0356	-.1095 (-1.47)	.0592
AGEM	-5.212 (-3.90)	.0597 (2.71)	.0143 (1.03)	.2738 (1.12)	-.0085	-.0615 (-1.49)	-.2895 (-2.13)	-.0367	-.0333
DIM	-2.311	.0153	-.0153	.6627 (1.40)	.0548 (1.39)	-.0572	.1381	-.0912	1.580 (2.08)
REGION	-5.520	-.1469	.2016 (1.44)	.5247	-.0940	1.060 (2.88)	-.9743	-.3624	-3.928 (-1.28)
CH43	-18.17 (-1.04)	.2815 (1.20)	.0900	.5891	-.0857	.3226	-1.550 (-1.30)	-.5530	-8.200 (-2.07)
CH3-5	-36.09 (-2.36)	-.1146	.0729	-.1658	-.1124	-.0208	-2.557 (-2.57)	.2874	-7.545 (-2.48)
CH6-9	-6.107	-.0409	.1019	-2.834 (-1.51)	-.2748 (-2.31)	.1661	-1.929 (-2.23)	-.5040 (-1.04)	-.7254
CH10-15	16.50 (1.29)	-.0071	-.1296	-2.673 (-1.34)	-.1791 (-1.06)	.3155 (1.00)	-1.237 (-1.32)	.3614	-9.772 (-3.05)
OF	-63.69 (-3.04)	-.3961	.0162	-1.227	.4363 (1.40)	-.0915	.9719	.1387	2.785
OSI	32.35 (2.71)	.1751	-.3026	-1.521	-.3829	.1414	-1.064	-.3562	2.449
F stat.	2.45	.958	1.15	.850	1.21	1.80	3.49	1.35	2.04
Signific. F	.005	.489	.319	.599	.277	.047	.000	.189	.021

Note: t-values are in parentheses if they are greater than 1.0 in absolute value.