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Young Children, Growing Children – How Does Their Presence in the Family Affect Time Allocation Decisions for Men and Women?

Abstract

Objective: This paper attempts to examine the influence of selected characteristics of household members on how they manage their time as an economic resource.

Methodology: In order to account for the interpenetration of different spheres of people's activity and preferences regarding their choice, a multiple-equation model, in the form of structural equations, was used.

Findings: Among the potential determinants of individuals' time allocation, the following were identified: gender, age, labor force participation, wage rates, the presence of children, education level, and the structure of the household itself, including the presence of a partner. The conclusions, formulated on the basis of the findings, focus on gender inequalities in terms of the time devoted to work and the role of children in shaping the daily activity of adults.

Value Added: While the presence of a young child primarily results in a decrease in paid-work time and an increase in household work for women, older children tend to help with housework, which mainly results in a reduction in housework for men. It was also observed that taking care of a child by a single person, irrespective of gender, is associated with a significantly greater increase in total domestic work time compared to the situation in households formed by two adults.

Recommendations: The traditional version of the neoclassical theory describes the demand for market goods and services separately. The new household theory breaks with this dichotomy and shows that consumption decisions cannot be interpreted without also considering the supply of labor, or the time allocation of individuals in general. Work on time allocation is important not only in the context of understanding the determinants of non-market activity and leisure time, but also in research on the valuation of working time. Time use databases combined with monetary budget data are used in analyses of the economics of human resource use and in new methods for estimating consumption among household members. Research on Polish households in this area is the next stage of research work that will be undertaken in the near future.

Key words: time allocation, household time-use, household production, social indicators, multi-equation regression

JEL Codes: A13, D11, D12, D13, J22

Introduction

The starting point for the calculations presented in this paper was an attempt to answer the question of how members of households manage their time in order to maximize utility from consumption. A more detailed look at the various factors that influence household members' decisions required the adoption of a specific conceptual apparatus and theoretical foundation. Reference was made to the work belonging to mainstream economics in the form of the neoclassical theory of time allocation and the household production function, which is referred to as the "New Home Economics" (Chiappori & Lewbel, 2015). The original version of the theory, which was proposed by Becker (1965), was subsequently modified in various ways by researchers who, while finding it valuable, also recognized its limitations. An example of this is the work of Gronau (1977, 1986a), who argued that Becker's theory could offer more adequate predictions of household

decisions if the activity of the non-market sphere was explicitly divided into acts of production and acts of consumption. This was not a new idea because, as Juster and Stafford (1991, p. 505) point out, the need to distinguish between work performed at home and activities connected with rest and relaxation was already recognized by Reid in her 1934 publication. The way people manage their time has become the subject of numerous economic and sociological analyses in recent decades (Jankiewicz, 2019). These have mainly addressed such issues as the determinants of the decision to enter the labor market, the amount of work performed by an individual in the market, and the allocation of time in the non-market sphere (Hamermesh, 1996, p. 1). Naturally, economic analyses of time allocation and non-market activity have primarily focused on production performed, broadly speaking, at home. One example of approaching this issue from a historical perspective is a study by Ramey (2009).

The choice of methodology used in the study was dictated by a rather obvious observation of the interpenetration of different spheres of human activity. It is not so much a question of determining how a given factor may determine the time devoted to market work or another category of activity, as of analyzing its impact on a person's activity as a whole. It was assumed that the exogenous factors selected for the study (socio-economic characteristics of household members) simultaneously affect choices concerning various forms of activity measured by the time expenditure. Therefore, instead of examining the impact of, for example, the presence of children on decisions concerning one category of a person's activity, a multiple-equation model was used to take into account the simultaneous impact of this factor on the activity of an individual in different spheres of their life.

The research carried out can be placed in the broad stream of empirical studies devoted to the allocation of time of households and their members. Analyses of this type are made possible by a significant increase in the quality and frequency of surveys of human activity by statistical offices. This has been particularly evident in the last 20 years, as exemplified by the work of Aschauer et al. (2019), Hamermesh and Pfann (2005), Pollak (2011, 2013), Vargha et al. (2017). The cited studies cover different aspects of time allocation, which highlights the importance of the time allocation problem in economics.

The paper is divided into several parts. The first section presents the methodology of the study and the statistical data that were used to perform the calculations. The second section discusses the basic features of the modelling used. The third section contains the results of the calculations and comments on the obtained results. The final part contains brief conclusions on the study's findings.

Methodology

The advantage of the calculations presented here is the simultaneous consideration of the market and non-market activity of individuals as these spheres are directly interlinked. This means that this study avoids the dichotomy characteristic of the neoclassical household theory in its basic form, where, for example, the demand for consumer goods is analyzed in isolation from labor market activity. The research strategy employed is in the spirit of Becker's (1965) time allocation theory, where different spheres of human activity intermingle in the sense of mutual interaction. Thus, the decision on time expenditure in the non-market sphere is directly related to the wage received for market work, and the time devoted to leisure depends not only on the allocation of time between labor market activity and household work, but also on the activity of other family members, particularly the partner.

In contrast to the classical theory describing the activity of individuals, which involves the management of scarce resources in the context of the market and the price system, no universally accepted set of stylized facts has been developed for the concept of time allocation in a broader sense, taking into account the management of this resource, also in the non-market sphere (Ramey & Neville 2009, pp. 189–190). One of the main reasons for this is the relatively low availability of relevant data that describe household members' activities in the non-market sphere. This, of course, does not mean that attempts are not made to identify regularities that relate to the time allocation and productive activity of individuals in the non-market sphere. One example of a search for

stylized facts is research conducted by Burda et al. (2006, p. 64), who identify among them the phenomenon of ISO work in developed countries, including the greater number of minutes spent daily on market and domestic work among Americans compared to Europeans. The authors indicate a regularity in the more evenly distributed daily and weekly working hours of the former compared to the activity rhythm of the latter. However, it is necessary to conduct further analyses to confirm certain regularities indicated by the economic theory of time allocation. In the author's opinion, the analysis presented here fulfils this need.

When studying ways of managing time and other scarce resources, it is necessary to choose the most objective criterion that can be used to classify the various activities of individuals. The activities that are included in the 2013 time-use database compiled by the Central Statistical Office are grouped into four basic types: market work, household production, leisure time and consumption, and a group of activities defined as physiological.

As regards the time spent travelling, the general rule was to assign it to the activity that required movement (Juster & Stafford, 1991, p. 474). For example, commuting time increased the number of minutes spent daily on market work.

One of the more difficult tasks at this stage was assigning specific activities in the non-market sphere to production activities. The third-party criterion, first formulated by Reid (1934, p. 11), was adopted in this case. According to this criterion, a non-market activity can be classified as production if having it performed by another person does not diminish the utility of consuming the end result. An example of this can be the activities, often immediately following each other, of preparing a meal and then eating it. The former can be asked to be performed by a third party without compromising one's own satisfaction. Consumption of the prepared dish, however, cannot be delegated to another person if we are to satisfy our own hunger and derive additional pleasure from the taste of the food.

It is worth mentioning here the negative consequence of the aggregation used, as pointed out by Słaby (1990, p. 73). This applies primarily to the main activity categories that were created, which comprise very diverse activities. Aggregating the minutes spent on, for example, various leisure activities significantly reduces the cognitive value of the information. This category includes

activities that can be described as consumption. Participation in various types of organizations and religious practices is also included here.

Other activities that are neither production nor consumption but that must be performed to maintain a healthy lifestyle were categorized as physiological. These include sleeping, eating, maintaining personal hygiene and, of course, the associated travel.

In his research on time allocation, Gronau (e.g. 1976) identifies time determinants related to market work, housework, and leisure time. Among the most important determinants, he lists elements such as age, education, family income, number of children of a certain age (0–2 years, 3–5 years, 6–12 years and 13–17 years) – but also place of origin (which was important in this detailed research). On page 205 of the article, he states that he believes a multivariate model (SUR) should be used for the analysis. It is important to remember that at the time of Gronau's study, there was no access to such detailed time budget data as we have today. Over the past two decades, the quality and frequency of the data collected have improved considerably. Compared to the study cited above, it was possible to build a single model that included the gender of the respondent as a determinant of time use. In addition, the fact that the respondent was employed and that the partner was employed was also taken into account. The section on the econometric model includes detailed justification for all exogenous variables in the model. Another example of work on the impact of the presence of children in the household on consumption and resource use decisions is the article by Gronau (1986b). In this work, time allocation was important in the context of valuing time for non-market activities.

Econometric model

In order to investigate the relationships between the categories of market work time, housework time, and leisure time, and to simultaneously investigate the determinants of these time categories, a SUR model in the form of a system of structural equations was used. In the equations, the aforementioned time

categories were selected as endogenous variables, whereas sleep time was excluded. This was because of the assumption that sleep time can be calculated as what remains of a 24-hour period once the times for the other categories have been obtained. If the aim of the article had been to estimate the duration of each category of activity, the inclusion of a fourth variable would have been appropriate. However, the focus of the article is on assessing the impact of socio-economic variables on the change in individual activity, ignoring the pre-dictive properties of the model.

The linear hypothetical equation for the m time category can be written in the following form:

$$(1) \qquad Y_m = \sum_{\substack{j=1 \\ j \neq m}}^{M} \gamma_{jm} Y_j + \sum_{i=1}^{I} \beta_{im} X_i$$

where the variables Y_j standing on the right and left side of the equation are endogenous variables that describe market work time, household work time, and leisure time. On the other hand, X_i variables are exogenous variables such as Sex – variable 0–1 indicating the sex of a person (1 for a woman); Age; Edu-cation Level – indicating one of 3 levels (1 – primary, 2 – secondary, and 3 – tertiary); No. of Children (age 0–2), No. of Children (age 3–6), No. of Children (age 7–12), No. of Children (age 13–18) – indicating the number of children of a specific age; Employment – variable 0–1 indicating the employment situation of a person (1 for an employed person); Employment of Spouse – indicating the partner's employment situation; and Wage – the hourly rate earned by a person (PLN).

Moving the Y_m variable to the right side of the equals sign, equation (1) can be written in an equivalent form:

$$(2) \qquad 0 = \sum_{j=1}^{M} \gamma_{jm} Y_j + \sum_{i=1}^{I} \beta_{im} X_i$$

where the parameter $g_{mm} = -1$.

Denoting as

$\Gamma = [\gamma_{jm}](j, m = 1, \ldots, M)$ – parameter matrix with endogenous variables

$B = [\beta_{\mathfrak{Z}}](i = 1, \ldots I; m = 1, \ldots, M)$ – parameter matrix with exogenous variables;

$Y = [Y_m](m = 1, \ldots, M)$ – vector of endogenous variables;

$X = [X_i](i = 1, \ldots, I)$ – vector of exogenous variables;

the system of hypothetical structural equations (2) can be written in the matrix form:

(3)
$$Y^T \Gamma + X^T B = \mathbf{0}$$

where $\mathbf{0}$ is a vector of zeros.

Denoting

(4)
$$\Pi = -B\Gamma^{-1}$$

a system of reduced equations is obtained for $Y_1,...,Y_M$

(5)
$$Y^T = X^T \Pi$$

where the parameter matrix of the reduced model is of the form:

$$\Pi = [\pi_{im}](i = 1,...I; m = 1,...,M)$$

Parameter estimation of the system of equations (3) and (5) was performed using two-stage least squares analysis.

The parameters standing next to the exogenous variables in the structural equation of the multi-equation model (1) b_{im} show a change in Y_m as a result of a unit increase in the I exogenous variable at the same moment in time. However, a change in the value of Y_m, which occurred in the m structural equation, may cause a change in another endogenous variable in another structural equation at the same moment in time. The resulting change in the values of the other endogenous variables carries over to variable Y_m. The value informing of the full change in variable Y_m as a result of a unit increase in variable X_i is equal to parameter p_{im} of the reduced equation (5). The parameters of model (5) will be the basis for formulating the conclusions of the study.

Sample description

In order to perform the planned calculations, information on households consisting of two adults aged 18–59 and possibly children under 18 was selected from the database of the 2013 time-use survey in Poland. This sample was then supplemented with data relating to households of single adults with or without children. Table 1 summarizes the descriptive statistics of the study population.

Table 1. Descriptive statistics of cohabitant and single households

	Mean	Std. Dev.	Min	Max
Cohabitant	Number of obs = 6177			
Market Work	334.14	210.87	0.00	1255.71
Housework	235.67	163.56	0.00	982.86
Leisure Time	214.77	116.31	0.00	840.00
Sex (1 – female, 0 – male)	0.46	0.50	0.00	1.00
Age	36.24	6.95	19.00	59.00
Education Level	2.17	0.80	1.00	3.00
No. of Children (age 0–2)	0.34	0.51	0.00	2.00
No. of Children (age 3–6)	0.45	0.59	0.00	3.00
No. of Children (age 7–12)	0.61	0.84	0.00	4.00
No. of Children (age 13–18)	0.52	1.00	0.00	6.00
Employment (1 – employ, 0 – not)	0.95	0.21	0.00	1.00
Employment of Spouse	0.82	0.38	0.00	1.00
Wage	14.80	4.19	1.00	58.76
Single	Number of obs = 3448			
Market Work	370.27	192.38	0.00	1320.00
Housework	168.78	119.73	0.00	787.14
Leisure Time	250.37	134.42	0.00	921.43
Sex (1 – female, 0 – male)	0.62	0.48	0.00	1.00
Age	40.83	11.57	19.00	59.00
Education Level	2.18	0.78	1.00	3.00
No. of Children (age 0–2)	0.02	0.15	0.00	2.00
No. of Children (age 3–6)	0.05	0.21	0.00	2.00
No. of Children (age 7–12)	0.12	0.41	0.00	3.00
No. of Children (age 13–18)	0.17	0.56	0.00	4.00
Employment	(omitted)*			
Wage	15.58	3.21	5.75	35.78

* In this case, collinearity occurred because all the surveyed singles declared being economically active. For this reason, this variable was omitted from further estimation.

Source: own elaboration.

A quick analysis of the descriptive statistics shows that the households of couples tend to include significantly more children than those of single adults. This is

indicated both by the maximum number of children of virtually all ages and, above all, by the average value of the variables describing the number of children. In addition, these households tend to be characterized by a lower average age. In single households, in turn, more time tends to be devoted to market work. Single people, very often childless (or with children who are no longer in the household), are more likely to spend more time working. But leisure time is also on average longer for these households than for those of couples. This is reflected in the time spent on housework, which is longer for the households of people with partners. The longer market work time of single people is also reflected in higher market rates – on average by almost 0.80 PLN per hour, which amounts to almost 125 PLN more per month (about 30 EUR at the average exchange rate in 2013).

Results of estimations

Estimation of the parameters of model (5) was performed using the STATA 14 statistical environment. The results of the calculations are shown in Table 2. Detailed results of the estimation of model (1) are provided in Appendix 1.

Table 2. Results of parameter estimation for reduced models (Coef. 1-ALL: families with 2 adults, Coef. 2-M: men living in relationships, Coef. 3-W: women living in relationships, Coef. 4-Singl: single people or single-parent families)

	Coef. 1-ALL	Coef. 2-M	Coef. 3-W	Coef. 4-Singl
Eq1: Market Work				
Sex	-93.52***	X	X	-
Age	-1.58***	-1.87**	-1.34*	-1.32***
Education Level	-23.86***	-18.86***	-17.15**	-10.42*
No. of Children (0–2)	-45.11***	-	-96.64***	-124.82***
No. of Children (3–6)	-	-	-14.28*	-63.67***
No. of Children (7–12)	-	-	-	-
No. of Children (13–18)	-	-	-	-
Employment	255.41***	ᵃ (omitted)	267.75***	ᵃ (omitted)
Employment of Sp.	-	-	-	X

	Coef. 1-ALL	Coef. 2-M	Coef. 3-W	Coef. 4-Singl
Wage	2.95**	-	-	-
_const	222.11***	506.74***	124.07***	467.46***
Eq2: Housework				
Sex	127.19***	X	X	40.11***
Age	1.19***	1.78***	-	2.19***
Education Level	14.78***	13.24***	-	-
No. of Children (0–2)	88.48***	52.54***	136.14***	221.88***
No. of Children (3–6)	27.29***	13.47***	45.66***	114.59***
No. of Children (7–12)	-	-	9.34**	47.68***
No. of Children (13–18)	-6.62***	-10.51***	-	21.48***
Employment	-137.81***	ᵃ (omitted)	-133.46***	0.00*
Employment of Sp.	31.75***	25.47***	-	X
Wage	-2.39***	-	-2.14*	-
_const	202.82***	-	342.73***	47.44***
Eq3: Leisure Time				
Sex	-48.18***	X	X	-54.94***
Age	0.91***	1.21***	-	-
Education Level	9.11***	-	10.30**	28.98***
No. of Children (0–2)	-35.64***	-36.72***	-34.76***	-70.51***
No. of Children (3–6)	-23.66***	-21.10***	-27.23***	-49.44***
No. of Children (7–12)	-5.95**	-	-8.48***	-11.00*
No. of Children (13–18)	-	-	-	-
Employment	-43.30***	ᵃ(omitted)	-38.07**	ᵃ (omitted)
Employment of Sp.	-	-	-	X
Wage	-	-	-	-
_const	259.83***	187.09***	232.91***	218.34***
Equation	Obs	Obs	Obs	Obs
Eq1	6177	3364	2813	3448
Eq2	6177	3364	2813	3448
Eq3	6177	3364	2813	3448

ᵃ in this case, collinearity occurred as more than 95% of men declared being economically active. In the case of singles, collinearity also occurred for the variable 'employment' because all the surveyed singles declared devoting time to market work. For this reason, these variables were omitted from the estimation.

X – using a variable makes no sense in this case

Source: own calculations.

Results obtained in the structural model

In the structural model, an asymmetry in parameter values was observed for endogenous variables. An increase in household work and leisure time results in a significant and sometimes even corresponding decrease in market work time. However, an increase in market work time does not produce an equally strong reaction in terms of a reduction in housework or leisure time. Thus, the main correlations as regards changes in time allocation can be seen between the time expenditure on market work and the performance of other activities. Changes in domestic production time and leisure time correlate with each other to a much lesser extent.

In the present analysis, the total amount of a person's time was divided according to four main categories of activities to which it is devoted. However, it should be borne in mind that this solution, while significantly facilitating the study of time allocation, also has certain drawbacks. The aggregation of various activities into homogeneous groups means that some of the information relating to people's choices can be lost. As noted by Słaby (1990, p. 73), this is especially true of leisure activities, which are generally diverse and multidimensional. Kooreman and Kapteyn (1987, p. 244), for example, divided the time spent on non-market activities into as many as seven categories. By doing so, they showed that with relatively small changes in the four basic aggregates presented as average time inputs, significant adjustments can take place within their subcategories. Krueger (2007), on the other hand, used two methods to divide activities into main categories. However, he used completely different division criteria than those used in the present work. In the first variant, the respondents' ratings of their attitude towards an activity and the satisfaction they felt, which they provided when reporting their activity, were used as the main criterion. The second variant used a percentage measure of satisfaction, which indicated the proportion of the respondents' time spent on activities that generated negative emotions. Krueger (2007, p. 194) argues that his way of categorizing activities is superior to the methodology typically used in time allocation studies because it is not based on a researcher's arbitrary decision, but takes into account the opinions and attitudes of the surveyed individuals themselves. However, it must be said that

Krueger's categorization of activities is very different from the standard division into market work, home production, leisure, and physiological activities. Thus, it would be difficult to use these categories while referring to time allocation theory in the spirit of Becker (1965) and Gronau (1977, 1986a, 1986b, 1997).

Gender differences

In the case of families, several regularities related to time allocation can be observed. Compared to men, women devote 127 minutes more per day to domestic work. At the same time, they allocate less time to market work and to leisure (by 93 minutes and 48 minutes, respectively). The observed differences evidence the sharing of responsibilities within families, which may be due to the preferences of household members or a calculation of what is more profitable. The latter may be related to at least two determinants. Firstly, women's lower involvement in market work may be connected with the gender pay gap, although according to the information provided by official statistics, this factor decreased in importance in the period from which the time-use data were obtained[1]. The organization of the labor market may be more important in this case. According to data describing the labor market in Poland, which take into account people aged 20–64, among employed women only 10.6 % were in part-time jobs. Considering that the social norms in Poland generally expect women to take care of young children, it is easy to conclude that the possibility of taking up part-time employment may be the only chance for many women, especially at certain periods of their lives, to enter the labor market. This is pointed out by Jaumotte (2003, p. 21). In his view, the possibility of part-time work can help a woman reconcile economic and social needs. When there are not many opportunities for part-time work on the market, a woman with a child has much fewer opportunities to be economically active.

Interestingly, smaller disparities in terms of time expenditure on housework were observed among those living without a partner. Single women spend

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1   In 2013, Poland had one of the lowest gender pay gaps among EU countries (6.4%).

"only" 40 minutes more on household work compared to men. In the case of market activities, the gender of the single person does not have a statistically significant role.

A higher level of education slightly reduces the time spent on market work. This applies to men and women to a similar extent. For men, the time reclaimed from market activity is predominantly spent on housework. This may be related to a growing awareness and an increased emphasis on living in a clean and tidy environment. In the case of women, on the other hand, the better educated they are, the more time they devote to consumption-related activities. This may be connected with striving for self-realization and development outside paid work. Gronau and Hamermesh (2008, p. 571) also investigated the relationship between the education level of individuals and the way they spend their time. The results of their calculations showed that as the time spent on education increases, so does the variety of activities undertaken and the diversity of consumption, which in principle can be considered as activities aimed at development and self-realization.

The age of people of both genders has an impact on time allocation, which manifests itself in a reduction of the time spent on paid work (lower by 2 minutes with each year of life). In addition, it can be seen that with passing years, men tend to place increasing importance on doing housework.

The model parameters for households with only one adult are shown in Table 2, column "Coef. 4". As all the surveyed singles declared doing market work, the variable describing this activity was omitted. Also, gender had no effect on the allocation of time to market work in this case. At the same time, however, it can be observed that single women devote more time to housework (on average 40 minutes per day) and less to leisure (on average 54 minutes per day) in comparison to men.

The people surveyed gradually reduce their market work time as they get older. The opposite is true for housework and leisure time. A positive relationship between the level of education and the amount of time devoted to leisure was also observed. This occurs at the expense of market and housework time.

The role of the partner

The fact that the partner undertakes market work has no significant impact on the extent of market work or leisure time of the respondents. On the other hand, the partner's activity on the labor market is linked with an extension of housework time. This is especially true for men whose partners are economically active, as such women significantly reduce their time expenditure on household work (over 133 minutes less per day). In this case, the income from the partner's work can be interpreted as the respondent's non-wage income.

It can also be observed that higher wage rates are related to a greater time expenditure on market work (every 1 zloty contributes to increasing this time by nearly 3 minutes) and a reduction in the time spent on household work. Wages, however, have no statistically significant effect on the length of daily leisure.

Presence of children

Interpreting the impact of having children considered by age group is problematic due to their different impact on time allocation in men and women. Therefore, the analysis of this factor was performed using a separate model for each gender. The results of these calculations are presented in columns 2 and 3 (Coef. 2 and Coef. 3) in Table 2 for men and women, respectively. The parameters estimated in the separate models clearly show that the presence of children in the family determines the time structure of women to a much greater extent than that of men. This is especially true for the youngest children, up to the age of 2, who need the most care, and to a lesser extent applies to children aged 3–6. At the same time, this is a factor that contributes to widening the disparity, above all in terms of the amount and structure of working time. When looking at the impact on leisure time, the youngest children reduce it to a similar extent for both genders.

Older children, those over 13 years of age, become a help, mainly from the perspective of men. In their case, the presence of an older child results in a decrease in housework time of more than 10 minutes per day (for each child). The domestic work time of women in a similar situation remains unchanged.

The presence of a child is the most challenging in the case of single parents. Market labor supply and consumption time are significantly (the most out of all the presented results) reduced. House work time also increases the most, compared to people living with partners. The period of reduction in individual utility due to a reduction in leisure and consumption time lasts until the child is at least 6 years old. The wage rate becomes virtually irrelevant, having no statistically significant effect on any of the three time categories.

In the aforementioned paper by Kooreman and Kapteyn (1987), the authors showed that the presence of a young child in the household primarily influenced the way the woman's time was allocated, only slightly affecting the man's time structure. In the case of men, one of the most significant factors that modified the way they spent their time appeared to be their age. For example, up to around the age of fifty, they reduced the amount of time spent on leisure activities, and after fifty this trend was reversed. The time expenditure on market work followed the opposite pattern. Changes in consumption decisions and time allocation in general which occurred with age were also analyzed by Kerkhofs and Kooreman (2003, p. 363).

Conclusions and future works

The traditional version of the neoclassical theory describes the demand for market goods and services separately, as it were, from the choices made by individuals in the labor market. The new household theory breaks with this dichotomy and shows that consumption decisions cannot be interpreted without also considering the supply of labor, or the time allocation of individuals in general (Gronau 1997, p. 199). Such decisions are affected by the demand for market goods, goods produced in the non-market sphere, as well as the production technology itself.

The results of the calculations show, similar to many other studies, that women devote more time to household work, while men devote more time to paid work and leisure (Jankiewicz, 2019). This applies to both women in relationships and those living alone. Thus, not all decisions stem directly from the division

of roles in relationships. In the context of utility maximization, it can be seen that women achieve greater overall "productivity" in housework than men. In contrast, the opposite is true for paid work, which may be partly due to the wage gap mentioned earlier.

One of the earliest empirical studies on the determinants of the time expenditure on market labor was the work by Wales and Woodland (1977). They showed that the time allocation of the husband and the wife could be seen as being cost-effective because it depended on their relative wage rates (Wales & Woodland, 1977, p. 130). Moreover, comparisons of different household groups showed that income levels determined the time expenditure on household production differently, depending on whether there were children in the family.

The results of calculations based on Polish data show that when there are children in the household, the number of children up to the age of 6 is the most relevant. At the same time, while the time the parents spend on housework increases regardless of gender with the arrival of more children, the time devoted to paid work is reduced primarily for women. For single parents (and in the Polish reality, it is mostly women), the reduction in the time spent on market work and the increase in the time spent on housework is the greatest, which, among other things, shows the scale of the problems such people have in providing childcare.

What is also interesting is that the presence of young children in the household triggers an almost equal reduction in leisure time for both parents. For single parents, the reduction in leisure time is twice as great compared to full families. A decrease in utility can be seen here due to the inability to share daily household chores.

Smaller disparities in terms of the expenditure of time on housework among those living without a partner compared to the division of responsibilities in couples were also noted by Pylkkänen (2002, pp. 6–7).

Work on time allocation is important not only in the context of understanding the determinants of non-market activity and leisure, but also in research on the pricing of working time. Work on the concept of 'shadow pricing' requires identifying how exogenous variables can affect time allocation. Time-use databases combined with data on monetary budgets are used in analyses of the economics of human resource use and in new methods of estimating consumption

among household members. The study of Polish households in this area is the next stage of research work to be undertaken in the near future.

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Declarations

Acknowledgements

APPENDIX 1. Detailed results of the estimation of model (1)

SUR (Seemingly unrelated regression) structural models.

Table 3. Families (2 adults in a relationship). Survey unit: adult

	Coef.	Std. Err.	z	P>|z|	[95% Conf. Interval]	
Eq1: Market Work						
Housework	-0.882	0.015	-58.52	0	-0.912	-0.853
Leisure Time	-0.777	0.018	-42.09	0	-0.814	-0.741
Sex	-18.750	5.273	-3.56	0	-29.085	-8.415
Age	0.189	0.386	0.49	0.625	-0.568	0.945
Education Level	-3.743	3.455	-1.08	0.279	-10.514	3.028
No. of Children (age 0–2)	5.253	5.428	0.97	0.333	-5.385	15.891
No. of Children (age 3–6)	-0.212	4.239	-0.05	0.96	-8.521	8.097
No. of Children (age 7–12)	1.270	2.847	0.45	0.655	-4.310	6.851
No. of Children (age 13–18)	-2.693	2.632	-1.02	0.306	-7.851	2.466
Employment	100.151	16.077	6.23	0	68.641	131.662
Employment of Spouse	17.168	6.016	2.85	0.004	5.378	28.958
Wage	0.348	0.879	0.4	0.692	-1.375	2.070
_const	603.061	19.873	30.35	0	564.110	642.012
Eq2: Housework						
Market Work	-0.470	0.008	-58.52	0	-0.486	-0.454
Leisure Time	-0.144	0.015	-9.91	0	-0.172	-0.115
Sex	76.293	3.691	20.67	0	69.058	83.527
Age	0.585	0.282	2.08	0.038	0.033	1.137
Education Level	4.868	2.522	1.93	0.054	-0.076	9.812
No. of Children (age 0–2)	62.144	3.866	16.08	0	54.567	69.720
No. of Children (age 3–6)	21.112	3.082	6.85	0	15.072	27.153
No. of Children (age 7–12)	3.486	2.078	1.68	0.093	-0.587	7.560
No. of Children (age 13–18)	-5.134	1.920	-2.67	0.008	-8.897	-1.370
Employment	-23.940	11.796	-2.03	0.042	-47.060	-0.821
Employment of Spouse	26.398	4.379	6.03	0	17.817	34.980
Wage	-1.098	0.641	-1.71	0.087	-2.355	0.159
_const	344.609	14.686	23.46	0	315.824	373.394

	Coef.	Std. Err.	z	P>|z|	[95% Conf. Interval]	
Eq3: Leisure Time						
Market Work	-0.315	0.007	-42.09	0	-0.329	-0.300
Housework	-0.109	0.011	-9.91	0	-0.131	-0.088
Sex	-63.722	3.323	-19.17	0	-70.236	-57.209
Age	0.549	0.246	2.23	0.025	0.067	1.030
Education Level	3.210	2.200	1.46	0.144	-1.101	7.522
No. of Children (age 0–2)	-40.173	3.433	-11.7	0	-46.902	-33.445
No. of Children (age 3–6)	-22.534	2.683	-8.4	0	-27.793	-17.276
No. of Children (age 7–12)	-4.547	1.811	-2.51	0.012	-8.096	-0.999
No. of Children (age 13–18)	0.246	1.675	0.15	0.883	-3.037	3.528
Employment	22.029	10.320	2.13	0.033	1.802	42.255
Employment of Spouse	0.913	3.829	0.24	0.812	-6.593	8.418
Wage	0.039	0.559	0.07	0.944	-1.057	1.135
_const	351.873	12.583	27.96	0	327.210	376.535
Equation	Obs	Parms	RMSE	„R-sq"	chi2	
Eq1	6177	12	179.86	0.27	7483.26	
Eq2	6177	12	127.65	0.39	7163.68	
Eq3	6177	12	109.57	0.11	2352.77	

Table 4. Results for men in a relationship

	Coef.	Std. Err.	z	P>|z|	[95% Conf. Interval]	
Eq1: Market Work						
Housework	-0.999	0.025	-39.95	0	-1.048	-0.950
Leisure Time	-0.783	0.025	-31	0	-0.832	-0.733
Age	0.859	0.544	1.58	0.114	-0.207	1.925
Education Level	-0.915	5.101	-0.18	0.858	-10.913	9.083
No. of Children (age 0–2)	18.454	7.478	2.47	0.014	3.797	33.112
No. of Children (age 3–6)	-1.697	5.883	-0.29	0.773	-13.228	9.833
No. of Children (age 7–12)	-3.782	4.071	-0.93	0.353	-11.761	4.197
No. of Children (age 13–18)	-9.106	3.784	-2.41	0.016	-16.523	-1.688
Employment	0.000	(omitted)				
Employment of Spouse	23.181	7.115	3.26	0.001	9.236	37.126
Wage	0.894	1.493	0.6	0.549	-2.033	3.821
_const	683.102	31.162	21.92	0	622.025	744.178

	Coef.	Std. Err.	z	P>|z|	[95% Conf. Interval]	
Eq2: Housework						
Market Work	-0.371	0.009	-39.95	0	-0.389	-0.353
Leisure Time	-0.120	0.017	-7.28	0	-0.153	-0.088
Age	1.234	0.331	3.73	0	0.586	1.882
Education Level	6.975	3.105	2.25	0.025	0.889	13.062
No. of Children (age 0–2)	46.165	4.486	10.29	0	37.373	54.957
No. of Children (age 3–6)	11.438	3.579	3.2	0.001	4.423	18.453
No. of Children (age 7–12)	-1.977	2.480	-0.8	0.425	-6.838	2.884
No. of Children (age 13–18)	-10.004	2.300	-4.35	0	-14.512	-5.495
Employment	0.000	(omitted)				
Employment of Spouse	24.218	4.318	5.61	0	15.755	32.681
Wage	0.540	0.910	0.59	0.553	-1.243	2.323
_const	240.325	19.794	12.14	0	201.530	279.121
Eq3: Leisure Time						
Market Work	-0.312	0.010	-31	0	-0.332	-0.293
Housework	-0.129	0.018	-7.28	0	-0.164	-0.095
Age	0.858	0.343	2.5	0.012	0.186	1.531
Education Level	1.850	3.224	0.57	0.566	-4.468	8.169
No. of Children (age 0–2)	-31.564	4.696	-6.72	0	-40.768	-22.360
No. of Children (age 3–6)	-18.930	3.701	-5.11	0	-26.184	-11.675
No. of Children (age 7–12)	-3.565	2.571	-1.39	0.166	-8.604	1.474
No. of Children (age 13–18)	-0.896	2.392	-0.37	0.708	-5.583	3.792
Employment	0.000	(omitted)				
Employment of Spouse	4.451	4.498	0.99	0.322	-4.365	13.266
Wage	0.764	0.943	0.81	0.418	-1.084	2.613
_const	349.258	20.168	17.32	0	309.729	388.79
Equation	Obs	Parms	RMSE	R-sq	chi2	
Eq1	3364	10	189.19	0.094	2795.130	
Eq2	3364	10	112.11	0.135	1934.160	
Eq3	3364	10	114.89	0.080	1150.040	

Table 5. Results for women in a relationship

	Coef.	Std. Err.	z	P>|z|	[95% Conf. Interval]	
Eq1: Market Work						
Housework	-0.763	0.018	-41.6	0	-0.799	-0.727
Leisure Time	-0.768	0.027	-28.74	0	-0.820	-0.715
Age	-0.369	0.559	-0.66	0.509	-1.464	0.726
Education Level	-4.736	4.785	-0.99	0.322	-14.115	4.642
No. of Children (age 0–2)	-19.508	7.817	-2.5	0.013	-34.829	-4.186
No. of Children (age 3–6)	-0.364	6.035	-0.06	0.952	-12.193	11.465
No. of Children (age 7–12)	6.817	3.921	1.74	0.082	-0.868	14.501
No. of Children (age 13–18)	3.865	3.584	1.08	0.281	-3.159	10.890
Employment	136.754	17.977	7.61	0	101.52	171.987
Employment of Spouse	1.635	13.269	0.12	0.902	-24.371	27.642
Wage	-0.712	1.099	-0.65	0.517	-2.866	1.441
_const	564.211	28.928	19.5	0	507.51	620.908
Eq2: Housework						
Market Work	-0.584	0.014	-41.6	0	-0.612	-0.557
Leisure Time	-0.164	0.025	-6.52	0	-0.214	-0.115
Age	0.020	0.489	0.04	0.967	-0.939	0.979
Education Level	-2.416	4.191	-0.58	0.564	-10.630	5.799
No. of Children (age 0–2)	73.972	6.657	11.11	0	60.925	87.020
No. of Children (age 3–6)	32.839	5.240	6.27	0	22.569	43.109
No. of Children (age 7–12)	11.567	3.428	3.37	0.001	4.849	18.286
No. of Children (age 13–18)	1.457	3.137	0.46	0.642	-4.692	7.606
Employment	16.676	15.985	1.04	0.297	-14.655	48.006
Employment of Spouse	13.446	11.610	1.16	0.247	-9.309	36.201
Wage	-1.306	0.961	-1.36	0.174	-3.190	0.578
_const	453.510	25.108	18.06	0	404.3	502.722
Eq3: Leisure Time						
Market Work	-0.324	0.011	-28.74	0	-0.346	-0.302
Housework	-0.091	0.014	-6.52	0	-0.118	-0.063
Age	0.189	0.363	0.52	0.602	-0.522	0.901
Education Level	5.281	3.108	1.7	0.089	-0.811	11.374
No. of Children (age 0–2)	-53.737	5.073	-10.59	0	-63.680	-43.794
No. of Children (age 3–6)	-27.722	3.893	-7.12	0	-35.351	-20.092

	Coef.	Std. Err.	z	P>|z|	[95% Conf. Interval]	
No. of Children (age 7–12)	-5.622	2.546	-2.21	0.027	-10.611	-0.632
No. of Children (age 13–18)	1.683	2.329	0.72	0.47	-2.881	6.248
Employment	36.587	11.905	3.07	0.002	13.253	59.921
Employment of Spouse	-7.621	8.620	-0.88	0.377	-24.516	9.273
Wage	-0.682	0.714	-0.96	0.339	-2.081	0.717
_const	304.169	18.800	16.18	0	267.32	341.017

Equation	Obs	Parms	RMSE	R-sq	chi2
Eq1	2813	11	165.58	0.335	3997.060
Eq2	2813	11	140.78	0.318	2852.9
Eq3	2813	11	102.74	0.100	1033.1

Table 6. Results for single-person households

	Coef.	Std. Err.	z	P>|z|	[95% Conf. Interval]	
Eq1: Market Work						
Housework	-0.996	0.026	-38.15	0	-1.047	-0.945
Leisure Time	-0.913	0.021	-44.46	0	-0.954	-0.873
Sex	-10.628	6.565	-1.62	0.105	-23.495	2.240
Age	1.220	0.271	4.5	0	0.689	1.751
Education Level	11.098	4.667	2.38	0.017	1.952	20.245
No. of Children (age 0–2)	31.779	20.657	1.54	0.124	-8.707	72.266
No. of Children (age 3–6)	5.306	14.098	0.38	0.707	-22.325	32.938
No. of Children (age 7–12)	22.785	7.348	3.1	0.002	8.384	37.186
No. of Children (age 13–18)	10.537	5.189	2.03	0.042	0.366	20.708
Employment	0.000	(omitted)				
Employment of Spouse	-1.274	1.051	-1.21	0.225	-3.333	0.785
Wage	714.140	19.187	37.22	0	676.533	751.746
_const	-0.996	0.026	-38.15	0	-1.047	-0.945
Eq2: Housework						
Market Work	-0.340	0.009	-38.15	0	-0.358	-0.323
Leisure Time	-0.190	0.014	-13.82	0	-0.217	-0.163
Sex	29.540	3.799	7.77	0	22.093	36.987

	Coef.	Std. Err.	z	P>|z|	[95% Conf. Interval]	
Age	1.815	0.155	11.7	0	1.511	2.119
Education Level	-3.012	2.729	-1.1	0.27	-8.361	2.336
No. of Children (age 0–2)	166.040	11.670	14.23	0	143.168	188.912
No. of Children (age 3–6)	83.550	8.088	10.33	0	67.699	99.402
No. of Children (age 7–12)	40.604	4.234	9.59	0	32.304	48.903
No. of Children (age 13–18)	18.311	3.015	6.07	0	12.401	24.222
Employment	0.000	(omitted)				
Employment of Spouse	-0.441	0.614	-0.72	0.473	-1.644	0.762
Wage	247.875	12.408	19.98	0	223.555	272.195
_const	-0.340	0.009	-38.15	0	-0.358	-0.323
Eq3: Leisure Time						
Market Work	-0.468	0.011	-44.46	0	-0.489	-0.447
Housework	-0.285	0.021	-13.82	0	-0.325	-0.245
Sex	-43.694	4.636	-9.42	0	-52.780	-34.607
Age	0.399	0.194	2.05	0.04	0.018	0.780
Education Level	22.686	3.316	6.84	0	16.187	29.186
No. of Children (age 0–2)	-65.702	14.795	-4.44	0	-94.701	-36.704
No. of Children (age 3–6)	-46.590	10.081	-4.62	0	-66.349	-26.830
No. of Children (age 7–12)	-4.273	5.266	-0.81	0.417	-14.594	6.048
No. of Children (age 13–18)	-1.458	3.717	-0.39	0.695	-8.743	5.827
Employment	0.000	(omitted)				
Employment of Spouse	-0.834	0.752	-1.11	0.268	-2.308	0.640
Wage	450.685	14.355	31.4	0	422.550	478.819
_const	-0.468	0.011	-44.46	0	-0.489	-0.447

Equation	Obs	Parms	RMSE	„R-sq"	chi2
Eq1	3448	10	179.63	0.128	3713.51
Eq2	3448	10	100.71	0.292	2806.24
Eq3	3448	10	124.32	0.144	2323.9