

Appendices to

The Role of Preferences and Opportunity Costs
in Determining the Time Allocated to Housework

by

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Abstract: Research on intrahousehold time allocations has assumed that housework is a necessary evil and focused exclusively on the causal role of opportunity costs. In fact, agents likely act to maximize happiness, and preferences regarding even mundane household chores differ considerably. We use information from the 2000-2001 UK Time Use Survey to examine time spent on laundry, ironing, cleaning, and food shopping. Joint multivariate analysis of his and her time on weekend and weekday days as well as maid service reveals that her opportunity cost of time matters more than his, but that his preferences play a greater role than hers.

LITERATURE REVIEW

The dominant economic theory used to explain intrahousehold time allocation has been specialization and the division of labor. Becker (1991) postulates that, much as in the case of the two country-two good trade model, couples should optimally specialize such that one partner focuses completely on either market or home-based production. The other partner then either fully or partially specializes in production of the other good. The goal is to reap the benefits of comparative advantage and maximize the household's utility. Efficient specialization is achieved by exploiting comparative advantage.

This theory has been tested empirically by modeling time spent in home production as a function of wages or relative wages. Assuming that everyone is equally skilled at home production and all else is equal, the partner with the highest relative earnings should specialize in market production and spend less time on housework. Work by Hersch and Stratton (1994) indeed finds that the higher the husband's share of household income in American dual earner households, the less time he spends and the more time his wife spends on housework. Other researchers model household behavior using not a household utility function but a bargaining model (see Lundberg and Pollak 1996) or a collective household model (Apps and Rees 1997; Blundell, Chiappori, Meghir 2005). These approaches often also suggest a link between wages and time spent on housework. This association may arise because wages reflect household members' other opportunities or their bargaining power within the household. In either case, the prediction is similar. Higher relative/absolute wages are associated with lower housework time. There is also a substantial sociology literature documenting this relation (see for example, Evertsson and Neramo 2004). More recent work by Gupta and Ash (2008) reports a stronger link for absolute than for relative earnings in driving housework time, with a stronger relation for

women. Stancanelli and Stratton (2011) also find that 'her' opportunity cost of time matters more than 'his' in determining intrahousehold time allocations to housework, but that both partners' opportunity costs are highly associated with the availability of time saving appliances and the decision to hire a maid.

These models of household behavior rely on a number of critical assumptions. Pollak (2011) offers a detailed critique of the Beckerian approach, but one assumption is that there are no 'process benefits' or at least no differential process benefits associated with either market or home production time. Thus, production is valued only for the goods that are produced not for the time spent in that activity. This assumption is standard as well in the labor supply literature where it is assumed that individuals work only for the money earned in the process. Housework likewise is assumed to be a necessary task that no one likes, that everyone would rather someone else performed. Yet in the sociology literature there has been substantial support for display theory also known as 'doing gender' (Brines 1994) whereby women who earn relatively high wages may contribute relatively more time to housework in order to demonstrate their feminine side. This suggests that there are social benefits associated with performing housework.

More generally, there may also be intrinsic or 'process benefits' associated with housework tasks. Kerkhofs and Kooreman (2003) and Gørtz (2011) estimate household production models that allow for the possibility of such 'process benefits' using Swedish and Danish time use data respectively. Both papers include time spent on a wide array of activities in their measure of housework - including the mundane tasks of cleaning and laundry as well as cooking, gardening, and do-it-yourself work that often constitute hobbies. Identifying preferences for such an amalgam of tasks would be difficult. Kerkhofs and Kooreman (2003) even include childcare which is well known to include a leisure component. No information on

preferences is available, so process benefits are identified in these papers by relying on household production and process benefit functions of a particular functional form. Process benefits are effectively observed if individuals spend more time on housework tasks than would be predicted given their opportunity cost of time.¹ That the evidence so obtained for process benefits is at best weak is perhaps not surprising given the composite amalgam of housework activities and the assumption of similar preferences by gender.

ESTIMATION SAMPLE

The data for this analysis are drawn from the 2000-2001 United Kingdom Time Use Survey (UKTUS). To focus on intrahousehold time allocation, we restrict our sample to heterosexual couple households. Data limitations necessitate excluding those in Northern Ireland. These restrictions yield an initial sample of 3822 households. Of these, 1780 completed household, individual, and partner surveys indicating they were single couple households comprised of individuals between the ages of 20 and 59 inclusive, not enrolled in school, not in the military, not on disability, and not retired. To analyze time spent on housework, this analysis further requires complete time diaries. Each partner was asked to complete two 24 hour time diaries, one for a weekend day and one for a week day. Typically, each partner completed diaries for the same days. Respondents filled these diaries out in 10 minute intervals using their own words. These entries were then recoded into approximately 170 standardized activities. Our goal is to obtain reliable diary information for normal days. Restricting the analysis to households for which four diaries are completed yields a sample of 1302 observations.² Finally,

¹ Gørtz (2011) points out that it is not possible using this approach to distinguish between individual process benefits and household partiality for home-produced rather than market purchased goods.

² Complete diaries are defined here as diaries for which at least 23 hours of data and five different activity spells are reported. The latter restriction is imposed because Juster (1985) indicates that diaries with very

the sample is restricted to households that provide information on purchased services yielding the final estimation sample of 1291.³

PREFERENCES

Figure A1 illustrates the distribution of average preferences by gender. These illustrations suggest there is sufficient heterogeneity in terms of preferences to warrant controlling for them in the analysis of time use.

OPPORTUNITY COST CALCULATIONS

The opportunity cost of each partner's time is captured using his/her predicted natural log of net hourly earnings. These predictions are generated by estimating standard Heckman selection corrected wage models separately by gender on the full sample of 20-59 year olds who are not in school, provide personal (and partner) information on education and potential experience as well as household data on non-labor income receipt. The middle 98% of wages for non-self-employed workers are modeled as a function of detailed education measures, a quadratic in potential experience, region of residence, marital status, the local unemployment rate, rural/urban residence, and a dummy to identify minorities. The estimation samples consist of 2571 men of whom 1351 report viable wages and 3015 women of whom 1618 report viable wages. The majority of the men missing wage information are either self-employed or are employed but fail to report earnings. The majority of the women missing wage information were not employed. The selection equations include all the variables included in the log wage model

few distinct activities are unreliable. 'Normal' days are identified here to exclude holidays and sick days. Individuals who report spending more than 30 minutes in bed sick or twenty or more hours sick or sleeping are judged to be sick.

³ Two households for which preference information is missing for both partners are also excluded.

as well as information on household composition, partner characteristics, non-labor income receipt, health indicators, seasonal dummies, and a dummy to indicate access to a computer. Net earnings are the appropriate measure of opportunity cost as they more closely than gross earnings reflect disposable income.

OTHER COVARIATES

As our focus is upon estimating a system of demand equations for the inputs to household production, it is necessary to control for non-labor income, household-specific factors influencing the need for such services, and individual-specific factors likely related to productivity in home production. To this end we include a dummy variable identifying those households who receive income from rent, interest, or alimony; a dummy variable identifying those who reside in London where cultural attitudes towards employment and maid services may differ; information on household composition (the number of other adults in the household, the number of children of various ages); a dummy to identify diaries completed during the summer that may incorporate seasonal differences in household time constraints and needs; as well as controls for each partner's age and gross educational background. Sample statistics for these control variables are reported in Table A1.

RESULTS

The estimated coefficients for the other covariates are reported in Table A2. Table A3 presents estimates of the cross-equation correlation terms.

SENSITIVITY ANALYSIS

We check the robustness of our estimates by running analyses with different measures of opportunity costs, different measures of preferences, and different samples. The market price of maid services we use in the results reported above comes from an industry survey, varies only by region and year, and includes a number of occupations other than domestic services. As such it is perhaps surprising that the results with respect to this cost measure are so robust. The maid price has a negative association with having a maid that is marginally significant and a positive association with household time on weekend days that is consistent across a broad array of specifications. We attempted to construct an alternate cost measure using wage data from the British Quarterly Labour Force Survey (LFS) for ‘cleaners, domestics’, however even when aggregated at the regional level, the number of such workers was so small we chose not to pursue this analysis. The mean value of the median wage so calculated is uniformly lower than that provided in the industry survey – not surprisingly given that the LFS likely includes many more individuals who are self-employed. However, the correlation between the LFS and the industry values is 0.90 lending further credibility to the industry measures we do use.

Alternate measures of the opportunity cost of time of the partners were constructed with more success. One was an imputed wage relying entirely on education, potential experience (current age minus age began work after school), and regional variation. This measure yielded results comparable to those reported here, albeit her value of time is somewhat less significantly associated with her time use. Matched wages using either the full set of variables employed in the wage imputation or only potential experience and detailed education yield if anything stronger results. Her preferences regarding these household tasks become significantly negatively related to the use of maid services. If she likes these activities, the household is less likely to hire a maid. Her opportunity cost is no longer significantly related to his time when

matched with the full set of covariates but is significantly positively correlated with his time on both weekends and weekdays when using the more limited set of covariates. Her weekday housework time becomes positively and significantly related to her preferences and in the case of the simple matching function positively and significantly related to his opportunity costs.

Although opportunity cost measures are by no means straightforward, preferences are by their very nature more difficult to capture. The main measure used here gives each activity equal weight and assumes indifference when no response is provided. An alternative measure that averages preferences only over those activities for which preferences are reported yields results that are similar in sign and significance. Another measure that weights the preferences based on sample average (not gender specific) time reported on the activity yields results that are even stronger. Men's preferences are now in all cases positively and significantly related to their time and negatively and significantly related to her time. Women's preferences are now negatively and significantly related to the use of maid services. Wage effects are substantially the same.

Dropping households for which there were proxy interviews yielded a substantially smaller sample (1081 households) and reduces the statistical significance of some of the wage effects – particularly the impact of his wage in the maid service equation and the impact of her wage on her weekday time. Overall, her wage but not his remains a significant determinant of household time. The role of preferences is robust to this sample change. His preference measures have the same size and significance as those reported in the full sample, while her preferences remain unrelated to reported time. The results are similar when individuals who report no preference data are dropped. Restricting the sample to dual earner households has similar results with her wages becoming less statistically significant and his preferences remaining statistically significant. The price of maids remains a significant determinant of their

weekend time and her preferences become significantly negatively related to use of maid services. The sensitivity analysis reveals a robust relation between his preferences and reported household time use.

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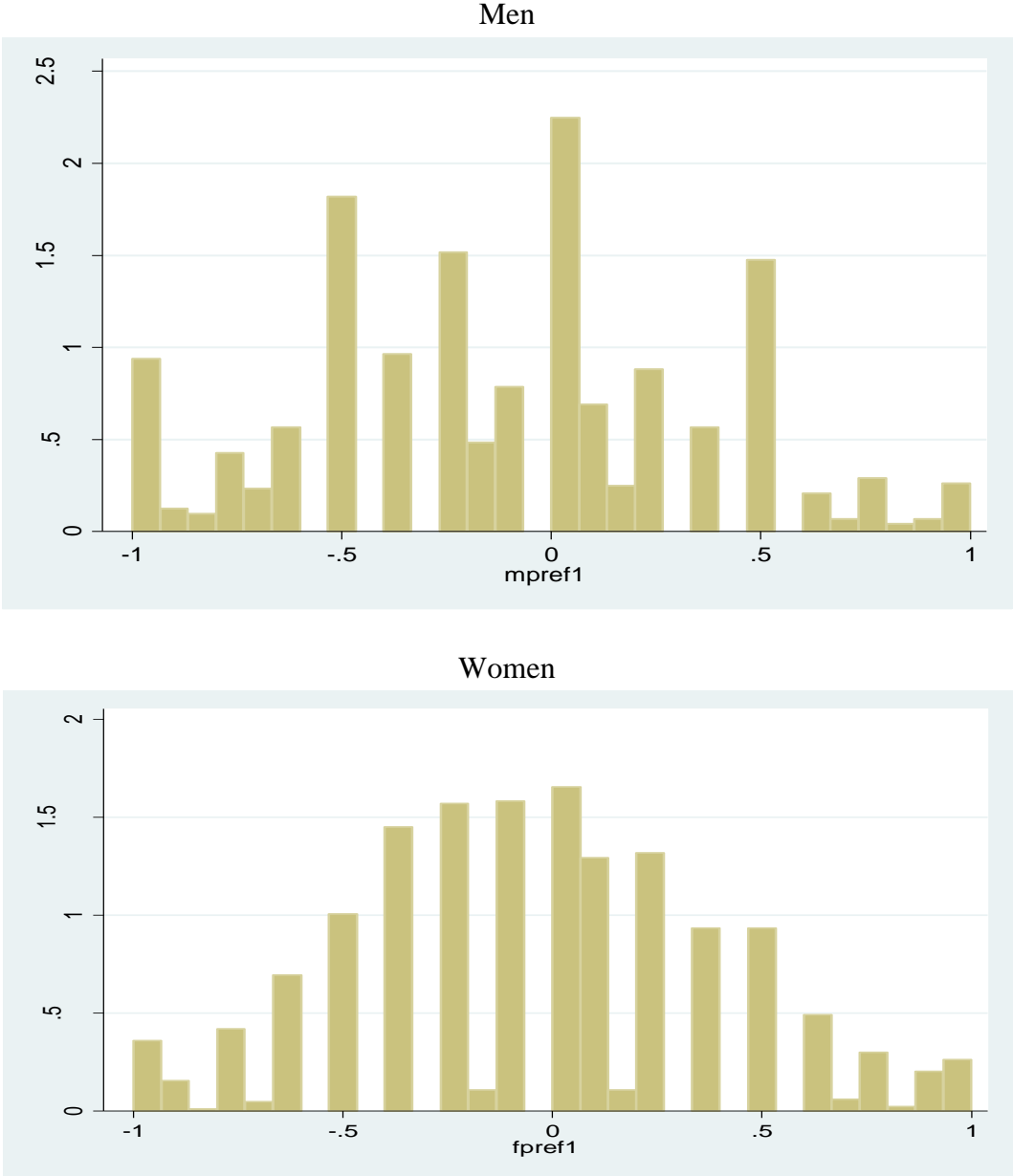
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Figure A1
Average Preferences by Gender



Excludes those for whom proxy interviews were provided as well as individuals who report they do not perform any of the four activities on which this analysis is focused. These restrictions substantially decrease the frequency of zero values.

Appendix Table A1
Sample Statistics for Other Covariates
 Couples in UKTUS

Receive Non-Labor Income	0.27	0.44
Residence in London	0.07	0.25
Cohabiting	0.18	0.38
Number of Other Adults	0.28	0.60
Number of Children age 0-2	0.17	0.37
Number of Children age 3-4	0.12	0.32
Number of Children age 5-9	0.25	0.43
Number of Children age 10-16	0.32	0.46
Summer	0.25	0.43
Woman's Age	38.92	9.57
Woman has University Education	0.14	0.34
Man's Age	40.92	9.52
Man has University Education	0.14	0.34
Number of Households	1291	

Appendix Table A2 Cross-Equation Correlations

	Has Maid Service	His Weekday Time	His Weekend Time	Her Weekday Time
<u>Correlation with</u>				
His Weekday Time	-0.0871 (0.0841)			
His Weekend Time	0.0555 (0.0524)	0.1397 *** (0.0327)		
Her Weekday Time	-0.0853 (0.0656)	-0.0657 *** (0.0253)	-0.0559 ** (0.0244)	
Her Weekend Time	-0.0127 (0.0636)	-0.0365 (0.0296)	0.0712 * (0.0394)	0.0677 ** (0.0317)

Standard errors are reported in parentheses below parameter estimates.

Asterisks indicate 2-sided significance level: *** 1%, ** 5%, * 10%.

All equations include the variables listed in Table 2 as well as controls for marital status, residence in London, the number of other adults, the number of children age 0-2, the number of children age 3-5, the number of children age 6-9, the number of children age 10-16, a dummy for non-labor income, a dummy for summer interviews, as well as controls for his and her age, university education, and proxy interview status and an intercept.

Appendix Table A3

	Has Maid Service		His Weekday Time		His Weekend Time		Her Weekday Time		Her Weekend Time
	<u>Coefficient</u>		<u>Coefficient</u>		<u>Coefficient</u>		<u>Coefficient</u>		<u>Coefficient</u>
Household receives non-labor income	0.2280 *		3.1689		1.2951		1.0751		3.8081
	(0.1224)		(2.2180)		(2.7231)		(4.3544)		(5.1000)
Residence in London	0.1491		-4.4516		-18.4791 ***		5.2818		-18.8794
	(0.2851)		(4.3499)		(6.4973)		(10.8375)		(12.0801)
Cohabiting Couple	-0.3712 *		1.0503		-0.2315		-11.1365 **		0.1607
	(0.2096)		(2.3561)		(3.0394)		(5.2784)		(5.9121)
Number of Other Adults in HH	0.1371		-0.2823		2.2100		8.5756		2.3489
	(0.1497)		(2.0409)		(3.5735)		(5.3494)		(6.4353)
Number of Children Age 0-2	0.1253		2.5471		-0.7472		19.4930 ***		0.8195
	(0.1802)		(2.4940)		(3.2823)		(5.5859)		(5.7394)
Number of Children Age 3-4	0.1713		1.1993		-0.8537		19.4540 ***		3.2867
	(0.2318)		(3.2966)		(3.8846)		(6.5453)		(7.4153)
Number of Children Age 5-9	-0.1329		0.2365		3.7536		15.4832 ***		9.4690 *
	(0.1560)		(2.3291)		(3.4132)		(4.8304)		(5.6748)
Number of Children Age 10-16	-0.1020		-0.2596		1.4768		8.2229 *		18.9446 ***
	(0.1470)		(1.9967)		(3.2372)		(4.9244)		(5.3989)
Summer	-0.0814		0.0711		-2.7852		0.9932		-0.9156
	(0.1511)		(2.0969)		(2.7123)		(5.1249)		(4.7855)
Her Age	0.0154		0.0654		-0.1253		1.6513 ***		0.6540
	(0.0156)		(0.1989)		(0.2782)		(0.4744)		(0.5577)
She has a University Education	0.1306		-3.0769		-5.9768		-6.4945		-24.5636 ***
	(0.2064)		(3.2393)		(5.3453)		(8.2704)		(8.8943)
Her Interview was a Proxy	-0.4272 *		5.2768		-7.3071		-10.1390		2.3207
	(0.2424)		(5.7315)		(6.5838)		(10.0464)		(15.4521)
Her Preferences	-0.2037		2.7705		0.4327		4.1231		2.3127
	(0.1731)		(1.9560)		(3.0100)		(5.0744)		(6.0121)
His Age	-0.0022		-0.0845		-0.0650		-0.3698		0.3029
	(0.0146)		(0.1938)		(0.2999)		(0.4770)		(0.5574)
He has a University Education	-0.2646		0.9006		8.3113		-4.0979		4.7544
	(0.1964)		(3.3011)		(5.2698)		(7.4601)		(8.0616)
His Interview was a Proxy	0.0980		-4.4670 **		-3.6143		17.4599 ***		8.4110
	(0.1700)		(1.9016)		(3.7055)		(5.9917)		(5.9095)
His Preferences	0.1807		6.7889 ***		7.0982 **		-9.7105 *		-6.0025
	(0.1473)		(1.9466)		(2.8709)		(5.5701)		(5.2283)
Constant	-1.0678		-39.0644		-149.8223 **		88.6349		-178.6413
	(3.2873)		(44.5903)		(67.6503)		(101.4923)		(112.5246)

Standard errors are reported in parentheses below parameter estimates.

Asterisks indicate 2-sided significance level: *** 1%, ** 5%, * 10%.