Maids, appliances, and couples' housework: The demand for inputs to domestic production

Elena G. F. Stancanelli CNRS, Sorbonne Economic Research Center, & Paris School of Economics & IZA

and

Leslie S. Stratton Virginia Commonwealth University & IZA <u>lsstratt@vcu.edu</u> Corresponding Author

301 W. Main Street Richmond, VA 23284-4000 (804) 828-7141

December 2012^a

^a We thank the anonymous referees, Daniel Hamermesh, Arthur Lewbel, Margaret McElroy, John Pencavel, Robert Pollak, Arthur van Soest, Frank Stafford, and participants to the 2011 SOLE Conference in Vancouver, the 2010 IATUR conference in Paris, and the 2010 Society of Government Economists meeting in D.C., as well as seminar participants at Aarhus University, Zaragoza University, and Cergy Pontoise University, for helpful comments. All errors are ours.

Maids, appliances, and couples' housework: The demand for inputs to domestic production

December 2012

Abstract

Maids, household appliances, and housework time are key inputs to domestic production. This study uses data from Great Britain and France to estimate the effects of resource prices on the demand for these inputs. We conclude that higher opportunity costs of time increase the likelihood of having maid services and appliances. Women's time costs are also positively related to his housework time and negatively related to hers. Finally, maid service appears a closer substitute for housework time on weekends than weekdays, suggesting smaller labor supply effects than anticipated by earlier literature.

Keywords: housework, maid service, time use, domestic work, prices. Classification JEL: D13, J22, L23

Maids, appliances, and couples' housework: The demand for inputs to domestic production

As is the case with most goods, domestic services are produced using a combination of labor and capital resources. The labor may be purchased in the market by hiring a maid or provided by household members at the cost of foregone time for employment or leisure. The capital resources consist of household appliances that reduce the amount of time necessary to complete domestic work. Maids, household appliances, and household time inputs to domestic work all contribute to well-being by producing a pleasant home environment. Though output in this sector is not measured, inputs have been and indicate that these services are of substantial value. The US Economic Census indicates that receipts for residential housekeeping services totaled 2.4 billion dollars while sales of household appliances totaled over 14 billion in 2002. Our calculations from the 2003 American Time Use Survey indicate that on average couple households reported spending 28 hours per week on housework, about 44% of the time these households devoted to market employment. Here we add to the literature in this area by estimating the effects of resource prices on the demand for all inputs to domestic production maids, appliances, and individual provision of housework. Measures of both market prices and individual opportunity costs of time are incorporated in the model using rich data drawn from household and industry surveys in France and the United Kingdom (UK). By using data from more than one country, we gauge the degree to which our results are robust and might be generalizable.

Aguiar and Hurst (2005) were in the vanguard in this area of research with their work addressing meal preparation. They recognized that inputs to food production include not just food (modeled by food expenditures) but also the time spent shopping and preparing meals. By

analyzing both these inputs to food production, they resolved a longstanding puzzle – the observation that food expenditures decline substantially following retirement. What they found was that these declining expenditures are offset by increased time spent shopping and preparing meals – suggesting that time and money are substitutes in food production. Stancanelli and Van Soest (2012) added to this literature by allowing the retirement status of both partners to affect the hours of home production of both partners. Hamermesh (2007), using time diary and expenditure survey data from 1985 and 2003 in the United States, examined this mix of inputs for the working age population. He estimated linear input demand equations, specifying as inputs the raw food materials that make up meals and also the time devoted to buying food, preparing meals, eating them, and cleaning up afterwards. His key explanatory variables were income and the husband's and wife's value of time. He concluded that income has a positive effect on all inputs, while the opportunity cost of time is negatively related to the time inputs. These key studies of household food production illustrate the importance of taking both market and household inputs into account in modeling the home production sector.

Most of the scant research to date on the domestic help industry (Suen 1994, Cortés and Pan 2009, and Cortés and Tessada 2011 - using microdata on foreign maids) and on home appliances (Cavalcanti and Tavares 2008 and Coen-Pirani et al. 2010) has focused on the positive impact these alternative inputs to domestic production have on women's labor supply. Cortés and Tessada (2011) find, combining information from different data sources, that the greater availability of maid services, instrumented with migration flows, has increased the labor supply of high earning women by between 4 and 20 minutes a week. Their estimates suggest a modest decrease of about 7 minutes a week in housework. None of these studies addresses the role of men as either potential providers or consumers of household services.

Related research focuses on the impact of opportunity costs on the time inputs to domestic services. Suen (1994) reports that women's predicted wages are significantly positively related to the probability of hiring domestic servants in Hong Kong. Cohen (1998) finds similar results in the US, but also finds a weak positive relation to men's earnings. The more extensive literature relating earnings to couples' time use (see, for example, Hersch and Stratton 1994 and Friedberg and Webb 2007) typically finds a negative relation between own opportunity costs and housework time.

We are not aware of any earlier study that has taken as comprehensive an approach to analyzing the inputs to domestic work in couple households, as we do here. While previous work has related the availability of maid services and appliances to female labor supply, we analyze the link between maid services, appliances, individual housework time, and resource prices. The time allocated by each partner in couple households to housework is valued using potential wages, as is often done in the labor supply literature. The prices of maid services and of electricity are constructed using regional measures. By simultaneously modeling the demand for maid services, appliances, and individual housework time as a function of these prices, we can shed some light on the degree of substitutability among these inputs. Furthermore, our data distinguish between weekend and weekday days, allowing us to estimate demand equations across different days of the week. Because many people in our surveys do not work for pay in the market on weekends, housework done on weekend days is more likely to be carried out at the cost of foregone leisure time than reduced labor supply hours, a potentially relevant issue that has been overlooked in the earlier literature.

The domestic chores on which we focus are house cleaning, dish washing, laundry, and ironing. These are routine tasks performed in virtually every household. Furthermore, these are

tasks that few people report enjoying. This is important as individual enjoyment of housework activities (process benefits) may obscure estimates of the price effects. Couple households in the US spend about 10.5 hours per week on these tasks. Our data indicate that couples in the UK spend an average of almost 12 hours while those in France spend just over 14 hours per week on domestic services thus defined. This constitutes a substantial time commitment equivalent to over 1.5 days of full-time employment. As these activities constitute an undesirable time burden, it is reasonable to suppose that households would seek alternative inputs to reduce that burden. The alternative inputs include maids, who typically provide just these services, and time saving household appliances, like dishwashers.¹

Our econometric model consists of a system of six equations estimated jointly by simulated maximum likelihood. One equation models households hiring a maid, another households having a dishwasher, and four the time spent by each partner on housework on week and weekend days. In both countries we find that higher maid prices are associated with more weekend but not weekday time, suggesting that maid service is a closer substitute for weekend than weekday time and hence that labor supply effects might be small. In addition, for both countries, we conclude that women's opportunity cost of time has a significant impact on all decisions, while men's is important mainly in determining the use of appliances and maid service. Thus, the higher her opportunity cost of time, the more time he spends and the less time she spends on housework, while the higher each partner's opportunity cost, the more likely the household is to have maid service and a dishwasher.

I. EMPIRICAL SPECIFICATION

Our empirical approach is to model jointly the various inputs to domestic production for each household. Following Aguiar and Hurst (2005) and Hamermesh (2007), we employ linear specifications to model the housework time inputs as a function of prices. Following Lundberg (1988), we simultaneously model these time inputs. Both the decision to hire a maid and the availability of appliances are estimated using probit specifications.

Let h_{ijk} represent the time (in minutes) spent on domestic work by household member k (k = m, f) of household i (i = 1, ..., N) on day j (weekend, weekday). Let w_{im} and w_{if} represent the opportunity costs of time for the husband and wife respectively.² The price of domestic services purchased from the market is p_d and the price of appliances is p_a . We also allow demand to be affected by other household (e.g. non-labor income and household composition) and individual (e.g. age and education) characteristics z and an error term u. The four equations for own housework time have the following form:

$$h_{ijk} = \gamma_{fjk} \ln w_{im} + \gamma_{mjk} \ln w_{if} + \theta_{jk} \ln p_{di} + \delta_{jk} \ln p_{ai} + z_i' \lambda_{jk} + u_{ijk}$$
(1-4)

The probability of hiring a maid (d_i) and the probability of having time saving appliances (a_i) , here a dishwasher, are modeled with a probit specification using the same covariates.

$$Pr(d_{i}=1) = \Phi(\psi_{m} \ln w_{im} + \psi_{f} \ln w_{if} + \xi \ln p_{di} + \tau \ln p_{ai} + z_{i}' \pi)$$
(5)
$$Pr(a_{i}=1) = \Phi(\mu_{m} \ln w_{im} + \mu_{f} \ln w_{if} + \alpha \ln p_{di} + \beta \ln p_{ai} + z_{i}' \tau)$$
(6)

We estimate equations (1) through (6) by simulated maximum likelihood using the Geweke, Hajivassiliou, and Keane or GHK algorithm (see Roodman 2007 and 2009, for an application in Stata). As all the price measures are in log form, the coefficient estimates to the price measures in the linear specifications are interpretable as the impact a doubling of price has

on time. In the case of the purchased time and appliance probit specifications, we report both coefficient estimates and marginal effects.

By estimating these six equations jointly our specification allows us to estimate the degree to which unobservable factors affecting the demand for different time inputs in the household production of domestic services are correlated. Estimating these cross-equation correlation terms will improve the efficiency of our parameter estimates, but may also shed light on other factors affecting input demand. As each partner provided information on both a weekday and a weekend day in the UK, residuals are available for all six equations for every household, so a full set of correlation terms (fifteen) can be estimated for the UK sample. For France, because time diaries were only collected on one day, we are able to estimate only four equations/four residuals for every household. This means we can estimate only eleven correlation terms for the French data. We are unable to observe how his (her) time is correlated (in the residuals) between weekend and weekday days or to measure how his time on one type of day is correlated with her time on the other type of day.

In general, we expect the greater a single input price, all else constant, the less of that input will be used in production because that input has become relatively more expensive. Cross-price effects are likely positive as these inputs are substitutes for one another in home production, but the magnitude and possibly even the direction of these effects will depend on the degree to which h_f , h_m , d, and a are substitutes and the relative productivity of each resource. In addition, the scope for substitution of partners' time inputs and market inputs may vary over different days of the week as a result of variation in either individual time budgets or household needs. Individuals employed on weekdays tend to have more time available to perform housework on weekends. On the other hand, some domestic tasks may need to be performed

every day – like doing the dishes – while others may be more readily deferred – like laundry and ironing. Given the fixed costs associated with maid service, it is unlikely that a maid would come every day to perform services, hence we hypothesize and examine empirically whether maid service is a better substitute for tasks that can be deferred and completed on weekends.

As the 'price' of the output or the value of having a clean house and neat/clean clothing is missing from these input demand equations, we expect differences in this valuation to be incorporated in the residuals. To the extent that these preferences are correlated with any of the covariates, the coefficient estimates obtained for these covariates will be biased as they will capture both the true association and the effect via their correlation with preferences. We find no particular reason to expect a correlation between preferences and our price measures or other covariates. However, to the extent that such preferences do differ among households we expect that those who value domestic services more will, all else equal, be likely to use more inputs causing the residuals to be positively correlated across equations.

Productivity in home production that is not already captured by the covariates (such as education) will also be incorporated in the residuals. Individuals with lower productivity in home production have to spend more time to produce the same output as others with identical characteristics and hence may have higher residuals in the time use equations. If this is the case, we would expect to see strong positive correlation between the residuals from the weekend and weekday equations for the same individuals. Significant positive correlations for a single partner may also be indicative of that individual's (as opposed to the household's) valuation of domestic services. It is not possible to distinguish here between individual preferences for domestic services and individual productivity.

II. DATA

Analysis Sample Criteria

The data for this analysis are drawn from two countries, France and the United Kingdom (UK). The general social structure is similar between these countries justifying comparative analysis to check robustness. OECD statistics indicate that the labor force participation rate of women age 25 to 59 was 69.6% in the UK and 73.1% in France in the year 2000. The use of maid service and availability of appliances are similar between the UK and France, as is confirmed by descriptive evidence in this paper. The surveys also have a similar design. Obtaining similar results using these two samples will, we believe, make these findings substantially more credible.

The primary source of the French data is the 1998-99 French time-use survey (Enquete Emploi du temps, henceforth EDT), carried out by the National Statistical Office (INSEE). The primary source of the British data is the 2000-2001 United Kingdom Time Use Survey (UKTUS). The EDT samples 8186 representative households; the UKTUS samples 6414 households.

Each of these surveys collected three types of questionnaires: household questionnaires with such household-specific information as household composition and location; individual questionnaires with such individual-specific information as age, education, and employment; and individual-specific 24-hour time diaries. For the time diaries, individuals were asked to use their own words to complete a written diary of their activities for each of 144 ten minute intervals. These activities were then recoded into approximately 140 standardized activities. One advantage of both these surveys is that time diaries were collected for each adult in the household and, for the most part, all household members filled out diaries for the same day. In

the case of the French data, diaries were collected for only one day – either a weekday or a weekend day. In the case of the British data, diaries were collected for both a weekday and a weekend day.

Both samples are restricted to heterosexual couple households. The British sample is further restricted to exclude those households residing in Northern Ireland and those households that do not have individual level surveys from both partners. These UK-specific restrictions are substantial (causing a 25% drop in the sample size), but necessary to identify such key covariates as education. These restrictions yield samples of 5287 households in France and 2893 households in the UK. Using individual information, we restrict the sample to couples in which both partners are between the ages of 20 and 59 inclusive and in which neither partner reports being in school full-time, in the military, on disability, or retired. This yields samples of 3405 households in France and 1782 in the UK. Finally, the sample is restricted to households that provide information on purchased services, households for which sufficient information is available to impute prices, and households for which both partners complete at least 23 hours and report at least five different activity spells for each possible time diary on days that are not deemed 'unusual'.³ Our goal is to obtain reliable diary information for a normal day.⁴ Our final sample consists of 2924 households in France and 1295 households in the UK.⁵

Housework Time

A key input to domestic services is household housework time. Our focus is on the time spent on routine tasks that individuals do not generally enjoy, that maids provide, and that all households perform. These surveys are quite remarkable in that preference data on various housework tasks are available.⁶ Figure 1 summarizes these data by country, gender, and activity

type. Panel A presents the results for the UK and Panel B the results for France. The fraction that enjoys an activity in France or enjoys it very much in UK is illustrated in white while the fraction that is indifferent to an activity is illustrated in grey and the fraction that dislikes an activity is illustrated in black. Those who enjoy an activity a little in Great Britain are captured in light grey. For both countries we have information on preferences pertaining to cooking everyday meals, shopping for food, cleaning, ironing, cooking for special occasions, gardening, and home repair. For France we also have information on preferences for dish washing. For the UK we have information for laundry and shopping for non-food items.

<<Figure 1 about here >>

The results indicate that substantially fewer people derive much pleasure from cleaning or ironing as compared to cooking for special occasions, gardening, and home repair. Less than 40% of British men and less than 50% of British women report enjoying the former tasks whereas between 60 and 80% report enjoying the latter. This distinction is even clearer from the French data. Less than 20% of the French report enjoying cleaning or ironing, while over 70% report enjoying cooking for special occasions, gardening, and home repair. Preferences for dish washing, available only from the French data, and for laundry, available only for the British data, indicate that these tasks are about as enjoyable as cleaning and ironing. Preferences for everyday cooking suggest that British individuals rather enjoy it. While it would be difficult to say that French men and women enjoy everyday cooking, they are more than twice as likely to say that they enjoy it as they are to say that they enjoy cleaning, dish washing, or ironing. Neither the British nor the French report enjoying food shopping, but Figure 1 shows that British women enjoy 'other shopping'. As the French time use data do not distinguish between food and other

shopping, we exclude shopping from our analysis and focus on cleaning, dish washing, laundry, and ironing.⁷

This definition of domestic services is further justified as these are tasks that maid services generally provide. The British survey includes information on the type of tasks for which households hire market labor, distinguishing among "food preparation", "cleaning, tidying up", "ironing", "shopping or errands", and "household accounts". The vast majority of purchased aid is for cleaning/tidying up activities, with ironing the second most common. None of the other services is purchased by even 1% of the sample. Meals can instead be purchased readymade, significantly altering preparation time, and indeed evidence from the UK Family Expenditure Survey 2000-2001 suggests that the vast majority of couple households do take advantage of such opportunities. Information on this alternative input to meal preparation is not available in the data used here, providing further support for excluding meal preparation from this analysis.⁸

Other activities are excluded because they are not performed in every household. The additional housework necessitated by the presence of children is reflected in the demand for inputs to domestic services. This increased demand should be accounted for in our model as we control for the presence of children of different ages. Other child-care (such as feeding, dressing, and playing) is excluded from our analysis because this task is child dependent, because there is evidence that the determinants of child-care and housework are quite different (Kimmel and Connelly 2007), and finally because private child-care services are not captured in our measure of maid services. Activities contingent on home ownership (such as lawn care, home repair, and gardening) and pet ownership (pet care) are excluded as well, though we do conduct some sensitivity analysis along this dimension. Cleaning, dish washing, laundry, and ironing

constitute the focus of our analysis and in fact correspond to activities that are often defined as "routine" or "compulsory" housework by sociologists (Presser 1994).

Maid Services

A second key input is maid services. Both surveys contain information on purchased housework services. The French questionnaire asks whether the household regularly purchases domestic help/services and if so how much time is purchased each week.⁹ The British questionnaire asks separately about paid help for "cleaning, tidying up" and "ironing" over the last four weeks. There are then additional questions about who provides the help¹⁰, how often, and for how long. However, given the small number of households that purchase maid services, we focus on whether or not a maid is hired. Less than 8% of all households purchased such services.

To evaluate the accuracy of these sample measures, we examined consumption surveys. A similar sample (couples aged 20 to 59) from the 2000 Household Consumption Surveys for France (enquete budget des familles) indicated that a comparable 8.6% of households purchased domestic help. Flipo, Fougere, and Olier (2007), in an analysis of maid service in France, also find that only a small minority purchase such assistance.¹¹ The UK Family Expenditure Survey 2000-2001 indicates that about 18% of couple households purchased household help within the last two weeks, but these figures include window cleaners. Including information on window cleaners from the UKTUS, 30% of our sample purchased a similar bundle of services within the last four weeks. As window cleaning services are likely not purchased more than monthly these figures, while more difficult to compare than the French data, do provide support for our sample statistics. Few households have maid service.

Appliances

Both surveys also ask respondents about appliances. Specifically there is information from each survey on whether there is a dishwasher or a clothes washer in the household. Use of a dishwasher is likely to affect the time devoted to washing up dishes while use of a washing machine is likely to affect the time spent doing laundry. In each country, over 98% of couple households have a clothes washer. With such little variation in outcomes, we do not model this input. By contrast, 42% of our British sample and 57% of our French sample reported having a dishwasher. Thus, we model in our analysis the availability of a dishwasher.¹²

Table 1 presents summary statistics for the dependent variables used in this analysis. In general, men report less time on housework than women, and more time is spent on weekends than weekdays. British men report more housework time than French men, while, perhaps to offset this, French women report more housework time than British women.

<< Table 1 about here >>

Looking at similar summary statistics for the sample with and without maid service, we see that in households with a maid, men report a little more housework time on average on weekends (4 to 10 minutes) while women report substantially less time on weekdays (20 to 45 minutes) and, at least in France, less time also on weekends. Those hiring a maid are also substantially more likely to have a dishwasher. Of course these figures do not control for other household characteristics as will our multivariate analysis.

Prices

In the specification that follows, the variables of greatest interest from an economic perspective are the prices. Chief amongst these are the opportunity costs of each partner's time. A price for maid services and one for appliances is also included.

To construct measures of the opportunity cost of time for each partner, we follow standard practice and impute wages much like Kalenkoski, Ribar, and Stratton (2011). All persons age 20 to 59 who are not in school and who provide personal (and partner) data on education and potential experience as well as household data on non-labor income receipt are included in the sample used to impute wages. This sample is not restricted based on the availability of time diary data or the presence of a partner. In total, 2571 (4141) men and 3015 (4560) women are included in the British (French) wage analysis. Hourly earnings for non-selfemployed workers are calculated and standard Heckman sample selection methods are employed to control for non-participation separately by gender.¹³ The wage regressions contain a standard set of controls for education, potential experience, region, marital status, minority status, home access to a computer, and in the case of the UK the local unemployment rate. Select characteristics of the respondent (a quadratic in age, disability status), as well as characteristics of the household (number of other adults, presence of children of various ages, non-labor income dummy) and the partner (age, education, experience, health, minority status), as well as season are used to identify employment. These equations are then used to predict unconditional wages for everyone in the final sample: wage workers, the self-employed, the unemployed, and those out of the labor force. Further details regarding the wage imputations are available upon request from the authors.¹⁴

These imputed wage measures constitute estimates of each individual's value/cost of time, and as such we enter them as regressors in the demand equations. As estimates, they introduce error. We employ robust estimation techniques and bootstrap the standard errors of the econometric model in order to obtain more robust standard errors.

The natural log of the regional median hourly pay for domestic services is used to proxy for the price of maid services. The median price of domestic services in France is obtained from the French Labour Force Survey 1998, which contains gross wages of workers in this specific industry, as well as information on regional variation.¹⁵ The British data on domestic service prices are obtained from the British Annual Survey of Hours and Earnings as conducted by the Office of National Statistics. These data provide annual information by region on median gross hourly pay for elementary occupations in sales and service, a category that the British Quarterly Labour Force Survey indicates is primarily (>50%) "cleaners, domestics".¹⁶ In total there are 21 regions in France and 11 in the UK. As the UK data span two years, we have 22 distinct values for the UK. The fact that this crude price measure shows relatively little variation within the sample will act to increase the standard error associated with these coefficient estimates and reduce the probability that the price of maid service has a statistically significant effect on any of the inputs to domestic production.

The 'price' associated with having access to an appliance – here a dishwasher – is substantially different in type than the price of any of the time inputs. Appliances are capital investments that are not 'used up' in a single period as is labor. A capital appliance would ideally be purchased only if the present discounted value of that appliance were greater than its present discounted cost over its expected lifetime. A lower market price would obviously lower its cost and, all else equal, would make households more likely to have the appliance. However,

once purchased, or once a residence with such an appliance is acquired, the appliance's price becomes a sunk cost.¹⁷ The relevant opportunity cost is then rather the cost of operating that appliance (and potentially many other appliances). Thus, we employ information on the log of the average regional price per kilowatt hour of electricity as our measure of the price of appliances. Electricity prices in France do not vary by region, so this variable drops out of the French analysis.

Other Explanatory Variables

In addition to the price variables, we include other measures to control for crosshousehold differences in demand for domestic production, taste for domestic production, and ability to pay. Neither data set contains detailed information on non-labor income, a variable that may impact ability to pay. For the French data, we construct a dummy variable to identify households that receive rents or dividends. In the case of the UK data, our non-labor income dummy identifies households receiving rents, dividends, or alimony. Dummy variables are also incorporated to identify those living in London or Paris. Numerous factors may differ in these major cities, for example cultural attitudes that influence preferences for domestic work as well as the average size of the residence. A dummy variable to identify the summer season is incorporated in recognition that the housework tasks performed may differ by season, particularly during the summer.

Controls for various household characteristics are also included. One such is a dummy variable to distinguish between married and cohabiting households. Cohabiters may be more independent and invest less in household production because their long run opportunity to recoup these investments is more limited. Information on the presence of children of various ages is

included primarily with the intent of controlling for differences in demand. The presence of other household adults also suggests a greater need for services. Of course, older children and other adults could help provide household labor, thus their impact is not clear ex-ante.

Dummy variables identifying nonwhite persons in the UK and persons not born in France ('minorities') are incorporated in recognition that there may be cultural differences in the valuation of home production. Individuals who have a college degree or more are identified, as there exists some evidence that more educated men are more willing to do housework and that more educated women may be more likely to "do gender" (see, for example, Bianchi et al., 2000, for a discussion). Information on the age of each partner is included as age may also capture attitudes towards domestic work.

A complete list of the explanatory variables and their sample statistics is provided in Table 2.

<< Table 2 about here. >>

III. RESULTS

The estimated common price effects are presented in Table 3 as are the effects of nonlabor income. Panel A reports the results for the UK and Panel B those for France. Appendix Table A1 presents the other covariate results for the UK and Appendix Table A2 does the same for France.

<< Table 3 about here. >>

The first rows of each panel present results for the probit equation for maid service. Both coefficient estimates and analytic marginal effects are reported. These marginal effects are calculated for married couples with sample average opportunity costs, sample average ages, and

one teenage child. All other covariates are assumed to take a value of zero. These covariate values generate a predicted probability of maid service of 3.6% in the UK and of 2.1% in France. The price effects indicate that, in both the UK and France, maid service is negatively related to its own price, positively related to both partners' opportunity costs of time, and positively related to the presence of non-labor income. In the UK, higher electricity prices are associated with a higher probability of hiring a maid, but the effect is not statistically significant (estimates shown in Appendix Table A1). The opportunity cost of the wife is significant at the one percent level in both countries. A 10% increase in her opportunity cost of time is associated with about a 1 percentage point increase in the probability of hiring a maid in the UK and a 0.6 percentage point increase in the probability of hiring a maid in France. These marginal effects are substantial given that the base probability of hiring a maid is only 3.6 to 2.1%. The opportunity cost of the husband has a positive effect in both countries that is significant at the five percent level. A 10% increase in his predicted wage is associated with a 0.8 percentage point increase in the probability of hiring a maid in Great Britain and a 0.3 percentage point increase in France. Thus, the impact of the wife's opportunity cost is both more statistically significant and larger in magnitude than that of the husband, particularly in France where women spend more time on these tasks. Since women on average earn less than men, the predicted gender differential following an absolute rather than relative change in opportunity cost is even greater. Receipt of non-labor income is significantly related to the probability of hiring a maid in both countries, having a marginal impact of approximately 2 percentage points in both countries. The wage of the maid has a negative impact as expected, but though its marginal effect is rather large (a 10% increase in the wage of the maid reduces the probability of having a maid by 2.0 percentage

points in the UK and 1.0 percentage point in France), its effect is not precisely estimated. The cross-country similarities are striking.

The next rows present results relating to the probability of having a dishwasher. As with maid services, in each country higher opportunity costs are associated with a higher probability of having a dishwasher. In this case, the marginal impact of his predicted wage is greater than the marginal impact of her predicted wage – with the difference being particularly large in the UK perhaps because British men spend more time on housework. Thus, in the UK (France), a 10% increase in his opportunity cost is associated with a 7.6% (4.0%) higher probability of having a dishwasher, while a 10% increase in her opportunity cost of time is associated with only a 1.9% (3.1%) higher probability of having a dishwasher (the base level is 46% in the UK and 63% in France). Overall, her value of time seems to have a greater impact on the decision to purchase maid services particularly in France where she spends more time on these activities, while his has a greater impact on the probability of having household appliances particularly in the UK where he spends more time on these activities. The price of maid services is negatively related to having a dishwasher, significantly so in France. The receipt of non-labor income has a positive effect in both countries, but this effect is only statistically significant in France. Electricity prices in the UK are negatively associated with having a dishwasher but not significantly so.

Strong cross-country similarities persist in the partners' housework time equations. Looking first at the opportunity costs, results in the first column indicate that his predicted wage has no consistent association with household time use. Only in the case of her weekday time in France is the association individually statistically significant - and in this case positive indicating that as his opportunity cost rises, she spends more time on housework. In both countries, a joint

test of the statistical significance of his predicted wages in the four household time use equations indicates there is no significant relation (p-value 0.41 in the UK and 0.39 in France).

By contrast, her opportunity cost has a quite consistent and statistically significant association with housework time. Higher predicted wages for the wife are consistently associated with more housework time by the husband, significantly so in three of four cases. A 10% increase in her predicted wage leads to a 0.3-0.7 minute increase in his reported weekday time and a 2.1 minute increase in his reported weekend time. These magnitudes translate to about a 5% and a 10% increase in his average weekday and weekend housework time. In three of four cases, an increase in her predicted wage is associated with a statistically significant reduction in her housework time. In the UK, a 10% increase in her wage is associated with a 3 minute decrease in her weekday housework time -a decrease of almost 4% compared to the sample average. In France, a 10% increase in her wage is associated with a decrease of over 7 minutes in her weekday time and about 4 minutes in her weekend time, differences of between 7 and 3% of sample means. The larger magnitude of the results in France is likely attributable in part to the greater amount of time French women spend on housework. More generally, in both countries the estimates indicate that when her opportunity cost increases he spends more time and she spends less time on housework. Thus, men and women are not complements but likely substitutes in production.

The results in the third column indicate that the market price of domestic services, while not significantly associated with weekday time, has a substantial and consistently positively relation to his and her housework time on weekends. This relation is statistically significant at the 5 percent level for men in the UK (at the 12 percent level for men in France). The magnitude of the impact suggests that a 10% increase in the market price of domestic services increases his

weekend time on housework by about 10 minutes in both countries. Though not estimated with as much precision, the magnitude of the effect is only a little less (7-9.5 minutes) for women on weekends. The fact that the time devoted to household production on the weekends is more sensitive to market prices than the time devoted on weekdays is in accordance with our hypothesis that maids are likely a closer substitute for tasks that can be deferred/accumulated rather than tasks that must be performed every day. That the relation is more significant for men than for women suggests that men are more likely to be burdened with these tasks when maid service is more expensive - while perhaps women perform them anyway. That we find any significant association given our rough measure of the price of maid service is rather remarkable. As regards non-labor income, only for women in France on the weekend is the presence of non-labor income associated with a statistically significant (p-value < 0.01) reduction in housework time.

As a major contribution of this analysis is its incorporation of alternative input prices in the analysis of demand for time inputs to home production, some discussion of the benefits of doing so is warranted. Not surprisingly given that his opportunity cost of time and the cost of maid service are not significant determinants in her time use equations, adding measures of these input prices does little to improve the fit of these equations. Adding her opportunity cost of time and the cost of maid service does, however, substantially improve the fit of his time use equations in both countries. R-squared increases by between 33% (France) and 43% (UK) in the case of his weekend time and by between 12 and 18% in the case of his weekday time. This is true including all the other covariates in both specifications.

All told, relatively few of the other covariates are statistically significant. The general lack of significance in the male housework equations is not new in the literature (see Hersch and

Stratton 1997 and Friedberg and Webb 2007). By contrast household composition (as measured by the presence of children of various ages and the presence of other adults) is highly statistically significantly associated with her weekday time in both countries and to a lesser extent with her weekend time in the UK. The magnitude of the effect of children is larger in the UK, perhaps because of the more widespread enrollment of young children in childcare and the longer school day in France. In addition, these results indicate that French women spend much more time on housework than their British peers and that French but not British households with children are significantly more likely to have maid service. Cohabiting couples are less likely to have a dishwasher in both countries and cohabiting women in both countries perform less housework on weekdays. Cohabiting women in France also report significantly less housework on weekends while cohabiting men in France report significantly more time on housework on weekdays. This cohabitation effect may be evidence that cohabiting women have more bargaining power in France.

Finally, this formulation allows us to estimate cross-equation correlations between the unobservables (see Table 4). As discussed earlier, all these correlation terms will tend to be positive if household preference regarding domestic services is an important component of the residual. Although households that are more likely to have maid service for unobserved reasons are also significantly more likely to have a dishwasher for unobserved reasons, there are more significant negative than positive correlations, suggesting that the residuals are likely not primarily driven by common household preferences. Several alternative explanations receive some support.

For example, it appears to be the case that unobservables that affect the probability of having maid service or a dishwasher are also likely to reduce time spent on housework. Fourteen

of these sixteen correlation terms are negative, all eight relating to weekday time and five of those significantly so. This negative correlation is particularly strong between maids and women and dishwashers and men. We observed earlier that her value of time had a somewhat greater marginal impact on the probability of having maid service while his value of time had a greater marginal impact on the probability of having a dishwasher so this relation is not simply an expression of opportunity costs but may reflect individual preferences regarding the tasks involved. While we have restricted our analysis to tasks individuals do not generally enjoy, preferences may still vary. Those who enjoy these activities the least are likely to spend less time on housework and be more likely to purchase the services.

<< Table 4 about here. >>

Also estimable in both countries are the correlations between partners and within day type. Here we find that the correlations between the unobservables affecting his and her domestic work are positive on weekends and negative on weekdays. This relation is statistically significant in France on both weekdays and weekends and in the UK on weekdays. Weekend schedules are less likely impacted by employment schedules and the positive relation on weekends may reflect common preferences for home produced goods or possibly shared production time. There is often less flexibility on weekday schedules and housework performed on these days may 'need' to be performed on these days. The negative relation in the unobservables on weekdays may indicate that what one partner does on a weekday spares the other partner from the task. Thus, there appears to be more substitution between partners on weekdays than on weekends.

As discussed earlier, it is possible to estimate the cross-day correlation terms only in the UK. These estimates indicate that individuals who spend more time on housework on weekends

for unobservable reasons are also likely to spend more time on housework on weekdays for unobservable reasons. These positive correlations could be the result of a number of different mechanisms. For example, they could reflect individual preferences over home production or productivity in home production. Between partners, between days correlations are consistently negative and statistically significant. Thus, when he (she) reports more time on a weekend day for unobservable reasons, she (he) reports less time on a weekday day.

Several alternative specifications were estimated to examine the robustness of these results. In deference to Stewart's (2009) concerns about the meaning of zero time values in diary records of time use, all the household time use equations discussed above were estimated using ordinary least squares (OLS). Stewart (2009) was perhaps the first to argue that individuals reporting no time spent on housework on a given day may actually do some housework the next day - implying that zeros in housework deserve different treatment than zeros in labor supply. The zeros in housework are random and capture infrequency rather than censoring. In this case, tobit need not (and should not) be used. More than 60% of French men and 50% of British men report spending no time on housework on a given day. Runs using a Tobit specification for all of the men's housework time equations yielded wage estimates of the same sign and level of significance as reported in the OLS specifications.

We also estimated the basic model restricting our sample to dual earner couples as in Friedberg and Webb (2007). To this end, we generated new imputed wage measures that did not include controls for sample selection, ie. were conditional upon employment. The results for the price effects in the UK were very similar with two exceptions. First, the marginal impact of her predicted wage on his weekend time while still of the same magnitude is now significant at only the 15% level. Second, the impact of her predicted wage on her weekday time while still

negative becomes statistically insignificant. The price effects in both the maid and the dishwasher equations remain highly statistically significant. In France, her opportunity cost of time continues to have the same associations with household time use in each equation but with substantially reduced statistical significance. Only in her weekday time equation does her predicted wage remain significant at the one percent level. Again, both his and her opportunity costs of time remain highly significant in both the maid service and dishwasher equations. In both countries, we continue to find a stronger relation between her opportunity cost and hiring a maid and between his opportunity cost and having a dishwasher. The price of maid service also appears to have a somewhat larger effect in most equations.

As cohabiting couples displayed somewhat different behavior in the basic model, we tested two alternative specifications. Restricting the analysis to married couples alone yielded results not noticeably different from those for the full sample. Using the full sample but distinguishing between the earnings of married and cohabiting partners yielded no significant differences in the case of the French data where all cohabiting women tend to spend less time on housework, while there were some differential affects by 'his' wages in the UK. Specifically, women cohabiting with men in the UK who have a higher opportunity cost of time appear to spend significantly less time on housework on weekdays and somewhat less time on housework on weekend days. One possible explanation for this result is that cohabiting women in the UK are able to exert more power than married women only if their partner has higher earnings potential.

Finally, in recognition that we have severely restricted our definition of housework to focus on activities that are typically viewed as women's tasks (cleaning, laundry, ironing, and dish washing), that there are other housework tasks that are primarily performed by men (see

Stancanelli and Van Soest 2012 for evidence regarding gardening in France), and that households may specialize by gender and trade off these tasks, we reestimate the model including time spent on yard work and gardening in our measures of time use. This increases the time reported by women in the UK by approximately 10%, while increasing the time reported by men in the UK by 50-90%. More time still is spent on these activities in France. Women's reported time increases by 10% on weekdays and 25% on weekends, while men's increases four to five fold (albeit from very low levels). The UK estimates change very little. The most notable change is that the price of maid service becomes statistically insignificant in his weekend time use equation, a result one might expect since maids do not generally perform yard work. In the case of France, his opportunity cost loses statistical significance as a determinant of her weekday time and hers loses any significant relation to his time use, while his opportunity cost becomes significantly negatively related to his weekday time. These French results might be interpreted to mean that her opportunity cost has a greater impact on his time spent on 'her' tasks (cleaning) while his opportunity cost has a greater impact on his time spent on 'his' tasks (gardening). However, it should also be noted that many French men and women report enjoying gardening and the substantial amount of time reported in this activity may be indicative of process benefits and reduce any association with opportunity costs.

Sensitivity tests were conducted with respect to the specification of opportunity costs as well. We experimented with different measures for the price of maid service (see footnotes 15 and 16) as we believe the weak significance of this variable is largely attributable to its poor measurement, but these alternative measures did not improve the fit. We estimated the model with alternative measures of predicted wage, with substantially the same results. We also used propensity score matching to generate opportunity costs as an alternative to predicted wages.

The matched wages have a much higher standard error than the predicted wages and correspondingly tend to have a smaller marginal impact. In each country, the opportunity cost effects on maid services and dishwashers were of a similar sign and at least as statistically significant. The same is true of the impact of opportunity costs in the household time equations in each country, though the results lose statistical significance in all but the women's weekday time equations in France. In general, our demand system results are quite robust to changes in the sample and to alternative measures of input price.

IV. CONCLUSION

We estimate a model of input demands for domestic work, analyzing the use of maid services, the availability of a dishwasher, and the time partners spend on weekend and weekday days performing routine and generally disliked household chores. All the input data derive from the same source, allowing us to model all these equations simultaneously and thus capture correlations in unobservable factors affecting these demands. Of particular interest is the sensitivity of input demand to resource prices. These prices are captured by the regional price of maid service, regional electricity prices, and the opportunity costs of time for the partners. We use data from both France and the UK.

Our results are remarkably similar across countries, suggesting our findings may be representative for highly developed economies. The results indicate that the decision to purchase maid service is negatively related to the price of maid service and positively related to electricity prices, each partner's opportunity cost, and the availability of non-labor income. Both maid and electricity prices vary little from region to region resulting in some lack of precision. Women's wages have the strongest marginal effect, with a 10% increase in her wages associated with a 1

percentage point increase in the probability of hiring a maid in the UK and a 0.6 percentage point increase in France. The association with men's wages is less precisely measured and of a smaller magnitude, particularly in France. That the time freed by hiring a maid could alter the time devoted to activities other than household production, such as child care or gardening, is something we do not study in this paper but suggests that work expanding this analysis to incorporate other time uses would be worth exploring.

Each partner's opportunity cost of time is likewise highly positively associated with access to a dishwasher. In this case, the resource is more sensitive to men's than to women's value of time. Women's but not men's opportunity cost of time is significantly associated with household time inputs. In households where she has a higher opportunity cost, she reports less time on these housework tasks while he reports more, suggesting that higher wages may be associated with negotiation power or that women earning higher wages may choose partners who do more housework! That cohabiting women in France and women cohabiting with men who have more earnings power in the UK spend less time on housework is also suggestive that power may be important. Cross-sectional analysis does not allow us to distinguish between these alternatives, but the issue is certainly deserving of future work.

Earlier literature suggested a large impact of maids and appliances on female labor supply. While we find evidence in both countries that, all else equal, in households more likely to have maid service women report spending less time on housework on weekdays, we find a much more direct association between maid service and weekend time use. Where maid service costs more, both men and women report more time doing housework on weekends, as might be expected if maids are disproportionately likely to engage in housework tasks that can be put off or delayed. To the extent that maids provide a better substitute for weekend than weekday

housework, the impact of maid services on both men's and women's leisure time is likely to be more substantial than its impact on their labor supply.

REFERENCES

- AGUIAR, M. and HURST, E. (2005). Consumption versus Expenditure. *Journal of Political Economy*, 113, No 5, 919-948.
- CAVALCANTI, T. V. de V. and TAVARES, J. (2008). Assessing the 'Engines of Liberation':
 Home Appliances and Female Labour Force Participation. *The Review of Economics and Statistics*, 90, No. 1, 81-88.
- COEN-PIRANI, D., LEÓN, A. and LUGAUER, S. (2010). The Effect of Household Appliances on Female Labor Force Participation: Evidence from Microdata. *Labour Economics*, 17, 503-513.
- COHEN, P. N. (1998). Replacing Housework in the Service Economy: Gender, Class, and Race-Ethnicity in Service Spending. *Gender & Society*, 12, No. 2, 219-231.
- CORTÉS, P. and PAN, J. Y. (2009). Outsourcing Household Production: The Demand for Foreign Domestic Helpers and Native Labor Supply in Hong Kong. University of Chicago, mimeo.
- CORTÉS, P. and TESSADA, J. (2011). Low-skilled Immigration and the Labor Supply of Highly Skilled Women. *American Economic Journal: Applied Economics*, 3, No. 2, 88-123.
- FLIPO, A., FOUGERE, D. and OLIER, L. (2007). Is the Household Demand for In-Home Services Sensitive to Tax Reductions? The French Case. *Journal of Public Economics*, 91, 365-385.
- FRIEDBERG, L. and WEBB, A. (2007). The Chore Wars: Household Bargaining and Leisure Time. University of Virginia, mimeo.

- HAMERMESH, D. (2007). Time to Eat: Household Production under Increasing Income Inequality. *American Journal of Agricultural Economics*, 89, No. 4, 852-863.
- HERSCH, J. and STRATTON, L. S. (1994). Housework, Wages, and the Division of Housework Time for Employed Spouses. *The American Economic Review*, 84, No. 2, 120-125.
- HERSCH, J. and STRATTON, L. S. (1997). Housework, Fixed Effects, and Wages of Married Workers. *Journal of Human Resources*, 32, No. 2, 285-307.
- IPSOS-RSL and OFFICE FOR NATIONAL STATISTICS. (2003). United Kingdom Time Use Survey, 2000 [computer file]. 3rd Edition. Colchester, Essex: UK Data Archive [distributor], September. SN: 4504.
- JUSTER, F. T. (1985). The Validity and Quality of Time Use Estimates Obtained from Recall Diaries. In F. T. Juster and F. P. Stafford (eds.), <u>Time, Goods, and Well-Being</u>. Survey Research Center, Institute for Social Research, University of Michigan, Ann Arbor, Michigan, 63-91.
- KALENKOSKI, C. M., RIBAR, D. C., and STRATTON, L. S. (2011). How do Adolescents Spell Time Use? An Alternative Methodological Approach for Analyzing Time Diary Data. Research in Labor Economics, 33, 1-44.
- KIMMEL, J. and CONNELLY, R. (2007). Mothers' Time Choices: Caregiving, Leisure, Home Production, and Paid Work. *Journal of Human Resources*, 42, No. 3, 643-681.
- LUNDBERG, S. (1998). Labor Supply of Husbands and Wives: A Simultaneous Equations Approach. *Review of Economics and Statistics*, 70, No. 2, 224-235.
- PRESSER, H. B. (1994). Employment schedules among dual-earner spouses and the division of household labor by gender. *American Sociological Review*, 59, 348–364.

- ROODMAN, D. (2009). Estimating Fully Observed Recursive Mixed-Process Models with cmp. Working Papers 168, Center for Global Development.
- ROODMAN, D. (2007). CMP: Stata module to implement conditional (recursive) mixed process estimator. Statistical Software Components S456882, Boston College Department of Economics, revised 22 May 2009.
- STANCANELLI, E. and A. VAN SOEST (2012). Retirement and Home Production: A Regression Discontinuity approach, *American Economic Review*, Papers and Proceedings, 102, No. 33, 600-605.
- STRATTON, L. S. (2012). The Role of Preferences and Opportunity Costs in Determining the Time Allocated to Housework. *American Economic Review*, Papers and Proceedings, 102, No. 3, 606-611.
- STEWART, J. (2009). Tobit or Not Tobit. IZA Discussion Paper #4588.
- SUEN, W. (1994). Market-procured housework: The demand for domestic servants and female labor supply. *Labour Economics*, 1, No. 3-4, 289-302.

Figure 1: Preferences Regarding Housework Activities

By Country, Gender, and Activity Type

A. Great Britain





Figure 1: Continued

B. France





Table1: Inputs to Domestic Production By Country

	Unite	d Kingdor	<u>m</u>	France					
	Full	No		Full	No				
(time in minutes)	<u>Sample</u>	Maid	Maid	<u>Sample</u>	Maid	Maid			
His time on Weekdays	14.8	14.9	12.6	11.2	11.2	11.2			
His time on Weekends	25.5	24.8	35.3	21.9	21.6	25.3			
Her time on Weekdays	78.5	79.9	59.0	103.9	107.4	62.3			
Her time on Weekends	91.0	91.1	88.6	113.5	115.6	89.2			
Hire a Maid (Y/N)	6.6%	0.0%	100.0%	7.7%	0.0%	100.0%			
Have a Dishwasher (Y/N)	42.1%	39.4%	80.2%	56.6%	53.8%	90.2%			
Number of Observations	1295	1209	86	2924	2699	225			

Table 2: Summary Statistics

	Br	itish	French				
Variable	Mean	Std. Dev.	Mean	Std. Dev.			
Man's imputed log wage	1.95	0.23	4.08	0.32			
Woman's imputed log wage	1.65	0.25	3.84	0.32			
Maid's log median wage ^a	1.52	0.04	3.52	0.06			
Log of electricity cost per kwh	2.01	0.06					
Receives some non-labor income	0.27	0.44	0.16	0.37			
Lives in London/Paris	0.07	0.25	0.02	0.15			
Summer	0.25	0.43	0.12	0.33			
Cohabits	0.18	0.38	0.21	0.41			
Number of other persons age 17+	0.28	0.60	0.42	0.75			
Presence of child age 0-2	0.17	0.37	0.16	0.37			
Presence of child age 3-4 ^b	0.12	0.32	0.16	0.37			
Presence of child age 5-9 ^b	0.25	0.43	0.28	0.45			
Presence of child age 10-16	0.31	0.46	0.32	0.47			
Woman is minority	0.03	0.18	0.06	0.23			
Woman has a university degree	0.14	0.34	0.10	0.30			
Woman's age	38.92	9.57	39.3	8.90			
Man is minority	0.04	0.20	0.06	0.23			
Man has a university degree	0.14	0.34	0.12	0.33			
Man's age	40.92	9.53	41.65	8.93			
Observations	1295		2924				

Notice that prices are measured in the UK in £ and in France in Euros.

^a Reported maid's wages are gross of taxes and thus represent actual cost. UK wages are net.
 ^b The age ranges for children reported in the table are for the UK. In France we distinguish between children age 3-5 and children age 6-9 as children begin attending elementary school at age 6 in France and age 5 in the UK.

Table 3 Price Effects

Panel A: UK Results

	His		Her		Maid's log		Non-labor	
Explanatory variables	imputed		imputed		median		Income	
	log wage		log wage		wage		dummy	
Dependent variable	Coeffic.		Coeffic.		Coeffic.		Coeffic.	
Maid Service (Y/N)	1.0586	**	1.3172	* * *	-2.4595		0.2388	*
	(0.4287)		(0.4514)		(2.3851)		(0.1331)	
	[0.0845]		[0.1052]		[-0.1963]		[0.0191]	
Dishwasher (Y/N)	1.9081	***	0.4912	**	-0.0446		0.0560	
	(0.2767)		(0.2478)		(1.4453)		(0.0854)	
	[0.7570]		[0.1949]		[-0.0177]		[0.0222]	
His Housework Time								
On Weekdays	-2.1492		3.2241		-3.4898		3.2893	
	(5.7658)		(6.4685)		(28.4262)		(2.1541)	
On Weekends	-7.4829		21.5920	* * *	108.2303	**	1.7715	
	(8.7900)		(8.2605)		(47.9785)		(3.1076)	
Her Housework Time								
On Weekdays	-11.1301		-30.0979	**	-13.2681		1.1082	
	(13.8940)		(15.2429)		(79.4209)		(5.0913)	
On Weekends	-25.4533		7.8362		96.1676		2.7097	
	(15.9750)		(14.3591)		(83.8524)		(5.3491)	

Panel B: French Results

Explanatory variables Dependent variable Maid Service (Y/N)	His imputed log wage <u>Coeffic.</u> 0.5230 (0.2657) [0.0262]	**	Her imputed log wage <u>Coeffic.</u> 1.2644 (0.2235) [0.0632]	***	Maid's log median wage <u>Coeffic.</u> -2.0090 (1.5023) [-0.1004]		Non-labor Income dummy <u>Coeffic.</u> 0.3958 (0.0976) [0.0198]	***
Dishwasher (Y/N)	1.0504 (0.1957)	***	0.8099 (0.1329)	***	-2.3024 (0.9289)	**	0.4177 (0.0793)	***
His Housework Time On Weekdays	-1.8379 (3.7490)		[0.3001] 7.0443 (2.8753)	**	[-0.8700] 1.8407 (21.3736)		0.4241 (1.8415)	
On Weekends	-1.0203 (9.8166)		20.9187 (6.8564)	***	97.1586 (60.9713)		-1.8433 (4.9848)	
On Weekdays	23.0708 (12.0264)	*	-73.1494 (8.0778)	***	-61.0661 (71.5604)		-2.7809 (4.1093)	
On Weekends	3.4796 (19.3589)		-37.0082 (15.1355)	**	74.5009 (107.0462)		-21.0213 (8.4429)	**

Standard errors in parentheses. Marginal effect in brackets.

Asterisks indicate statistical significance for 2-tailed tests: *** 1%, ** 5%, * 10%.

Also included in the specification are dummy variables to identify those living in London (Paris), those cohabiting, the presence of children of various ages, individuals who are in poor health, and a summer interview; a continuous measure of the number of other adults in the household; and the age, university degree status, and minority status for each partner.

Marginal effects are calculated for married couples with sample mean opportunity costs, sample mean maid and electricity log prices, who are of approximately sample mean age, and have a teenager. All other covariates are zero.

Table 4 Correlations

Panel A: UK				His I	House	Her Housework Time				
	Maid Service	Dishwasher		On Weekdays		On Weekends		On Weekdays		
Dishwasher (Y/N)	0.3477 ***	k								
	(0.0731)									
His Housework Time										
On Weekdays	-0.0810	-0.0988	***							
	(0.0735)	(0.0380)								
On Weekends	0.0483	-0.0458		0.2422	***					
	(0.0510)	(0.0375)		(0.0348)						
Her Housework Time										
On Weekdays	-0.1652 ***	* -0.0445		-0.1393	***	-0.0845	***			
	(0.0559)	(0.0403)		(0.0212)		(0.0253)				
On Weekends	0.0037	0.0235		-0.0593	**	0.0093		0.1241 *	**	
	(0.0558)	(0.0352)		(0.0250)		(0.0387)		(0.0286)		
Panel B: France				His I	House	work Time				
	Maid Service	Dishwasher		On Weekday	<u>/S</u>	On Weekends	<u>s</u>			
Dishwasher (Y/N)	0.3280 ***	k								
	(0.0586)									
His Housework Time										
On Weekdays	-0.0599	-0.1147	***							
	(0.0604)	(0.0309)								
On Weekends	-0.0158	-0.0017								
	(0.0881)	(0.0492)								
Her Housework Time										
On Weekdays	-0.2285 ***	* -0.1353	***	-0.0456	**					
	(0.0576)	(0.0280)		(0.0217)						
On Weekends	-0.1122	-0.0579				0.0922	**			
	(0.0926)	(0.0491)				(0.0389)				

Appendix Table A1: Othe	er Covariates for	Home Produ	uction	Inputs						
United Kingdom										
				His Hou	sework Time		Her H	Iouse	work Time	
Dependent variables:	Maid Service	Dishwash	ner	On Weekday	s On Weeke	nds	On Weekd	ays	On Weeke	nds
Explanatory Variables	Coeffic.	Coeffic.		Coeffic.	Coeffic.		Coeffic.		Coeffic.	
Log of electricity price	0.285	-0.178		-21.062	-13.967		32.378		-58.988	
	(1.235)	(0.745)		(16.013)	(23.996)		(37.816)		(43.741)	
Lives in London	0.187	-0.190		1.976	-17.852	**	4.615		-16.935	
	(0.368)	(0.226)		(4.969)	(7.098)		(13.291)		(14.827)	
Cohabits	-0.304	-0.286	**	0.616	-1.676		-9.803	*	-2.877	
	(0.204)	(0.124)		(2.638)	(3.340)		(5.149)		(6.364)	
Number of persons age 17+	0.076	-0.021		-1.378	1.434		9.672	**	1.678	
	(0.109)	(0.065)		(1.554)	(2.171)		(4.094)		(4.629)	
Presence of child age 0-2	0.167	0.114		3.358	2.661		28.887	***	4.448	
	(0.198)	(0.109)		(2.455)	(3.213)		(5.828)		(6.100)	
Presence of child age 3-5	0.167	0.289	**	0.324	2.503		27.214	***	8.269	
	(0.199)	(0.113)		(2.986)	(4.098)		(6.575)		(7.484)	
Presence of child age 6-9	-0.141	-0.123		2.671	4.175		19.245	***	11.781	*
	(0.155)	(0.105)		(2.277)	(3.160)		(5.372)		(6.016)	
Presence of child age 10-16	-0.083	0.026		0.311	3.593		11.956	**	20.148	***
	(0.135)	(0.082)		(2.085)	(2.956)		(5.017)		(5.584)	
Summer	-0.107	-0.162	*	-1.147	-2.869		0.168		-0.531	
	(0.147)	(0.093)		(1.928)	(2.839)		(4.868)		(5.138)	
Woman's age	0.009	0.022	**	-0.015	-0.080		1.566	***	0.829	
	(0.016)	(0.010)		(0.201)	(0.262)		(0.469)		(0.530)	
Woman has a university degree	0.104	-0.065		-4.308	-4.657		-6.272		-19.620	**
	(0.213)	(0.140)		(3.461)	(5.290)		(8.340)		(8.634)	
Woman is minority	0.472	-0.044		-3.048	-13.033		9.573		-14.461	
	(0.392)	(0.284)		(6.120)	(9.821)		(12.112)		(22.729)	
Man's age	0.003	0.005		0.165	0.036		0.005		0.434	
	(0.016)	(0.009)		(0.207)	(0.296)		(0.472)		(0.513)	
Man has a university degree	-0.279	-0.293	**	2.757	10.310	*	-3.908		1.255	
	(0.183)	(0.142)		(3.372)	(5.417)		(7.341)		(8.808)	
Man is minority	-0.678 **	0.080		-1.094	3.020		-12.026		30.957	
-	(0.342)	(0.286)		(6.866)	(10.211)		(10.882)		(19.561)	
Constant	-3.240	-5.297	*	53.632	-131.948		27.146		41.652	
	(5.126)	(3.170)		(54.734)	(104.177)		(170.843)		(173.336)	
Standard errors in parentheses.										
Asterisks indicate significance usi	ing a 2-tailed test: **	* 1% ** 5% *	10%							

Appendix Table A2: Othe	er Covaria	tes for	Home Prod	uction	Inputs								
France													
					His Housework Time				Her Housework Time				
Dependent variables:	Maid Ser	vice	Dishwash	her	On Weekd	ays	On Weeke	nds	On Weekd	On Weekends			
Explanatory Variables	Coeffic.		Coeffic.		Coeffic.		Coeffic.		Coeffic.		Coeffic.		
Lives in Paris	0.194		0.000		-2.378		-23.735	***	-8.867		-26.350		
	(0.222)		(0.219)		(3.539)		(8.810)		(11.302)		(16.740)		
Cohabits	0.062		-0.386	***	5.167	***	1.873		-10.256	**	-14.525	*	
	(0.117)		(0.076)		(1.798)		(4.359)		(4.631)		(7.600)		
Number of persons age 17+	0.020		0.036		-1.420	*	-2.748		8.411	***	3.879		
	(0.067)		(0.039)		(0.845)		(2.353)		(3.177)		(4.612)		
Presence of child age 0-2	0.251	*	0.098		-0.931		1.324		8.314	*	1.155		
	(0.152)		(0.079)		(1.795)		(4.721)		(4.597)		(8.495)		
Presence of child age 3-5	0.257	**	0.094		-0.319		2.731		10.312	**	6.513		
	(0.114)		(0.065)		(1.873)		(4.051)		(4.718)		(9.026)		
Presence of child age 6-9	0.294	***	0.179	***	0.772		3.632		12.810	***	11.227		
	(0.091)		(0.061)		(1.366)		(3.554)		(4.172)		(7.217)		
Presence of child age 10-16	0.009		0.163	***	-1.135		-3.463		16.794	***	3.110		
	(0.085)		(0.058)		(1.404)		(3.545)		(4.198)		(6.984)		
Summer	0.027		0.038		2.202		0.540		-3.862		-11.066		
	(0.138)		(0.079)		(2.095)		(4.277)		(5.142)		(9.274)		
Woman's age	-0.010		0.022	***	-0.067		-0.656		1.215	***	1.227		
	(0.013)		(0.007)		(0.171)		(0.444)		(0.450)		(0.828)		
Woman has a university degree	-0.045		-0.338	***	0.763		-6.163		6.504		9.199		
	(0.177)		(0.125)		(3.364)		(7.717)		(7.257)		(13.157)		
Woman is minority	-0.094		-0.114		-1.536		-4.347		-1.338		-30.785	**	
2	(0.290)		(0.159)		(4.266)		(9.628)		(11.246)		(15.523)		
Man's age	0.021	*	-0.007		0.044		0.327		-0.043		-0.100		
	(0.013)		(0.007)		(0.171)		(0.411)		(0.460)		(0.819)		
Man has a university degree	0.262		-0.338	**	-0.011		-0.127		-12.596		1.876		
	(0.181)		(0.147)		(3.490)		(7.520)		(8,655)		(14.429)		
Man is minority	-0.407		-0.492	***	-1.046		-0.727		11.833		14.154		
	(0.306)		(0.156)		(4.363)		(9.714)		(9,905)		(12.909)		
Constant	-2.157		0.488		-13.083		-381.449	*	435,338	*	-73.022		
	(5.132)		(3.171)		(74,416)		(207.135)		(245.610)		(377.287)		
	(3.132)		(5.171)		(,		(2071155)		(210.010)		(277.207)		
Standard errors in parentheses.													
Asterisks indicate significance usi	ing a 2-tailed	test: *	** 1%. ** 5%. *	10%.									

Footnotes

¹ Another appliance associated with these tasks would be a clothes washer. While roughly fifty percent of our sample reported having a dishwasher, almost all reported having a washing machine. Hence we model only the presence of a dishwasher.

² The terms husband and wife are used here for convenience. Our sample includes both married and cohabiting couples.

³ An 'exceptional day' in France is defined to include vacation days, special holidays, special occasions (like weddings or funerals), sick days, and the like. Similar information is not available for the UKTUS, however we were able to exclude holidays and days during which the respondent was likely sick – as judged by reporting more than thirty minutes in bed sick or twenty or more hours sick or sleeping.

⁴ Juster (1985) finds that diaries including very few distinct activities are unreliable.

⁵ Diaries are missing for a larger percentage of the UK than the French sample. Sample characteristics for those with complete and incomplete diaries are substantially the same. About half of the sample size differential is attributable to the fact we require four complete diaries in the UK but only two in France. Estimates obtained using the 1450 UK households providing at least two complete diaries are substantially the same as those reported below, suggesting this restriction does not significantly affect our results.

⁶ Some individuals fail to provide information on preferences. About 13% of the men and 3% of the women in the British sample did not answer the questions. In both countries, information on preferences was only collected from individuals who reported performing the activity. The fraction of individuals reporting not engaging in an activity varies considerably by activity, gender, and country. Less than 3% of women in France or the UK reported not preparing a meal,

not food shopping, or not cleaning the house. This compares with about 10% of men in the UK and up to 63% of men in France (for cleaning). For ease of exposition, we suppress information on those persons not reporting preferences in the descriptive statistics presented.

⁷ This evidence suggests that process benefits will not be important in determining the time devoted to these housework tasks. See Stratton (2012) for an analysis of housework time that includes such preferences, assuming they are exogenous.

⁸ Laundry services can also be purchased outside of the home but evidence suggests this is rare. The French time use survey collects information on the frequency with which dry-cleaning services and laundry services are used. Dry cleaning is purchased very infrequently by French households: 56% of households report having used dry cleaning services within the past year, but only 2% of those using some dry cleaning services do so weekly. As regards other laundry services, only about 9% of the French sample reports having used such services in the past year, and only 1% of those do so weekly; suggesting that use of a launderette is rare and perhaps limited to vacation use. Expenditure survey data from the UK indicate that only 2% of couple households there used laundry services within the last 2 weeks – again a fraction so low that these could be vacationers. A higher percent (5.7%) report having used dry cleaning services, but no information on either dry cleaning or laundry services was collected in the UKTUS so we are unable to include these services in the analysis that follows.

⁹ This does not include child-care services (which respondents are asked about in a separate set of questions). It includes only domestic tasks (*taches menageres*, in French).

¹⁰ We ignore paid help from family members.

¹¹ In particular, Flipo, Fougere, and Olier (2007) examine the impact of a French policy allowing tax payers to deduct part of the cost of maid services from their tax bill. They conclude that only

a few very rich households benefited from the policy. Moreover, the income tax system in France is such that there is a considerable time lag (one year or more) between purchasing maid's services and receiving the tax discount. There is no evidence that this policy affected the price of maids.

¹² Expenditure surveys in both countries confirm these figures.

¹³ The measures of earnings used here are net of income taxes and contributions for the UK sample and gross of income taxes but net of social security contributions for the French data. This is reasonable, since in the UK income taxes are levied at the source while in France they are levied later on, implying that British individuals are likely to report more precisely net than gross earnings, and vice-versa for the French. Upper and lower cutoffs on the hourly pay measures that excluded approximately 1% of the samples were imposed to reduce measurement error.
¹⁴ The variables used to identify participation are jointly significant at the 5% level in both countries for both men and women in the selection equations, thus the selection equations are identified. Excluding these variables from the wage equations generally makes sense theoretically as employers should not set wages as a function of household or partner characteristics. Empirically these exclusion restrictions do not hold. Alternative specifications that pass both tests for both exclusion and identification were estimated. Results using these alternative price measures yielded substantially the same results.

¹⁵ Different measures of the wages of domestic industry workers were explored, combining answers to different questions on industrial classification and the type of job performed, but they yielded substantially the same results.

¹⁶ Results using the pay of "domestic staff and related occupations" were substantially similar.
Alternative measures obtained for "cleaners, domestics" from the British Labour Force Survey

were explored, but the sample size off which these values were based was very low and the variance of the resulting estimates quite high.

¹⁷ Of course one could always sell the appliance, but we have no information on the age or value of the appliance that we could exploit to take this value into account.