Gender effect on housework allocation: Evidence from Spanish two-earner couples

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Abstract. In this paper we study the reasons behind the asymmetric distribution of housework within Spanish two-earner couples. Spouses' housework times are estimated jointly in a bivariate framework using data from the 1991 Work Situation and Time Use Survey. In order to understand the impact of gender-specific factors on the observed allocation of housework, we perform estimations that are in line with the Oaxaca decomposition. Our results suggest that the unequal division of domestic work between wives and husbands in our sample is mainly explained by gender-specific effects rather than by differences in their observable characteristics.

1. Introduction

Opinion polls show a clear egalitarian trend in attitudes towards gender division of labor: attitudes about women's rights to a career or over the division of housework in two-earner couples have moved significantly in this direction during the past 25 years (Costa 2000; Blau 1999; Bittman and Matheson 1996;

Benin and Agostinelli 1988). However, facts highlight that couples' behavior is much less egalitarian and has changed much less than attitudes. Time-use surveys reveal that, in most developed countries, working wives do about two thirds of the total housework and that women specialize in the most physically demanding domestic activities (see, among others, Juster and Stafford 1991; Hersch 2000; van der Lippen and Sieger 1994; Bittman and Matheson 1996).

In Spain, the sweeping socio-economic changes that have taken place since the end of the dictatorship in 1975 have had marked effects on family life. During this period, the percentage of women with higher education has risen steadily and the female rate of labor force participation has doubled; women postpone marriage and motherhood due to entry to the labor market, and remain in the market after marriage or motherhood (Alba 2000; Carrasco and Rodriguez 2000). Despite these changes, Spanish behavior with regard to family roles continues to be rather traditional. In particular, according to the Work Situation and Time Use Survey (*Encuesta de Situación en el Trabajo y Uso del Tiempo*) carried out by the Spanish Institute for Women's Affairs in 1991, women do almost all the housework in nearly 75% of two-earner households. Clearly, any movement towards a more egalitarian distribution of unpaid work is expected to have a positive impact on women's living standards as well as on their labor outcomes (Blau et al. 1998). But to implement equalizing policies it is crucial to analyze the sources of the differences between men's and women's behavior.

Theoretical models offer a variety of explanations for asymmetric division of housework between spouses. The main arguments concern the relative efficiency of spouses at performing various tasks (Becker 1991) or the bargaining theories claiming that women's lower earnings lead to less power to get their own way at home (McElroy and Horney 1981; Lundberg and Pollak 1993; Mahoney 1995). Empirical studies, however, show that these models, and economic variables in general, explain only a small share of the asymmetry in housework shares. This gives rise to the idea that an important part of the division of labor still depends on gender-specific effects (Juster and Stafford 1991; Bittman et al. 2001).

In this paper we have investigated to what extent unequal housework shares in Spanish two-earner couples are explained by differences in observable characteristics (e.g. labor earnings or educational attainments) and to what extent by gender-specific effects. Our contribution is twofold. Firstly, this study adds new empirical evidence to the literature dealing with housework allocation in Spain. Secondly, econometric approaches usually focus on modelling either the conditional expectations of spouses' housework times or their housework shares. In this paper, however, we model the whole housework time probability distribution through a bivariate count data process. This specification accounts for the interdependence of the spouses' decisions, something that has been widely claimed by theoretical models. Considering this interdependence may increase the efficiency of the estimated parameters. Furthermore, the approach offers the possibility of evaluating the effect of explanatory variables on every point of the bivariate housework distribution, which may broaden understanding of the time allocation process.

In order to measure the impact of gender-specific factors on housework time allocation, we perform estimations in line with the Oaxaca-Blinder decomposition. We distinguish two sources of asymmetry in housework allocation: one due to spouses' differences in observable characteristics (education,

labor market conditions, etc.) and another related to the different weights assigned to these characteristics in their housework time structures. The difference between wives' and husbands' *weights* quantifies the effect of gender-based roles at home in terms of housework division.

We find, using data from the 1991 Spanish Work Situation and Time Use Survey, that the effect of gender prevails over economic variables in the explanation of asymmetric housework allocation within two-earner couples in Spain. In particular, we find that equalizing the observable characteristics of spouses increases the probability of an egalitarian allocation of housework by a mere 7%, with respect to the actual situation. However, equalizing male and female *weights* of these characteristics in the allocation decision process leads to an increase of 93% in the probability of achieving an egalitarian share of domestic work between spouses. We interpret this result as evidence of gender-based division of domestic work.

The rest of the paper is organized as follows. In Sect. 2, we discuss the sample selection and we briefly describe the data. In Sect. 3, we present the estimation of the bivariate probability model and comment on the main results. Section 4 analyzes the sources of differences on male and female housework times. In Sect. 5, we conclude.

2. Data description

The data used in this paper were obtained from the 1991 Work Situation and Time Use Survey (WSTUS), carried out by the Spanish Institute for Women's Affairs (a section of the Ministry of Labor and Social Affairs). The original aim of this survey was to compare male and female performances in paid and unpaid activities. To reduce unobserved heterogeneity as much as possible the sample was restricted to sectors and occupations in which men and women had similar participation rates. Information was collected among wage-earners from six regions: Andalusia, Catalonia, Galicia, Madrid, Basque Country and Valencia. Interviews were carried out at the workplace and the total sample size of the survey was 2,054 employees (1,049 women and 1,005 men). The WSTUS collected information on the personal situation and job conditions of the interviewed workers, on the distribution of time between paid and unpaid work, and in the case of married or cohabiting workers, on educational attainment, work status and time use of the interviewee's partner.

The variables of interest are the number of hours spent on housework daily by each spouse, which were obtained as the response to the question: "*About how many hours do you spend on housework in an average day? And how many does your partner spend*?" It was made clear to the interviewee that this question did not refer to time spent on child care. Although the WSTUS does include a specific question on this time use, we have not considered it in our analysis because we are interested in time spent on essentially unattractive domestic tasks.

In order to compare spouses in similar conditions, and to minimize reported housework time inconsistencies that may arise from the tendency of any task to fill the amount of time available, we restricted the analysis to couples in which both members are in paid labor (see Hersch and Stratton 1994 for a similar sample selection). Hence, our sample was of 559 working

Table 1. Hours of housework per day, and husbands' share (means, with standard deviations in parentheses) in the 1991 WSTUS data

| Sample	Wives	Husbands	Husband's share	No. of couples
Whole sample	4.543	1.259	0.229	782
	(3.341)	(1.552)	(0.221)	
Working husband and non-working wife	7.863	0.863	0.110	198
	(4.051)	(1.483)	(0.181)	
Working wife and non-working husband	3.760	1.920	0.326	25
	(1.786)	(1.631)	(0.247)	
Both spouses working	3.402	1.370	0.267	559
	(2.110)	(1.547)	(0.218)	

couples, one member responding to all the survey questions used in our analysis.

Table 1 summarizes means and standard deviations of housework times (in daily hours) for the couples in our sample. For the sake of comparison, the table also includes analogous data for single-earner couples and for the whole group of 782 couples. This table shows a clear uneven distribution of housework hours between spouses. Overall, husbands average about 1.2 h housework per day while wives average 4.5 h. Controlling for employment status mitigates these differences, but does not remove them completely. When both spouses are employed, men average around 1.4 h/day, while their wives average 3.4 h. These results are similar to those observed in other countries, such as France where husbands devote 2 h as opposed to wives' 4 h (Dominique et al. 2001) or the USA, where husbands spend 1 h/day on housework and wives 3 h (Blau 1999).

A limitation of our data is that information for each couple was obtained from only one member of each couple in our sample, which may aggravate the usual problem of mis-reporting of housework times (Hersch and Stratton 1994; Roe 1996; Alberdi 1999). This problem is shown, for example, by the proportion of husbands reportedly devoting zero hours to housework being about 25% among responding husbands and nearly 40% for the husbands of responding wives (Fig. 1a, b). By contrast, the reported housework times of wives were not significantly affected by the identity of the respondent. In order to take mis-reporting into account, our econometric model includes a dummy variable which indicates whether the information was reported by the spouse or was self-reported.

Table 2 lists the sample means and standard deviations of explanatory variables selected in the light of relevant theoretical and empirical literature. For each continuous explanatory variable we show its correlation with male and female housework times. Additionally, we present the mean male and mean female housework times for each category of the discrete variables.

According to economic models, market wage should affect the intra-household time allocation process by determining the opportunity cost of housework time and/or the spouses' bargaining power in the home (see Bittman et al. 2001 for a review of these perspectives from the point of view of the allocation of household work). Any of these perspectives predicts that each spouse's wage will negatively affect his/her housework time whether wage and
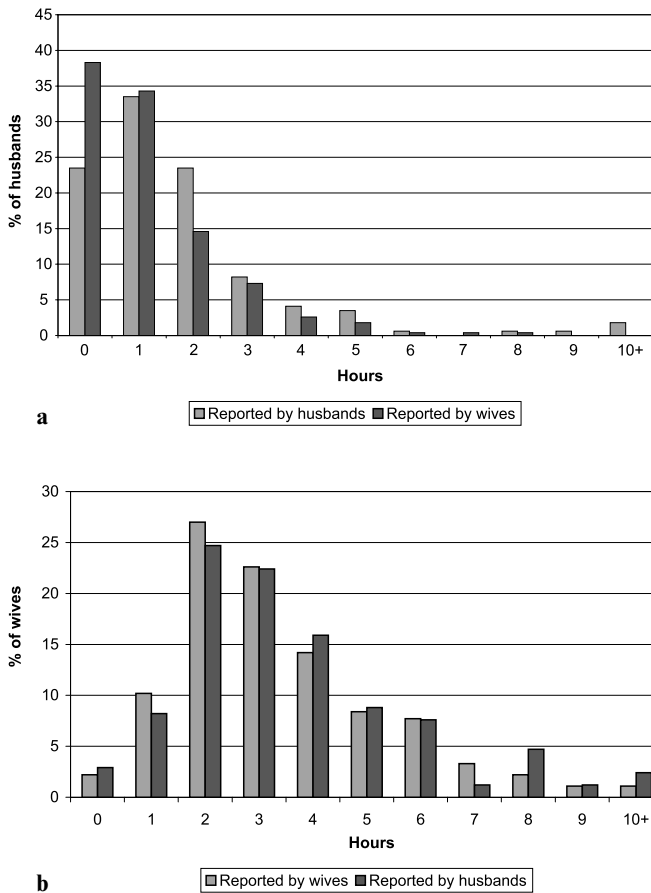
Fig. 1a. Husbands' housework hours. **b** Wives' housework hours

housework are measured absolutely or relative to the other partner. To account for this effect, the model includes the share of labor earnings contributed by each spouse. We expect a negative effect of one's share of labor earnings on time devoted to housework, especially in the case of women, given their traditional situation as secondary earners in Spanish households. In our sample, women contribute an average of 42% of couples' combined labor earnings.

It is commonly accepted that schooling and age (through experience) raise marginal productivity in both paid and unpaid activities and also influence the perception of gender roles. These notions are compatible with the prediction that young and highly-educated couples are more likely to exhibit egalitarian gender-role orientations at home and, consequently, an egalitarian division of housework. On the contrary, conservative values that support traditional gender-role division are expected to arise among older people with a lower educational level. In our sample the possession of a university degree reduces the wife's housework time by about one hour, however the husband's housework time is not significantly affected by either his own or his spouse's educational

Table 2. Descriptive statistics of explanatory variables

	Mean	Std	Wife's housework	Husband's housework
			Correlation	
Weekly paid work hours (wife)	38.13	8.46	−0.09	−0.00
Weekly paid work hours (husband)	41.24	8.72	0.02	−0.11
Wife's share of labor earnings	0.42	0.11	−0.12	−0.07
Respondent's age	37.8	8.08	0.07	−0.04
			Mean	
Age group in 1975				
Age less than 20 years	0.53	0.49	3.32	1.45
Age more than 20 years	0.47	0.49	3.50	1.28
Children				
No children	0.27	0.46	2.89	1.42
0–3 years	0.25	0.48	3.50	1.00
4–14 years	0.31	0.57	3.71	1.82
>=15 years	0.47	0.96	4.01	1.45
Educational level				
Primary (wife)	0.37	0.48	3.94	1.26
University (wife)	0.35	0.48	2.84	1.36
Primary (husband)	0.33	0.47	3.96	1.30
University (husband)	0.35	0.47	3.05	1.41
Household help				
Yes	0.42	0.49	2.97	1.10
No	0.58	0.49	3.72	1.56
Region				
South	0.08	0.28	3.02	1.59
Other	0.92	0.28	3.44	1.35
Respondent				
Wife	0.60	0.49	3.36	1.17
Husband	0.40	0.49	3.48	1.67

level. Similarly, we observe a positive correlation between the interviewee's age (considered as a proxy for the couple's ages) and the wife's housework time and a negative correlation between the interviewee' age and the husband's housework time. A dummy variable for the cohort of couples aged less than 20 years in 1975 is also included in the model to reflect the effect of the change in social norms affecting family life since the end of the dictatorship.

Although the WSTUS question on housework explicitly excluded time spent on child care, it is unlikely that respondents' reported housework times are the result of deducting from their total housework time, the time spent on work created by children, such as extra laundering, cooking and cleaning. To investigate the effect of the presence of children we consider three variables indicating the number of children in three age groups: less than 3 years, between 4 and 14 years and 15 years or over.

Finally, since external household help (hired or provided by relatives) can substitute the time each spouse spends on domestic work, a dummy variable for this situation has been included. Also, differences in housework times between couples living in the South of Spain and the rest of the country are reflected by a variable distinguishing these two broad geographical areas. Re-

gional differences in couples' performance at home should be understood in the context of more general economic, sociological, cultural and environmental characteristics between the South of Spain and the rest of the regions in which interviews were carried out.

To avoid possible endogeneity problems we do not include time spent by spouses in paid employment as an explanatory variable. Therefore, our specification may be interpreted as a reduced form of a structural model in which both spouses' market times and spouses' housework times are determined simultaneously. To give the reader an idea of the composition of our sample, Table 2 reports mean values and standard deviations of these variables. A closer look at the distribution of spouses' working times shows that 94% of men and 84% of women considered in this analysis devote 35 or more hours per week to paid work.

3. Econometric model

3.1. A bivariate model

Let the data observed for household i be $\{h_{wi}, h_{hi}, x_{wi}, x_{hi}\}$, $i = 1, \ldots N$, where $h_{ji} = 0, 1, 2, \ldots$, $j = w, h$, denote the number of hours spent on housework by the wife and the husband, respectively, and x_{ji} is a $(k_j \times 1)$ vector of explanatory variables, including the intercept. The variables h_w and h_h can be described in terms of count data processes, given that they take non-negative integer values. If, as theoretical models suggest, the number of hours devoted by the wife and the husband to housework are jointly determined, a bivariate count data process would be needed to characterize the couple's time allocation process. To test for this possibility, we implemented the independence test[1] proposed by Cameron and Trivedi (1993). The p-values are all below a significance level of 10% which constitutes enough evidence against the hypothesis of zero interdependence between h_w and h_h. Thus estimation of bivariate models seems accurate in this context.

To model the bivariate probability distribution of male and female housework times, we follow the specifications developed by Arbous and Kerrich (1951) and Marshall and Olkin (1990). Consider that the dependent count variables are Poisson distributed, with respective parameters $\tilde{\lambda}_{ji} = \lambda_{ji} u_i$, $j = w, h$ where u_i denotes the unobserved heterogeneity component that generalizes the Poisson distribution to allow for overdispersion. Assuming u_i is gamma distributed with shape parameter α and scale parameter $\tau = 1$, it can be shown that the mixture bivariate density has negative binomial marginal distributions and a joint distribution given by

$$\Pr(h_{wi}, h_{hi} \mid \lambda_{wi}, \lambda_{hi}, \alpha) = \frac{\Gamma(h_{wi} + h_{hi} + \alpha)}{h_{wi}! h_{hi}! \Gamma(\alpha)} \left(\frac{\lambda_{wi}}{\lambda_{wi} + \lambda_{hi} + 1}\right)^{h_{wi}} \left(\frac{\lambda_{hi}}{\lambda_{wi} + \lambda_{hi} + 1}\right)^{h_{hi}}$$

$$\times \left(\frac{1}{\lambda_{wi} + \lambda_{hi} + 1}\right)^{\alpha}$$

Our parametrization of this model follows what is usual in empirical literature by assuming $\lambda_{ji} = \exp(x'_{ji} \beta_j)$, with $j = w, h$ and $i = 1, \ldots, n$, where β_j is a

Table 3. Bivariate negative binomial estimates

Variable	Husband		Wife	
	Coefficient	Standard error	Coefficient	Standard error
Const.	−1.662	0.559	−1.157	0.371
Respondent's age $\times 10^{-1}$	−0.038	0.137	−0.014	0.059
Age group in 1975 (<20 years)	0.042	0.200	−0.026	0.085
Number of children				
0–3 years	0.121	0.095	0.168	0.056
4–14 years	0.135	0.125	0.087	0.070
>=15 years	0.099	0.053	0.121	0.032
Educational level				
university	0.148	0.128	−0.232	0.058
Spouse's educational level				
primary	−0.167	0.127	0.138	0.062
university	−0.109	0.125	0.067	0.065
Household help	−0.389	0.113	−0.220	0.054
Share of labor earnings	−0.443	0.427	−0.391	0.227
Residence in the South (Andalusia)	0.165	0.159	−0.256	0.089
Anwered by spouse	−0.289	0.096	0.055	0.051
α	13.095	3.742		
log-likelihood		−1976.58		

$(k_j \times 1)$ vector of unknown coefficients. Estimation of parameters is carried out by maximum likelihood.

3.2. Coefficient estimates

In Table 3, we present the coefficient estimates and standard errors of the bivariate negative binomial model. Overall, the signs and significance of coefficients are consistent with those found in other studies showing that women's housework times are more responsive to changes in explanatory variables than men's, which highlights the lack of symmetry between male and female housework structures.

Discussing particular estimates we observe, firstly, the effect of educational attainments on the time spent on domestic activities. Having a university degree decreases the wife's housework hours but does not significantly alter the husband's contribution. As for the effect of the partner's education, estimations show that women whose husbands have low educational attainments devote, on average, more hours to housework than women married to highly educated men. As a contrast, husbands' time devoted to domestic tasks does not depend significantly on their spouses' education. So it would appear that the more egalitarian housework distribution observed among couples with higher education is mainly due to a reduction in the wives' housework times rather than an increase in the husbands' contribution.

We also find that neither the couple's age nor the cohort dummy for couples aged less than 20 in 1975 is significant, showing that gender roles in housework sharing have not been influenced by generational change as such.

The presence of children aged less than 3 years or more than 15 years sig-

nificantly increases women's housework time but, in keeping with the results of other studies (e.g. Kooreman and Kapteyn 1987; Dominique et al. 2001), children do not significantly affect men's housework time. This suggests that domestic tasks, other than specific child care, that are generated by children are taken on by wives. In other words, the presence of children at home contributes to widen the gap between male and female housework times.

We find a negative and significant relationship (at a 10% significance level) between the share of the wife's labor earnings and the time she devotes to household work. However, the husband's housework hours are not affected significantly by changes in the proportion he contributes to the couple's earnings. Since we do not control for spouses' hours of paid work, the negative effect of the wife's share of labor earnings on her own housework hours contains bargaining and efficiency effects (Bittman et al. 2001). The efficiency-related component acts when the wife does a high number of housework hours because of doing less market work.

Domestic help (hired or provided by relatives) reduces both men's and women's housework times, but its effect is about 1.8 times higher for men than for women. Finally, residing in the South of the Spain does not have a significant effect on men's housework time, but it leads to significant reductions in their wives' housework time. Although explaining regional differences is complex, this finding may reflect the greater emphasis on out-of-home activities in the South (favored by its climate), which most probably increases the opportunity cost of home activities.

3.3. Effects of explanatory variables on housework hours allocation

For a greater insight into the effects of the explanatory variables on the allocation process of housework time, we carry out a prediction exercise based on the model estimates presented in Table 3. The exercise consists in predicting the probabilities of housework

a) being shared in an egalitarian manner (defined as the situation in which $h_w = h_h \pm 1$),
b) being performed mainly by the wife ($h_w > h_h + 1$), and
c) being performed mainly by the husband ($h_w < h_h - 1$).

These probabilities are computed for a reference couple and for other couples in which some characteristics are modified. Specifically, we consider a reference couple in which both spouses have primary education, the average mean ages and earnings, with no children, without household help, not residing in the South and self-reporting information. This basic configuration is altered by

 i) the wife having a university degree;
 ii) both spouses having university degrees;
 iii) the presence of one pre-school child; or
 iv) the presence of household help.

Table 4 displays predicted probabilities of situations a), b) and c) for these five couples.

Table 4. Effects of explanatory variables on the bivariate distribution of housework times

Predicted probabilities

Housework sharing regime	Reference couple	Change in the explanatory variables with respect to reference couple			
		Wife university degree	Wife and husband university degree	One pre-school child	Household help
$h^w = h^h \pm 1$	0.336	0.452	0.496	0.275	0.387
$h^w > h^h + 1$	0.629	0.481	0.401	0.695	0.587
$h^w < h^h - 1$	0.035	0.067	0.103	0.030	0.026

Note: Reference couple: without children, with primary education, without household help, not living in the South and self reporting information. Age and earnings fixed at their means.

The results of this exercise emphasize once more the relevance of the spouses' education in the achievement of egalitarian housework sharing. If the wife has a university degree, the probability of an equal share increases by 11 percentage points with respect to the reference couple, while the probability of the wife doing most of the domestic work decreases by 15 percentage points. These changes are of about 16 percentage points and 23 percentage points, respectively, when both spouses have university degrees. By contrast, a couple with a pre-school child has a 6 percentage points lower probability of egalitarian housework sharing than the reference couple. The presence of a pre-school child also increases the probability of the wife bearing the brunt by 6.6 percentage points. Finally, having household help increases the probability of egalitarian housework allocation by 5 percentage points, reducing the probability of the wife bearing most of housework by 4 percentage points and that of the husband doing most of housework by 1 percentage points.

To analyze the marginal effect of labor earnings, in Fig. 2 we plot the predicted probabilities of housework sharing regimes a), b) and c) across the range of the wife's share of labor earnings. We reproduce this graph for the reference couple and for couples with characteristics ii), iii) and iv), described in the previous paragraph.

These plots show that the probability of an egalitarian share of domestic work increases with the wife's share of labor earnings. Nevertheless, this trend towards equality is mainly due to the reduction of the wife's housework share rather than to an increase in the husband's. According to Bittman et al. (2001) these results are consistent with the idea that women use bargaining power to reduce their own housework but not to increase men's, either because they do not try it or because they face husbands' resistance to changing their roles towards more "feminine" tasks. Since the bivariate model does not include interactions between the share of earnings and other explanatory variables, then we have that spouses' education, the presence of pre-school children and household help affect the level but not the shape of the relationship between the share and the probabilities predicted in Fig. 2.

4. Gender effect on housework allocation

This section focuses on identifying the reasons behind this asymmetric housework allocation within couples. For that purpose, we carry out an empirical
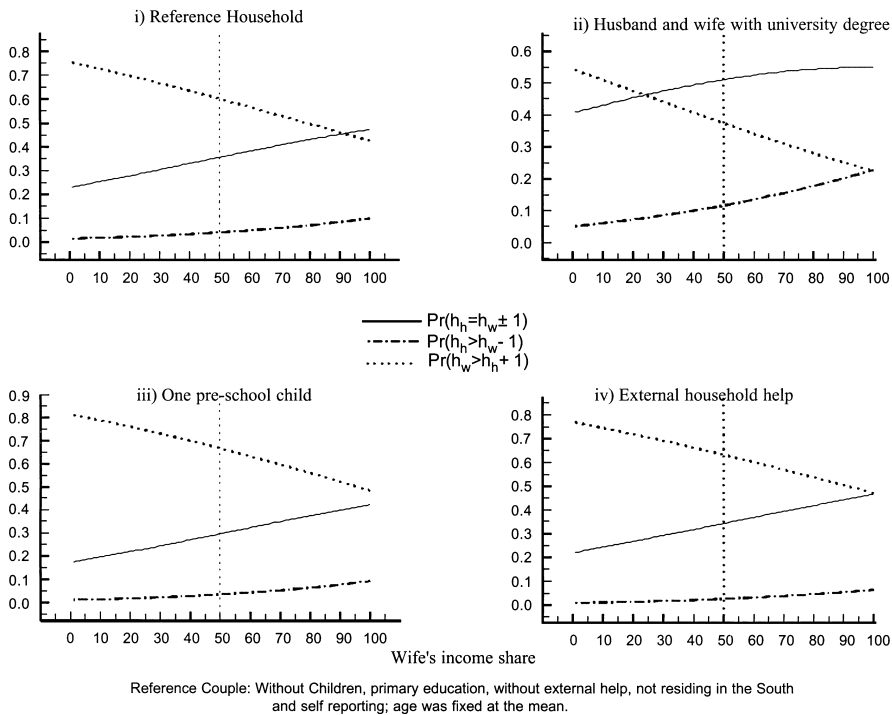
Fig. 2. Effect of wife's share of labor earnings on housework hours allocation

exercise in line with the Oaxaca (1973)-Blinder (1973) decomposition. Our calculations, however, account for the idiosyncratic nature of the data, hence they are performed on the bivariate distribution of counts[2]. According to the Oaxaca-Blinder methodology, we may distinguish two main sources of gender differences in housework allocation: one due to differences in measured characteristics (education, labor market conditions, etc.) and another related to the different weights assigned to these characteristics in the couple's decision-making process (different coefficient estimates for men and women, $\hat{\beta}_h$ and $\hat{\beta}_w$, respectively). When studying male-female wage differentials, these weights are associated with the *price* the market pays for men's and women's human capital endowments. In our context, the coefficient estimates may be understood as the value that household members assign to wife's and husband's characteristics in the housework allocation process. We call them *gender weights*.

First, we compute the predicted bivariate distribution of wives' and husbands' housework hours using the negative binomial estimates presented in Table 3. The first rows of each cell in Table 5 present the average, over all the observations, of the predicted probabilities fitted for each pair of counts, that is

$$\widehat{P_1}(f,m) = \frac{1}{n}\sum_{i=1}^{n} \Pr(h_{wi} = f, h_{hi} = m \mid \hat{\lambda}_{wi}, \hat{\lambda}_{hi}, \hat{\alpha}) \quad f, m = 0, 1, 2, \dots \quad (1)$$

Table 5. Predicted probabilities of wives' and husbands' housework times: i) original scenario (Eq. 1); ii) equalizing observable characteristics (Eq. 2); iii) equalizing observable characteristics and gender weights (Eq. 3)

	Predicted probabilitites of hours husband						
wife	0	1	2	3	4	5 or +	Marginal
0	0.022[i]	0.020	0.010	0.004	0.001	0.001	0.058
	0.019[ii]	0.020	0.012	0.005	0.002	0.001	0.058
	0.060[iii]	0.067	0.042	0.019	0.008	0.004	0.200
1	0.048	0.048	0.027	0.011	0.004	0.002	0.141
	0.041	0.047	0.030	0.014	0.006	0.003	0.141
	0.077	0.095	0.065	0.033	0.014	0.008	0.292
2	0.060	0.064	0.038	0.017	0.007	0.003	0.190
	0.051	0.062	0.042	0.021	0.009	0.005	0.190
	0.055	0.074	0.056	0.031	0.014	0.009	0.239
3	0.055	0.062	0.040	0.019	0.008	0.004	0.188
	0.046	0.060	0.043	0.023	0.010	0.006	0.188
	0.029	0.043	0.035	0.021	0.010	0.007	0.145
4	0.041	0.050	0.034	0.017	0.007	0.004	0.153
	0.034	0.047	0.036	0.020	0.009	0.006	0.153
	0.013	0.020	0.018	0.011	0.006	0.005	0.073
5 or +	0.062	0.083	0.063	0.035	0.016	0.011	0.271
	0.050	0.077	0.065	0.041	0.021	0.016	0.271
	0.007	0.013	0.013	0.009	0.005	0.005	0.052
Marginal	0.288	0.327	0.212	0.104	0.043	0.025	
	0.242	0.312	0.228	0.125	0.057	0.037	1.000
	0.242	0.312	0.228	0.125	0.057	0.037	

where $\hat{\lambda}_{wi} = \exp(x'_{wi}\hat{\beta}_w)$, $\hat{\lambda}_{hi} = \exp(x'_{hi}\hat{\beta}_h)$ and $\hat{\beta}_w$, $\hat{\beta}_h$ and $\hat{\alpha}$ are the maximum likelihood coefficient estimates in Table 3. We call this prediction the *original scenario*.

The estimates are supportive of the existence of an unequal situation of men and women in our sample. In particular, the probability of finding a couple where the wife bears most of the housework burden is about five times that of the inverse situation. Also, whereas nearly 83% of husbands devote between 0 to 2 h to housework per day, wives would go up to 5 h to accumulate the same marginal probability. The probability of $(h_w = h_h)$, i.e. the sum of the diagonal entries corresponding to the first rows of Table 5 is 0.145. Note that the greatest contribution to this sum are those of the values for $(h_w = h_h = 1)$ and $(h_w = h_h = 2)$. This is of some concern because it emphasizes that couples are more prone to halve domestic work in households with a relatively low total housework burden but, when this burden increases, it is generally borne by the woman.

To approximate the contribution of spouses' observed characteristics to housework allocation, let us equalize men's and women's characteristics at the values observed for women. The bivariate probability distribution of male and female housework for this counterfactual scenario can be estimated as

$$\widehat{P_2}(f,m) = \frac{1}{n}\sum_{i=1}^{n}\Pr(h_{wi}=f,h_{hi}=m\mid\hat{\lambda}_{wi},\hat{\lambda}_{hi}^{w},\hat{\alpha}) \quad f,m=0,1,2,\ldots \quad (2)$$

where $\hat{\lambda}_{wi}=\exp(x'_{wi}\hat{\beta}_w)$, $\hat{\lambda}_{hi}^{w}=\exp(x'_{wi}\hat{\beta}_h)$ are predicted using wives' characteristics but leaving the *gender weights*, $\hat{\beta}_w$ and $\hat{\beta}_h$, unchanged. The predicted probabilities are presented in the second rows of cells in Table 5. The probability distribution is only quite slightly more egalitarian. This suggests that the difference in spouses' observable characteristics are not the primary explanation for the unequal allocation of domestic work within two-earner couples. This finding is perhaps not very surprising, since wives and husbands in our sample are allowed to differ only as regards education and earnings (apart from the ''Answered by spouse'' variable), and in the case of education the observed differences are not significant (see Table 2). However, this result reveals the first interesting fact of the counterfactual exercise: given the actual structure of housework allocation, the approximation of men and women in terms of education and labor market conditions would not necessarily equalize them in the home. Therefore, it follows that the remaining significant asymmetry is due to factors not included in the model, such as norms, values and other sociological and psychological influences. This unexplained portion of housework differential is that due to differences in coefficients, here called *gender weights*.

To account for the effect of the *gender weights* we compute the joint probability of spouses' housework times by setting the husbands' characteristics equal to the wives' and the wives' parameters equal to the husbands' (except for the coefficient of the ''Answered by spouse'' variable for which the corresponding component of β_w is used)[3]. In this case, the predicted probabilities are computed as

$$\widehat{P_3}(f,m) = \frac{1}{n}\sum_{i=1}^{n}\Pr(h_w=f,h_h=m\mid\hat{\lambda}_{hi}^{w},\hat{\lambda}_{hi}^{w},\hat{\alpha}) \quad f,m=0,1,2,\ldots \quad (3)$$

where $\hat{\lambda}_{hi}^{w}=\exp(x'_{wi}\hat{\beta}_h)$. The third rows of cells in Table 5 display predictions for this new scenario. In contrast to the previous hypothetical situation, now the probability distribution has changed significantly with respect to the *original scenario*. One striking fact arising from these predictions is the remarkable increase in the probability of halving housework between spouses. In addition, the off-diagonal probabilities are much more uniformly distributed, meaning a similar probability of finding a wife or a husband bearing most of the housework burden. For the marginal distributions of the spouses' housework times, we find that the probability of high counts has diminished, in particular there is a transition of couples from higher counts to cells corresponding to 0, 1 or 2 h per day.

To summarize the results for the three scenarios discussed in the last paragraphs, Table 6 compares the predicted probability for each of the situations considered in Sect. 3.3. The first row of this table displays the probability of housework being shared in an egalitarian way, i.e. $\sum_{\{f=m\pm 1\}}\hat{P}_t(f,m)$, $f,m=0,1,2,\ldots$ and $t=1,2,3$, where t denotes the corresponding scenario; the second row presents the probability of housework being performed mainly by the wife, $\sum_{\{f>m+1\}}\hat{P}_t(f,m)$; and the third row presents the probability of housework being performed mainly by the husband, i.e. $\sum_{\{f<m-1\}}\hat{P}_t(f,m)$.

Table 6. Gender effect on housework allocation

Housework sharing regime	Predicted probabilities			
	Original scenario	Equalizing characteristics	Equalizing characteristics and gender weights	Gender effect
	(1)	(2)	(3)	(3)–(2)
$h^w = h^h \pm 1$	0.390	0.405	0.615	0.21
$h^w > h^h + 1$	0.561	0.525	0.225	−0.30
$h^w < h^h - 1$	0.049	0.070	0.160	0.09

This table summarizes the predicted probabilities presented in Table 5.

The last column of Table 6 shows the difference of these estimated probabilities for the hypothetical distributions (2) and (3). We call this differential the ''gender effect'' as far as it accounts for the unequal treatment, in terms of housework allocation, of wives and husbands equally endowed.

As expected from the discussion of Table 5, equalizing both characteristics and *gender weights* greatly increases the probability of egalitarian behavior (from 0.390 to 0.615), and by far the greater part of this increase (93%) is due to the ''gender effect''. Our empirical findings are thus consistent with the notion that traditional gender roles, supported by deeply ingrained traditional social patterns or habits, continue to shape men's and women's distribution of household work.

5. Concluding remarks

The results of previous studies have generally confirmed the persistence of gender inequalities in housework allocation. In this paper, we have attempted to estimate, in the case of Spanish two-earner couples, how much of this inequality reflects differences between certain characteristics of the two and how much is attributable to differences between the spouses as regards the weight these characteristics have in the allocation of housework time. Our results suggest that even when the spouses' earnings contribution and educational attainments are very similar, their housework times differ significantly due to the latter of the above two causes. This finding is consistent with claims that habitual patterns of gender-differentiated activity at home are mainly the result of gender identities.

Clearly our approach has some limitations, given that it only addresses the issue of gender differences in housework allocation in terms of couples' measured characteristics. Differences in the distribution of unmeasured characteristics of wives relative to husbands could still have an impact on the observed asymmetric allocation of domestic work. For instance, it is possible that sex differences in productivity may explain part of the ''gender effect''. Furthermore, we have only focused on differences in housework allocation in terms of time spent on these activities. Undoubtedly, gender-segregation of domestic tasks is another important source of inequality between men and women in the home. These are important topics that require further research, and that clearly depend on the data available.

Nevertheless, the results of our analysis raise some interesting issues for further reflection. We find that convergence of Spanish men and women in the labor market is not accompanied by equal changes in the home. Given that increases in male housework time do not compensate for women's increases in paid labor, a realistic equalizing public policy should be oriented towards lowering the contribution of women's domestic labor. In this sense, favoring substitution of wives' time in household production by market domestic services, through reductions in tax payments related to the incorporation of this external help, could be a feasible option.

Undoubtedly, policies targeting gender-discriminatory attitudes by means of educational or affirmative action policies are most desirable. This, however, is a long-term process the benefits of which will be enjoyed by future generations.

Endnotes

[1] This test is based on the idea that a joint probability distribution function factorizes into a product of its marginal distributions which, in turn, can be expressed as orthogonal polynomial sequences. The test of independence requires testing for zero correlation between all pairs of orthonormal polynomials. Assuming negative binomial marginals and and first and second polynomial orders, p-values ranged from 0.015 to 0.077.

[2] See Belman and Heywood (1990) for an application of this methodology to binary probability models.

[3] Notice that these coefficients account for the measurement error that arises because only one of the spouses reports information on both members of the couple.

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