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Gender imbalance in housework allocation: a question of time?

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Abstract
Using the 2002–2003 and 2009–2010 Spanish Time Use Surveys, this paper analyzes whether increases in nonworking time help dual-earner couples to reduce gender imbalance in housework allocation. Our empirical strategy exploits the fact that interviewed partners complete the survey on the same randomly assigned day, which may be a working day or a nonworking day for each spouse. This survey design allows us to compare the housework allocation decisions of dual-earner couples that are similar in key observable characteristics but differ in their work schedules during the interview day. We find that own nonworking days are associated with increases in men's and women's own contribution to housework and with decreases in the time their spouses spend on such activities. Yet the resulting imbalance in housework allocation differs depending on whether it is the wife or the husband with a day off. Thus, a husband's nonworking day leads to an (almost) equal distribution of housework, whereas a wife's nonworking day leads the partners to approach full specialization—with the wife performing most of the household tasks.

Keywords Household labor · Time allocation · Gender · Nonworking time

JEL Classification C21 · D13 · J16 · J22

1 Introduction

One of the most robust findings in time allocation literature is the existence of asymmetries in the way men and women allocate their time within the household. Men spend more time on paid work while women do the bulk of unpaid work in all

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OECD countries.[1] Yet in many countries the female gender gap in unpaid labor outweighs the male gender gap in paid labor. This leads to sizable differences in the average amount of leisure enjoyed by men and women. For instance, the average time women devote to total work (paid and unpaid) in Spain, Italy, Portugal, and Greece exceeds the time spent by their male counterparts by 20%. Even when we restrict to dual-earner couples, statistics show that women continue to perform, on average, a greater proportion of housework and child care than their male partners (e.g., Sevilla-Sanz et al. 2010; García-Mainar et al. 2011; Hwang et al. 2019). Most puzzling are results showing that the gender gap in time spent on unpaid household labor is, on average, greater when the wife earns more than the husband (Bertrand et al. 2015).

Disentangling what moves couples towards a more or less egalitarian time allocation is complex because this decision depends on the interactions of partners' time restrictions, preferences, abilities, bargaining power, and contextual factors such as social norms (Stratton 2012; Sevilla-Sanz et al. 2010). From a policy point of view, learning about the relevance of these factors is important because besides creating a gender gap in leisure, gender imbalance in housework time allocation has been identified as a key explanatory factor of gender differentials in wages (e.g., Hersch and Stratton 1997, 2002; Maani and Cruickshank 2010; Bryan and Sevilla-Sanz 2011), in marital and life satisfaction (Amato et al. 2003; Dew and Wilcox 2011; Álvarez and Miles-Touya 2016) and in relationship instability (Frisco and Williams 2003).

In this paper, we explore the role of working time constraints on Spanish dual-earner couples' housework allocation. Some policies aimed at promoting an equal involvement of working men and women in home responsibilities place the emphasis on relaxing working time constraints so that men can contribute more domestic work and women can achieve a better balance in total work. Among these kind of measures are the promotion of flexible work schedules and the reduction of working time by entitling employees to days off, non-transferable parental leaves, or permanent workweek reductions.[2] Measures aimed at reducing the time spent at work find theoretical foundation in the *time availability perspective*. Based on the premise that male and female time of domestic work are substitutes, this hypothesis suggests that housework asymmetries may decrease if husbands (who traditionally have longer working days) are given additional available time relative to their wives (e.g., Presser 1994). But how do couples actually react in terms of housework allocation when confronted with increases in one partner's nonworking time? Does relaxing men's working time lead to housework allocation outcomes that are symmetrical to those

[1] For example, in Spain, the ratio of women's to men's mean time of unpaid labor is 1.98; this value reflects a more egalitarian gender balance than in Portugal (3.4), Greece (2.4), Italy (2.3), and Ireland (2.3) but a less egalitarian gender balance than in Germany (1.6), France (1.66), and Denmark (1.3). See the OECD Statistics website (http://stats.oecd.org/index.aspx?queryid=54757).

[2] For example, the recent *Directive 2019/1158 of the European Parliament and of the Council on work-life balance for parents and carers* promotes men's take-up of family-related time off work. The Directive acknowledges that improving the gender-balanced design of parental leave, carers' leave, time off from work on grounds of *force majeur* and flexible working arrangements for caring purposes can help to rebalance the distribution of unpaid work within the household.

resulting from relaxing women's working time? These are the questions we try to address in this paper.

There is not much empirical evidence on the kinds of activities in which people engage when working fewer paid hours (Hamermesh 2016). Most empirical findings on the link between nonworking time and unpaid labor are based on inferences obtained from cross-sectional comparisons of couples in which both partners work full-time with couples in which one partner is either inactive, working part-time, or unemployed (Bianchi et al. 2000; Solaz 2005; Álvarez and Miles 2006; Burda and Hamermesh 2010). Yet deriving causal inferences from these analyses is challenging because there are unobserved factors that affect both working schedules and the time allocated to home production. Some studies tackle this problem by using longitudinal data. For example, Gough and Killewald (2011) explore the effect of unemployment episodes on intra-couple housework allocation in the United States. In Australia, Foster and Stratton (2018) likewise study how changes in paid work time (due to job terminations or promotions) affect intra-couple housework allocation. Once they control for individual fixed effects, both studies find that increases in nonworking time are associated with increases in couple's housework time—but that women's housework time is more responsive to changes in paid work time than is men's.

More recent papers have gone a step further in identifying the effects of permanent declines in market work time—at constant earnings—due to legislatively mandated reductions in weekly hours worked. For instance, Lee et al. (2012) and Kawaguchi et al. (2013) explore the effects of this type of policy in Japan and South Korea. These authors analyze the time allocation patterns of individuals and couples that were observationally equivalent before and after reform and, therefore, had similar propensities to have been affected by legal changes. Their findings show that, in Japan, a gift of time is spent on increasing leisure and "personal maintenance"; in Korea, though, extra time increases household production. Along these lines, Goux et al. (2014) analyze how the 1998 legal reduction in the French workweek[3] affected the labor supply of *treated* workers' partners. They find that husbands of *treated* women reduced their labor supply more than did wives of *treated* men. The authors suggest that this may be due to different degrees of leisure complementarities in the partners' utilities or to a lower ability of women to control their working schedule, since they work shorter hours and are less likely than men to have managerial positions. Pailhé et al. (2019) explore the implications of the French reform in terms of household labor. They document that men who benefited from reduced working hours increased the time they spent on male-oriented housework (repairs, maintenance, etc.), whereas women affected by work time reduction increased the time they devoted to childcare.

These findings are of considerable interest, but the scarcity of longitudinal data on time allocation and the infrequency of legal changes that modify statutory working hours limit the scope of existing evidence. Therefore, we need to search for new ways to explore this issue with available cross-sectional data. Our paper uses data

[3] In 1998, the French socialist government mandated a reduction of the legal workweek (at constant earnings), from 39 to 35 h. Goux et al. (2014) evaluate the effect of this measure by exploiting the fact not all firms implemented the shorter workweek before the interruption of the reform that was approved by the conservative party in 2002.

from 2002–2003 and 2009–2010 Spanish Time Use Surveys to explore how men and women in dual-earner couples modify their housework time allocation on non-working days for one of the partners (e.g., statutory days off, holidays, etc.) with respect to usual working days for both partners. More specifically, we try to address the following questions: How much do men and women increase the housework time on nonworking days? Are there cross-effects on the time their partners devote to these tasks? Does the partner who has a nonworking day bear a similar share of housework regardless of his/her gender? The answer to these questions is theoretically ambiguous. In general, we expect the partner endowed with a nonworking day to shift part of his/her extra time (with respect to usual working days) to home production. This would alleviate the other partner's housework burden. However, the resulting intra-couple housework balance may differ depending on whether it is the wife or the husband that enjoys the nonworking day. Specifically, partner's reactions might be constrained by the gender power imbalance in household decision-making, the home production technology, differences between male and female preferences and the social norms that prescribe the behavior each gender *should* have. The combination of all these forces may lead to alternative housework balance outcomes.

In this paper, we analyze this issue empirically. For this purpose, we exploit a feature that the Spanish Time Use Survey shares with similar surveys in other countries: the random assignment of the day of the week on which all household members are asked to create a diary of their respective activities. Such design implies that the interview day can be a working day or a nonworking day for each partner. Therefore the dataset allows us to compare housework allocation decisions of couples that are balanced in observable characteristics but differ in the working time constraints affecting each partner during the interview day.

Consistent with other studies, our results suggest that increases in available time for one partner have a direct effect on his/her own housework time and a cross-effect on his/her partner's. More specifically, we find that when an individual has a non-working day (but the partner is working) s/he increases the housework contribution relative to the contribution made on working days whereas the partner reduces the time spent on these activities, albeit to a lower extent. However, nonworking days are not gender neutral with respect to intra-couple housework distribution. On a non-working day for the husband (and a working day for the wife), partners share female-typed housework almost equally (on average); but on a nonworking day for the wife (working day for the husband), the outcome is practically full specialization because she ends up doing most household tasks. According to our theoretical framework, this gender-asymmetric pattern is consistent with scenarios in which the husband's—but not the wife's—housework time can be almost fully substituted by the partner's housework time. Another interpretation of our findings is that they reflect settings in which social norms shaping male and female preferences for housework put an upper bound on the husband's contribution to housework and/or a lower bound on the wife's contribution. Although the cross-sectional nature of our data precludes any assessment of whether the observed relationships are causal or not, our findings are robust to some empirical checks that explore the influence of possible sources of bias. In particular, we reject that our results are driven purely by differences in preferences for time coordination among couples with different time schedules during the interview day. Furthermore, we show that changes in housework time associated

with alternative nonworking days (voluntarily requested or not) are statistically similar, which reduces the likelihood of biases caused by days off that partners may request to perform domestic duties.

The rest of the paper is organized as follows. In Section 2, we present a conceptual framework for understanding the mechanisms underlying intra-couple time allocation decisions. Section 3 describes the data and our sample selection procedure. Section 4 presents the empirical strategy used, reports our main estimation results and some robustness checks. In Section 5, we summarize our findings and offer some conclusions.

2 Theoretical Framework

Most empirical work on intra-couple housework allocation is built on collective models of labor supply with household production (Chiappori 1997; Browning and Chiappori 1998; Chiappori et al. 2002; Couprie 2007; Rapoport et al. 2011). The collective approach assumes that partners have different utility functions, but they cooperate by adopting a sharing rule that represents their relative powers in the decision-making process. A key feature of the collective model is that, regardless of the bargaining process the couple is engaged in, the household decision-making process results in Pareto-efficient outcomes (Chiappori 1988). We shall use this approach to frame the mechanisms that may drive housework time allocation within dual-earner couples when one of the partners experiences an increase of nonworking time at constant earnings.

In a collective model, the couple maximizes a welfare function of each partner's utility: $W = W(U_m, U_f)$, where m denotes male and f female. Following Van Klaveren et al. (2008), we consider that individual utility depends on the consumption of two public goods: a market good, C, and a household good, H, that is produced at home using partners' housework time (h_m and h_f) as inputs. Partners also obtain direct utility from own leisure, l, and housework time, h. As Stratton (2012) highlights, although housework is generally considered an undesirable activity, preferences vary across individuals and influence time allocation. The origin of these preferences is complex.[4] For example, Akerlof and Kranton (2000) suggest that social norms on how people should behave in different situations shape preferences. An implication of this view is that similar patterns of time allocation result in different levels of well-being depending on the partners' adherence to traditional gender prescriptions that consider housework as a 'woman's responsibility'. Here, individual preferences are

[4] Literature on preference formation states that individual preferences are acquired through genetic evolution or through learning and other forms of social interactions (see, for instance, Bowles 1998 and Bisin and Verdier 2011). Empirical studies on gender differences in intra-household time allocation have mainly emphasized the role of social norms and cultural transmission of gender attitudes in shaping male and female preferences (e.g., Fernández et al. 2004; Sevilla-Sanz et al. 2010; Burda et al. 2013; Campaña et al. 2018). The 'nature' explanation for preference formation—which is linked to evolutionary psychology and biology—has been less analyzed in this setting, with a few exceptions. For example, Alger and Cox (2013) suggest the presence of an evolutionary basis for maternal-paternal disparities in altruism toward children and, therefore, for gender differences in childcare. In contrast, Cochard et al. (2018) find, using a controlled experiment, that men and women do not have a different intrinsic preference for investing in a household public good.

represented by the following utility:

$$U_i = U_i\left(C, H\left(h_m, h_f; z\right), l_i, h_i; x\right), \quad i = \{m, f\}, \tag{1}$$

where z denotes a vector of household production shifters (e.g., presence and age of children), and x is a vector of taste shifters that may partially overlap with z.

Each partner devotes his/her time endowment, T, to paid work, household production or leisure. Since our empirical analysis focuses on dual-earner couples' behavior on a given day, we consider that the partners' working times, $\overline{t}_m$ and $\overline{t}_f$, are exogenously set by contract. We can then write the household's budgetary and time restrictions as follows:

$$C = y = Y + w_m\overline{t}_m + w_f\overline{t}_f, \tag{2}$$

$$h_m + l_m + \overline{t}_m = h_f + l_f + \overline{t}_f = T, \tag{3}$$

where w_m and w_f denote male and female wage rates and Y is nonlabor income.

As usual in this literature, we assume that the household welfare function is a weighted sum of partners' utilities. Substituting 2 and 3 in 1, we may write the problem that the couple solves as

$$\begin{aligned} \max_{h_m, h_f} W_c = \mu U_m(y, H, T - \overline{t}_m - h_m, h_m) + (1 - \mu) \\ U_f\left(y, H, T - \overline{t}_f - h_f, h_f\right). \end{aligned} \tag{4}$$

The weighting factor $\mu = \mu(Y, w_m, w_f, d)$ defines the relative bargaining power of each partner. This measure differs among couples according to the partners' wages, nonlabor income and the so-called 'distribution factors', d, that affect bargaining power, but not preferences, such as the ratio of partners' wages[5] (e.g., Browning et al. 1994). Note that the higher the weighting factor, the more favorable the intra-household allocation is to the husband.

The solution to the maximization problem gives the time devoted to all activities.[6] In particular, we can express the time each partner chooses to spend on housework as the following reduced forms:

$$h_f^* = h\left(w_f, w_m, \overline{t}_m, \overline{t}_f, d, z, x\right),$$

$$h_m^* = h\left(w_f, w_m, \overline{t}_m, \overline{t}_f, d, z, x\right).$$

Within this framework, we try to ask the following question: How would a decrease in one partner's working time, at constant earnings, affect intra-couple time allocation to household good production? The model predicts two effects: A direct

[5] Other distribution factors considered in empirical literature include age and education differences between partners (Browning et al. 1994), the ratio of men to women in a given age interval and legislation on divorce (Chiappori et al. 2002) or gender role attitudes (Couprie 2007), among others.

[6] According to Chiappori (1997), the household decision can be interpreted as a two-stage process. In the first step, partners agree on some efficient production of the household good—bounded on spouses' available times—$[0, T - \overline{t_m}] \times [0, T - \overline{t_f}]$—and a distribution of non-labor income. At this stage, partners maximize in h_m and h_f the profit or net value of domestic production: $\pi = H - w_m h_m - w_f h_f$. In the second step, each partner freely chooses leisure time and private consumption levels subject to their individual income that includes individual wage and the corresponding share of non-labor market income (see, for instance, Rapoport et al. 2011).

effect on own housework time, $\partial h_i^*/\partial \bar{t}_i$, and a cross-effect on the partner's housework time, $\partial h_j^*/\partial \bar{t}_i$, where $i, j = \{m, f\}$, $i \neq j$, that appears only because H influences the utility function of both partners.

Regarding the direct effect, a decrease in working time at constant earnings will only modify the individual's time restriction by increasing his/her available time for either leisure or household good production. Therefore, we expect the change in own housework time to be nonnegative. Yet its magnitude would depend on the individual's relative bargaining power, the household good production technology and the rate of substitution between leisure and housework time. Note that even if partners have the same bargaining power, obtain the same benefit from the household good and their housework times are perfect substitutes, we may observe gender asymmetric responses to own nonworking days if the wife and the husband have different preferences for doing housework. Stratton (2012) provides empirical evidence that supports this hypothesis. Using information on whether men and women like or dislike performing different types of household chores, she shows that direct preferences for doing these tasks play a role in intra-couple housework time allocation decisions. Interestingly, she finds that it is the man's preferences, not the woman's, that matter.

As for the cross-effect on the partner's housework time, its sign and magnitude is theoretically ambiguous given that it comes from the composition of several partial effects. First, the direction of the expected change crucially depends on whether the partner's housework time is a complement, substitute or unrelated input—due to specialization in certain tasks—of the other partner's time in producing the household good, H. Second, it depends on the relative productivities of wife's and husband's housework times. A third component arises from the direct utility (or disutility) the partner derives from housework. Hence, even if partners' housework times are perfect substitutes and equally productive, the cross-effect could be negligible if the partner has a strong preference for performing housework. Yet if partners' housework times are complementary or if certain domestic activities are tied to specific a partner, the sign and magnitude of the cross-effect is more difficult to predict. Therefore, assessing the effect becomes an empirical issue.

3 Data

Our empirical analysis is based on two repeated cross-sections of the Spanish Time Use Survey (STUS) carried out in 2002–03 and 2009–10. These are household-based surveys that include both questionnaire and time-diary components and are harmonized with surveys in other European countries. The STUS collects information on household characteristics such as income, housing, and family composition as well as individual characteristics that include education, employment status, earnings, and demographic information. The survey was administered to all household members at least 10 years of age and on the same randomly chosen day, with heavier sampling of weekends (Friday to Sunday) than weekdays. Respondents were asked to record, for each 10-min period, their main activity as well as any secondary activity undertaken simultaneously. In the time diary, individuals report whether the survey is filled out on a usual working day or rather on a nonworking day. This second category

includes holidays, statutory days off, and nonworking weekends. It is important to remark that respondents can neither decide nor modify the interview day.[7]

For the empirical analysis, we select married and unmarried mixed-gender couples aged 20–64 years in which both partners report themselves to be full-time wage earners. Partners with this labor schedule are confronted with similar time constraints during a typical working day. To homogenize the sample still further, we exclude couples in which at least one of the partners is on transitory or permanent sick leave; to avoid complex interactions between household members, we also drop couples cohabiting with relatives or non-relatives aged 25 and over. Finally, since we are interested in exploring the effect of either a husband's or a wife's nonworking day, we do not consider couples interviewed on days when *both* partners were not working. Appendix Table 8 shows that this last restriction, unlike the previous ones, alters the distribution of sampled households across the week with respect to the survey design. More specifically, we see that couples interviewed on Saturdays and Sundays are under-represented because those are the days on which it is most likely that both partners are not working. Our final sample comprises 1282 couples that satisfy the conditions just described. For the sake of simplicity, in what follows we will use the terms "wife" and "husband", though the sample also includes unmarried couples.

Table 1 presents the distribution of wives' and husbands' interviews between working and nonworking days and across the week. Observe first of all the *lack* of any sizable differences in the prevalence of nonworking days for men and women: in our sample, 9.2% of the men and 10.3% of the women were interviewed on nonworking days. Second, nonworking days are fairly well balanced between weekdays and weekends. This reflects our decision to exclude couples in which both partners were interviewed on a nonworking day.

Our outcome variables are the times (measured in 10-min intervals) each partner devotes to housework during the interview day. Following the empirical literature on this issue, we focus on two housework categories: female-typed housework and total housework. Female-typed housework includes routine domestic tasks that are usually performed on a daily basis and cannot be delayed such as laundry, housecleaning, washing dishes, and cooking.[8] As discussed by Kahneman et al. (2004), these are the least enjoyable and the most physically demanding domestic activities. Total housework includes female-typed housework in addition to other domestic duties that could be viewed as "semi-leisure" activities: interior and exterior house maintenance, gardening, pets, vehicle repair, management activities, shopping, and so forth.

In Table 2, we compare average housework times and sociodemographic characteristics of individuals who completed the survey on working and nonworking days; we also present balancing tests for the equality of means. Results show that

[7] Respondents can delay filling out the questionnaire, but even in this case the information must refer to the original randomly assigned day.

[8] Using the sample of cohabiting men and women interviewed in the STUS 2009–10, Vivas et al. (2014) find positive gender differentials (female vs. male) in participation rates in laundry and clothing activities (38.2 pp), housecleaning (38.2 pp) and cooking (40 pp). In contrast, gender differentials are negative in gardening and pets (−8.4 pp), repairing (−5.4 pp) and management activities (−0.8 pp).

Table 1 Number [percentage] of husbands and wives interviewed on working and nonworking days across weekdays and weekends

	Weekdays	Weekend	All
Husbands			
Working day	1055[94.87%]	109[64.12%]	1164[90.80%]
Nonworking day	57[5.13%]	61[38.88%]	118[9.20%]
Wives			
Working day	1044[93.88%]	106[62.35%]	1150[89.7%]
Nonworking day	147[6.12%]	64[37.65%]	132[10.30%]
Total	1112	170	1282

The sample consists of men and women in dual-earner couples working full-time who were interviewed on days when at least one of the partners was working

Source: STUS for 2002–2003 and for 2009–2010

both men and women are balanced in terms of key observable variables (e.g., age, education, number of children, earnings and hired domestic help) across working and nonworking days, which provides further evidence of the response day's randomness. We do find statistically significant differences between the average housework time spent on working and nonworking days. The average time men spend on female-typed domestic activities ranges from 42 min on working days to 105 min on nonworking days; women spend more than twice that amount: from 113 to 208 min, respectively. The female gap in total housework is also sizable. On average, men spend 75 min on working days and about 193 min on nonworking days, whereas women spend (respectively) 155 and 279 min.

4 Nonworking Days and Intra-Couple Housework Allocation

4.1 Empirical strategy

Identifying the *causal* effect of a partner's nonworking day on housework allocation would require observing the same couples under different time schedules, which is not possible in our cross-sectional data set. Instead, we exploit the fact that, although both partners fill out the STUS on the same randomly assigned day, their working schedules need not coincide. Our empirical strategy consists of comparing couples for which the day of interview was a usual working day for both partners (i.e., both face similar time constraints) with two alternative groups composed of couples in which either the husband or the wife completed the questionnaire on a nonworking day (i.e., the time constraint is relaxed for one of the partners). Table 3 shows how the couples in our sample are distributed among these three groups. About 80.5% of the couples were interviewed on working days for both partners, 9.2% on a nonworking day for the husband only, and 10.3% on a nonworking day for the wife.

Although the three groups are composed of different couples, the key point is to what extent they are similar, on average, so we can interpret the difference in housework outcomes *as if* we were observing the same couples under different time schedules. In Table 4, we compare the three groups in terms of some individual and

Table 2 Respondents' characteristics by gender and type of day

	Men			Women		
Characteristic	Working day	Nonworking day	Equality of means: *p* value	Working day	Nonworking day	Equality of means: *p* value
Female-typed housework[a]	4.20 (4.81)	10.55 (10.64)	0.000	11.27 (7.58)	20.85 (12.31)	0.000
Total housework[a]	7.56 (7.43)	19.26 (13.09)	0.000	15.55 (9.27)	27.90 (14.21)	0.000
Age	41.01 (8.04)	40.48 (7.33)	0.489	38.73 (7.66)	39.28 (7.74)	0.439
Monthly labor earnings	1571.70 (612.25)	1583.05 (630.06)	0.848	1323.61 (561.64)	1354.17 (562.23)	0.554
Wife's relative earnings	0.46 (0.09)	0.45 (0.09)	0.163	0.46 (0.09)	0.47 (0.09)	0.159
Split-shift at work	0.458	0.373	0.077	0.353	0.696	0.188
Primary education	0.09	0.07	0.482	0.07	0.04	0.186
Secondary education	0.48	0.49	0.857	0.45	0.45	0.958
Tertiary education	0.43	0.44	0.816	0.48	0.51	0.548
No. of children	3.22 (0.95)	3.18 (0.95)	0.635	3.20 (0.95)	3.33 (0.87)	0.141
Domestic help	0.21	0.19	0.527	0.21	0.20	0.893
N	1164	118		1150	132	

The sample consists of men and women in dual-earner couples working full-time who were interviewed on days when at least one of the partners was working. Housework times are measured in 10-min periods. Standard deviations are reported in parentheses

Source: STUS for 2002–2003 and for 2009–2010

[a]Measured in 10-min intervals

Table 3 Number and percentage of couples, in control and treatment groups, by interview time

	Both partners on working day	Only the husband on nonworking day	Only the wife on nonworking day	Total sample
Weekday	987 [95.64%]	57 [48.31%]	68 [51.52%]	1112
Weekend	45 [4.36%]	61 [51.69%]	64 [48.48%]	170
No. couples	1032 (80.5%)	118 (9.2%)	132 (10.3%)	1282

Column (resp. row) percentages are given in brackets (resp. parentheses). The sample consists of men and women in dual-earner couples working full-time who were interviewed on days when at least one of the partners was working

Source: STUS for 2002–2003 and for 2009–2010

household baseline characteristics. The tests for the equality of means suggest that the random design allowing us to observe couples with different working schedules during the interview day is orthogonal to usual predictors of housework allocation such as partners' age and education, family composition or absolute and relative earnings. The only statistically significant (at the 10% level) discrepancy refers to the prevalence of split shift at work among men. This evidence suggests that selection based on observable variables may be less relevant. Nonetheless, in the regression analysis we control for individual and household characteristics to increase the precision of our estimates.

Yet selection on unobservables remains a possibility. That is, there may be unobserved factors that influence both the likelihood of observing couples with a certain working schedule during the interview day and the partners' housework allocation pattern during the same day. For example, partners deriving utility from joint leisure time can seek out jobs with work schedules similar to those of their partners. Couples with such preferences are more likely to be interviewed on working days (or nonworking days) for both partners than couples with a lower taste for coordination in their work schedules. These preferences may explain couples' housework allocation patterns on a given day. Thus, couples who are prone to coordination are expected to display a uniform pattern of housework distribution between partners across the whole week because both face similar restrictions. In contrast, partners with different work schedules will be more likely to perform the bulk of housework on different days according to daily working restrictions. Then, in such a setting, the observed differences in housework allocation between couples interviewed on working days for both partners and couples interviewed on nonworking days for one partner would just reflect differences in time coordination.

Another source of unobserved heterogeneity would occur if the partner's nonworking day is a decision driven by factors or events involving an additional amount of housework such as moving to another residence, carrying out house reforms or looking after an ill family member—circumstances which cannot be observed in our dataset. Although the low frequency of these events[9] reduces the likelihood of this source of unobserved heterogeneity, it does not eliminate it.

[9] The Spanish Labor Force Survey requests information on the reason why interviewees worked less hours than usual during the previous week. In 2002 and 2009 (our periods of analysis) less than 5% of them reported "personal reasons or family responsibilities" as the main reason.

Table 4 Couples' characteristics across groups

	Both partners on working day	Only the husband on nonworking day	Only the wife on nonworking day	Equality of means: *p*-value
Husband				
Female-typed housework[a]	4.36	10.55	2.96	0.000
Total housework[a]	7.64	19.26	7.01	0.000
Age	41.03	40.48	40.90	0.741
Earnings	1576.98	1583.05	1530.30	0.663
Split-shift at work	0.48	0.37	0.30	0.000
Primary education	0.09	0.07	0.07	0.658
Secondary	0.48	0.49	0.49	0.957
Tertiary	0.43	0.44	0.43	0.972
Wife				
Female-typed housework[a]	11.54	8.91	20.85	0.000
Total housework[a]	15.79	13.42	27.89	0.000
Age	38.79	38.24	39.24	0.551
Earnings	1330.62	1262.30	1354.17	0.329
Split-shift at work	0.35	0.37	0.30	0.353
Primary education	0.07	0.08	0.04	0.244
Secondary	0.45	0.42	0.45	0.804
Tertiary	0.48	0.50	0.51	0.752
Couple				
Wife's share of earnings	0.46	0.45	0.47	0.175
Number of children	1.21	1.18	1.33	0.320
Children aged 0–6	0.31	0.33	0.33	0.832
Ages 7–16	0.41	0.40	0.43	0.857
Ages 17+	0.19	0.20	0.20	0.937
Domestic help	0.21	0.17	0.20	0.789

The sample consists of men and women in dual-earner couples working full-time who were interviewed on days when at least one of the partners was working. Housework times are measured in 10-min periods. To test for equality of means across the three groups, we estimate linear regression models *without* a constant term and in which the dependent variable is the corresponding characteristic while the explanatory variables are the three dummies for control and treatment groups. Each *p*-value corresponds to an *F*-test for the equality, in each regression, of the coefficients for these three dummies

Source: STUS for 2002–2003 and for 2009–2010

[a]Measured in 10-min intervals

Finally, our analysis is based on information for only one day. Thus we implicitly assume that couples solve a day-by-day optimization problem to set housework time allocation. However, couples may optimize their housework time allocation over longer time periods (e.g., a week). To the extent that partners adjust their behavior

across the whole week by anticipating the day off, our estimates would fail to truly characterize the housework response to the partner's nonworking day by just analyzing couple's time allocation on the interview day.

Due to these limitations, we remain cautious and do not interpret our estimates as causal effects but rather associations. Nonetheless, in Section 4.5 we perform a number of robustness checks to analyze the extent to which some of our previous concerns might be driving the results.

4.2 Graphical evidence on differences in housework allocation across groups of couples

Before moving on to the regression analysis, we provide graphical evidence of the differences in housework allocation among the three groups of couples. Figure 1 displays the *timing* of female-typed and total housework performed by wives and husbands during the interview day. In particular, it plots the percentage of wives and husbands doing female-typed housework (left panel) or total housework (right panel) at each time of the day within the groups of both partners on a working day (top row), the husband on a nonworking day (middle row) and the wife on a nonworking day (bottom row).

We observe that, for the days on which both partners are working, wives are (on average) more likely to do housework than are their husbands at *any* hour of the day. The gender gap in housework engagement widens from 2 p.m. onward and peaks around 8–9 p.m., with about 27% of women doing female-typed housework against 13% of men performing the same tasks at that time.

Time use patterns change on nonworking days, with considerable differences based on who (wife or husband) has the day off. Figure 1 suggests that there may be direct effects on the housework of the nonworking partner as well as cross-effects on the partner's housework time. On days when the husband does not work (middle two graphs in Fig. 1), the percentage of husbands doing housework increases with respect to that observed on days in which both partners are working, especially from 10 a.m. to around 2 p.m. As for their performance of female-typed housework, the pattern resembles more a rescheduling of those activities across the day than a true increase in the time devoted to them. However, the increase in husbands' time becomes more evident when total housework is considered. When the husband has a nonworking day, the wife's behavior does not change much (with respect to usual working days for both partners)—except in the evening, when we observe a sizable decline in wives' housework engagement. It is interesting that, under these time schedule circumstances, husbands are more likely than wives to do housework until about 4 p.m. From that time onward, wives are more likely to engage in female-typed activities; yet the male and female percentages for total housework are virtually indistinguishable, which reflects a certain synchronicity between partners.

On days when the wife does not work (bottom graphs in Fig. 1), the picture changes dramatically. In terms of housework, wives outperform husbands (on average) across the whole day. The percentage of men doing any female-typed (resp. total) housework declines considerably as compared with days on which both partners are working: it barely exceeds 5% (resp. 10%) at any hour. These low percentages of husbands performing domestic tasks suggest that their time adjustment

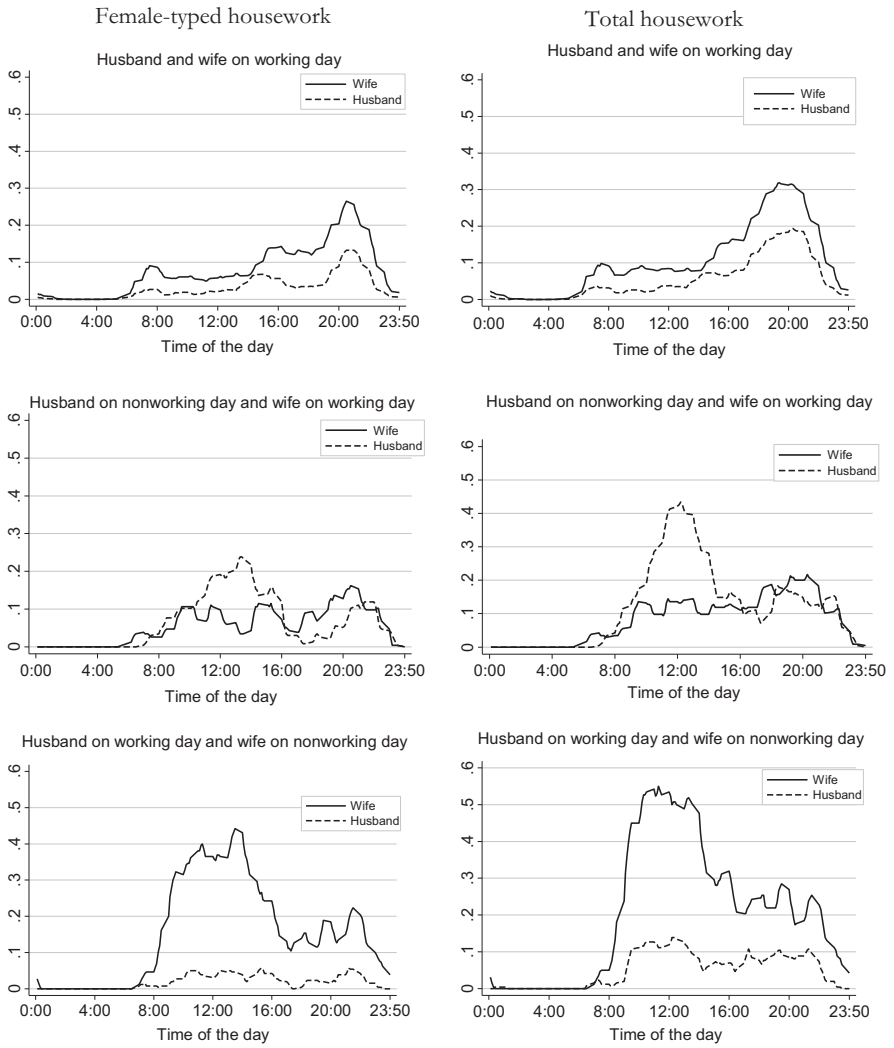

Fig. 1 Proportion of wives and husbands engaging in housework during the interview day.The sample consists of men and women in dual-earner couples working full-time who were interviewed on days when at least one of the partners was working. *Source:* STUS for 2002–2003 and for 2009–2010

might be at the extensive margin (participation in housework) in addition to the intensive margin (housework time).

The descriptive evidence presented so far suggests that there are asymmetries in the way partners allocate housework when either the wife or the husband experiences a short-term increase in nonworking time. In what follows, we quantify the magnitude and significance of observed changes and then discuss their implications for housework gender balance.

4.3 Regression analysis

According to the theoretical model, a partner's housework time is explained by partners' working times and a set of variables that include individual and household characteristics. We specify the following linear regression model:[10]

$$h_c = \alpha_1 + \alpha_2 I_{hn,c} + \alpha_3 I_{wn,c} + X_c'\beta + \varepsilon_c. \quad (5)$$

We denote by h_c the housework outcome for couple c. As explained previously, we consider two categories: female-typed housework and total housework. For each, we measure three couple-related outcomes: time spent by the husband during the reference day, time spent by the wife during the reference day, and the husband's share of housework. Partners' time schedule during the interview day is captured by two dummy variables, I_{hn} and I_{wn}, that indicate (respectively) whether the husband or the wife is interviewed on a nonworking day. The vector X_c includes controls for the partners' educational level, the couple's average age, the wife's share of couple's earnings, the number and age of cohabiting children, indicators for whether each partner works a split shift, a dummy variable for the presence of hired domestic help and a set of indicators for the day, quarter, and year of the interview. Finally, ε_c is the error term.

In this model—which considers couples with both partners on a working day as the reference category— the parameters α_2 and α_3 measure the change associated with a wife's or a husband's nonworking day. So if the dependent variable is a husband's housework outcome, parameter α_2 captures the average change associated with an own nonworking day and α_3 measures the average change associated with the wife's nonworking day. Conversely, if the outcome variable is a wife's housework outcome, α_3 measures the change associated with an own nonworking day and α_2 is the average change associated with the husband's nonworking day.

Table 5 presents the main regression results for female-typed housework (Panel A) and total housework (Panel B). For each outcome, we report the estimated coefficients on husbands' and wives' nonworking days. The first rows of Panel A and B display the estimated average levels of each housework outcome for couples in which both partners were interviewed on a working day. Appendix Table 9 provides the whole set of OLS coefficient estimates for these baseline models.

Consistently with previous descriptive evidence, we find that—for men and women—a nonworking day is associated with an increase in their own housework times and with a decrease in their partners' housework times. These changes are statistically significant, but their magnitudes differ across genders. Results in columns [2] and [3] show that when the husband has a nonworking day, his own time devoted to female-typed (resp. total) housework increases, on average, by 59 (resp., 109) min as compared with days on which both partners are working. The

[10] Time use variables recorded for short reference periods (e.g., one day) usually exhibit a high proportion of zeros. In our setting, this is observed with respect to husbands' time but not to wives' time, which reflects the lower men's housework engagement relative to women's. These circumstances suggest using a Tobit model; however, such a specification assumes that zeros indicate nonparticipation in housework, which might not be the case. Foster and Kalenkoski (2013) show that, in this setting, a Tobit specification is highly sensitive to the percentage of zeros that do *not* correspond to nonparticipation. In contrast, OLS results are more robust to this misclassification of zeros and hence to the resulting measurement error.

Table 5 Effect of nonworking time on intra-couple housework allocation

	Husband's time (10-min intervals)	Wife's time (10-min intervals)	Husband's share	Husband's participation in housework
Panel A: female-typed housework				
Both partners on working day	4.459***(0.175)	11.396***(0.236)	0.294***(0.008)	0.780***(0.013)
Δ on husband's nonworking day (α_2)	5.910***(1.058)	−1.682*(0.863)	0.206***(0.033)	0.132***(0.034)
Δ on wife's nonworking day (α_3)	−2.111***(0.513)	9.905***(1.111)	−0.172***(0.023)	−0.199***(0.050)
*T*est statistic for joint significance of added controls [*p* value]	2.87[0.000]	14.35[0.000]	5.32[0.000]	37.26[0.011]
R^2	0.14	0.25	0.16	
N	1282	1282	1282	1282
Panel B: total housework				
Both partners on working day	7.804***(0.249)	15.602***(0.300)	0.325***(0.007)	0.858***(0.011)
Δ on husband's nonworking day (α_2)	10.958***(1.287)	−1.309(1.173)	0.244***(0.028)	0.142***(0.017)
Δ on wife's nonworking day (α_3)	−1.647**(0.817)	13.014***(1.384)	−0.154***(0.022)	−0.159***(0.045)
*T*est statistic for joint significance of added controls [*p* value]	4.30[0.000]	10.84[0.000]	5.08[0.000]	33.31[0.031]
R^2	0.19	0.23	0.18	
N	1282	1282	1282	1282

The sample consists of men and women in dual-earner couples working full-time who were interviewed on days when at least one of the partners was working. The first three columns report OLS estimates of Eq. (5) for different outcome variables. Wife's and husband's time refer to time spent on housework during the interview day. The reference housework times when both partners are on a working day are the estimated average levels for these group of couples. The fourth column reports probit estimates of husbands' likelihood of participation in housework while using the same explanatory variables as in Eq. (5). In this column, the level on usual working days for both partners corresponds to the *average* probability of husbands' housework participation when both partners are on a working day; the changes driven by a wife's or a husband's nonworking day reflect the estimated average marginal effects of the dummy variable for nonworking day. Robust standard errors are reported in parentheses, and *p* values for test for joint significance of additional controls (F (20, 1258) in OLS regressions and $\chi^2(20)$ in probit models) are given in brackets. All models include controls for each partner's education, couple's average age, the wife's share of the couple's earnings; indicators for whether each partner works a split shift; number of children; dummies for children aged 0–6, 6–16 and 17 or more, the presence of hired domestic help, day of the week, quarter and year of interview

Source: STUS for 2002–2003 and for 2009–2010

*$p < 0.10$, **$p < 0.05$, ***$p < 0.01$

simultaneous change in the wife's female-typed (resp., total) housework time is a decrease of about 17 (resp., 13) min. When the wife has a nonworking day, the time she devotes to female-typed (resp., total) housework increases, on average, by 99 (resp., 130) min and the time her husband devotes to these tasks declines, on average, by 21 (resp., 16) min, with respect to days in which both partners are working. So, notwithstanding the wives' greater burden of housework on usual working days, their average contribution to housework time increases more intensely (in absolute terms) on nonworking days than does the husbands' housework time. Note that the estimated changes hardly differ from the raw differences in average housework times shown in Table 4; this suggests that couples' working time schedules are orthogonal to observable individual and household characteristics.

Our findings also reveal that the increase in own housework associated with nonworking days more than compensates for the decrease in the partner's housework time. On average, then, the total time couples devote to household production increases when one partner (wife or husband) is not working. Specifically, that time rises from an average of about 234 min (on usual working days for both partners) to about 330 min (on days when the husband has a day off) and to 348 min (on days when the wife has a day off).

It is interesting that the ratio of average housework times that men and women devote to housework on own nonworking days differs from the same ratio on usual working days. Thus, whereas on usual working days for both partners women do almost twice the amount of housework performed by men, on nonworking days (but working days for the partner), women do on average 1.5 times the housework performed by men in the same situation. This absence of proportionality suggests that couples do not decide housework allocation on the only basis of fixed proportions defined by their bargaining sharing rule; other aspects such as household good technology or preferences for doing housework may also play a role.

How do these changes reshape the gender balance of housework within the couple? Column [3] of Table 5 reports coefficient estimates for the husband's share of housework. We can see that, on usual working days for both partners, husbands perform (on average) about 29.4% of the couple's time spent on female-typed housework. Once we control for the rest of explanatory variables, we obtain that a husband nonworking day is associated with an increase of about 21 percentage points in the husband's share, reaching 50% of couple's time spent on these activities. Note that this percentage is far below the average wife's share (70.6%) on days when both partners are working. In contrast, a wife's nonworking day is associated with a decrease of 17.2 percentage points in the husband's share of female-typed housework —moving it close to 12%, which leads partners to approach full specialization, with the wife doing most of these tasks. For total housework, partners' behavioral patterns are similar, although the husband's share reaches slightly higher values (see Panel B of Table 5). These results are in line with Solaz (2005). In her analysis with French data, she finds that the wife specializes in female-typed activities when she is unemployed, she specializes but leaves to the husband the tasks that are less clearly gendered (e.g., shopping, accounts or administrative tasks).

To complement this evidence, in the last column of Table 5 we explore the husband's housework adjustment at the extensive margin by estimating a probit model for the likelihood of him contributing any housework. Our results show that,

on average, 78% (resp. 86%) of husbands devote any time to female-typed (resp. total) housework on days when both partners are working. When the husband has a nonworking day, the probability of him contributing to female-typed (total) housework increases by 13 (14) percentage points, whereas a wife's nonworking day leads to a decline of about 20 (16) percentage points in the probability that he engages in these activities. Then our estimates suggest that men do adjust housework not only at the intensive but also at the extensive margin when they or their partners have a nonworking day.

In sum, we find no substantial differences in either the sign or statistical significance of housework time changes by gender. However, the different magnitude of wives' versus husbands' responses to additional nonworking time—when combined with the already unbalanced distribution of housework on working days—induces the resulting couple's gender balance in housework to depend asymmetrically on who, husband or wife, has a day off. According to the theoretical framework, this asymmetric pattern of male and female responses would be consistent with a situation in which the husband's housework time can be substituted but the wife's cannot. Our findings also accord with cases where social norms concerning what "a man and a woman should do" define—through preferences—an upper (resp. lower) bound on husbands' (resp. wives') contribution to household labor. Either of these channels (or their combination) could explain why women in dual-earner couples perform about 84% of the total housework on nonworking days even as their husbands barely achieve 57% in a similar situation.

4.4 Heterogeneous effects

The estimates we have derived so far characterize the average effect of nonworking days on housework outcomes of Spanish dual-earner couples working full-time. In Table 6, we explore four possible sources of heterogeneity. First, we analyze whether behavioral patterns of intra-couple time allocation have changed during the seven-year period from 2002–2003 to 2009–2010. Panel A of the table reports specifications that include interactions between our key indicators for the couples' time schedule and a dummy for the survey year. We observe that, on usual working days for both partners, the average time that men spend on female-typed activities does not differ significantly between the two surveys whereas the average time their wives spend performing similar tasks decreased a statistically significant 21.7 min.[11] This change moved the husbands' share of time devoted to these tasks from 27.8% during 2002–2003 to about 31.4% during 2009–2010, a modest but statistically significant increase. Total housework exhibits a similar pattern. On average, women reduced the time they spent on domestic work by 27 min, which implies that the husbands' share of total housework in dual-earner couples rose from almost 31% in 2002–2003 to about 34.3% in 2009–2010, a statistically significant difference. The observed convergence between male and female involvement in unpaid domestic work keeps

[11] Giménez-Nadal and Sevilla (2014) show that, during the period 2002–2003 to 2009–2010, Spanish women increased, on average, time spent on market work by 8 h per week and reduced nonmarket work and leisure by 6 and 2 fewer hours per week, respectively. In the same period, Spanish men reduced time spent on market work by 8.5 h per week but increased time spent on nonmarket work and leisure by about 4 and 4.6 h per week, respectively.

Table 6 Heterogeneity of effects

	Female-typed housework			Total housework		
	Husband's time (10-min intervals)	Wife's time (10-min intervals)	Husband's share	Husband's time (10-min intervals)	Wife's time (10-min intervals)	Husband's share
Panel A: interactions by year						
Both partners on working day	4.438***(0.206)	12.034***(0.287)	0.278***(0.010)	7.755***(0.307)	16.424***(0.378)	0.309***(0.009)
×Year 2009–2010	0.013(0.321)	−2.174***(0.494)	0.036**(0.017)	0.134(0.489)	−2.698***(0.583)	0.034**(0.016)
Δ on husband's nonworking day	7.117***(1.552)	−1.472(1.185)	0.232***(0.041)	13.877***(1.877)	−0.840(1.614)	0.281***(0.034)
×Year 2009–2010	−2.539(1.910)	0.008(1.448)	−0.052(0.062)	−6.133***(2.314)	0.495(1.980)	−0.070(0.052)
Δ on wife's nonworking day	−1.793***(0.611)	9.977***(1.463)	−0.140***(0.028)	−1.702*(0.986)	12.986***(1.709)	−0.143***(0.026)
×Year 2009–2010	−0.742(0.762)	−0.089(2.103)	−0.075**(0.038)	0.153(1.445)	0.153(2.505)	−0.024(0.039)
Panel B: interactions by wife's share of earnings						
Both partners on working day	4.172***(0.177)	11.190***(0.245)	0.278***(0.009)	7.529***(0.266)	15.360***(0.313)	0.312***(0.008)
×Wife's share of earnings > 1/2	1.485**(0.588)	0.035(0.698)	0.058**(0.026)	1.767**(0.757)	0.268(0.859)	0.047**(0.023)
Δ on husband's nonworking day	6.122***(1.034)	−1.277(0.907)	0.216***(0.035)	11.523***(1.317)	−0.652(1.255)	0.259***(0.029)
×Wife's share of earnings > 1/2	−1.682(3.872)	−1.204(2.149)	−0.071(0.101)	−4.785(4.175)	−3.099(2.503)	−0.102(0.079)
Δ on wife's nonworking day	−2.231***(0.527)	10.646***(1.184)	−0.188***(0.023)	−2.288***(0.835)	13.614***(1.403)	−0.175***(0.022)
×Wife's share of earnings > 1/2	1.158(1.111)	−3.884(2.899)	0.135**(0.064)	4.123**(2.004)	−3.030(4.042)	0.156**(0.065)
Panel C: interactions by partners' education						
Both partners on working day	4.468***(0.210)	11.852***(0.278)	0.274***(0.009)	7.896***(0.298)	16.034***(0.352)	0.315***(0.009)
×Both tertiary education	−0.112(0.324)	−1.938***(0.498)	0.054***(0.018)	−0.324(0.515)	−1.897***(0.613)	0.026(0.017)
Δ on husband's nonworking day	6.126***(1.235)	−2.488**(1.059)	0.234***(0.042)	10.674***(1.583)	−2.429*(1.411)	0.265***(0.035)
×Both tertiary education	−0.491(2.087)	2.757*(1.515)	−0.069(0.065)	1.042(2.491)	3.802*(2.108)	−0.042(0.037)
Δ on wife's nonworking day	−2.226***(0.564)	10.365***(1.295)	−0.166***(0.025)	−2.020**(0.938)	13.426***(1.592)	−0.160***(0.025)
×Both tertiary education	0.471(0.810)	−2.126(2.293)	−0.009(0.045)	1.446(1.490)	−1.909(2.707)	0.033(0.047)

Table 6 continued

	Female-typed housework			Total housework		
	Husband's time (10-min intervals)	Wife's time (10-min intervals)	Husband's share	Husband's time (10-min intervals)	Wife's time (10-min intervals)	Husband's share
Panel D: interactions by presence of children aged 0–16 years						
Both partners on working day	4.252***(0.340)	10.973***(0.511)	0.281***(0.016)	8.180***(0.509)	15.173***(0.636)	0.328***(0.016)
×children 0–16 years	0.310(0.510)	0.507(0.718)	0.013(0.023)	−0.605(0.728)	0.192(0.844)	−0.012(0.022)
Δ on husband's nonworking day	5.153***(1.456)	−2.386*(1.343)	0.228***(0.059)	10.291***(2.137)	−1.884(1.841)	0.239***(0.046)
×children 0–16 years	1.217(1.927)	1.523(1.510)	−0.026(0.067)	1.049(2.542)	1.020(2.097)	0.020(0.055)
Δ on wife's nonworking day	−1.278*(0.771)	7.389***(1.898)	−0.144***(0.041)	−1.779(1.311)	10.293***(2.244)	−0.146***(0.039)
×children 0–16 years	−1.260(0.827)	3.748*(2.223)	−0.038(0.042)	0.234(1.507)	4.053(2.590)	−0.007(0.043)

See notes to Table 5

Source: STUS for 2002–2003 and for 2009–2010

*$p < 0.10$, **$p < 0.05$, ***$p < 0.01$

pace with advances in social norms on men's and women's roles[12] throughout that period and the consideration of gender equality as a political priority (Bustelo 2016). Such advances may have influenced men's and women's direct preferences for performing housework. Another potential explanation could be related to improvements in labor-saving devices for performing female-typed domestic tasks. The use of better household appliances may have increased the relative productivity of women's time in home production. This would explain the significant drop of women's housework time throughout this period.

Regarding the changes associated with wives' or husbands' nonworking days, we obtain that the decrease in the husband's share of female-typed housework associated with a wife's nonworking day was larger in 2009–2010 than it had been in the seven prior years. Likewise, the increase in husbands' time of total housework associated to own nonworking days went down during this period. It is difficult to attribute these findings to a sole explanation. The Great Recession had a dramatic impact on the Spanish labor market and, thus, on households. Women increased their labor force participation to cope with family economic instability as men experienced comparatively higher job losses. The composition of dual-earner couples may have changed as a result of the entrance of less career-oriented women into the labor market. Moreover, during the economic crisis, expenditures on items for which unpaid work may provide a substitute (e.g., catering and services for routine maintenance) decreased (Bettio et al. 2012). Such economic constraints may have increased women's unpaid work burden relatively more than men's. Without additional information we cannot distinguish between these explanations, or among them and others.

A second potential source of heterogeneity stems from partners' relative earnings. As mentioned in Section 2, collective models assume that relative earnings determine partners' bargaining power and, hence, the sharing rule in couples' decisions. Since housework tends to be considered a necessary but undesirable task for both partners (Stancanelli and Stratton 2014), it follows that we should find a negative relationship between each partner's economic power and their respective shares of domestic work. However, the "doing gender" hypothesis (Coltrane 2000) or the economic models of identity (Akerlof and Kranton 2000) predict that when the wife earns more than the husband, she may increase her share of the housework as a way to compensate for her deviance from the behavior prescribed for women by traditional norms .To examine this conjecture, we re-estimate (see Panel B of Table 6) the baseline specifications by including interactions between our key indicators of partners' time schedule and a binary indicator variable for whether (or not) the wife earns more than the husband. In 13.3% of couples in our sample, the wife reports higher earnings than her husband. Our estimates show that, on usual working days for both partners, the husband's share of both housework categories is significantly higher when his wife earns more than when she earns less (or the same). Yet a wife's relative earnings do not significantly alter the housework changes associated with a

[12] According to the European Social Survey, between 2004 and 2010, the percentage of Spanish respondents who agreed or strongly agreed with the statement "Women should be prepared to cut down on paid work for the sake of family" decreased from 55.4% to 45.1. Along the same period, the percentage of those who agreed or strongly agreed with "Men should have more right to a job than women when jobs are scarce" decreased from 30.7 to 25%.

husband's nonworking day. Nonetheless, it does modify the effect of a wife's nonworking day on the couple's housework gender balance. In particular, if the wife earns more than the husband then the husband's share of female-typed housework decreases less (5.3 percentage points)[13] than in couples where the wife does not earn more than her partner (18.8 percentage points). Table 6 reports similar qualitative results for total housework. Overall, these findings suggest that, in our sample, the wife is able to negotiate a more beneficial housework allocation on working days and nonworking days as her economic power increases.

The third possible source of heterogeneity is partners' educational level. Research has established a positive association between education and egalitarian attitudes (Vella 1994; Fan and Marini 2000; Fortin 2015; Foster and Stratton 2018), so we compare the housework allocation decisions made by couples of different educational levels. For this purpose, we interact our measures of couples' time schedule with a dummy variable set to 1 if both partners achieved tertiary education (about 30.2% of the couples in our sample) and set to 0 otherwise. Our estimates (see Panel C of Table 6) reveal that, on usual working days for both partners, university-educated couples achieve a more egalitarian gender balance: men contribute, on average, 33% of the female-typed housework versus 27.4% in less educated couples. This statistically significant difference mainly reflects that women in more educated couples spend about 20 min less on these activities. We find no statistically significant differences in how differently educated couples behave on wives' nonworking days. However, we observe that, on husbands' nonworking days, wives in less educated couples reduce their housework time more than wives in university-educated couples. Differences are only significant at a 10% level. Such behavior by wives may reflect a higher degree of complementarity between wives' and husbands' housework in highly educated couples.

Finally, we analyze the extent to which parents' behavior differs from nonparents' behavior. In Panel D, we include interactions with a binary indicator for the presence of children between 0 and 16 years old. We find no statistically significant differences between couples with or without children. Although unexpected, this result is in line with previous evidence by Sevilla-Sanz et al. (2010) who, using the STUS 2002–03, find that neither the number of children nor their ages significantly modify women's specialization on housework.

4.5 Robustness checks

Table 7 reports results from several checks intended to judge the robustness of our main results.

As argued in Section 4.1, a possible concern with our approach is that the results just reflect differences in work schedules of couples interviewed on usual working days for both partners and those interviewed on a nonworking day for one partner. Although we are uncertain as to the type of mechanism leading these two groups of

[13] We compute this change by adding up the estimated average husband's share of female-typed housework on usual working days in couples where the wife earns more than the husband ($0.278 + 0.058$), and the estimated change on a wife's nonworking day for the same type of couples ($-0.188 + 0.135$). See Table 6.

Table 7 Robustness checks

	Female-typed housework			Total housework		
	Husband's time (10-min intervals)	Wife's time (10-min intervals)	Husband's share	Husband's time (10-min intervals)	Wife's time (10-min intervals)	Husband's share
Panel A: sample restricted to partners with different week work schedules						
Both partners on working day	5.067**(0.698)	11.030***(0.679)	0.293***(0.023)	8.534**(0.888)	15.328***(0.977)	0.331***(0.022)
Δ husband on nonworking day	5.723***(1.272)	−1.317(1.089)	0.220***(0.039)	10.769***(1.551)	−1.163(1.543)	0.252***(0.034)
Δ wife on nonworking day	−2.448***(0.908)	10.396***(1.303)	−0.164***(0.316)	−2.044*(1.214)	13.262***(1.696)	−0.150***(0.029)
N	401	401	401	401	401	401
Panel B: differences by type of nonworking day—STUS 2002–03[a]						
Both partners on working day	4.479***(2.215)	11.852***(0.282)	0.282***(0.010)	7.567***(0.303)	16.176***(0.384)	0.310***(0.009)
Δ husband on nonworking day	5.978***(2.017)	−0.818(1.962)	0.199***(0.061)	11.459***(2.481)	−1.712(2.603)	0.230***(0.051)
×Day requested	1.304(3.193)	−1.174(2.428)	0.020(0.083)	4.236(3.759)	0.858(3.288)	0.085(0.067)
Δ wife on nonworking day	−2.918**(1.178)	12.131***(1.960)	−0.235***(0.044)	−2.827*(1.556)	12.671***(2.340)	−0.200***(0.039)
×Day requested	1.290(1.286)	−3.533(2.804)	0.137**(0.056)	1.290(1.917)	0.584(3.326)	0.069(0.051)
N	812	812	812	812	812	812
Panel C: sample includes all dual-earner couples						
Both partners on working day	4.662***(0.234)	11.645***(0.309)	0.294***(0.009)	7.861***(0.341)	15.697***(0.399)	0.326***(0.009)
Δ husband on nonworking day	5.803***(1.027)	−2.501***(0.815)	0.211***(0.032)	10.886***(1.273)	−2.190**(1.107)	0.251***(0.027)
Δ wife on nonworking day	−2.076***(0.459)	9.034***(1.089)	−0.156***(0.021)	−1.390*(0.809)	12.210***(1.331)	−0.141***(0.021)
Δ both on nonworking day	1.693***(0.571)	5.096***(0.796)	−0.008(0.021)	6.339***(0.922)	7.522***(1.013)	0.032*(0.018)
N	1779	1779	1779	1779	1779	1779

See notes to Table 5 and the explanations reported in subsection 4.5

Source: Panels A, B, and C, STUS for 2002–2003 and for 2009–2010; Panel D, STUS for 2002–2003

[a]We label as "Day requested" reported nonworking days that respondents classified as paid holidays or days off (see Section 4.5 for explanation)

couples to differ in housework allocation decisions, one candidate is a different preference for partners' time coordination across the week. Some papers have found empirical evidence that partners who coordinate their work times and schedules have more synchronous leisure and housework times (e.g., Hamermesh 2000; Van Klaveren and Van den Brink 2007; Bryan and Sevilla 2017; Qi et al. 2017). If this were the case, then the estimated change in partners' housework times observed on nonworking days would only reflect their lower taste for coordinating paid and unpaid work rather than the effect of increased nonworking time. The STUS offers information that allows us to infer whether or not partners coordinated work schedules on the previous seven days (including the interview day). In Panel A of Table 7, we re-estimate the baseline models by eliminating the couples who filled out the survey on working days for both partners and who reported to be working or not working on the same days during the week before the interview. This restriction intends to reduce the likelihood of comparing couples who differ in coordination preferences. We find no evidence indicating that this fact drives our results to an important extent. Although the sample size reduces notably, the coefficient estimates on nonworking days are rather similar to the baseline results in Table 5.

An additional concern with our analysis is that nonworking days may have been voluntarily requested by workers (i.e., in accordance with statutory or contractual conditions). If the decision to request a day off were based on the need to run personal errands involving any type of domestic labor, then the estimated direct effects of own nonworking day on housework time would be biased upward. In our data, we cannot truly distinguish whether or not the worker requested the nonworking day. Nonetheless, the 2002–03 STUS did include a question (modified in the 2009–2010 version) that allows us to classify the nonworking day into two categories: (i) paid vacation or day off; (ii) public holiday or weekend. Although employers can impose the periods of paid vacation (e.g., from June to September), workers may decide on the exact dates (or at least on part of them). Similarly, workers can decide when to take their legal entitlement to days off. Yet we cannot discard that respondents label as a day off a nonworking day that belongs to his/her usual weekly schedule. In contrast, public holidays or nonworking weekends are exogenously set nonworking days. Then, the category (i) is more likely to include requested nonworking days than (ii). To assess the extent to which nonworking days decided by the worker could drive our estimates, we re-estimated our models using the 2002–2003 subsample[14] while interacting our indicators for the couples' day schedule with a dummy set to 1 if the nonworking day was classified as paid vacation or day off (and to 0, otherwise). Roughly 46% of individuals interviewed on nonworking days (62 individuals out of 134) classified the day as paid vacation or day off. Note that the small number of individuals reporting this type of nonworking day may condition the precision of our estimates. Panel B in Table 7 presents the estimation results. In general, we find that the magnitude of partners' housework time changes do not differ significantly between both categories of nonworking days. The only statistically significant disparity appears in the husband's share of female-typed activities. In this specification, we find that wives' *nonrequested* days off reduce the

[14] This restriction leaves us with 812 couples from which 678 were interviewed on a working day for both partners, 62 on a nonworking day for the husband and 72 on a working day for the wife.

husband's share by 23.5 percentage points but that a *requested* nonworking day leads to a much smaller reduction of around 10 percentage points. We remark this finding runs counter to the hypothesis that women's requests for a day off are best explained by domestic labor demands.

Finally, we explore the sensitivity of our estimates to our decision to exclude couples interviewed on nonworking days for both partners. This exclusion restriction implied eliminating a sizable number of diaries filled out on Saturdays or Sundays. Some papers find that housework patterns differ substantially across the week and the weekends (e.g., Bloemen et al. 2010; Bredtmann 2014), so this decision may have also affected the estimated coefficients on our key variables. In Panel C we re-ran the baseline regression by eliminating this sample restriction. Results show that the estimates on the coefficients on wives' and husbands' nonworking days are rather similar to the baseline estimates in Table 5. Furthermore, we find that wives and husbands increase the time spent on female-typed housework on nonworking days for both partners, but they do so in an unbalanced way so the husband's share of female-typed housework remains unchanged with respect to usual working days. Yet the husbands' share of total housework is 3.2 percentage points higher, on average, than in working days, though the difference is significant only at the 10% level.

5 Conclusions

Is gender imbalance in housework allocation a matter of time? We have investigated this topic by exploring the effect of nonworking days on the intra-couple housework allocations of Spanish dual-earner couples. Nonworking days due to holidays, weekends, or statutory days off amount to reductions in paid-time work at constant earnings, so our analysis excludes the confounding effects of income and of changes in partners' economic power.

Consistent with studies based on legal workweek reductions (Kawaguchi et al. 2013; Goux et al. 2014), labor market promotions and terminations (Foster and Stratton 2018) or changes in employment status (Solaz 2005), we show evidence that time allocation by men and women differ when paid work is reduced, and constraints on one partner's paid work time also alter the time allocation of the other partner. Our main finding is that, although time restrictions imposed by paid work explain the amount of time men and women devote to housework, the relaxing of these restrictions (on nonworking days) has *asymmetric* results—in terms of gender balance—depending on which of the partners is affected. In particular, we observe that the housework gender gap widens on days when the wife does not work (and the husband does). On those days, the couple moves toward a male breadwinner–housewife allocation: on average, women perform about 87% of the female-typed housework and 83% of the couple's total housework. This result is primarily explained by the large increase in time spent by wives on these activities—which adds to their already sizable contribution on working days—and not by an absolute decrease in the time spent by husbands. In contrast, housework tends to be distributed equally between partners when the husband has a day off and the wife is working. Such gender asymmetries are consistent with a relatively lower substitutability of female housework in household production and also with the bounds that

prevailing gender role norms may impose on time allocation among Spanish couples. In spite of its advances over the last decades, Spain still ranks in intermediate positions—relative to other European countries—in terms of gender-equitable attitudes (Arpino et al. 2015). This raises the question of whether our results are specific to the Spanish context. An interesting avenue for future research would be to extend the analysis to other countries so we can identify which part of the gender asymmetric reaction to a partner's nonworking day is driven by gender social norms. Cross-country variation in the presence of gender in language (Gay et al. 2018) or in reported attitudes towards gender stereotypes (Walter 2018) could be used as markers of this cultural influence.

Preferences for housework time synchronization are another issue that deserves more attention in this setting. Our analysis focuses on changes in partners' average housework times. Yet nonworking days may also affect the timing of activities. Recent research has found that measures aimed at promoting work-life balance, such as flexitime, have a positive effect on a couple's time synchronization (e.g., Bryan and Sevilla 2017). It would be interesting to complement this evidence by exploring the extent to which reduction of working time through employees to days off, parental leaves, or permanent workweek reductions lead dual-earner couples to modify the amount of partners' synchronous time spent on different types of activities. A more specific question related to our findings would be to analyze whether, on wives' nonworking days, the husbands tend to retain domestic activities in which partners are usually more synchronized or they just keep doing male-typed tasks, reinforcing in that way gender-segregation in housework. The STUS provides information on whether partners perform the same activity at the same time that would allow exploring these issues.

From a policy perspective, our paper provides empirical evidence that regulations that aim to increase nonworking time (through additional days off, parental leave, or shorter workweeks) affect intra-household division of unpaid domestic labor. The results reported here suggest that workers devote part of the extra time resulting from nonworking days to increasing housework, which may help balance work and life spheres. Yet even though an increase in wives' nonworking time generates changes in couples' housework time allocation of the same sign as did an increase in their husbands' nonworking time, women continue to contribute a larger proportion of their free time to housework than men do—that is, regardless of the couple's working time schedules. In other words, achieving gender balance in intra-couple housework allocation seems more than simply a matter of time. As Stratton (2012) highlights, preferences may have a relevant but complex influence on these decisions. In this sense, there is evidence (see Álvarez and Miles 2016) showing that doing less housework than desired has a greater penalty on Spanish working women's subjective well-being than doing more housework than desired. In contrast, working men's subjective well-being is unaffected by these type of mismatches in housework time. Likewise, Foster and Stratton (2018) find that when husbands conform to social stereotypes in terms of housework, their wives are less happy with housework allocation but happier in broader dimensions. Such preferences—shaped by the prevalence of traditional gender norms—could contribute to rationalizing women's specialization in housework on nonworking days.

Table A9 Baseline regression models: OLS coefficient estimates

	Total housework			Female-typed housework		
	Husband's time (10-min intervals)	Wife's time (10-min intervals)	Husband's share	Husband's time (10-min intervals)	Wife's time (10-min intervals)	Husband's share
Only husband on working day	10.958***(1.288)	−1.309(1.173)	0.244***(0.028)	5.910***(1.058)	−1.682*(0.863)	0.206***(0.034)
Only wife on working day	−1.647**(0.817)	13.014***(1.384)	−0.154***(0.022)	−2.111***(0.513)	9.905***(1.111)	−0.172***(0.024)
Partners' mean age	0.102**(0.040)	0.148***(0.045)	−0.000(0.001)	0.012(0.025)	0.075**(0.038)	−0.002(0.001)
Husband: tertiary education	0.429(0.497)	−1.285**(0.595)	0.028*(0.015)	0.106(0.336)	−1.539***(0.478)	0.040**(0.016)
Wife: tertiary education	0.049(0.501)	−0.570(0.580)	0.015(0.014)	−0.102(0.320)	−0.914**(0.463)	0.023(0.015)
Wife's earnings share	5.992**(2.681)	−5.836*(3.171)	0.226***(0.080)	6.330***(1.887)	−5.357**(2.521)	0.319***(0.081)
Husband: split-shift at work	−2.862***(0.447)	0.573(0.553)	−0.067***(0.014)	1.142***(0.312)	−0.609(0.450)	0.044***(0.015)
Wife: split shift at work	0.808*(0.482)	−2.843***(0.594)	0.068***(0.015)	−0.660**(0.333)	2.481***(0.456)	−0.063***(0.016)
Number of children	0.613(0.446)	0.803(0.508)	−0.003(0.013)	0.805**(0.341)	0.916**(0.417)	−0.004(0.013)
Children aged 0–7	−0.739(0.695)	−2.819***(0.849)	0.022(0.021)	−0.466(0.491)	−2.093***(0.669)	0.027(0.022)
Children aged 7–16	−1.173*(0.702)	1.601*(0.835)	−0.050**(0.021)	−0.685(0.498)	1.812***(0.668)	−0.043**(0.021)
Children aged 17+	−0.593(0.842)	−0.514(0.956)	0.002(0.023)	−1.130*(0.615)	0.186(0.839)	−0.013(0.024)
Hired domestic help	−1.224**(0.611)	−2.481***(0.672)	0.004(0.018)	−1.012**(0.408)	−2.655***(0.519)	0.006(0.020)
Tuesday	0.085(0.759)	0.702(0.889)	−0.022(0.025)	−0.562(0.587)	−0.152(0.765)	−0.024(0.026)
Wednesday	0.899(0.789)	0.152(0.881)	−0.001(0.025)	−0.033(0.592)	−0.989(0.734)	0.001(0.026)
Thursday	0.007(0.770)	−0.777(0.862)	0.002(0.025)	−0.814(0.544)	−1.771**(0.720)	−0.000(0.026)
Friday	0.990(0.692)	1.223(0.808)	0.0001(0.022)	−0.834*(0.490)	−0.607(0.689)	−0.004(0.023)
Saturday	1.743(1.215)	0.022(1.503)	0.015(0.031)	−0.627(0.949)	−2.093**(1.063)	−0.020(0.034)
Sunday	1.215(1.479)	−2.516(1.824)	0.060*(0.036)	1.363(1.064)	−1.626(1.675)	0.076**(0.039)
Second quarter	−0.034(0.591)	0.961(0.703)	0.012(0.018)	−0.347(0.418)	0.455(0.571)	0.015(0.019)
Third quarter	0.436(0.675)	1.169(0.780)	0.001(0.019)	−0.315(0.471)	1.011(0.642)	−0.009(0.020)

Table A9 continued

	Total housework			Female-typed housework		
	Husband's time (10-min intervals)	Wife's time (10-min intervals)	Husband's share	Husband's time (10-min intervals)	Wife's time (10-min intervals)	Husband's share
Fourth quarter	−0.126(0.621)	0.280(0.733)	0.016(0.018)	−0.283(0.481)	−0.033(0.553)	0.013(0.019)
Year 2009–10	−0.486(0.496)	−2.355***(0.581)	0.032**(0.015)	−0.280(0.341)	−1.820***(0.479)	0.029*(0.016)
Constant	−0.443(2.075)	11.624***(2.361)	0.211***(0.061)	1.503(1.461)	11.215***(1.969)	0.211***(0.062)
R^2	0.19	0.23	0.19	0.14	0.26	0.16
N	1282	1282	1282	1282	1282	1282

The sample consists of men and women in dual-earner couples working full-time who were interviewed on days when at least one of the partners was working. Wife's and husband's time refer to time spent on housework during the interview day. Robust standard errors are reported in parentheses

Source: STUS for 2002–2003 and for 2009–2010

*$p < 0.10$, **$p < 0.05$, ***$p < 0.01$

Table A8 Distribution of households by day of week in the STUS and in our sample (%)

	STUS 2002–3003			STUS 2009–2010			Pooled sample
Day of week	Households in the survey	Initial sample[a]	Final sample[a]	Households in the survey	Initial sample[a]	Final sample[a]	Households in our sample
Monday	12.43	13.14	17.00	10.21	8.64	11.49	14.98
Tuesday	12.69	11.08	14.16	10.38	12.58	16.81	15.13
Wednesday	12.90	12.96	16.50	9.77	10.61	14.26	15.68
Thursday	12.73	13.76	17.86	9.98	9.24	12.13	15.76
Friday	16.33	17.96	22.66	20.25	12.58	29.57	25.50
Saturday	16.19	16.09	8.37	19.39	17.73	9.36	8.74
Sunday	16.74	15.01	3.45	20.02	18.64	6.38	4.52
No. of households	20,603	1119	812	9541	660	470	1282

[a]The initial (resp. final) sample includes (resp. excludes) couples who were interviewed on days when *neither* of the partners was working

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Compliance with ethical standards

Conflict of interest The authors declare that they have no conflict of interest.

6 Appendix

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