



# Body mass index and the distribution of housework among British couples

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## Abstract

In this paper, we analyze the relationship between Body Mass Index of the members of the couple and the distribution of housework within the same couple. Prior research has documented that higher-BMI spouses compensate their partners by increasing their market work hours. The question remains, does this compensation mechanism extend to the share of the time dedicated to housework. Using the British Household Panel Surveys for the years 2004 and 2006, we analyze the relationship between spouses' Body Mass Index and the time devoted to housework. Our results show that a relatively higher BMI of any member of the couple is related to a decrease in his/her fraction of housework. This result is maintained when we restrict our sample to two-earner couples. We find no evidence for the compensation mechanism by which higher-BMI spouses work longer hours. By analyzing the relationship between housework time and Body Mass Index within the couple, we examine an important issue, given the significant contribution that members of couples make to their households via housework time.

**Keywords** Body Mass Index · Couple · Housework · British Panel Household Survey · Instrumental Variables.

JEL D13 · J16 · J22

## 1 Introduction

Being overweight is a global phenomenon, and it is growing as obesity has almost tripled since 1975. The World Health Organization estimates that there were more than 1.9 billion overweight adults, and at least 650 million obese adults, worldwide,

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in 2016.<sup>1</sup> Sutton (2011) shows that the proportion of obese adults in the UK gradually increased over the 1993–2011 period, from 13.2% in 1993 to 23.6% in 2011 for men, and from 16.4 to 25.9% for women. Currently, in England, 25.6% of people aged 16 years and over are obese (Public Health England, 2016). The potential health consequences of being overweight include being at increased risk of morbidity from hypertension, stroke, type 2 diabetes, osteoarthritis, respiratory problems, and breast, prostate, and colon cancer (National Heart, Lung, and Blood Institute, 1998). Thus, being overweight poses one of the greatest public health challenges for the 21st century in the developed world, and accounts for a significant percentage of health care costs (WHO, 2016). We cannot ignore the fact that, according to official statistics, at least 2.8 million adults die each year from factors related to being overweight or obese (<https://easo.org/media-portal/statistics/>).

Apart from the problems of obesity at the societal level, being overweight also has important consequences for individuals. Prior research has examined the impact of being overweight on outcomes such as wages (Cawley, 2004; Brunello & D’Hombres, 2007; Wada & Tekin, 2010; Sabia & Rees, 2012) and income (Garcia-Villar & Quintana-Domeque, 2009; Jolliffe, 2011), labour force participation and employment (Lakdawalla & Philipson, 2007; Loh, 2009; Lindeboom et al., 2010; Mosca, 2013), educational achievement (Kaestner & Grossman, 2009; Scholder et al., 2012), marriage market matching (Averett et al., 2008; Brown, 2011), and marital dissolution (Bellido & Marcén, 2020). The evidence generally indicates poorer individual outcomes for obese women compared to their non-obese counterparts, while the results for men are less clear-cut.

Despite prior research into the relationship between being overweight and public and individual outcomes, little work has been done on how the relative obesity of the couple affects behaviours within the couple. Physical appearance has been found to matter in household models. As argued by Sobal et al. (1995), being overweight is stigmatized by spouses, and social pressure to be slim affects marital matching and interactions and divorce (Averett et al., 2008; Brown, 2011; Chiappori et al., 2012; Bellido & Marcén, 2020)<sup>2</sup>, but only Oreffice and Quintana-Domeque (2012) have directly analyzed the effect of relative appearance (i.e., relative Body Mass Index in couples) on the hours devoted to the labour market by the two members of the couple. These authors find evidence that relatively high body weight induces individuals to compensate for their negative physical trait by working more hours, while their spouses work less. The authors argue that “discrepancies in physical appearance lead to a better position inside the household for the better-looking spouse, in terms of intra-household allocation of resources, and thus of hours worked by husbands and wives [pp. 2].”

Regarding the possible relationship between housework and Body Mass Index (BMI), two competing hypotheses emerge. First, in the same way that individuals in couples may compensate their partner for their less desirable characteristics by working more in the labour market (Grossbard-Shechtman, 1984; Grossbard-

<sup>1</sup> Figures are obtained from the following link: <https://www.who.int/news-room/fact-sheets/detail/obesity-and-overweight>

<sup>2</sup> Being overweight is a stigmatized feature associated with low marital quality, which is why the overweight compensate, through different mechanisms, their slimmer partners (Sobal et al., 1995).

Shechtman & Neuman, 1988; Chiappori et al., 2012; Oreffice & Quintana-Domeque, 2012), the same individuals may also work more within the household (doing housework) to compensate the partners (Grossbard et al., 2014). This hypothesis implies that spouses with a high BMI relative to that of their spouse will work more in household production than when married to spouses with similar BMI. Second, individuals with a relatively lower marital quality within the couple (i.e., higher relative BMI), who devote more time to the labour market (Oreffice & Quintana-Domeque, 2012), may be substituting non-market work within the household (housework time) for more hours of paid market work, thus transferring income to their partners, and working less in household production. If this negative trade-off between market and non-market work exists, spouses with a relatively higher BMI will devote less time to non-labour production, and thus reduce their contribution to housework time. In addition, housework is composed of physically demanding activities. If those members of the couples with a relatively higher BMI find difficulty in facing these household chores, then they may dedicate less time to them. This being true, higher-BMI members would spend less time doing the housework, a result that points in the opposite direction to the compensation effect.

Against this background, we focus on the relationship between the relative BMI of the members of a couple and their distribution of the time devoted to housework, and test the two competing hypotheses. To that end, we use the years 2004 and 2006 of the British Household Panel Survey (BHPS), containing information on individuals' height and weight, and the weekly hours devoted to housework activities. Our analysis shows that a relatively higher BMI of any member of the couple is related to a decrease in the relative time devoted to housework by that member. We find that this correlation is driven by the behaviour of both men and women, and that it is specially strong at the bottom of the distribution of the relative BMI. However, it could be that these findings on housework hours simply "mirror" the decisions on market working hours, as reported by Oreffice and Quintana-Domeque (2012). To deal with this issue, we additionally estimate our models in a sample of two-earner couples, obtaining the same conclusions.

By analyzing the relationship between partners' relative BMI and the time devoted to housework, we contribute to the literature on the effects of being overweight on individual outcomes. To the best of our knowledge, we are the first to empirically look at the relationship between partner's relative BMI and the distribution of time devoted to housework, adding to the work on the individual welfare effects of being overweight: non-market work activities (such as housework) provide a low momentary-experienced utility (are less satisfying) compared to leisure activities (Kahneman et al., 2004; Kahneman & Krueger, 2006; Krueger, 2007). Our results indicate that relatively more obese individuals are not penalized at the couple level with more time in household production, since they devote comparatively less time to these activities. We also contribute to the existing literature on the determinants of the allocation of time to household production at the couple level, a body of work that includes John and Shelton (1997), Bittman et al. (2003), Kalenkoski et al. (2005), Aguiar and Hurst (2007), Connelly and Kimmel (2007, 2009), Burda et al. (2008), Bloemen and Stancanelli (2008), Sayer and Fine (2011), and Gimenez-Nadal and Molina (2013), among others.

We extend our analysis to study the impact of the partners' relative BMI on the time devoted to the labour market, finding no empirical evidence of the compensation effect described by Oreffice and Quintana-Domeque (2012). The fact that we have information on the BMI of both members of the couple allows us to observe how market work is affected by own BMI (through wages) and intra-household bargaining, which is an improvement in comparison to Grossbard and Mukhopadhyay (2017), since those authors do not have information on partner's BMI

The rest of the paper is organized as follows. Section 2 reviews the prior literature on this topic. Section 3 describes the data used, and Section 4 presents our econometric strategy. Section 5 presents the results on the relationship between individual relative BMI and the time devoted to housework, and Section 6 sets out our main conclusions.

## 2 Literature review

Physical appearance has been found to be an important factor in personal life. Langlois et al. (2000) review the existing literature on the personal benefits derived from a positive physical appearance and show that good-looking people are better-judged and better-treated by their counterparts (regardless of whether they know them or not), pointing to the existence of rewards in terms of salaries, mental health, and self-esteem, among other things. Wong and Penner (2016) analyze the pecuniary benefits derived from physical appearance, quantifying the monetary reward of 'attractive' people at 20%, compared to those of average attractiveness, with no gender differentials in this reward. Hamermesh and Biddle (1994, 1998) and Hamermesh and Abrevaya (2013) also document the positive effects of 'beauty' on labour market outcomes. Physical appearance has also been found to positively impact the status attained within social groups (Anderson et al., 2001). Haas and Gregory (2005) work with a sample of women and demonstrate that more attractive women influence more their less-attractive counterparts than vice-versa. In the same vein, Dollinger (2002) shows the social differences between college students classified as physically attractive and their less attractive counterparts, with the former showing a much more intense social life than the latter.

Among personal relationships, marriage seems to be no exception regarding the important role played by physical appearance. Among other indicators of beauty, the BMI has been found to be connected to the likelihood of being married (Jæger, 2011), and to the likelihood of marital dissolution, since overweight people are more likely to stay married (Bellido & Marcén, 2020). McNulty et al. (2008) find that differences in physical attractiveness between the members of the couple are important in predicting marital behaviour: in those cases where the wife is more attractive than the husband, the behaviour of both spouses is more positive, with the opposite being true for marriages where the husband is more attractive than the wife.

Physical attractiveness has also been found to affect marital satisfaction. Meltzer et al. (2014) find gender differences regarding this issue, since the husband's satisfaction is more related to his partner's physical attractiveness than is the wife's satisfaction. Meltzer et al. (2011) use the own and partner BMI as indicators of physical appearance, and study to what extent marital satisfaction is affected by the

measure. The authors find that when the wife has a lower BMI than the husband, both the husband's initial satisfaction and the wife's satisfaction over time are greater.

All in all, being overweight is considered a non-desirable condition, with obese people being stigmatized and discriminated against in many different ways (see, for a review, Puhl & Heuer 2009). With this in mind, it is not surprising that spouses with that non-desirable characteristic tend to compensate their partners in different ways. Oreffice and Quintana-Domeque (2010) show that wife's obesity (BMI and weight) and husband's short height are penalized within marriage. Chiappori et al. (2012) make use of the Panel Study of Income Dynamics (PSID) and find a compensation mechanism by which married men's wages increase by one per cent for every 1.3 additional units of BMI. Married women may compensate two units of BMI increase with one year of education. Oreffice and Quintana-Domeque (2012) study the relationship between the relative physical attractiveness of the members of the couple, measured by their BMIs, and the hours they spend in the labour market, finding a compensation mechanism: in marriages where the husband is slimmer, he works fewer hours, while in marriages where the wife is heavier, she works more hours.

We contribute to the existing literature by analyzing whether there is a similar compensation mechanism operating in terms of unpaid work (housework). The argument is based on prior research showing that those individuals with non-desirable characteristics may compensate their partners by working harder at home. For instance, Grossbard et al. (2014) consider the social status of various ethnicities in the US as personal characteristics, affecting attractiveness in the marriage market. The authors postulate that individuals with less desirable characteristics (e.g., belonging to a relatively lower-status ethnic group) may compensate their partners with a greater contribution to household production, relative to what they would have contributed if they were married to a partner of the same ethnic group. Results show that whites married to blacks spend less time in household production than their counterparts married to whites, which is consistent with a lower value of black ethnicity in marriage markets. Similarly, Grossbard and Vernon (2016) test for compensating differentials in marriage based on a distinction between natives and immigrants, and find that, to some extent, migrants compensate native spouses by working more in household production than they would if marrying endogamously.

In the same vein, one may argue that this compensating mechanism in marriage leads spouses with a higher BMI to do more housework when married to slimmer spouses than when married to spouses who are also overweight. On the contrary, higher BMI may be related to less housework, since overweight and obesity are related to a decline in physical functioning, and household chores are physically demanding. In this sense, higher levels of participation in housework are related to lower levels of overweight and obesity, and thus spouses with a higher BMI may do less housework when married to slimmer spouses than when married to spouses who are also overweight.

### 3 The British household panel survey

We use data from the British Household Panel Survey (BHPS), a longitudinal survey carried out by the Institute for Social and Economic Research (ISER) at the

University of Essex. In Wave 1 of the Survey, every adult member of 5500 households, from 250 areas of the UK, participated, resulting in 10,300 separate responses. The main objective of the Survey is to improve the understanding of the social and economic behaviour of British households, gathering data on personal, occupational, socio-demographic, health, and household characteristics. Information on the height and weight of individuals is only available in Waves 14 (2004) and 16 (2006) of the BHPS, and so we restrict the analysis to those years.

For the time devoted to housework, we use the question “About how many hours do you spend on housework in an average week, such as time spent cooking, cleaning, and doing the laundry?”. We acknowledge the extensive literature confirming the reliability and validity of diary data, and its superiority over time-use surveys based on stylized questions, which ask respondents to estimate time spent in activities on a “typical day” or “typical week” (Juster & Stafford, 1985; Robinson & Godbey, 1985).<sup>3</sup> We are not aware of any other time use survey that contains information on the height and weight of individuals, and time use information for both members of the couple, and hence we rely on the BHPS, which contains stylized questions about the time devoted to housework.<sup>4</sup>

The information on height and weight is used to calculate individual BMI, as the weight in kilograms divided by the square of height in metres ( $BMI = \frac{\text{weight(kg)}}{(\text{height(m)})^2}$ ). Height is obtained from the question “How tall are you without shoes?”, and individuals report their height in feet and inches, or in centimetres. We consider centimetres as the unit of reference, converting the height in feet and inches to centimetres. Weight is obtained from the question “What is your current weight?”, and individuals report their weight in stones and pounds, or in kilograms. We consider kilograms as the unit of reference, converting the weight in stones and pounds to kilograms.<sup>5</sup>

For the sake of comparison with prior studies (e.g., Aguiar & Hurst, 2007; Gimenez-Nadal & Sevilla, 2012), and to minimize the role of time-allocation decisions that have a strong inter-temporal component over the life cycle, such as education and retirement, we restrict the sample to non-retired/non-student women, who are heterosexual and married or cohabiting, between the ages of 21 and 65 (inclusive), so results are interpreted as being “per working-age woman”. Additionally, we have excluded cases where individuals can be considered as “outliers” according to their BMI and housework time. We have identified outliers using the algorithm of Billor et al. (2000), where the significance level for outlier cut-off is  $p = 0.05$ , which allows us to drop 3 households from the main regression, resulting in a sample of 3331 couples available for analysis.

<sup>3</sup> Most studies documenting how individuals use their time are now based on these data sets, including recent studies of trends in time use (e.g. Aguiar & Hurst, 2007; Guryan et al., 2008; Gimenez-Nadal & Sevilla, 2012; Sevilla et al., 2012).

<sup>4</sup> Hamermesh (2010) uses the Eating and Health Module of the American Time Use Survey (ATUS) 2006–2007 to analyze grazing behaviour. However, the ATUS includes information for only one member of the household, and cannot be used to analyze the relationship between BMI and the time use of couples.

<sup>5</sup> In the 2004 wave, there are a total of 15,791 observations. A total of 1,127 observations are missing for height, and 1,736 observations for weight, and many of them coincide. Regarding how many observations are lost from one wave to another (i.e., attrition), there are a total of 15,791 observations in the 2004 wave and 15,392 in the 2006 wave, making a total of 31,183 observations. Of those, 1,980 appear only in the first wave, 1,581 appear only in the second wave, and 27,622 appear in both waves.

**Table 1** Descriptive statistics (Dependent and explicatory variables)

Variable	Mean	Std. Dev.
Husband's housework time	6.134	5.638
Wife's housework time	15.836	10.028
Housework Indicator	5.472	7.169
Husband's BMI	27.067	4.494
Wife's BMI	26.478	5.217
BMI Indicator	0.997	0.228
Wife's age	42.369	11.264
Husband's age	44.292	11.331
Husband college (vs. no qualif.)	0.277	0.447
Husband secondary level (vs. no qualif.)	0.243	0.429
Husband elementary level (vs. no qualif.)	0.236	0.425
Wife college (vs. no qualif.)	0.266	0.442
Wife secondary level (vs. no qualif.)	0.193	0.395
Wife elementary level (vs. no qualif.)	0.283	0.450
Husband working	0.844	0.363
Wife working	0.734	0.442
Husband full-time	0.689	0.463
Wife full-time	0.267	0.442
Husband's labour income	1.804	1.607
Wife's labour income	0.970	1.013
Household non-labour income	0.446	0.693
Household size	3.191	1.161
Children in household	0.833	1.057
Married (vs. cohabiting)	0.802	0.398
Pregnant	0.032	0.177
Husband good health	0.942	0.233
Wife good health	0.918	0.274

Note: Sample consists of heterosexual couples aged 21–65 from the 2004 and 2006 BHPS. We have identified outliers using the algorithm of Billor et al. (2000), where the significance level for outlier cut-off is  $p = 0.05$ , dropping 3 households. Figures regarding our main result (Table 2, Column (1)). BMI indicator is defined as the wife's BMI divided by the husband's BMI

Table 1 shows the mean time devoted to housework and the overall BMI for men and women in our sample of British couples. We observe that men report devoting 6.13 h per week to housework activities, while women report devoting 15.84 h per week to these activities. Thus, there is a gender gap in housework as women devote almost 10 more hours per week in comparison to men, consistent with prior studies (Gimenez-Nadal & Sevilla, 2012). Given the limited time invested by men in housework, we expect their weekly hours devoted to these activities to be less sensitive to economic and socio-demographic factors, as has been shown in other research (Connelly & Kimmel, 2009). Regarding the BMI, we find that the mean BMI for men is

27.07 and 26.48 for women. Although we could expect a greater difference in the BMI between men and women in the UK, these figures are consistent with the Report of the Health and Social Care Information Centre (Sutton, 2011), showing that the BMI for adult men and women in the UK is 27.2 kg/m<sup>2</sup> and 27.1 kg/m<sup>2</sup>, respectively. Thus, the difference in BMI for British adults is almost 0 and consistent with our figures, which is non-statistically significant at standard levels. Besides, the mean of the main BMI indicator, defined as the wife's BMI divided by the husband's BMI, is 0.997, and its standard deviation is 0.228. Figure 1 in the Appendix shows the Kernel density function of this BMI indicator, whose behaviour is consistent with a normal distribution around the value 1, and presents an asymmetry to the right.<sup>6</sup>

Other explanatory variables included in the analysis are wife's and husband's age, dummy variables to control for wife's and husband's primary, secondary, and college education (reference is 'no qualification'), dummy variables to control for whether the wife and the husband are working, and full-time working, wife's and husband's labour income, household non-labour income, household size, a variable to control for the number of own children in the household, a dummy variable to control for whether the members of the couple are married (vs. cohabiting), a dummy variable controlling for the pregnancy status of women, and dummies indicating whether the health status of the members of the couple over the last 12 months is, at least, fair.<sup>7</sup> Table 1 shows sum stats of these variables and we observe that husbands are comparatively older than wives (a 2-year difference), a higher proportion of wives have elementary level of education and a lower proportion have secondary education, a lower proportion of wives are working –and full-time working– in comparison to husbands, husbands' labour income is almost double that of wives, average household size is 3.19 members, with 0.83 own children living in the household, on average, 80.2 percent of couples are married, and 94.1 and 91.8 percent of husbands and wives, respectively, state that their health status over the last 12 months is either excellent, good, or fair.

#### 4 Econometric specification

We analyze the relationship between partners' relative BMI and the share of time devoted to housework. In this framework, it may be argued that the member of the couple with a relatively higher BMI compensates the partner by dedicating more time to household chores. On the contrary, housework activities, which are physically demanding, may be taken up by the member of the couple with a relatively lower

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<sup>6</sup> We also study the correlation between the BMI indicator and the educational difference between spouses. To that end, we create a variable for the husband's level of education (college = 4; secondary = 3; elementary = 2; no education = 1), and also for the wife's level of education. Then, we create the variable *difference of education*, as the husband's level of education minus the wife's level of education (this variable ranges from -3 to 3). We observe that the BMI indicator is related to the educational differences of the couple, since the greater the difference (e.g., the husband having a higher level of education than the wife) the lower the BMI indicator. Results are shown in Fig. 2 in the Appendix.

<sup>7</sup> It could be possible that a change in health may have led to an increasing BMI, and a decrease in housework, which could potentially explain the findings. To partially address this, we include the self-perceived health status of the members of the couple.



BMI. To empirically determine this relationship, we define the following model:

$$\text{Housework\_indicator}_{it} = \beta_0 + \beta_1 \text{BMI\_indicator}_{i,t} + \beta X_{i,t} + \varepsilon_{i,t} \quad (1)$$

where  $\text{Housework\_indicator}_{i,t}$  for couple “i” and year “t” ( $t = 2004, 2006$ ) measures the relative participation of the wife in housework regarding her husband, defined as follows:

$$\text{Housework\_indicator}_{it} = \frac{\text{Wife\_housework\_time}_{it}}{\text{Husband\_housework\_time}_{it}}$$

where an increase indicates that the fraction of the housework done by the wife is greater, and the fraction done by the husband is lower.

The variable  $\text{BMI\_indicator}_{i,t}$  measures the relationship of BMI for couple “i” in period “t”, defined as follows:

$$\text{BMI\_indicator}_{it} = \frac{\text{Wife\_BMI}_{it}}{\text{Husband\_BMI}_{it}}$$

where a higher value of the BMI indicator implies that the wife has a higher BMI, compared to the husband. A negative value of the coefficient of interest,  $\beta_1$ , implies that an increase in the BMI indicator (due to an increase in wife’s BMI or a decrease in husband’s BMI) is linked to a decrease in the housework indicator (which means that wife’s fraction of housework time decreases, or husband’s increases), suggesting that the member of the couple with a greater BMI faces a lower fraction of the physically demanding household chores. A positive value of  $\beta_1$  would imply the opposite, pointing to the existence of a compensation effect, through which the less physically attractive member of the couple compensates the partner. In short, it would imply that if the BMI of any member of the couple increases, his/her share of the housework rises.  $X_{it}$  covers the socio-demographic characteristics of individuals and couples “i” in period “t”, that include the controls described above, and  $\varepsilon_{i,t}$  is the error term in Eq. (1).

## 5 Results

Column (1) in Table 2 shows the results of estimating Eq. (1). Considering our explanatory variable of interest, the share of BMI, we observe a negative coefficient on the fraction of time devoted to housework by wives, with this coefficient being statistically significant at the 99 percent level. This implies that, in a couple that equally distributes household chores (housework indicator takes value 1) in which the wife’s BMI is 26.5 and the husband’s BMI is 27 (these values are the mean BMI for women and men in our baseline regression), an increase of 1 point in the wife’s BMI is related to a decrease of 0.08 in the housework indicator, which is a decrease of 8 percentage points. In the same example, an increase of 1 unit in the husband’s BMI is linked to a decrease of 0.08 of the household indicator, 8 percent in our example. In light of these results, we find that a relatively lower BMI, compared to the partner, is associated with a greater fraction of housework, irrespective of which member of the couple we are focusing on, and vice-versa. We find no evidence of the existence of a compensation mechanism, according to which the member of the

**Table 2** Main results (BMI indicator defined as (wife's BMI / husband's BMI))

	Housework Indicator Sample: Total	Market Indicator	Housework Indicator Sample: Both working at least 10 h per week	Market Indicator
BMI Indicator	-2.156*** (0.499)	-0.010 (0.028)	-1.910*** (0.558)	0.004 (0.022)
Wife's age	0.046* (0.025)	-0.001 (0.001)	0.039 (0.029)	-0.002 (0.001)
Husband's age	-0.007 (0.025)	0.002 (0.001)	0.000 (0.029)	0.001 (0.001)
Husband college	-0.211 (0.354)	0.031 (0.020)	0.100 (0.393)	0.029* (0.015)
Husband secondary level	0.348 (0.339)	0.036* (0.019)	0.408 (0.382)	0.050*** (0.015)
Husband elementary level	0.338 (0.332)	0.029 (0.018)	0.672* (0.372)	0.026* (0.014)
Wife college	0.110 (0.369)	-0.064*** (0.021)	-0.489 (0.423)	-0.052*** (0.017)
Wife secondary level	0.728* (0.373)	-0.024 (0.021)	-0.111 (0.410)	-0.015 (0.016)
Wife elementary level	0.927*** (0.311)	-0.006 (0.017)	0.178 (0.361)	0.015 (0.014)
Husband working	2.036*** (0.502)	0.338*** (0.033)		
Wife working	-2.218*** (0.344)	0.505*** (0.020)		
Husband full-time	0.556* (0.323)	-0.279*** (0.018)	0.217 (0.331)	-0.288*** (0.013)
Wife full-time	-1.079*** (0.306)	0.312*** (0.018)	-0.994*** (0.293)	0.325*** (0.012)
Husband labour income	-0.087 (0.074)	-0.023*** (0.004)	-0.013 (0.081)	-0.019*** (0.003)
Wife labour income	-0.889*** (0.156)	0.111*** (0.009)	-0.994*** (0.165)	0.074*** (0.007)
HH non-labour income	-0.731*** (0.236)	0.038*** (0.011)	-0.378 (0.313)	0.023** (0.012)
Household size	0.302* (0.179)	0.002 (0.010)	0.443** (0.200)	-0.011 (0.008)
Own children in HH	0.457** (0.208)	-0.029** (0.012)	0.242 (0.232)	-0.028*** (0.009)
Married (vs. cohabiting)	0.555* (0.337)	0.008 (0.019)	0.365 (0.360)	0.018 (0.014)
Pregnant	-1.704** (0.692)	-0.039 (0.040)	-0.809 (0.771)	-0.039 (0.031)
Husband good health	0.355 (0.518)	-0.032 (0.030)	1.679** (0.684)	-0.080*** (0.026)
Wife good health	0.547 (0.464)	0.018 (0.026)	0.352 (0.640)	0.009 (0.025)
Constant	4.115*** (1.215)	-0.045 (0.069)	2.530* (1.461)	0.934*** (0.057)
Observations	3331	3554	2220	2437
R-squared	0.120	0.525	0.093	0.486

Notes: Robust standard errors in parentheses. \*\*\*, \*\*, \* denote statistical significance at 1, 5 and 10% level, respectively. Housework Indicator is defined as the wife's housework time divided by the husband's housework time. Labour Market Indicator is defined as the wife's hours spent in the labour market divided by the husband's hours spent in the labour market

couple with the higher BMI would compensate the partner with more housework, as Oreffice and Quintana-Domeque (2012) showed with labour-market hours.<sup>8</sup>

We expand our study to check the existence of this compensating effect regarding labour-market hours, defining the following labour market indicator:

$$\text{Labour\_market\_indicator}_{it} = \frac{\text{Wife\_labour\_market\_time}_{it}}{\text{Husband\_labour\_market\_time}_{it}}$$

According to our results, shown in Column (2) of Table 2, we find no evidence of the compensating effect defined by Oreffice and Quintana-Domeque (2012). The existence of this labour market compensating effect may have implied that our results

<sup>8</sup> Ceteris paribus, more traditional couples in terms of gender norms (in which the wife is physically attractive and has a lower BMI than her husband, physically less attractive and the main breadwinner) are more traditional in the distribution of housework, with a greater value in the indicator of the distribution of household chores. The positive association between the wife-husband gap in BMI and the wife-husband gap in the distribution of housework is consistent with this mechanism, being a potential explanation of this result.

regarding housework chores simply “mirror” the labour market behaviour: since higher-BMI spouses spend more hours in the labour market, they have less time available for housework. However, since our results do not support the labour market compensating mechanism, we conclude that spouses with a relatively higher BMI spend less time doing the housework, which includes physically demanding activities.

In our previous estimates, we include couples whose members work in the labour market, but also couples in which (at least) one member does not work. This being true, our results could be driven by “specialized” couples, in which one member is the “bread-winner” and the other deals with the housework, irrespective of their relative BMI. To deal with this issue, we replicate our previous estimates, including only those couples in which both members work in the labour market for at least ten hours a week.<sup>9</sup> Results are shown in Table 2, Columns (3) and (4), for the housework and the labour market hours indicators, respectively. As can be observed, the main conclusions regarding the impact of the BMI indicator remain unchanged.<sup>10</sup>

At this point, the use of our main indicator of the share of BMI introduces few concerns. First, the interpretation of the coefficient may be considered unintuitive, since a one-unit increase in the indicator would imply a large variation in the BMI of the wife or the husband, which would be rare, given the population distribution of BMI values. Second, since this indicator is a ratio, the first-order derivative is still a function of the partner’s BMI, and we observe that these derivatives are asymmetric, depending on whose BMI we are taking:

$$\frac{\partial \text{BMI\_Indicator}}{\partial \text{Wife\_BMI}} = \frac{1}{\text{Husband\_BMI}}$$

$$\frac{\partial \text{BMI\_Indicator}}{\partial \text{Husband\_BMI}} = -\frac{-\text{Wife\_BMI}}{\text{Husband\_BMI}^2}$$

To deal with this problem, we follow Orefice and Quintana-Domeque (2012). In their work studying the compensation mechanism through which lower-BMI husbands, relative to their wives, work fewer hours while higher-BMI wives relative to their husbands work more hours, the authors define a dummy variable indicating whether the husband’s annual hours of work are more than the average husband’s work hours. They also define an indicator that takes value 1 if the wife’s relative BMI is higher than the wives’ average relative BMI. We replicate their strategy by defining an indicator that takes value 1 if the husbands’ weekly hours of household chores is higher than the average husbands’ housework hours, and a relative BMI indicator that takes value 1 if the wife’s relative BMI is higher than the average wives’ relative BMI. Results are shown in Table 3, Columns (1) and (2) for household chores and labour market hours, respectively.

With respect to household chores, we observe that in those couples in which the wife’s relative BMI is higher than the average wives’ relative BMI, the coefficient is

<sup>9</sup> When we reduce the sample to those couples in which both members work full-time (more than 37.5 hours per week), the number of observations is greatly reduced.

<sup>10</sup> We have replicated the results shown in this Table excluding pregnant women from the sample, and the conclusions remain unchanged. Results are available upon request.

**Table 3** Robustness check (BMI indicator defined as in Orefice & Quintana-Domeque, 2012)

	Housework Indicator Sample: Total	Market Indicator	Housework Indicator Sample: Both working at least 10 h per week	Market Indicator
BMI Indicator	0.056*** (0.017)	-0.022* (0.012)	0.083*** (0.021)	-0.025 (0.018)
Wife's age	-0.004** (0.002)	0.001 (0.001)	-0.002 (0.002)	-0.001 (0.002)
Husband's age	0.003* (0.002)	-0.003** (0.001)	0.001 (0.002)	0.002 (0.002)
Husband college	0.036 (0.025)	-0.067*** (0.019)	0.047 (0.033)	-0.081*** (0.027)
Husband secondary level	-0.007 (0.024)	-0.047*** (0.018)	0.016 (0.032)	-0.052** (0.026)
Husband elementary level	-0.010 (0.024)	-0.027 (0.017)	-0.019 (0.031)	-0.042* (0.025)
Wife college	-0.025 (0.027)	-0.039** (0.020)	0.014 (0.035)	-0.004 (0.029)
Wife secondary level	-0.021 (0.027)	0.008 (0.020)	-0.015 (0.034)	-0.020 (0.028)
Wife elementary level	-0.023 (0.022)	0.006 (0.016)	-0.003 (0.030)	-0.068*** (0.025)
Husband working	-0.177*** (0.036)	0.714*** (0.028)		
Wife working	0.017 (0.025)	0.014 (0.019)		
Husband full-time	-0.002 (0.023)		-0.028 (0.027)	0.337*** (0.023)
Wife full-time	0.037* (0.022)	0.051*** (0.017)	0.051** (0.024)	-0.038* (0.021)
Husband labour income	-0.012** (0.005)	0.005 (0.004)	-0.012* (0.007)	-0.001 (0.006)
Wife labour income	0.043*** (0.011)	-0.029*** (0.009)	0.050*** (0.014)	0.011 (0.012)
HH non-labour income	0.051*** (0.017)	-0.056*** (0.011)	0.063** (0.026)	0.075*** (0.021)
Household size	0.022* (0.013)	0.022** (0.009)	0.007 (0.017)	-0.011 (0.014)
Own children in HH	0.002 (0.015)	-0.007 (0.011)	0.019 (0.019)	0.017 (0.016)
Married (vs. cohabiting)	0.015 (0.024)	-0.009 (0.018)	0.010 (0.030)	-0.036 (0.025)
Pregnant	0.041 (0.050)	-0.084** (0.037)	0.066 (0.064)	-0.016 (0.055)
Husband good health	-0.069* (0.037)	0.071** (0.028)	-0.174*** (0.057)	-0.001 (0.046)
Wife good health	-0.059* (0.033)	-0.009 (0.024)	-0.059 (0.053)	-0.106** (0.045)
Constant	0.467*** (0.079)	0.152*** (0.059)	0.495*** (0.112)	0.147 (0.093)
Observations	3331	3554	2220	2437
R-squared	0.048	0.327	0.038	0.096

Notes: Robust standard errors in parentheses. \*\*\*, \*\*, \* denote statistical significance at 1, 5 and 10% level, respectively

positive and significant at the 1% level, increasing the possibility that her husband's weekly hours dedicated to housework are higher than the husbands' average hours dedicated to household chores, which is in line with our previous finding. Regarding the labour market indicator, we observe in Column (2) that when the wife's relative BMI is greater than the wives' average relative BMI, her husband's possibility of dedicating more hours to the labour market than the husbands' average decreases, with this coefficient being significant at the ten per cent level, which points to the existence of a compensation effect, as suggested by Orefice and Quintana-Domeque (2012).<sup>11</sup>

We replicate these results reducing the sample to those couples in which both members work in the labour market at least 10 h per week, Columns (3) and (4), for housework and the labour market hours indicators, respectively.<sup>12</sup> The main

<sup>11</sup> The variable indicating whether the husband works full-time is removed, since the average of husbands working in the labour market is almost 37 hours per week, which is the threshold for the full-time working consideration. Therefore, there is a perfect correlation between this variable and the indicator showing whether the husband works more hours than the husbands' average.

<sup>12</sup> Another option would be to consider full-time working in the analysis. However, this restriction limits the sample size to just over 300 observations.

conclusions remain unchanged, with the exception of the labour market indicator, where we find no evidence of the compensation effect previously mentioned.<sup>13</sup>

## 5.1 Panel data analysis

The BHPS is a household-based database that follows the same representative sample of individuals over a period of years, and provides enough information to build a panel. Despite the fact that there are numerous cases in which the members of our sample only appear in one of the waves used, we have taken advantage of this possibility to build a panel and replicate our previous estimates.

Table 4 replicates our results shown in Table 2, but treating the data as a panel. Columns (1) and (2) show our estimates for the housework and the labour market hours indicators, and Columns (3) and (4) restrict the sample to those couples in which both members work at least 10 h per week. Results are consistent with those shown in Table 2: as the wife's relative BMI increases (husband's relative BMI decreases), her fraction of household chores is reduced (his fraction is increased), which again indicates the absence of a compensation effect. The same conclusion applies when we focus on couples formed by two members who work at least 10 h per week in the labour market. We find that the relative BMI indicator plays no role in terms of its impact on the labour market indicator.

In Table 5, we use the panel data to replicate our results, but defining the housework and the labour market hours indicators as in Table 3 (as proposed by Orefice and Quintana-Domeque (2012)). Again, the main conclusions regarding the BMI indicator are maintained: if wife's relative BMI is above the average wives' relative BMI, then the possibility that her husband spends more weekly hours on household chores than the husbands' average increases, pointing to the non-existence of the compensation effect. On the contrary, the BMI indicator is not statistically significant when analyzing the labour market indicator.

## 5.2 Channels

We provide empirical evidence to improve the understanding of the channels through which the correlation between the BMI indicator and the distribution of housework takes place. We start by analyzing whether this correlation is driven by the behaviour of men or women. With this, we redefine the dependent variable in Table 6, using the total hours that the husband spends in housework and the labour market in Columns (1) and (2), respectively (Columns (3) and (4) for the wife).

<sup>13</sup> We have also done the analysis for couples where there are children present. Children may change the bargaining relationship between partners, and thus be a potential explanation for our results. The results are concentrated in couples with children present, since the level of significance remains at the 99% level, while in the case of couples with no children the results are marginally significant at the 10% level. The results are available upon request. We have also done the analysis separately according to whether the couples are married or cohabiting, since bargaining may be different in cohabiting couples relative to married couples (Mukhopadhyay, 2008; Malcolm & Kaya, 2016). We observe that the main results are applicable to married couples, while for cohabiting couples we find no evidence of the relationship between the relative BMI of the members of the couples and the share of housework. However, the results for the latter should be taken with caution, due to the small sample size. Results are available upon request.

**Table 4** Panel data (BMI indicator defined as (wife's BMI / husband's BMI))

	Housework Indicator Sample: Total	Market Indicator	Housework Indicator Sample: Both working at least 10 h per week	Market Indicator
BMI Indicator	-1.721*** (0.541)	0.009 (0.034)	-1.376** (0.587)	0.010 (0.025)
Wife's age	0.051* (0.027)	-0.001 (0.002)	0.078*** (0.029)	-0.001 (0.001)
Husband's age	-0.004 (0.027)	0.002 (0.002)	-0.042 (0.028)	0.001 (0.001)
Husband college	-0.563 (0.394)	0.026 (0.025)	-0.446 (0.418)	0.011 (0.018)
Husband secondary level	-0.061 (0.372)	0.030 (0.023)	-0.427 (0.399)	0.021 (0.017)
Husband elementary level	-0.222 (0.369)	0.018 (0.023)	0.040 (0.399)	0.007 (0.017)
Wife college	0.453 (0.407)	-0.029 (0.026)	-0.776* (0.434)	-0.017 (0.019)
Wife secondary level	0.641 (0.398)	-0.018 (0.025)	-0.621 (0.418)	-0.000 (0.018)
Wife elementary level	0.782** (0.348)	0.010 (0.022)	-0.153 (0.385)	0.027 (0.016)
Husband working	2.591*** (0.505)	0.326*** (0.034)		
Wife working	-2.609*** (0.358)	0.519*** (0.022)		
Husband full-time	0.833** (0.334)	-0.280*** (0.019)	0.481 (0.313)	-0.288*** (0.013)
Wife full-time	-1.114*** (0.316)	0.291*** (0.019)	-1.041*** (0.276)	0.314*** (0.012)
Husband labour income	-0.186** (0.088)	-0.023*** (0.005)	-0.009 (0.090)	-0.020*** (0.004)
Wife labour income	-0.843*** (0.167)	0.115*** (0.011)	-0.861*** (0.160)	0.068*** (0.007)
HH non-labour income	-0.418* (0.235)	0.024** (0.012)	0.207 (0.322)	0.025* (0.013)
Household size	0.752*** (0.184)	0.002 (0.011)	0.450** (0.197)	-0.010 (0.008)
Own children in HH	0.093 (0.216)	-0.032** (0.013)	0.181 (0.227)	-0.037*** (0.010)
Married (vs. cohabiting)	0.649* (0.343)	0.001 (0.021)	0.422 (0.340)	0.013 (0.015)
Pregnant	-1.487** (0.642)	-0.016 (0.035)	-0.029 (0.645)	-0.012 (0.028)
Husband good health	0.249 (0.501)	-0.021 (0.028)	1.177* (0.630)	-0.050* (0.026)
Wife good health	1.601*** (0.429)	0.013 (0.024)	-0.026 (0.541)	0.001 (0.023)
Constant	1.219 (1.214)	-0.083 (0.075)	3.363*** (1.343)	0.933*** (0.058)
Observations	3381	3609	2251	2473
Number PID	2671	2838	1814	1976

Notes: Robust standard errors in parentheses. \*\*\*, \*\*, \* denote statistical significance at 1, 5 and 10% level, respectively

We observe a positive and significant coefficient in the case of husbands, implying that an increase in the BMI indicator, motivated by a decrease of his BMI (or an increase of his wife's), is related to more hours dedicated to household chores by him. When we turn our attention to wives, we find that the coefficient is negative and significant, pointing to the same conclusion: when the BMI indicator rises due to an increase of the wife's BMI (or a decrease of her husband's), she dedicates fewer hours to housework. These results support the conclusions obtained in the previous sections.

We also study the existence of non-linearities in the correlation between the BMI indicator and the distribution of household chores. One may argue that this relationship is stronger for more traditional couples, who show a lower value of the BMI indicator, in which the wife has more beauty and has a lower BMI than the husband, the (main) breadwinner. To check this hypothesis, we create four dummy variables, one for each quartile of the BMI indicator distribution. Thus, the variable *First quartile BMI Indicator* takes value 1 for those couples who belong to the first quartile (BMI indicator equal to or lower than 0.845), and 0 otherwise; *Second quartile BMI Indicator*

**Table 5** Panel data (BMI indicator defined as in Oreffice & Quintana-Domeque, 2012)

	Housework Indicator Sample: Total	Market Indicator	Housework Indicator Sample: Both working at least 10 h per week	Market Indicator
BMI Indicator	0.057*** (0.017)	-0.003 (0.012)	0.072*** (0.021)	-0.019 (0.018)
Wife's age	-0.003 (0.002)	0.000 (0.001)	-0.003 (0.003)	-0.001 (0.002)
Husband's age	0.003 (0.002)	-0.003** (0.001)	0.003 (0.002)	0.002 (0.002)
Husband college	0.005 (0.027)	-0.068*** (0.021)	0.050 (0.036)	-0.071** (0.030)
Husband secondary level	-0.007 (0.026)	-0.011 (0.019)	0.051 (0.034)	-0.057** (0.028)
Husband elementary level	-0.014 (0.026)	-0.013 (0.019)	0.026 (0.034)	-0.000 (0.028)
Wife college	0.010 (0.028)	-0.043** (0.021)	0.014 (0.037)	0.027 (0.031)
Wife secondary level	0.005 (0.028)	-0.004 (0.021)	-0.016 (0.036)	0.000 (0.030)
Wife elementary level	-0.002 (0.024)	-0.000 (0.018)	-0.008 (0.033)	-0.022 (0.027)
Husband working	-0.151*** (0.035)	0.688*** (0.027)		
Wife working	0.009 (0.025)	-0.000 (0.019)		
Husband full-time	-0.037 (0.023)		-0.050* (0.027)	0.311*** (0.022)
Wife full-time	0.047** (0.022)	0.061*** (0.016)	0.029 (0.024)	-0.024 (0.020)
Husband labour income	-0.013** (0.006)	0.017*** (0.004)	-0.014* (0.008)	-0.005 (0.006)
Wife labour income	0.034*** (0.012)	-0.037*** (0.009)	0.040*** (0.014)	-0.000 (0.012)
HH non-labour income	0.019 (0.017)	-0.038*** (0.010)	0.019 (0.028)	0.073*** (0.022)
Household size	0.018 (0.013)	0.021** (0.009)	0.005 (0.017)	0.009 (0.014)
Own children in HH	0.011 (0.015)	-0.013 (0.011)	0.030 (0.020)	0.003 (0.016)
Married (vs. cohabiting)	-0.034 (0.024)	-0.014 (0.018)	-0.039 (0.029)	-0.009 (0.024)
Pregnant	0.051 (0.046)	-0.071** (0.031)	0.034 (0.057)	-0.076 (0.047)
Husband good health	-0.070** (0.036)	0.075*** (0.025)	-0.128** (0.056)	0.015 (0.044)
Wife good health	-0.068** (0.030)	0.018 (0.021)	0.036 (0.048)	-0.039 (0.039)
Constant	0.502*** (0.075)	0.147*** (0.056)	0.405*** (0.106)	0.033 (0.087)
Observations	3381	3609	2251	2473
Number PID	2671	2838	1814	1976

Notes: Robust standard errors in parentheses. \*\*\*, \*\*, \* denote statistical significance at 1, 5 and 10% level, respectively

takes value 1 for those couples whose BMI indicator is between the values 0.845 and 0.967, and 0 otherwise; *Third quartile BMI Indicator* takes value 1 for couples with a BMI indicator greater than 0.967 and lower than 1.108, and 0 otherwise; and the variable *Fourth quartile BMI Indicator* takes value 1 for couples whose BMI indicator is greater than 1.108, and 0 otherwise. We include these dummy variables instead of the plain BMI indicator, and Results are shown in Column (1) of Table 7 for the housework indicator and Column (2) for the labour market hours' indicator.

In Column (1), results indicate that the correlation between the share of BMI in the couple and the housework distribution may be stronger for more traditional couples. Those couples who belong to the first and the second quartile in terms of BMI indicator (more traditional couples) show a positive and significant at 1% level coefficient, related to a greater housework indicator, which means that the wife spends more time doing the household chores, given that the reference variable is *Fourth quartile BMI Indicator*, which is supposed to include less traditional couples. In Column (2), we observe that there are no differences regarding the labour market hours' indicator depending on the quartile to which the couples belong, according their BMI indicator. When we replicate these estimations, reducing the sample to those couples in which

**Table 6** Number of hours of housework and labour market (Number of hours by sex of the spouse)

	Housework Dependent Vble. Husband's housework and market hours	Labour Market	Housework Dependent Vble. Wife's housework and market hours	Labour Market
BMI Indicator	1.369*** (0.361)	-0.572 (0.553)	-1.591** (0.623)	0.346 (0.463)
Wife's age	-0.039** (0.018)	-0.042 (0.028)	0.027 (0.032)	-0.071*** (0.023)
Husband's age	0.038** (0.018)	0.040 (0.028)	0.075** (0.031)	0.043* (0.023)
Husband college	-0.156 (0.257)	-1.413*** (0.393)	-0.023 (0.443)	-0.381 (0.330)
Husband secondary level	-0.095 (0.243)	-0.557 (0.372)	-0.038 (0.419)	0.729** (0.312)
Husband elementary level	-0.370 (0.237)	0.308 (0.362)	0.209 (0.408)	0.148 (0.303)
Wife college	0.213 (0.268)	0.543 (0.410)	-1.226*** (0.462)	-0.795** (0.344)
Wife secondary level	0.055 (0.267)	0.169 (0.409)	-0.234 (0.462)	0.168 (0.343)
Wife elementary level	-0.119 (0.222)	-0.331 (0.340)	-0.604 (0.383)	0.664** (0.285)
Husband working	-3.558*** (0.357)	29.281*** (0.547)	3.143*** (0.617)	1.940*** (0.458)
Wife working	0.260 (0.244)	-0.311 (0.374)	-4.686*** (0.421)	19.228*** (0.313)
Husband full-time	-0.317 (0.233)	12.324*** (0.357)	-0.018 (0.403)	-0.278 (0.299)
Wife full-time	0.386* (0.225)	-0.460 (0.346)	-1.753*** (0.389)	13.003*** (0.289)
Husband labour income	-0.078 (0.055)	0.231*** (0.084)	-0.152 (0.094)	-0.298*** (0.070)
Wife labour income	0.620*** (0.115)	0.228 (0.176)	-1.473*** (0.198)	3.204*** (0.148)
HH non-labour income	0.156 (0.143)	0.078 (0.219)	-0.399 (0.247)	-0.299 (0.184)
Household size	0.279** (0.126)	0.262 (0.193)	1.570*** (0.218)	0.110 (0.162)
Own children in HH	0.071 (0.149)	0.137 (0.228)	1.001*** (0.258)	-1.042*** (0.191)
Married (vs. cohabiting)	-0.342 (0.243)	-0.727* (0.374)	0.655 (0.420)	-0.507 (0.313)
Pregnant	0.298 (0.506)	0.553 (0.777)	-1.598* (0.874)	-1.690*** (0.651)
Husband good health	0.424 (0.359)	0.672 (0.550)	-1.006 (0.624)	-1.656*** (0.461)
Wife good health	-1.469*** (0.332)	0.442 (0.510)	1.653*** (0.577)	0.730* (0.428)
Constant	6.663*** (0.862)	0.317 (1.321)	9.806*** (1.490)	2.170* (1.107)
Observations	3731	3750	3727	3750
R-Squared	0.090	0.783	0.245	0.835

Notes: Robust standard errors in parentheses. \*\*\*, \*\*, \* denote statistical significance at 1, 5 and 10% level, respectively

both members work for at least 10 h per week (Columns (3) and (4) for housework and labour market hours' indicator, respectively), the main conclusions are maintained.

All in all, the relationship between the BMI share of members of the couple and the housework indicator is driven by the behaviour of the husband and the wife, and is stronger for more traditional couples.

## 6 Conclusions

In this paper, we analyze how the relationship between the Body Mass Indices (BMIs) of the members of a couple affects their share of housework, using a sample of British couples. Prior research has shown that being overweight has an impact on economic outcomes such as wages and income, labour force participation, and educational achievement. Physical measures have also been shown to be important at



**Table 7** BMI Indicator by quartiles (Reference Variable: Fourth Quartile BMI Indicator)

	Housework Indicator Sample: Total	Market Indicator	Housework Indicator Sample: Both working at least 10 h per week	Market Indicator
First Quartile BMI Indicator	1.561*** (0.324)	0.018 (0.018)	1.438*** (0.353)	0.016 (0.014)
Second Quartile BMI Indicator	1.651*** (0.324)	-0.008 (0.018)	1.969*** (0.358)	-0.001 (0.014)
Third Quartile BMI Indicator	0.623* (0.322)	-0.004 (0.018)	0.822** (0.354)	0.020 (0.014)
Wife's age	0.046* (0.025)	-0.001 (0.001)	0.039 (0.029)	-0.002 (0.001)
Husband's age	-0.005 (0.025)	0.002 (0.001)	0.003 (0.029)	0.001 (0.001)
Husband college	-0.212 (0.353)	0.031 (0.020)	0.102 (0.392)	0.028* (0.015)
Husband secondary level	0.356 (0.339)	0.036* (0.019)	0.413 (0.380)	0.049*** (0.015)
Husband elementary level	0.358 (0.332)	0.029 (0.018)	0.660* (0.371)	0.025* (0.014)
Wife college	0.145 (0.368)	-0.063*** (0.021)	-0.467 (0.422)	-0.051*** (0.017)
Wife secondary level	0.734** (0.372)	-0.024 (0.021)	-0.083 (0.408)	-0.014 (0.016)
Wife elementary level	0.948*** (0.311)	-0.006 (0.017)	0.240 (0.362)	0.017 (0.014)
Husband working	2.058*** (0.501)	0.339*** (0.033)		
Wife working	-2.205*** (0.344)	0.505*** (0.020)		
Husband full-time	0.543* (0.322)	-0.280*** (0.018)	0.235 (0.330)	-0.290*** (0.013)
Wife full-time	-1.091*** (0.305)	0.312*** (0.018)	-1.005*** (0.292)	0.325*** (0.012)
Husband labour income	-0.096 (0.074)	-0.023*** (0.004)	-0.019 (0.080)	-0.019*** (0.003)
Wife labour income	-0.878*** (0.155)	0.111*** (0.009)	-0.980*** (0.164)	0.073*** (0.007)
HH non-labour income	-0.734*** (0.236)	0.038*** (0.011)	-0.384 (0.312)	0.023** (0.012)
Household size	0.311* (0.179)	0.002 (0.010)	0.459** (0.199)	-0.012 (0.008)
Own children in HH	0.453** (0.208)	-0.029** (0.012)	0.256 (0.231)	-0.027*** (0.009)
Married (vs. cohabiting)	0.569* (0.336)	0.008 (0.019)	0.391 (0.359)	0.018 (0.014)
Pregnant	-1.674** (0.691)	-0.038 (0.040)	-0.803 (0.768)	-0.041 (0.031)
Husband good health	0.374 (0.517)	-0.030 (0.030)	1.575** (0.681)	-0.078*** (0.026)
Wife good health	0.507 (0.463)	0.018 (0.026)	0.139 (0.639)	0.008 (0.025)
Constant	0.877 (1.106)	-0.060 (0.063)	-0.284 (1.350)	0.930*** (0.053)
Observations	3331	3554	2220	2437
R-Squared	0.124	0.526	0.101	0.487

Notes: Robust standard errors in parentheses. \*\*\*, \*\*, \* denote statistical significance at 1, 5 and 10% level, respectively

the couple level; being overweight is stigmatized by spouses (Oreffice & Quintana-Domeque, 2012), and social pressures for being slim affect marital matching and interactions, leading individuals with relatively high body weight to compensate for their perceived-negative physical trait by working more hours in the labour market, while their spouses work less. We focus on another dimension of time-allocation decisions, that of household production, and examine the existence of a compensation mechanism via housework, studying the relationship between the relative BMI of the members of the couple and their hours of housework.

We find that a relatively higher BMI is associated with a smaller share of housework, irrespective of the member of the couple we are considering. However, since some couples are formed by (at least) one member who does not work in the labour market, specialization between paid and unpaid work may be driving our results. To solve this problem, we replicate our estimates, reducing the sample to those couples in which both members work, at least, 10 h a week in the labour market, and we reach the same conclusions. This result holds when we treat the data as a panel.

We also study the existence of the compensation effect defined by Oreffice and Quintana-Domeque (2012), according to which individuals in couples may compensate for their less desirable characteristics by working more in the labour market. We find no evidence of the existence of any compensation mechanisms through which the comparatively higher-BMI member of the couple does more paid work, even when adapting our indicators to replicate those used by Oreffice and Quintana-Domeque (2012).

This paper has certain limitations. Despite the existence of prior time-use research showing the superiority of time use surveys over panel surveys with stylized questions, such as the BHPS, the PSID, and the GSOEP, we are not aware of any time use survey with information on anthropometric measures of weight and height and information on the time use of couples, so we must rely on the BHPS for our analysis. Second, we cannot take into account the unobserved heterogeneity of couples that may be correlated with both the measure of BMI, and the time devoted to housework. The fact that we have only two waves, and that (relative) body weight has weak time-series variation in a short time span makes first-differenced and within-OLS estimators unreliable and even undesirable (see Oreffice and Quintana-Domeque 2012). Given that there are no suitable instruments to follow an Instrumental Variable Approach, we cannot talk in terms of causality. Endogeneity concerns remains (Oreffice & Quintana-Domeque, 2012; Grossbard & Mukhopadhyay, 2017). Furthermore, it would be better to have a database with a time use survey (diary data) with information on anthropometric measures of weight and height, as mentioned above, in order to provide more evidence on the lack of compensation from higher-BMI members of the couple through housework.

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### **Compliance with ethical standards**

**Conflict of interest** The authors declare no competing interests.

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### 7 Appendix

Figures 1 and 2

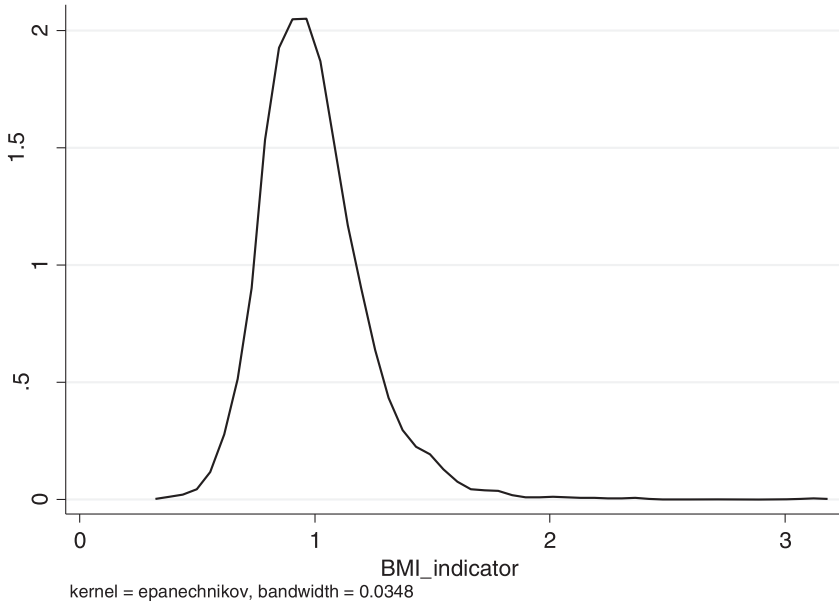


Fig. 1 Kernel density estimate. variable: BMI indicator

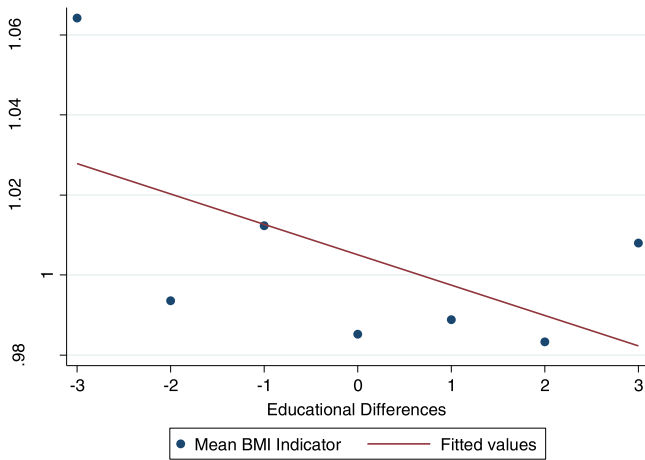


Fig. 2 Correlation between BMI Indicator and Educational Differences. (Educational Difference defined as Husband's education – Wife's education)

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