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A Matter of Weight?
Hours of Work of Married Men and Women and Their Relative Physical Attractiveness

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A Matter of Weight? Hours of Work of Married Men and Women And Their Relative Physical Attractiveness

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Abstract

We explore the role of relative physical attractiveness within the household on the labor supply decisions of husbands and wives. Using data from the Panel Study of Income Dynamics, we find that husbands who are heavier relative to their wives work more hours, while wives who are thinner relative to their husbands work fewer hours. We also find a 9%-elasticity of annual hours of work with respect to own BMI for married men, and a –7%-elasticity with respect to wife's BMI. For married women, we find an 8%-elasticity of annual hours of work with respect to own BMI, and a –6%-elasticity with respect to husband's BMI. While own BMI is positively related to own hours of work for married individuals, no statistically significant relationship emerges for either unmarried men or unmarried women.

Keywords: hours worked, body mass index, marital status.

JEL Codes: D1, J1, J22.

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1 Introduction

Economists have been inquiring about the determinants of labor supply, the intra-household allocation of resources, and the economic impact of physical attractiveness for decades. Is there any common link between all these different forces? As illustrated in the seminal work by Chiappori (1992), the family has considerable influence on the behavior of its members, and in particular on their labor supply choices. The wife's decision power, which depends on her characteristics and wellbeing outside marriage relative to her spouse's (relative age, wage, education, non-labor income, divorce laws, etc.), will affect both her own and her husband's allocation of hours of work. Although many studies have analyzed the role of spouses' differences along several dimensions, the literature has remained silent on the role of *differences in physical attractiveness*.[1] This is somewhat surprising, since *relative* attractiveness seems to be a relevant determinant of the bargaining power of each spouse, and existing works directly link attractiveness to several economic outcomes, such as individual employment status, earnings, and criminal activity (e.g., Hamermesh and Biddle, 1994; Rooth, 2009; Mocan and Tekin, 2010).

In this paper, we explore the role of *relative* physical attractiveness within the household on the labor supply decisions of husbands and wives, proxied by relative body mass index (BMI, weight-for-height). Evidence from psychology explicitly points to fatness being stigmatized by spouses, and that social pressures for slimness affect marital interaction (Sobal, 1995). In particular, it is the *relative* attractiveness within the couple which is thought to affect *household behavior*. McNulty and Neff (2008) actually claim that how the discrepancy in spouses' attractiveness affects household outcomes and satisfaction is an open question in family and social psychology. By establishing a link between relative attractiveness and intra-household allocation of resources of married men and women, our work is consistent

[1] For example, Browning et al. (1994) have shown that differences in age and income among the members of the household appear to be determinants of household outcomes, such as consumption expenditures. Lundberg, Pollak and Wales (1997) estimate that which spouse receives the child allowance affects household decisions. See Vermeulen (2002) for a survey of bargaining power measures in collective models.

with the long tradition in labor supply research that emphasizes the family context in which work decisions are made (e.g., Blundell and MaCurdy, 1999; Chiappori, Fortin and Lacroix, 2002; Blau and Kahn, 2007).

Our analysis extends and complements the literature on the marriage market penalties of low physical attractiveness. Heavier (or obese) men and women are found to be penalized in the marriage market by matching with partners who are weaker along socioeconomic dimensions, i.e., educational attainment and wages (Averett and Korenman 1996; Hamermesh and Biddle, 1994; Oreffice and Quintana-Domeque, 2010). Indeed, the very recent work by Chiappori, Oreffice and Quintana-Domeque (2010) considers multidimensional matching and tests that *absolute* attractiveness of individuals (proxied by weight-for-height, body mass index, BMI) is an important characteristic in explaining matching patterns of married couples. Heavier men tend to marry heavier women, and heavier women (men) can compensate their negative trait by being endowed with higher education (wage).

We use a standard collective labor supply model with relative physical attractiveness affecting the decision power of each spouse (Chiappori et al., 2002). Following Gregory and Rhum (2009) and Chiappori et al. (2010), among others, we consider BMI as a proxy for physical attractiveness. Viewing the role of relative physical attractiveness through the lens of a collective labor supply framework allows us to investigate its consequences in terms of hours of work of both married men and women. In such a context, relatively high *body* weight transforms into low *Pareto* weight in the household, inducing individuals to compensate for their negative physical trait by working more hours, while their spouse works less (Chiappori et al., 2002). Discrepancies in physical appearance lead to a better position inside the household for the better looking spouse, in terms of intrahousehold allocation of resources, and thus of hours worked by husbands and wives.

Using data from the Panel Study of Income Dynamics (PSID) on married heads and their wives from 1999 to 2007, we show how relative attractiveness proxied by husband's BMI relative to wife's BMI matters in explaining their labor supply patterns, i.e., the annual hours of work, of married men and women. We find that husbands who are heavier relative to their wives work more hours, while wives who are thinner relative to their husbands work fewer hours. Acknowledging that own weight (or BMI) has already been linked to labor supply –individuals working more hours may work in sedentary jobs (Ruhm, 2005; Lakdawalla and Philipson, 2007; Loh, 2009) or consume more highly-caloric food to economize on the scarcity of their time (Chou, Grossman and Saffer, 2004)– we also present estimates controlling for sedentary job-type and the ratio of expenditures of food at home versus total food. The results in each case are virtually identical. Finally, we also account for spousal characteristics and estimate the spouses' labor supply equations simultaneously. Interestingly, we cannot reject that the estimated effects of husband's relative BMI are the *same* for men and women but with *opposite* signs, and show a significant response of both male and female labor supplies, which is also consistent with recent work on body size and the marriage market emphasizing that male physical attractiveness matters as well (e.g., Chiappori et al., 2010; Hitsch, Hortaçsu, and Ariely, 2010).

Since the *identification* of the effect of the relative husband's BMI on labor supplies may depend on symmetric but of-opposite-sign effects imposed by the BMI ratio, we then replace the ratio by the logs of own BMI and spousal BMI, as separate variables. We find a 9%-elasticity of annual hours of work with respect to own BMI for married men, and a –7%-elasticity with respect to their wives' BMI. For married women, an 8%-elasticity of annual hours of work is associated with own BMI, while a –6%-elasticity to their husbands' BMI. In addition, to uncover the bargaining power channel from the sorting at the time of the match, we focus on couples who have been married for *at least* 4 years, and show that sorting would *not* predict the positive correlations we find between hours and own BMI. Finally, we compare the spouses' labor supply elasticities with respect to own BMI to those of *unmarried* individuals, to distinguish within-family mechanisms from alternative ones. While own BMI is positively related to hours of work for both married men and married women, no statistically significant relationship emerges for either unmarried men or unmarried women.

While negative effects of *own* BMI on both labor-[2] and marriage-market outcomes[3] have been well-documented in the social sciences, our evidence indicates that the *relative* BMI within the couple reinforces these negative penalties through the *household decision process*. This induces relatively heavier married individuals to work more hours to compensate their spouses for their defect, regardless of gender. More generally, our work contributes to the understanding of labor supply responses of married men and women. The estimated sizeable impacts of relative BMI on both spouses, and with opposite signs, are all the more remarkable given the acknowledged rigidities in the labor supplies.

The paper is organized as follows. Section 2 discusses the conceptual framework. Section 3 describes the data. Section 4 presents the empirical results and discusses potential alternative explanations. Section 5 concludes the paper.

2 Conceptual Framework

2.1 Measuring (relative) physical attractiveness

Our study analyzes the role of relative physical attractiveness in labor supply decisions. Hence, we first need to define how to measure physical attractiveness. There exists a considerable literature in which weight scaled by height (body mass index, BMI) is used as a proxy for socially defined physical attractiveness. Recent examples in economics include Gregory and Rhum (2009) and Chiappori et al. (2010). Indeed, BMI is shown to be negatively related to physical attractiveness. Interestingly, Rooth (2009) found that photos that were manipulated

[2] See Cawley (2000, 2004), Brunello and d'Hombres (2006), Garcia and Quintana-Domeque (2007), Atella, Pace and Vuri (2008), Han, Norton and Stearns (2009), and Rooth (2009) among others.

[3] See Averett and Korenman (1996), Fu and Goldman (2000), Lundborg, Nystedt, and Lindgren (2007), Averett, Sikora, and Argys (2008), Mukhopadhyay (2008), Tosini (2009), Hitsch et al. (2010), Chiappori, et al. (2010), Oreffice and Quintana-Domeque (2010), among others.

to make a person of normal weight appear to be obese (BMI≥30) caused a change in the viewer's perception, from attractive to unattractive. In particular, BMI is reported to be the dominant cue for female physical attractiveness, while the waist-to-chest ratio (WCR) plays a more important role than BMI in the case of male attractiveness (Swami, 2008). However, it must be emphasized that BMI and WCR are strongly positively correlated, and, not surprisingly, BMI is correlated with the male attractiveness rating by women, though this correlation is lower than the one with WCR (Tovée, Maisey, Emery and Cornelissen, 1999; Tovée and Cornelissen, 2001; Wells, Treleaven and Cole, 2007).

We are not aware of any study with detailed measures of body shape and socioeconomic characteristics which simultaneously provides these data for *both* spouses. Since BMI has been shown to constitute a good proxy for both male and female physical attractiveness, and evidence from psychology explicitly points to fatness being stigmatized by spouses (and that social pressures for slimness affect marital interaction; Sobal, 1995), we will use this measure in our analysis.[4] Specifically, to capture relative attractiveness, we will use the husband's relative BMI (husband's BMI over wife's BMI), and then the spouses' BMIs as two separate variables.

2.2 A standard model

We apply the collective household labor supply model with distribution factors of Chiappori, Fortin and Lacroix (2002). A household is composed of two decision makers, husband and wife, each having a distinct utility function on consumption and leisure, and making Pareto-efficient decisions. Preferences are egoistic, in that one spouse's utility does not depend on the other's consumption or leisure, although the model can be extended to allow for caring preferences, and public goods. Let h_i and C_i for $i = 1, 2$ denote member i's labor supply and consumption of a private composite good (whose price is normalized to unity), with leisure

[4] Our study refers to the Western culture, as in some developing countries the relationship between female attractiveness and BMI may be different.

time $l_i = 1 - h_i$, y the household non-labor income, w_i the wage rate of spouse i, and z_i possible preference parameters of spouse i. Finally, let s represent the relative attractiveness of the two spouses, specifically spouse 1's attractiveness with respect to spouse 2's. Opportunities outside marriage and personal qualities shape an individual's relative attractiveness, and are found to enhance a spouse's role and decision power in the household, affecting household choices.[5] The utility function of member i is $U^i(C_i, l_i)$, where U^i is strictly quasi-concave, increasing, and continuously differentiable.[6]

The optimal allocations of labor supplies are determined by the following program:

$$\max_{\{C_1,C_2,h_1,h_2,\}} \mu U^1(C_1, 1-h_1) + (1-\mu)U^2(C_2, 1-h_2)$$

subject to

$$C_1 + C_2 \leq w_1 h_1 + w_2 h_2 + y$$

$$0 \leq h_i \leq 1, \qquad\qquad i = 1, 2$$

where the corresponding (Pareto) weighting factor is $\mu(w_1, w_2, z_1, z_2, s)$, representing the household decision process, and in particular spouse 1's bargaining power. The scalar function μ is assumed continuously differentiable in its arguments, non-negative, and can be normalized to belong to $[0, 1]$ without loss of generality. s measures the discrepancy in spouses' attractiveness, and we define it to be $s = \frac{BMI_1}{BMI_2}$, the BMI of individual 1 relative to the BMI of individual 2. In general, μ may also depend on other factors, such as prices, incomes or any characteristic of the household environment that may affect the intra-household distribution

[5] The relative age, relative income, relative education, relative wages, as well as the sex ratios, divorce laws, abortion legalization, alimony, and child benefits laws, are examples of distribution factors that have been studied in the literature (Browning, Chiappori, Weiss, 2011; Chiappori et al., 2002; Lundberg and Pollak, 1996; Oreffice, 2007; Vermeulen, 2002).

[6] Following convention, the utility from companionship is assumed to be additive and not to influence the trade-off between leisure and consumption.

of resources and thus the decision process (Browning et al., 1994; Browning and Chiappori, 1998; Vermeulen, 2002). Here, we focus on relative physical attractiveness.

In this framework, relative physical attractiveness of individual 1 with respect to individual 2 increases the weighting factor μ (the weight on spouse 1's utility function in the household welfare function), while decreasing the relative importance of individual 2, and thus affects the household choices of consumption and leisure. Therefore, we predict that $\frac{\partial \mu}{\partial s} < 0$.

Assuming interior solutions, and following Chiappori et al. (2002), we can state that the couple's Pareto-efficient decisions yield the following equilibrium labor supply functions of the two spouses:

$$h_i = H_i(w_1, w_2, y, \mu(w_1, w_2, y, z, s)) \quad \forall i = 1, 2 \quad \text{with } \frac{\partial H_1}{\partial \mu} < 0 \text{ and } \frac{\partial H_2}{\partial \mu} > 0$$

so that:

$$\frac{\partial h_1}{\partial s} = \frac{\partial H_1}{\partial \mu}\frac{\partial \mu}{\partial s} > 0$$

and

$$\frac{\partial h_2}{\partial s} = \frac{\partial H_2}{\partial \mu}\frac{\partial \mu}{\partial s} < 0$$

Therefore, the labor supply function of *each* spouse is negatively related to his/her level of relative attractiveness, ceteris paribus, in particular controlling for own and spouse's wage, and for the couple's total non-labor income y. If having a relatively low BMI strengthens a spouse's relative outside opportunities and welfare, thus increasing his/her weight in household decisions, he/she will work *fewer* hours. At the same time, we should observe the *opposite* impact on the labor supply of his/her spouse, who would experience a decline in his/her decision power, and thus work *more* hours.

We will investigate these patterns for both married males and females, by testing whether a husband (individual 1)'s labor supply is positively related to the relative BMI, s, while his wife (individual 2)'s hours of work are negatively related to it. More *physical* weight implies less *Pareto* weight in the household, compensating their spouse for the negative physical attribute by working more hours. In other words, lower relative weight of individual 1 in the decision process should, by standard income effects, lead to an increase in individual 1's labor supply and a reduction in individual 2's, all else equal. These differences in response to BMI would support the claim that hours of work are affected by the physical attractiveness of both spouses through its relevance in the household decision process, regardless of gender, and *in addition* to the individual and spousal characteristics that are traditionally thought to affect labor supply (Blau and Kahn, 2007; Browning, Chiappori and Weiss, 2011).

Our empirical analysis focuses on couples where *both* individuals are working, according to the predictions by Chiappori et al. (2002) which were developed for married working couples. In addition, Blundell et al. (2007) state that the case where both spouses work is the one yielding the strongest identifying power for preferences and for the impact of distribution factors on the division of household resources. Our labor supply analysis is exactly in terms of intra-household bargaining and allocation of resources.[7]

3 Data Description

Our empirical work uses data from the Panel Study of Income Dynamics (PSID). The PSID is a longitudinal household survey collecting a wide range of individual and household demographic, income, and labor-market variables. In addition, in all the most recent waves since 1999 (1999, 2001, 2003, 2005, and 2007), the PSID provides the weights (in pounds) and heights (in feet and inches) of both household heads and wives, which we use to calculate the BMI of each spouse, defined as an individual's body weight (in kilograms) divided by the

[7] Excluding domestic production does not necessarily bias the estimated effects of distribution factors on welfare (Donni, 2008).

square of his or her height (in meters squared).[8]

In each of the survey years under consideration, the PSID comprises about 4,500 married households. We select households with a household head and a wife where both are actually present. In our sample years, all the married heads with spouse present are males, so we refer to each couple as husband and wife, respectively. We confine our study to white couples, and to those whose wife is between 26 and 48 years old, and whose husband is between 28 and 50 years old, given the average two-year intra-household age gap in the US (Chiappori, Iyigun, and Weiss, 2009). The lower and upper bounds are chosen to focus on prime-age individuals, since our analysis concerns labor supply behavior. We exclude individuals with work-limiting disability conditions, as measured by reporting a physical or nervous condition that limits an individual's type or amount of work.

The analysis comprises white individuals because in the PSID blacks are disproportionately over-represented in low-income households ("poverty/SEO sample"). Moreover, following Conley and Glauber (2007), we discard those individuals whose height and weight values include any extreme ones: a weight of more than 400 or less than 70 pounds, a height above 84 or below 45 inches. We focus on men whose BMI is between 20 and 40, and women between 18.5 and 40, thus excluding (medically) severely obese or underweight individuals (WHO, 2004).

Our main samples consist of working men and women, married to one another, since our main predictions concern hours worked in the labor market, and reflect the long tradition in labor supply research that emphasizes the family context in which work decisions are made (e.g., Blundell and MaCurdy, 1999; Blau and Kahn, 2007). Unlike many previous studies (e.g., Averett and Korenman, 1996; Averett et al., 2008; Hamermesh and Biddle, 1994), the focus is

[8] Weight and height are originally reported in pounds and inches, respectively, in the PSID. The pounds/inches BMI formula is: Weight (in pounds) $\times$ 704.5 divided by Height (in inches) $\times$ Height (in inches). Oreffice and Quintana-Domeque (2010) has shown that non-response to body size questions appears to be very small in the PSID data. Specifically, item non-response for husband's height is below 1.4% in each year, for wife's height is below 1.4% in each year, and for husband's weight is below 2.2% in each year. Regarding wife's weight, item non-response is below 5.5% in each year.

on matched partnerships, rather than on groups of husbands and wives that are not necessarily associated to each other. This has the advantage to assess labor supply outcomes actually decided at the household level. In particular, we consider couples where both husbands and wives are working because the compensation effects for BMI arise in the household in terms of labor supply decisions of both spouses. In addition, the empirical analysis closely refers to the predictions of Chiappori et al. (2002), which were developed for working couples.

Because the PSID main files do not contain any direct question concerning the duration of the marriages, we rely on the "Marital History File: 1985-2007" Supplement of the PSID to obtain the year of marriage and number of marriages, to account for the duration of the couples' current marriage. We merge this information to our married sample using the unique household and person identifiers provided by the PSID, and we consider married couples who have been married for *at least* 4 years, to capture the role of bargaining power rather than of sorting at the time of the match.

In the PSID all the variables, including the information on the wife, are reported by the head of the household. Reed and Price (1998) found that family proxy-respondents tend to overestimate heights and underestimate weights of their family members, so that family proxy-respondent estimates follow the same patterns as self-reported estimates (see Gorber et al., 2007, for a review). The authors suggest that the best proxy-respondents are those who are in frequent contact with the target. Since we are considering married couples, the best proxy-respondents are likely to be the spouses. Additionally, although it is well-known that self-reported anthropometric measures are likely to suffer from measurement error, Thomas and Frankenberg (2002) and Ezzati et al. (2006) showed that in the United States, self-reported heights exaggerate actual heights, on average, and that the difference is close to constant for ages 20-50.[9]

[9] We note that Cawley (2000, 2004) used the National Health and Nutrition Examination Survey III (NHANES III) to estimate the relationship between measured height and weight and their self-reported counterparts. First, he estimated regressions of the corresponding measured variable to its self-reported counterpart by age and race. Then, assuming transportability, he used the NHANES III estimated coefficients to adjust the self-reported variables from the NLSY. The results for the effect of BMI on wages were very

In all of our regressions, the dependent variable is the log of annual hours worked, defined in the PSID as "total annual work hours on all jobs, including overtime". We focus on individuals working more than 1000 annual hours if male, and 750 if female, and on those earning more than \$5 per hour. These restrictions are meant to exclude couples who are not really attached to the labor market. Specifically, those couples where the husband works less than part-time ($\leq$20 hours per week), and the wife works less than about 15 hours per week.

The main explanatory variables are either the ratio of the husband's BMI to the wife's BMI, or the logs of husband's and wife's BMIs, separately. The control variables used in our analysis are: age; log hourly wage; non-labor income (constructed as total family income minus the labor income of each spouse[10]); education (defined as the number of completed years of schooling and is top-coded at 17 for some completed graduate work); health status (1 if excellent, very good, or good; 0 if fair or poor); number of children in the household under 18 years; and a dummy variable for the presence of children aged 2 years old or less (to control for a recent pregnancy).

In addition, occupation categories are considered to create a categorical variable for sedentary job type, following the very recent medical classification by Choi et al. (2010), and we also create the ratio of the expenditures of food at home versus total food. This is to account for the fact that individuals working more hours may work in sedentary jobs (Lakdawalla and Philipson, 2007) or consume more highly-caloric food to economize on the scarcity of their time (Chou et al., 2004), and therefore exhibit a higher BMI. Finally, state dummy variables are included to capture constant differences in labor and marriage markets across geographical areas in the US, such as the proportion of obese men and women and cultural attitudes toward BMI and obesity (e.g., Lundborg et al., 2007). As our analysis concerns several PSID waves, year dummy variables are also used. The regression analysis uses the PSID-provided

similar, whether corrected for measurement error or not. Hence, we rely on his findings, and we are confident that our results (based on unadjusted data) are unlikely to be significantly biased. Recent papers confirm that the BMI-adjustment makes no difference (see Kelly et al., 2011).

[10] An alternative measure of non-labor income using the spouses' taxable income minus their labor incomes yields comparable estimates

sample household weights.[11]

Table 1 contains the main descriptive statistics for our sample of married couples. The average husband works 2361 hours per year, while the average wife works 1857 annual hours. Part of this difference is due to the fact that we are focusing on couples were husbands work more than 1000 hours (hence, excluding part-time husbands) and wives work more than 750 hours. The average husband in our sample has a BMI of 27.7, so he is overweight (BMI$\geq$25), while the average wife is almost overweight, with a BMI of 24.7. The average household has a non-labor income of approximately $9000 per year. The spouses' wage difference is $7, with the average husband earning $26.6 per hour and the average wife having an hourly wage of $19.6. No mean differences between husbands and wives are found in terms of either completed education, around 14 years, or health status, 97% and 98%, for married men and women, respectively. The average age is 40 for married men, and 38 for married women. The average number of children per household is 1.4, and in 10% of cases, there has been a recent pregnancy. Finally, we note that nearly 60% of husbands work in sedentary jobs, while this percentage is almost 90% for wives.

[Table 1 about here]

4 Empirical Evidence

We start exploring the relationship between annual hours of work and relative attractiveness in Table 2. We run two regressions, for married men and women separately, of an indicator of husband's (wife's) annual hours of work –which takes value 1 if the husband's (wife's) works more than the average husband's (wife's) work hours, i.e., 2361 (1857)– on a type of couple indicator –which takes value 1 if the relative husband's BMI is higher than the average, i.e,

[11] Longitudinal weights are available throughout the period 1999-2007, whereas cross-sectional weights are absent for the most recent waves of 2005 and 2007. Consequently, we consider the entire time period 1999-2007 using longitudinal weights.

1.15– controlling for own age, state and year fixed effects. 45% of husbands work above the average, while 55% of wives work above the average. Note that in 48% of the couples, the husband's BMI is 15% higher than the wife's BMI. The main results of the table are that husbands who are relatively heavier (15% or more) than their wives are a 6% more likely to work more hours than the average husband, while wives who are relatively thinner than their husbands are a 6% less likely to work more hours than the average wife.

[**Table 2 about here**]

This table is consistent with the basic story presented above. A husband's lower relative physical attractiveness (or higher BMI) leads him to work more hours and her wife to work fewer hours, and conversely. However, while these findings are supportive of a standard collective model, they do not constitute clean tests of it, because labor supply depends at least on wages, which may be related to the BMI ratio.

4.1 Relative BMI and Labor Supplies

Table 3 presents the results of several regressions where the dependent variable is the log annual hours of work (our measure of labor supply) of married men. In the first column we estimate a standard labor supply equation, which postulates a log-linear relationship between hours of work and wages controlling for a vector of demographic characteristics (age, education, household non-labor income, and number of children), state and year fixed effects. This is a prototype empirical specification that encompasses many economic models of labor supply (Blundell and MaCurdy, 1999). In the second column, we add our measure of relative attractiveness between spouses, namely the ratio of husband's BMI to his wife's, to the standard labor supply equation. Consistently with our predictions, we find a *positive* significant correlation between relative BMI and hours worked by married men, which corresponds to an elasticity of roughly 6.5%, significant at the 5% level, while the estimated coefficients associated to the hourly wage and other variables (results available upon request) do not exhibit any significant change with respect to the previous column.

Acknowledging that weight (or BMI) has already been linked to labor supply –individuals working more hours may work in sedentary jobs (Lakdawalla and Philipson, 2007)– we also present estimates controlling for sedentary job-type, column (3). The estimated relationship between labor supply and relative BMI remains virtually the same. Finally, in the last column, we add the food expenditure ratio to account for the possibility that individuals working more hours may consume more highly-caloric food to economize on the scarcity of their time (Chou et al., 2004). This does not alter the estimated association between hours of work and relative BMI.

[**Table 3 about here**]

To sum up, relatively heavier husbands tend to work more hours, on average. Moreover, this strong positive correlation persists and exhibits comparable magnitudes when accounting for sedentary job-type and the ratio of food at home versus total food expenditures.

Table 4 displays the same set of regressions for married women. As expected, relatively thinner wives tend to work fewer hours. The relationship is robust and present in all the specifications, as it is the case for married men.

[**Table 4 about here**]

Tables 3 and 4 indicate that both men and women seem responsive to their relative BMI within marriage, and willing to alter their labor supply behavior. This is suggestive of a compensation mechanism, so that a relative defect is compensated with a quality. Everything else being equal, if a male (female) individual is heavier relatively to his wife (husband), he (she) works more hours to compensate for the relatively poor physical trait.

Next, in Table 5 we include spousal characteristics and estimate the spouses' labor supply equations simultaneously, to account for the existence of common random shocks affecting labor supply decisions within a couple. The first panel in Table 5 uses the ratio, while the second panel uses the log-ratio. Interestingly, we cannot reject that the estimated effects of husband's relative BMI are the *same* for men and women but *with* opposite signs, which is also consistent with recent work on body size and the marriage market emphasizing the relevance not only of female physical attractiveness but also of male attractiveness (e.g., Chiappori et al., 2010; Hitsch et al., 2010).[12]

[Table 5 about here]

4.2 Addressing Identification Concerns

4.2.1 *Relaxing and testing the symmetry imposed by the BMI ratio*

Since the identification of the effect of the relative husband's BMI on labor supplies may depend on imposing symmetric but of-opposite-sign effects, we now relax this assumption by including the logs of own BMI and spousal BMI, as two separate variables. In Table 6 we estimate the same simultaneous labor supply equations as in Table 5, but replacing the husband's relative BMI with the logs of own BMI and spousal BMI. Our conceptual framework has two main predictions. First, *own* BMI and *own* hours of work are positively related, ceteris paribus. Own BMI decreases own bargaining power in the household, leading to an increase in own labor supply that acts as a compensation mechanism within the household. The second prediction concerns the cross-effect of *spousal* BMI on *own* hours of work. Ceteris paribus, spousal BMI increases own bargaining power because it improves own relative attractiveness in the couple, leading to a decrease in own labor supply.

[Table 6 about here]

Table 6 confirms both predictions. Looking at the first column, we find a 9%-elasticity of annual hours of work with respect to own BMI for married men, and a –7%-elasticity

[12]The residuals of each labor supply equation are positively correlated ($\rho = 0.0651$ and $\rho = 0.0653$), and the Breusch-Pagan tests reject independence at the 1% level.

with respect to wife's BMI. For married women, the second column displays an 8%-elasticity of annual hours of work with respect to own BMI, and a –6%-elasticity with respect to husband's BMI. This last elasticity, although sizeable, is not statistically significant. This is not surprising, and it can be easily understood in a classical measurement error world, as long as the *variance* of the classical measurement error is higher when the household head reports the measure of his/her spouse than when he reports his own.

To assess the validity of our symmetry assumption and the plausibility of our mechanism, we perform several tests. The tests in row A indicate that we cannot reject the equality of the coefficients but with opposite signs within equations, i.e., we cannot reject the symmetry imposed by the ratio. Moreover, the tests in rows B and C indicate that we cannot reject either the equality of own BMI effects across equations or the equality of cross-BMI effects across equations. Hence, our regressions based on the ratio do not appear to be misspecified.

4.2.2 *Sorting during the match or bargaining power after the match*

It could be argued that the negative relationship between own hours of work and spousal BMI may reflect sorting at the moment of the match, rather than bargaining power. There are at least two reasons to believe that this phenomenon does not interfere with our results and their interpretation. First, we are focusing on *non-recently* married couples, in particular, those who have been married for *at least* 4 years, so that (part of) these negative associations capture our bargaining power explanation, and not sorting at the moment of the match. Second, although it is true that if we were capturing sorting the cross-effect should be expected to be *negative*, the *own* effect should be expected to be *negative* as well (see Appendix for a simple derivation). However, our estimated own effect is positive. Hence, our empirical findings are not simply the mere reflection of sorting at the time of the match.

4.2.3 *Alternative non-marriage market explanations: the unmarried*

We have acknowledged that own weight (or BMI) has already been linked to labor supply – individuals working more hours may work in sedentary jobs (Lakdawalla and Philipson, 2007) or consume more highly-caloric food to economize on the scarcity of their time (Chou et al., 2004)– and we have controlled for sedentary job-type and the food ratio. However, these controls may not fully address the underlying correlations.

To single out the family-origin correlation of BMI and labor supply from alternative explanations, we implement a *placebo* test using the *unmarried.* If our bargaining power mechanism is at work, ceteris paribus, we should find a positive relationship between own BMI and own hours of work for both married men and married women. Conversely, *no relationship* for either unmarried men or unmarried women should emerge since they have no spouse to relate to, and therefore are not involved in any intra-household bargaining.

In Table 7 we compare own-effects of BMI on hours of work between unmarried and married individuals. Both for men and women, no statistically significant relationship emerges between BMI and hours of work, and the magnitudes are much smaller. The coefficient for married men is 2.5 times bigger than the one corresponding to unmarried men, while the coefficient for married women is 1.4 times bigger than the one corresponding to unmarried women.

[**Table 7 about here**]

4.2.4 *Potential non-linearities in BMI*

In Table 8 we estimate the same regressions as in Table 6 but including squared log BMIs to assess the existence of non-linearities in the relationship between hours of work and (own and spousal) BMI. We do not find evidence of non-linearities. We have also estimated the same regressions as in Table 6 but including the square of log(own BMI) for unmarried men and women, without finding evidence of non-linearities (results available upon request).

[**Table 8 about here**]

5 Conclusions

Our paper relies on the simple idea that relative physical attractiveness matters for the intra-household allocation of resources, and therefore for the labor supply decisions of both spouses. This is appealing, we think, in light of the absence in the literature of a link between the existing work highlighting the family context in which work decisions are made (e.g., Blundell and MaCurdy, 1999; Chiappori et al., 2002; Blau and Kahn, 2007), and those estimating the impact of physical attractiveness in the workplace (e.g., Hamermesh and Biddle, 1994; Rooth, 2009; Mocan and Tekin, 2010). Furthermore, evidence from psychology explicitly points to fatness being stigmatized by spouses, and to the fact that it is the relative attractiveness within the couple which is thought to affect household behavior (McNulty and Neff, 2008).

Using data from the Panel Study of Income Dynamics (PSID) on married heads and their wives from 1999 to 2007, we find that husbands who are heavier relative to their wives work more hours, while wives who are thinner relative to their husbands work fewer hours, also when controlling for sedentary job-type and the ratio of expenditures of food at home versus total food. Moreover, accounting for spousal characteristics and estimating the labor supply equations simultaneously, we cannot reject that the estimated effects of husband's relative BMI are the *same* for men and women but *with* opposite signs, and show a significant response of both male and female labor supplies. Finally, replacing the ratio by both the log of own BMI and the log of spousal BMI, we find a 9%-elasticity of annual hours of work with respect to own BMI for married men, and a –7%-elasticity with respect to their wives' BMI. For married women, an 8%-elasticity of annual hours of work is associated with own BMI, while a –6%-elasticity to their husbands' BMI. Our household bargaining interpretation is reinforced by the evidence that no statistically significant relationship emerges for unmarried individuals.

Appendix: Challenging the alternative explanation of sorting

Consider the case where sorting of couples at the moment of the match takes place along two characteristics, namely BMI (observable to the econometrician) and x (unobservable to the econometrician), where a high BMI is perceived as a negative trait, while a high x is a positive one. If both characteristics were observable to the econometrician, to investigate the presence of sorting, and similarly to Hitsch et al. (2010), we could regress each wife (husband) characteristic on her (his) spouse characteristics at the time of the match. For spouse 1, we could simultaneously estimate the following two equations:

$$\log(BMI_1) = \alpha_0 + \beta_1 \log(BMI_2) + \gamma_1 \log(x_2) + \varepsilon_1 \tag{1}$$

$$\log(x_1) = \alpha_1 + \beta_2 \log(BMI_2) + \gamma_2 \log(x_2) + \varepsilon_2 \tag{2}$$

where ε_1 and ε_2 capture some sort of randomness.

And similarly for spouse 2:

$$\log(BMI_2) = \pi_0 + \delta_1 \log(BMI_1) + \rho_1 \log(x_1) + v_1 \tag{3}$$

$$\log(x_2) = \pi_1 + \delta_2 \log(BMI_1) + \rho_2 \log(x_1) + v_2 \tag{4}$$

where v_1 and v_2 capture some sort of randomness.

Unfortunately, we do not observe x, but we assume that it is *positively* related with *hours of work*. Specifically, and for simplicity, x and hours of work are related in the following way:

$$\log(h_1) = \log(x_1) + u_1 \tag{5}$$

$$\log(h_2) = \log(x_2) + u_2 \tag{6}$$

where u_1 and u_2 are classical measurement errors.

Replacing expressions (5) and (6) into (1)-(4) we obtain:

$$\log(BMI_1) = \alpha_0 + \beta_1 \log(BMI_2) + \gamma_1 \log(h_2) + (\varepsilon_1 - \gamma_1 u_2) \tag{7}$$

$$\log(h_1) = \alpha_1 + \beta_2 \log(BMI_2) + \gamma_2 \log(h_2) + (\varepsilon_2 + u_1 - \gamma_2 u_2) \tag{8}$$

$$\log(BMI_2) = \pi_0 + \delta_1 \log(BMI_1) + \rho_1 \log(h_1) + (v_1 - \rho_1 u_1) \tag{9}$$

$$\log(h_2) = \pi_1 + \delta_2 \log(BMI_1) + \rho_2 \log(h_1) + (v_2 + u_2 - \rho_2 u_1) \tag{10}$$

If heavier men tend to marry heavier women, then $\beta_1, \delta_1 > 0$. Similarly, if high-x men tend to marry high-x women, then $\gamma_2, \rho_2 > 0$. Moreover, if there is some degree of *substitutability* between spousal characteristics, we should expect $\gamma_1, \beta_2, \rho_1, \delta_2 < 0$. The estimates in Table A1 are consistent with these signs. Note, however, that the estimates of $\gamma_1, \gamma_2, \rho_1$ and ρ_2 reported in Table A1 suffer from attenuation bias due to (5) and (6).

[Table A1 about here]

What happens if we regress labor supply on both *own* and *spousal* BMI?

Replacing (10) into (8), we obtain:

$$\log(h_1) = \varphi_1 + \left(\frac{\beta_2}{1-\gamma_2\rho_2}\right)\log(BMI_2) + \left(\frac{\gamma_2\delta_2}{1-\gamma_2\rho_2}\right)\log(BMI_1) + \eta_1 \tag{11}$$

Similary, replacing (8) into (10), we obtain:

$$\log(h_2) = \varphi_2 + \left(\frac{\delta_2}{1-\gamma_2\rho_2}\right)\log(BMI_1) + \left(\frac{\rho_2\beta_2}{1-\gamma_2\rho_2}\right)\log(BMI_2) + \eta_2 \tag{12}$$

where $\varphi_1 = \left(\frac{\alpha_1+\gamma_2\pi_1}{1-\gamma_2\rho_2}\right)$, $\varphi_2 = \left(\frac{\pi_1+\rho_2\alpha_1}{1-\gamma_2\rho_2}\right)$, $\eta_1 = \gamma_2\left(\frac{v_2-\rho_2 u_1}{1-\gamma_2\rho_2}\right) + \left(\frac{\varepsilon_2+u_1}{1-\gamma_2\rho_2}\right)$, $\eta_2 = \rho_2\left(\frac{\varepsilon_2-\gamma_2 u_2}{1-\gamma_2\rho_2}\right) + \left(\frac{v_2+u_2}{1-\gamma_2\rho_2}\right)$.

Hence, as long as $1-\gamma_2\rho_2 > 0$, $\left(\frac{\beta_2}{1-\gamma_2\rho_2}\right) < 0$, $\left(\frac{\gamma_2\delta_2}{1-\gamma_2\rho_2}\right) < 0$, $\left(\frac{\delta_2}{1-\gamma_2\rho_2}\right) < 0$, $\left(\frac{\rho_2\beta_2}{1-\gamma_2\rho_2}\right) < 0$.[13]

Therefore, the expected relationship between hours of work and *own* BMI is negative, as well as the expected relationship between hours of work and *spousal* BMI. In other words, if sorting were driving our empirical results, labor supply should be *negatively* related to *own* BMI, while the standard collective model predicts, and our evidence shows, the opposite.[14]

[13] Indeed, the tables indicate that $1 > \gamma_2\rho_2$ is satisifed.

[14] Note that estimation of (11) and (12) by OLS (or SUREG) will lead to biased estimates of the *cross*-effects, $\left(\frac{\beta_2}{1-\gamma_2\rho_2}\right)$ and $\left(\frac{\delta_2}{1-\gamma_2\rho_2}\right)$, since $corr(\log(BMI_2), u_1) \neq 0$ and $corr(\log(BMI_1), u_2) \neq 0$, but *not* of the *own*-effects $\left(\frac{\gamma_2\delta_2}{1-\gamma_2\rho_2}\right)$ and $\left(\frac{\rho_2\beta_2}{1-\gamma_2\rho_2}\right)$.

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TABLES

Table 1
Descriptive statistics
PSID 1999-2007.

Variable	**Mean**	**SD**
Hours husband	2361.24	512.81
Hours wife	1857.09	545.62
BMI husband	27.69	3.82
BMI wife	24.68	4.38
Non-Labor Income	9224.45	34610.09
Hourly wage husband	26.62	31.61
Hourly wage wife	19.61	13.15
Age husband	40.26	6.05
Age wife	38.53	5.91
Education husband	13.81	2.15
Education wife	13.97	2.07
Good Health husband	0.97	0.18
Good Health wife	0.98	0.15
Recent pregnancy	0.10	0.30
Number of children	1.42	1.03
Sedentary job husband	0.58	0.49
Sedentary job wife	0.86	0.34
BMI husband/BMI wife	1.15	0.21
N	2043	

Note: Men aged 28-50 and working more than 1000 hours per year, women aged 26-48 working more than 750 hours per year, both earning more than $5 per hour and non-disabled. Married individuals are those with a marital duration of at least 4 years.

Table 2
Regressions of annual hours of work indicators per type of couple indicator, PSID 1999-2007.
I (·) indicator variable that takes value 1 if the condition (·) is satisfied

	I(Hours husband ≥ 2361)	I(Hours wife ≥ 1857)	Mean
I(husband's BMI/wife's BMI ≥ 1.15)	**0.056****	**-0.061****	48%
	(0.028)	**(0.028)**	
Means	45%	55%	

Note: The regressions include own age, year and state fixed effects. Men aged 28-50 and working more than 1000 hours per year, women aged 26-48 working more than 750 hours per year, both earning more than $5 per hour and non-disabled. Married individuals are those with a marital duration of at least 4 years. Robust standard errors clustered at the household-head id level are reported in parentheses. Sampling weights are used.
*** p-value<0.01, ** p-value<0.05, * p-value<0.1

Table 3:
Regressions of husband's log annual hours of work on husband's BMI relative to wife's BMI.
PSID 1999-2007.

	(1)	(2)	(3)	(4)
husband's BMI/wife's BMI	--	**0.057****	**0.057****	**0.063****
		(0.027)	**(0.027)**	**(0.027)**
log(husband's wage)	-0.041***	-0.044***	-0.044***	-0.048***
	(0.014)	(0.014)	(0.014)	(0.014)
Demographic characteristics	YES	YES	YES	YES
Sedentary-job type	NO	NO	YES	YES
Home food ratio	NO	NO	NO	YES
N	2,043	2,043	2,043	2,025
Adj. R^2	0.065	0.068	0.068	0.076

Note: Demographic characteristics include age, completed years of education, a good health status indicator, household non-labor income, number of children, a recently pregnant indicator, state and year fixed effects. Men aged 28-50 and working more than 1000 hours per year, women aged 26-48 working more than 750 hours per year, both earning more than $5 per hour and non-disabled. Married individuals are those with a marital duration of at least 4 years. Robust standard errors clustered at the household-head id level are reported in parentheses. Sampling weights are used.
*** p-value<0.01, ** p-value<0.05, * p-value<0.1

Table 4:
Regressions of wife's log annual hours of work on husband's BMI relative to wife's BMI.
PSID 1999-2007.

	(1)	(2)	(3)	(4)
husband's BMI/wife's BMI	--	**-0.082***	**-0.079***	**-0.076***
		(0.044)	**(0.044)**	**(0.044)**
log(wife's wage)	0.046**	0.048**	0.045**	0.038*
	(0.021)	(0.021)	(0.021)	(0.021)
Demographic characteristics	YES	YES	YES	YES
Sedentary-job type	NO	NO	YES	YES
Home food ratio	NO	NO	NO	YES
N	2,043	2,043	2,043	2,025
Adj. R^2	0.098	0.101	0.102	0.105

Note: Demographic characteristics include age, completed years of education, a good health status indicator, household non-labor income, number of children, a recently pregnant indicator, state and year fixed effects. Men aged 28-50 and working more than 1000 hours per year, women aged 26-48 working more than 750 hours per year, both earning more than $5 per hour and non-disabled. Married individuals are those with a marital duration of at least 4 years. Robust standard errors clustered at the household-head id level are reported in parentheses. Sampling weights are used.
*** p-value<0.01, ** p-value<0.05, * p-value<0.1

Table 5:
Seemingly unrelated regressions of log annual hours of work on husband's BMI relative to wife's BMI.PSID 1999-2007.

	Husbands	Wives	*Test of equality with opposite signs*	
I.				
husband's BMI/wife's BMI	**0.066*** **	**−0.060***	$\chi^2(1)=0.02$	*p-value=0.8796*
	(0.021)	(0.031)		
	Corr(residuals) 0.0651			
	Breush-Pagan test of independence $\chi^2(1)=8.649$ *p-value=0.0033*			
II.				
log(husband's BMI/wife's BMI)	**0.076*** **	**−0.072** **	$\chi^2(1)=0.01$	*p-value=0.9243*
	(0.024)	(0.035)		
	Corr(residuals) 0.0653			
	Breush-Pagan test of independence $\chi^2(1)=8.716$ *p-value=0.0032*			
N	2043			

Note: Regressions, which are simultaneously estimated, include own and spousal characteristics (age, log-hourly wage, completed years of education, a good health status indicator, a sedentary-job type indicator, and a recently pregnant indicator), household non-labor income, number of children, state and year fixed effects. Men aged 28-50 and working more than 1000 hours per year, women aged 26-48 working more than 750 hours per year, both earning more than $5 per hour and non-disabled. Married individuals are those with a marital duration of at least 4 years. Standard errors are reported in parentheses. Sampling weights are used.
*** p-value<0.01, ** p-value<0.05, * p-value<0.1

Table 6:
Seemingly unrelated regressions of log annual hours of work on log own-BMI and log spouse-BMI. PSID 1999-2007.

	Husbands	Wives
log(husband's BMI)	**0.086****	−0.058
	(0.035)	(0.051)
log(wife's BMI)	**−0.070****	**0.081***
	(0.029)	(0.042)
A. Test of equality with opposite signs within equations	$\chi^2(1)=0.16$ *p-value=0.6889*	$\chi^2(1)=0.14$ *p-value=0.7070*
B. Test of equality of own-effects across equations	$\chi^2(1)=0.01$ *p-value=0.9163*	
C. Test of equality of cross-effects across equations	$\chi^2(1)=0.04$ *p-value=0.8411*	
N	2043	

Note: Regressions, which are simultaneously estimated, include own and spousal characteristics (age, log-hourly wage, completed years of education, a good health status indicator, a sedentary-job type indicator, and a recently pregnant indicator), household non-labor income, number of children, state and year fixed effects. Men aged 28-50 and working more than 1000 hours per year, women aged 26-48 working more than 750 hours per year, both earning more than $5 per hour and non-disabled. Married individuals are those with a marital duration of at least 4 years. Standard errors are reported in parentheses. Sampling weights are used.

*** p-value<0.01, ** p-value<0.05, * p-value<0.1

Table 7:
Regressions of log annual hours of work on log own-BMI by marital status.
PSID 1999-2007.

	Men		**Women**	
	Unmarried	**Married**	**Unmarried**	**Married**
log(own BMI)	0.030	**0.076***	0.067	**0.096***
	(0.087)	(0.043)	(0.061)	(0.055)
N	838	2043	1020	2043

Note: All regressions include own characteristics (age, log-hourly wage, completed years of education, a good health status indicator, a sedentary-job type indicator, and –for women- a recently pregnant indicator), household non-labor income, number of children, state and year fixed effects. Men aged 28-50 and working more than 1000 hours per year, women aged 26-48 working more than 750 hours per year, both earning more than $5 per hour and non-disabled. Married individuals are those with a marital duration of at least 4 years. Robust standard errors clustered at the household-head id level are reported in parentheses. Sampling weights are used.
*** p-value<0.01, ** p-value<0.05, * p-value<0.1

Table 8: Allowing for non-linearities on BMIs.
Seemingly unrelated regressions of log annual hours of work on log own-BMI and log spouse-BMI. PSID 1999-2007.

	Husbands	Wives
log(husband's BMI)	1.20	0.250
	(1.31)	(1.91)
$(\log(\text{husband's BMI}))^2$	-0.167	-0.046
	(0.196)	(0.287)
log(wife's BMI)	-0.098	0.164
	(0.919)	(1.34)
$(\log(\text{wife's BMI}))^2$	0.005	-0.013
	(0.142)	(0.207)
N	2043	

Note: Regressions, which are simultaneously estimated, include own and spousal characteristics (age, log-hourly wage, completed years of education, a good health status indicator, a sedentary-job type indicator, and a recently pregnant indicator), household non-labor income, number of children, state and year fixed effects. Men aged 28-50 and working more than 1000 hours per year, women aged 26-48 working more than 750 hours per year, both earning more than $5 per hour and non-disabled. Married individuals are those with a marital duration of at least 4 years. Standard errors are reported in parentheses. Sampling weights are used.

*** p-value<0.01, ** p-value<0.05, * p-value<0.1

Table A1:

Seemingly unrelated regressions of log annual hours of work and log BMI. PSID 1999-2007.

I.	**Log(husband's hours)**	**Log(husband's BMI)**
log(wife's hours)	**0.045*** **	-0.011
	(0.015)	(0.009)
log(wife's BMI)	**-0.059** **	**0.161*** **
	(0.028)	(0.018)
II.	**Log(wife's hours)**	**Log(wife's BMI)**
log(husband's hours)	**0.094*** **	**-0.042** **
	(0.032)	**(0.017)**
log(husband's BMI)	-0.050	**0.240*** **
	(0.050)	(0.026)
N	2043	

Note: Regressions, which are simultaneously estimated, include own and spousal characteristics (age, log-hourly wage, completed years of education, a good health status indicator, a sedentary-job type indicator, and a recently pregnant indicator), household non-labor income, number of children, state and year fixed effects. Men aged 28-50 and working more than 1000 hours per year, women aged 26-48 working more than 750 hours per year, both earning more than $5 per hour and non-disabled. Married individuals are those with a marital duration of at least 4 years. Standard errors are reported in parentheses. Sampling weights are used.

*** p-value<0.01, ** p-value<0.05, * p-value<0.1

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