Beauty Premium and Marriage Premium in Search Equilibrium: Theory and Empirical Test*

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Abstract

We propose a theoretical explanation for the so-called "beauty premium". Our explanation is based entirely on search frictions and the fact that physical appearance plays an important role in attracting a marriage partner. We analyse the interaction between frictional labour and marriage markets and establish the existence of a search equilibrium characterised by male wage differentials. The equilibrium may also display the "marriage premium", predicted to be lower among attractive men. The link between beauty premium and marriage premium provides a falsification test of the model. We carry out the empirical analysis and conclude that we cannot refute the theory.

Keywords: search, frictional labour market, frictional marriage market, beauty premium, marriage premium.
JEL Classification: D83, J12, J31

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1 Introduction

There is widespread evidence that labour market outcomes are influenced by more than just productivity. More specifically, anthropometric characteristics such as beauty, height and - to some extent - weight seem to have an effect on employment outcomes in general, and wages in particular. Individuals perceived as having attractive physical attributes tend to earn higher wages. This earnings gap is called "beauty premium" in the literature, and has recently been the subject of extensive research, most of it empirical.[1]

In a pioneering study, Hamermesh and Biddle (1994) found that individuals with below-average attractiveness earned 9% less than the "average-looking" ones, whereas the wage of individuals with above-average looks was 5% higher. Their results were obtained after controlling for educational attainment and experience. Persico et al.(2004) attempted to quantify the so-called height premium and found that increasing height at age 16 by one inch increased adult wages by 2.6%, on average. In two fairly recent studies using UK data, Case and Paxson (2008) and Case at al.(2009) found that the height premium remains significant after controlling for education and for sorting into higher status jobs. On the other hand, the effect of weight on labour market outcomes seems to be less clear. Garcia and Quintana-Domeque (2007), Cawley (2004) and Han et al. (2009) find a wage penalty coupled with reduced employment probability for obese. In contrast, Hamermesh and Biddle (1994), Sargent and Blanchflower (1994) and Morris (2006) argue that weight has no effect on male earnings.

Physical attributes (beauty, weight and height) are also known to play an important role in the marriage market. Extensive empirical results from sociology, anthropology, psychology and other fields confirm this fact. Following the path-breaking work of Becker (1991) on marriage markets, there is also an extensive economics literature that investigates assortative mating. Some studies, such as Choo and Siow (2006) and Weiss and Willis (1997) focus on matching based on age, earnings and education. Others consider the effect of various anthropometric characteristics on marital outcomes. For height, Oreffice and Quintana-Domeque (2010) find that shorter men are more likely to be matched with less educated heavier partners, while Ponzo and Scoppa

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[1]For a stimulating survey, see Hamermesh (2011).

(2014) conclude that taller males tend to marry more educated women. Manfredini et al. (2013) find a negative selection of short men on marriage, while Herpin (2005) finds that short men are less likely to be married or live in a permanent relationship than their taller counterparts. For weight, Oreffice and Quintana-Domeque (2010) find that heavier husbands are matched with shorter wives, while Silventoinen et al. (2003) observe assortative matching along weight (as well as height). Finally, Averett et al. (2008) conclude that spouses tend to pay less attention to their body-mass index (BMI) once they get married.

In this paper we propose a theoretical explanation for the existence of male beauty premium as an equilibrium outcome in a model that incorporates search frictions (uncertainty in the matching process) as well as multi-dimensional preferences that reflect an implicit trade-off between anthropometric and socio-economic characteristics. The key insight is that labour market decisions and outcomes may be influenced by expectations and behaviour in the marriage market.

To capture this inter-dependence, we construct a simple equilibrium search model where the two frictional markets are inter-linked.[2] Single men are heterogeneous in terms of their physical appearance: in the eyes of all women, some men are more attractive than others. We look at two-sided search where men and women look for each other, and unemployed men also search for jobs knowing that earnings (together with looks) determine whether or not they can form marriage partnerships. Crucially, although physical appearance does not affect mens' *options* in the labour market, it affects their *decisions* in that market, as their marriage prospects are influenced both by looks *and* wages.

Assuming that women regard physical characteristics and wages as substitutes and rank men in the same way, we show that there exists an equilibrium in which less attractive men find it optimal to accept jobs that pay lower wages than the wages of their more attractive rivals. The trade-off is straightforward and comes from the frictional nature of the labour market: although a less attractive man needs a high wage in order to attract a woman, such a well-paid job might just be too difficult to find, so he settles for a lower

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[2]The literature on inter-linked frictional markets is sparse. For two interesting recent papers, see Kaplan and Menzio (2014) and Rupert and Wasmer (2012).

wage. As a consequence, more attractive men (single or married) will earn on average higher wages than less attractive (single or married) men.

Interestingly, the strategies that give rise to the beauty premium can also account for the so-called "marriage premium" - the phenomenon whereby married men earn higher wages than their single rivals. Empirical studies find (after controlling for education and other characteristics) that this premium is consistently around 10% or above. On the other hand, marital wage differentials are considerably smaller for women, and their sign varies. For excellent surveys of the empirical literature on male marriage wage premium, see Daniel (1995) and Grossbard-Shechtman and Neuman (2003).

We establish a delicate theoretical link between beauty premium and marriage premium. We show that a positive beauty premium is only consistent with a situation where the marriage premium of less attractive men is positive and higher than that of the more attractive ones. On the other hand, a zero beauty premium requires a zero marriage premium for attractive men coupled with a positive marriage premium for the less attractive ones.

The relationship between the two types of premia provides a straightforward test of the theoretical predictions of the model. In the empirical section of our paper we explore the existence of beauty premium and marriage premium across male workers who differ in terms of anthropometric characteristics. Following the empirical literature, we use height and weight as proxies for physical attractiveness. We carry out a falsification test of our theory and conclude that the empirical results do not invalidate the model and therefore its predictions are relevant for the study of beauty premium and marriage premium.

Our contribution relates to the existing literature in two other important ways.

First, the focus is on male beauty premium (rather than assortative matching) and we consider one-sided heterogeneity (recall that women are homogeneous). Nonetheless, our approach incorporates some aspects of the marriage market whose importance was stressed by Chiappori et al. (2012) in the context of assortative matching. They argue that the standard theoretical marriage matching framework is too narrow: it overlooks the role played by uncertainty, and it restricts attention to one-dimensional matching processes. That is, it ignores richer patterns where partners may consider

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multiple characteristics, which in turn would allow for potential trade-offs between anthropometric features and socio-economic characteristics.[3] Our model captures the random nature of matching in frictional markets and also considers preferences over multi-dimensional characteristics, with our results being driven by the existence of search frictions and the perceived trade-off between physical attributes and wages.

Second, throughout our theoretical analysis, the focus is on the reservation wage decisions of male workers. This allows us to ignore the wage policies of firms and issues related to possible discrimination based on looks. Crucially, productivity heterogeneity plays no role whatsoever in establishing our results. This is in stark contrast with existing explanations of beauty premium and marriage premium, all of which rely on some sort of productivity differences.

More specifically, the literature on beauty premium is based on the idea that some physical traits might affect job performance in ways that are not as easily measured as other factors (such as human capital or work experience). One argument is that physical attractiveness may affect a person's self-esteem or communication skills, and hence their productivity. Cawley (2004) finds that productivity is negatively correlated with weight, possibly because of factors such as health or confidence. Persico et al. (2004) suggest that height increases the probability that teens participate in social activities, and in turn these activities help them acquire productivity-enhancing skills. However, in contrast with these results, Hamermesh and Biddle (1994) found that the beauty premium exists even outside of jobs that involve frequent inter-personal contact and communication.

Similarly, almost all explanations of marriage premium rely on some sort of male productivity heterogeneity. According to the so-called *selection* theory, some unobservable traits of men which are valued in the marriage market are correlated with productivity. However, the empirical evidence on this is quite weak - for example, Chun and Lee (2001) argue that the selection effect is minimal. Alternatively, household *specialisation* models postulate that

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[3]Chiappori et al. (2012) consider marital matching along multi-dimensional characteristics and reduce it to a matching problem with preferences captured by a one-dimensional index. Using PSID data on married couples, they also find an interesting trade-off between anthropometric and socio-economic factors affecting marital outcomes: men compensate 1.3 additional units of BMI with a 1% increase in wages.

marriage increases a man's productivity. Korenman and Neumark (1991) provide some limited empirical support for this hypothesis. However, Loh (1996) finds that men whose wives also work earn a larger premium, while Hersch and Stratton (2000) conclude that the marriage premium is not due to household specialisation even if one doesn't use wives' employment status as proxy for specialisation. Blackburn and Korenman (1994) assess the relative merits of the two theories and find that the evidence is mixed: overall, neither selection nor specialisation are sufficient explanations for the existence of the male marriage wage gap. In this context, the only theoretical paper we are aware of that offers a different explanation for the existence of marriage premium is Bonilla and Kiraly (2013), who show that the marital earnings gap can arise simply as a result of search frictions.

The present paper is structured as follows. First, we set up our theoretical model. Next, we analyse the optimal search strategies of men and women. Section 4 looks at the search equilibrium characterised by beauty premium and marriage premium, and contains the main theoretical results. Section 5 carries out an empirical falsification test of the model. The final section concludes.

2   The model

The economy consists of women and men, all risk neutral. Assume a continuum of men (normalised to 1), and a measure n of single women. Time is continuous and all agents discount the future at rate r.

Men enter the economy unemployed and single. In the labour market, they face a range of posted wages which are distributed according to an exogenous cumulative distribution function $F(w)$ with support $[\underline{w}, \bar{w}]$. In order to capture productivity homogeneity, we assume that all men face exactly the same job prospects - here, the wage distribution F. Men use costless random sequential search to locate firms and contact occurs at rate λ_0. An employed man has flow wage payoff w. There is no on-the-job search, so a man's wage remains constant throughout his working life.

Men are heterogeneous (with i denoting type) in terms of their physical appearance. This is a composite quality that captures anthropometric

traits such beauty, height and weight - characteristics which are known to be important in marital matching. Single men look for potential marriage partners. In the marriage market, a man is viewed by all women as *either* attractive (type H) *or* less attractive (type L). A married man earning wage w enjoys flow payoff $w + y$, where $y > 0$ captures the non-material utility of marriage. There is no divorce so marriage partnerships are for life.

Women are single when they enter the economy and they don't look for jobs. Let x denote the flow payoff of a woman when single. We treat it as exogenous and it simply reflects the utility difference between being single and being married.[4] In turn, the difference between x and y allows for possible asymmetries in the way women and men, respectively, value the benefits of marriage.[5]

Women use costless random sequential search to locate single men. Let λ_w^i (with $i = L, H$) be the rate at which a woman meets such a man. A married woman's flow payoff is equal to her partner's wage w plus a fixed flow utility z_i, where $z_H > z_L$.[6] The payoff z_i captures the utility a woman gets from marrying a type i man. This is a crucial ingredient in our model and it captures two important considerations. First, it allows some participants in the marriage matching process (in this case, women) to have preferences about multi-dimensional features of potential marital partners. Secondly, it reflects the perceived trade-off between anthropometric characteristics and socio-economic status: all women regard a man's wage and his looks as substitute goods and therefore physical appearance, together with earnings determine whether or not a single man is accepted for marriage.

Anticipating the type of equilibria we are interested in, we assume for now that women do not marry unemployed men. Later, we show that this is a best response.

Given sequential search and the fact that utilities are increasing in wages, both men and women use optimal strategies characterised by the reservation value property. Denote these reservation values by R_i and T_i, respectively.

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[4]Alternatively, x could be endogenously determined in a model that includes the female labour market.

[5]For empirical evidence that, on average, men don't seem to care much about women's wages, see Gould and Paserman (2003).

[6]Note that upon marriage, a woman gives up x, so we assume that $x < \overline{w}$, as otherwise there would be no potential surplus from marriage.

The case when men are marriageable even if they ignore the marriage market is uninteresting. Therefore, anticipating that $R_i > T_i$ occurs under this scenario only, we omit it from the analysis.

Singles and couples alike leave the economy at an exogenous rate δ and we only consider steady states. Every time an unemployed man of type i accepts a job or leaves the economy, he is replaced by another type i unemployed. This means that the fraction of unemployed men of each type (u_i) can be treated as exogenous. Let N_i denote the number of *marriageable* employed single men of type i and let λ_w^i be the rate at which a woman meets such an eligible bachelor. We assume a quadratic matching function with parameter λ that measures the efficiency of the matching process. Then, $\lambda_w^i = \frac{\lambda(N_H+N_L)n}{n} \frac{N_i}{(N_H+N_L)} = \lambda N_i$. Similarly, assume a new single woman comes into the market every time a single woman gets married or exits the economy. This means that n can be regarded as exogenous and, with quadratic matching, we have $\lambda_m = \frac{\lambda(N_H+N_L)n}{(N_H+N_L)} = \lambda n$. Both N_i and λ_w^i are of course endogenous.

3 Steady state and optimal search

3.1 Steady state:

The inflow of unemployed men who find jobs with marriageable wages (above T_i), and the outflow from the stock of marriageable men are equal when

$$u_i \lambda_0 \left[1 - F(T_i)\right] = N_i(\lambda n + \delta)$$

Marriageable men of type i get married at rate λn and die at rate δ, while unemployed men find marriageable wages at rate $\lambda_0 \left[1 - F(T_i)\right]$. From here,

$$N_i = \frac{u_i \lambda_0 \left[1 - F(T_i)\right]}{\lambda n + \delta} \tag{1}$$

In order to discuss the optimal behaviour of women and men, we also need the distribution of *earned* wages across marriageable employed men of type i. This is denoted by $G_i(w)$ and is obtained by combining (1) with a second steady-state equation:

$$u_i \lambda_0 \left[F(w) - F(T_i)\right] = N_i G_i(w) \left[\delta + \lambda n\right]$$

This equates the flow into employment of men who find jobs with marriageable wages (between T_i and w), and the outflow from the stock of men earning a wage between T_i and w. From here, we get

$$G_i(w) = \frac{F(w) - F(T_i)}{1 - F(T_i)}.$$

3.2   Women:

Sequential search in the marriage market implies that the optimal strategy for women has the reservation *value* property. But, since wages and looks are substitutes, and since women regard men as either attractive or less attractive, they use a reservation *wage* strategy $T_i(z_i)$ in the marriage market, rejecting men of type i who earn wage $w < T_i(z_i)$.

The key observation is that since the flow utility for a married woman is $w + z_i$, women have a *unique* threshold reservation value that can be fulfilled *differently* by the two types of men. In other words, even a less attractive man can get married as long as he earns enough (a wage higher than his attractive rival). Of course, whether he does that or not will depend on the wages he encounters and chooses to accept.

The *expected* value of being a single woman is denoted by $W^S(w)$. Recall that we only consider the case with $T_i \geq R_i$. Standard derivations (and making use of (1))lead to the following Bellman equation:

$$(r + \delta)W^S(w) \;=\; x + \frac{\lambda u_H \lambda_0 \left[1 - F(T_H)\right]}{\lambda n + \delta} \int_{T_H}^{\overline{w}} \max\left\{W_H^M(w) - W_H^S(w), 0\right\} dG_H(w) +$$

$$+\frac{\lambda u_L \lambda_0 \left[1 - F(T_L)\right]}{\lambda n + \delta} \int_{T_L}^{\overline{w}} \max\left\{W_L^M(w) - W_L^S(w), 0\right\} dG_L(w)$$

In the above, $W_i^M(w) = \frac{w + z_i}{r + \delta}$ is the value of being married to an attractive or to a less attractive man, and it has the standard interpretation.

Alternatively, given that $G_i(w) = \frac{F(w) - F(T_i)}{1 - F(T_i)}$, we obtain

$$(r + \delta)W^S(w) \;=\; x + \frac{\lambda u_H \lambda_0}{(\lambda n + \delta)} \int_{T_H}^{\overline{w}} \max\left\{W_H^M(w) - W_H^S(w), 0\right\} dF_H(w) +$$

$$+\frac{\lambda u_L \lambda_0}{(\lambda n + \delta)} \int_{T_L}^{\overline{w}} \max\left\{W_L^M(w) - W_L^S(w), 0\right\} dF_L(w)$$

Lemma 1 $T_H < T_L$.

Proof. The proof is straightforward. By the definition of the reservation value, $(r + \delta)W^S(w) = T_H + z_H = T_L + z_L$. From here, it is clear that $T_H < T_L$ for $z_H > z_L$. ∎

Please note that for $R_i \leq T_i$, the expected value of being single is in fact independent of men's search strategy. This is essentially due to the fact that wages are exogenous. Firstly, men's search behaviour does not affect the minimum wage in the exogenous distribution $F(.)$. Secondly, men's search behaviour does not affect the rate at which they find marriageable wages either. In turn, from (1) it is obvious that the measure of marriageable men N_i is independent of R_i.

3.3   Men:

Sequential search and the fact that utilities are increasing in wages imply that the optimal strategy has the reservation *wage* property. An unemployed man faces a wage distribution $F(w)$ and, for any given reservation wage T which makes him acceptable for marriage, he uses a reservation wage *function* $R(T)$. As both L and H type men face the *same* wage distribution (and other relevant parameters), their reservation functions are identical: $R_L(T) = R_H(T) \equiv R(T)$. Crucially however, the two optimal reservation *wages* R_i will of course be different: they are simply the reservation function evaluated at the two reservation values chosen by women. That is, $R_i = R(T_i)$.

In what follows, we fully characterise the function $R(T)$. First, let $\underline{R}$ be defined as the unique solution to

$$\underline{R} = \frac{\lambda_0}{r + \delta} \int_{\underline{R}}^{\overline{w}} [1 - F(w)]\, dw.$$

We will show later that $\underline{R}$ is the reservation wage that would obtain in a setting without a marriage market (i.e. when $\lambda n = 0$). We will also show that this is lowest reservation wage in any equilibrium.

Next, we look at the reservation wage function $R(T)$ when the marriage market does have an effect (through T) on the optimal job search.

Define $\widehat{T}$ as the threshold wage for which $R(T)$ attains its maximum level. We will show that

$$\widehat{T} = \frac{\lambda_0}{r+\delta} \left[\int_{\widehat{T}}^{\overline{w}} [1 - F(w)] + \frac{\lambda n \left[1 - F(\widehat{T})\right]}{r + \delta + \lambda n} y \right]. \tag{2}$$

Clearly, $\widehat{T} > \underline{R}$ when both $y > 0$ and $F(\widehat{T}) < 1$.

Overall, a man (of either type) can be in one of three states: unemployed and single, employed at wage w and single (S), or employed at wage w and married (M). For any T, denote his value of being unemployed by U, and let $V^S(w)$ describe the value of being single and earning a wage w.

Standard derivations lead to the Bellman equation for an unemployed man:

$$(r + \delta)U = \lambda_0 \int_{\underline{w}}^{\overline{w}} \max \left[V^S(w) - U\right] dF(w)$$

Anticipating that $V^S(w)$ is not a continuous function (see below), we can define

$$R(T) = \min \left\{ w : V^S(w) \geq U \right\}$$

Since there is no divorce, the value of being married and earning a wage w is $V^M(w) = \frac{w+y}{r+\delta}$. Hence, for any T, we have

$$V^S(w) = \left\{ \begin{array}{lll} \frac{w}{r+\delta} & \text{if} & w < T \\ \frac{w}{r+\delta} + \frac{\lambda n}{(r+\delta+\lambda n)(r+\delta)} y & \text{if} & w \geq T \end{array} \right\}$$

Please note that when $\lambda n = 0$ (no marriage market), we have $V^S(w) = \frac{w}{r+\delta}$ for all w. Then, from $U = V^S(R)$, standard manipulation yields $R = \underline{R}$. This is also the reservation wage that would be chosen by a hypothetical unemployed married man, since without divorce, the situation is as if there was no marriage market.

Next, we construct the reservation wage function and establish that it is non-monotonic.

Proposition 1 *The reservation wage function $R(T)$ is continuous and:*

(a) $R = \underline{R}$ for $T \leq \underline{R}$ and $T > \overline{w}$;

(b) $R = T$ for $T \in (\underline{R}, \widehat{T}]$;

(c) $R < T$ and decreasing for $T \in (\widehat{T}, \overline{w}]$.

Proof. First, consider $\overline{w} > T \geq \widehat{T}$. Assume for a moment that $R(T) \leq T$. Then, using $V^S(R) = \frac{R(T)}{r+\delta} = U$, $R(T)$ is given by

$$R(T) = \frac{\lambda_0}{r+\delta} \int_{R(T)}^{\overline{w}} [1 - F(w)]\, dw + \frac{\lambda_0 \lambda n [1 - F(T)]}{(r+\delta)(r+\lambda n + \delta)} y \qquad (3)$$

From the above, $R(\widehat{T}) = \widehat{T}$, where $\widehat{T}$ as defined in (2). Call this reservation wage $\widehat{R}$. Also, from (3), when $T = \overline{w}$ we have $R(T) = \underline{R}$ (since $F(\overline{w}) = 1$). It is easy to show that $\widehat{T} < \overline{w}$, and $R(T)$ is decreasing in T. Hence, $R(T) < T$ iff $T > \widehat{T}$. For $T < \widehat{T}$, the reservation function derived above does not survive as an optimal strategy. Also, unemployed men are not marriageable since a married unemployed would choose $\underline{R}(< T)$.

Now consider $\underline{R} < T < \widehat{T}$. Unemployed men are still not marriageable. The value of being a single unemployed with any reservation wage $R > T$ is given by

$$(r+\delta)U = \frac{\lambda_0}{r+\delta} \int_R^{\overline{w}} [1 - F(w)]dw + \frac{\lambda_0 \lambda n}{(r+\delta)(r+\delta+\lambda n)} y$$

On the other hand, this value when choosing T as the reservation wage is given by

$$(r+\delta)U = \frac{\lambda_0}{r+\delta} \int_T^{\overline{w}} [1 - F(w)]dw + \frac{\lambda_0 \lambda n}{(r+\delta)(r+\delta+\lambda n)} y$$

It is clear that the latter is higher than the former. Intuitively, the only reason to increase R above $\underline{R}$ would be to become marriageable. But $R = T$ is already enough for that.

Next, consider $T \leq \underline{R}$. If men believe they are marriageable irrespective of their employment status, they choose $R = \underline{R}$ both when single and married. This is because $V^S(w) = \frac{w}{r+\delta} + \frac{\lambda n}{(r+\delta+\lambda n)(r+\delta)} y$ for all $w \geq R$. For $T < \underline{R}$, they are indeed always marriageable.

Finally, consider the case with $T > \overline{w}$. We have $1 - F(T) = 0$, and therefore no man can ever get married (as the highest available wage is $\overline{w}$). Men optimally set $R(T) = \underline{R}$ since they behave as there was no marriage market. ∎

The optimal reservation wage strategy of men is illustrated in Figure 1. The diagram captures the fact that the best response function is non-monotonic and attains its maximum value when $T = \widehat{T}$, where $R = \widehat{R}$ $(= \widehat{T})$.

This non-monotonicity captures an interesting trade-off faced by men for varying levels of T. When the marriage problem is not trivial, an increase in reservation wage has two effects. On the one hand, in order to ensure marriageability the reservation wage must jump to match women's reservation value. On the other hand, any increase in the reservation wage comes at the cost of limiting your job prospects.

If the marriage threshold wage is relatively low (but above $\underline{R}$), the cost described above is not too high, and hence men hold out for such a wage. This cost increases with T and there is a threshold value $(\widehat{T})$ for which it is not compensated by the prospect of marriage once you are employed.

For $\widehat{T} < T < \overline{w}$, by being willing to accept a wage lower than the threshold required by women, a single man risks throwing away the prospect of marriage. The willingness to accept such a risk by setting $R < T$ is purely because of search frictions and what one might call the "bird in hand effect". Here, a job offer is deemed acceptable by a single man even if it precludes marriage: the wage may be slightly less than the (relatively high) threshold set by women, but it is still high enough not to risk holding out for an even higher offer. For even more demanding threshold values, the likelihood of encountering such high wages decreases further, and with it the reservation wage of men.

Please note that in both the above scenarios unemployed men cannot get married - as we assumed at the very beginning. To show this is true, consider what happens if women do marry unemployed men. Without divorce, a married unemployed man will choose $\underline{R}$: he can safely ignore the marriage market as he will never go back to it. In other words, men cannot credibly commit to a high reservation wage. Such a promise becomes empty as soon as they tie the knot. With no divorce, women optimally choose to reject

single unemployed men. Also, note that, as anticipated, $R > T$ only occurs when $T < \underline{R}$.

It is interesting to note that even for a very high (but finite) y, as long as there are search frictions in the labour market, there will always be a range of T's such that optimal $R(T) < T$ and $\frac{\partial R(T)}{\partial T} < 0$. Intuitively, this is because in this economy, before they can think of marriage, single men need to find a job first. Unless men have a "lexicographic" preference for marriage, no matter how high the T is, the utility of marriage is never high enough to outweigh the cost of having limited job prospects.

Lemma 2 *Given $\lambda_0 < \infty$, for any $y < \infty$, we have $\widehat{R} < \overline{w}$.*

Proof. First, if there are no frictions in the labour market $(\lambda_0 \to \infty)$, then $R(T) = \overline{w}$ and hence the $R < T$ region disappears. Second, recall that $R(\widehat{T}) = \widehat{R} = \widehat{T}$ and $\widehat{T}$ is a function of y. Then,

$$y = \frac{(r + \delta + \lambda n)\left\{(r + \delta)\widehat{T} - \lambda_0 \int_{\widehat{T}}^{\overline{w}} [1 - F(w)]\, dw\right\}}{\lambda_0 \lambda n \left[1 - F(\widehat{T})\right]}.$$

Then, $\lim_{\widehat{T} \to \overline{w}} y = \infty$ (since the limit of the numerator is a positive constant, while the limit of the denominator is zero). As $\widehat{T}$ is an invertible function, it follows that $\lim_{y \to \infty} \widehat{T} = \overline{w}$. ∎

Furthermore, since $\frac{\partial F(\widehat{T})}{\partial \widehat{T}} > 0$, we have

$$\frac{\partial \widehat{T}}{\partial y} = \frac{\lambda_0 \lambda n \left[1 - F(\widehat{T})\right]}{(r + \delta + \lambda n)\left\{r + \delta + \lambda_0 \left[1 - F(\widehat{T})\right]\right\} + \lambda_0 \lambda n \frac{\partial F(\widehat{T})}{\partial \widehat{T}} y} > 0$$

As one would expect, the higher the non-material utility of a partnership, the smaller the range of T's for which men accept wages that preclude marriage.

4 Equilibrium

Our main focus is on a search equilibrium characterised by beauty premium, where attractive men earn higher wages than less-attractive men. In the context of our model, this means that the H type men set a higher reservation wage than the L type men. Whether both types choose reservation wages that may jeopardise their marriage prospects also plays a key role.

From the above, it is apparent that in such an equilibrium the strategies that give rise to the phenomenon of beauty premium are also behind the so-called marriage wage premium, whereby married men earn higher wages than their single rivals. In this section we also explore in detail the intimate link between the two types of premia.

4.1 Definition of search equilibrium:

A search equilibrium with $R_i \leq T_i$ is a system $\{G_i(.), R_i, T_i, N_i, u_i\}$ satisfying the following:

(i) The distribution of wages earned by marriageable men of type i is

$$G_i(w) = \frac{F(w) - F(T_i)}{1 - F(T_i)};$$

(ii) Men's reservation wage R_i solves

$$R(T_i) = \frac{\lambda_0}{r + \delta} \int_{R(T_i)}^{\overline{w}} [1 - F(w)] \, dw + \frac{\lambda_0 \lambda n \left[1 - F(T_i)\right]}{(r + \delta)(r + \lambda n + \delta)} y \quad (< T_i)$$

for $\widehat{T} < T < \overline{w}$, and

$$R(T_i) = T_i$$

for $\underline{R} < T \leq \widehat{T}$.

(iii) Women's reservation value satisfies

$$T_i + z_i = (r + \delta)W^S(w),$$

with $W^S(w)$ as defined.

(*iv*) Steady state turnover conditions

$$N_i(\lambda n + \delta) = u_i \lambda_0 \left[1 - F(T_i)\right]$$

and

$$u_i \lambda_0 \left[F(w) - F(T_i)\right] = N_i G_i(w) \left[\delta + \lambda n\right]$$

4.2 Equilibrium with beauty premium and marriage premium

In a search equilibrium characterised by beauty premium, the reservation wage of H type men is higher than the reservation wage of the L type men: $R_H > R_L$. As a consequence, in this equilibrium the average wage of H men is also higher than the average wage of L men.

In a search equilibrium with marriage wage premium for type i men, the reservation wage of these men is lower than the reservation wage of women: $R_i < T_i$. This in turn means that the average wage of married type i men is higher than the average wage of single type i men. Also, note that the marriage wage premium for i type men increases with the difference $T_i - R_i$.

The following Theorem provides sufficient conditions for the existence of a search equilibrium with beauty premium, and also characterises the marriage wage premia for the two types of men.

Theorem 1 *(a) There exists a search equilibrium characterised by beauty premium. (b) The marriage premium of L type men is higher than that of H type men iff the marriage premium of L type men is positive.*

Proof. We have described women's reservation match strategy and have established that it is independent of R_i. It is easy to show that $\frac{\partial T_i}{\partial x} > 0$. We have also fully characterised men's optimal reservation wage strategy $R(T)$ and have shown that it is continuous. Furthermore, by Lemma 2, $R(T)$ is non-monotonic in T.

Without loss of generality, assume that $z_L = 0$ and $z = z_H (> 0)$. Let the combination (x, z) be such $T_H = \widehat{T}$. Then, by Lemma 1, $T_L > \widehat{T}$. Fix $z < \overline{w} - \widehat{T}$ so that $T_L(= T_H + z) < \overline{w}$.

Firstly, consider a small increase in x and hence in T_i. Then, $T_L > T_H > \widehat{T}$. Using continuity arguments, an equilibrium results in which $R_H > R_L$, $R_H < T_H$ and $R_L < T_L$. Also, $T_H - R_H < T_L - R_L$, so the marriage premium of L types is higher than that of H types (which in turn is positive). Now consider a small decrease in z. From $T_L = T_H + z = (r + \delta)W^S(w)$, it is easy to show that $\frac{\partial T_H}{\partial z} < 0$ and $\frac{\partial T_L}{\partial z} > 0$. Then, T_L decreases, T_H increases, and the resulting equilibrium has the same properties as before.

Secondly, consider a small decrease in x, so that T_H becomes lower than $\widehat{T}(< T_L)$. Using similar continuity arguments, an equilibrium results in which $R_H = T_H$, so the marriage premium of H types is zero, and $R_L < T_L$, so the marriage premium of L types is positive. Once again, $R_H > R_L$. Alternatively, consider a small increase in z. Then, T_L increases, T_H decreases, and the resulting equilibrium outcome has the same characteristics as above. ∎

Figure 1 illustrates all the above.

FIGURE 1   (please see at the end of paper)

Theorem 1 is not exhaustive. Indeed, from Figure 1 above, it is easy to see that one can isolate different sets of sufficient conditions (in terms of x and z) for the existence of other types of equilibria. For example, if

the combination of (x, z) is so high that $T_L > \overline{w}$ and $\widehat{T} < T_H < \overline{w}$, there is an equilibrium with a positive beauty premium in which the L type men never marry. On the other hand, if the combination of (x, z) is such that both T_L and T_H belong to $(\underline{R}, \widehat{T})$, the equilibrium displays a negative beauty premium.

The following three results establish the subtle relationship between the two types of premia as it emerges from our analysis of the inter-linked frictional markets.

Corollary 1 *A positive beauty premium exists only if the marriage premium for L type men is positive.*

Proof. By contraposition. A positive marriage premium for L types requires $\widehat{T} < T_L < \overline{w}$. If instead T_L was lower than $\widehat{T}$ (but higher than $\underline{R}$), we would have the following: $R_L = T_L$, $T_H < \widehat{T}$ (and hence $R_H = T_H$ if $T_H > \underline{R}$, or $R_H = \underline{R}$ if $T_H \leq \underline{R}$). This would result in $R_H < R_L$. ∎

Corollary 2 *A zero beauty premium exists only if the marriage premium for H type men is zero and the marriage premium for L type men is positive.*

Proof. By contraposition. A zero marriage premium for H types requires $\underline{R} < T_H < \widehat{T}$. If instead T_H was higher than $\widehat{T}$ (but lower than $\overline{w}$), then we would have $R_L < R_H$ (since $T_L > T_H$). Likewise, a positive premium for L type men requires $\widehat{T} < T_L < \overline{w}$. If instead T_L was lower than $\widehat{T}$, we would have $R_L > R_H$ (this follows from the proof of Corollary 1). ∎

The results above show an interesting link between beauty premium and marriage wage premium. Following this, observed measures of the two types of premia provide a very strong falsification test of the theoretical model.

5 An empirical test

In this section we carry out a strict falsification test of our theory. By making clear the link between the two types of premia, the Theorem together with Corollaries 1 and 2 implicitly point to how one could potentially refute our model.

In particular, if we were to find a statistically significant positive effect of beauty on wages but no marriage wage premium across L type workers, our theory would not be appropriate in explaining the existence of beauty premium. By the same token, if we observed a zero beauty premium coupled with either a positive marriage premium for attractive men or a zero marriage premium for less attractive men, the model would be once again refuted.

With this in mind, our empirical investigation is structured as follows.
In order to match the assumptions of the model, we need relevant proxies for beauty. To this end, we use measures of height and weight. Height is possibly better suited for our purposes as it is time-invariant, whereas weight isn't.[7]
First, we look to find and measure the extent of beauty premium in our sample. Then, we check for the existence and pattern of marriage wage premium among different groups of men.

Our results show that when we use height as a measure of attractiveness, we find a positive beauty premium. Furthermore, both the beauty premium and the relevant marriage wage premium display a pattern consistent with that predicted by the Theorem and Corollary 1. A comparison across types confirms that the marriage wage premium for less attractive (shorter) men is positive and the marriage premium for attractive (tall) men is lower.

On the other hand, when we use weight as a proxy for beauty, our results are consistent with Corollary 2. We observe a zero beauty premium together with a positive marriage premium for the less attractive (obese) men and a zero marriage premium for the attractive (not obese) men.

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[7]Furthermore, individuals with very low or very high weight (in absolute terms or relative to a given height) may be penalised in the labour market, while individuals of normal weight are not.

5.1 Data

We use data from the British Household Panel Survey (BHPS) from Great Britain. The BHPS is a longitudinal panel survey that was first collected in 1991, with the last wave collected in 2008.[8]

Initially the BHPS interviewed 5,000 households, providing around 10,000 interviews. The same individuals are interviewed each year, and if individuals split off from their original household into a new household then the other members of the new household are also interviewed. The data is supplemented by extra samples covering geographical areas of Great Britain. The BHPS includes rich information on income and socio-economic status, making it ideal for estimating wage equations.

To classify individual physical attractiveness we use data on height and weight as measured by body mass index BMI (from waves 14 in 2004 and 16 in 2006). Only waves 14 and 16 collected data on both BMI and height, but we treat height as time invariant.
Hence, when classifying individuals by height we are able to use the height measurements for each individual in waves 14 and 16 and apply those heights to all waves in which the individuals appear, providing a much larger sample size. Heights and weights were measured in either metric or imperial units. However, for this paper all measures were converted to metric units.

For all the empirical models below the dependent variable is the log of hourly wages. While this variable does not occur within the BHPS it is possible to construct it using hours normally worked per month, and usual monthly take-home pay. We only include men in employment, removing those in self-employment or out of the labour force. Our focus is on men who are either married or have not yet married.

Initially, individuals are classified as "not tall" if their height is 1.70 metres or less. The average height of our estimation sample is 1.78 metres, which is approximately average height for men in Great Britain. The bottom 10% is 1.70 metres tall or less. To check for robustness we alter the

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[8]The BHPS respondents have subsequently been included in the Understanding Society longitudinal study that is currently three waves old. BHPS respondents were not included in the first wave and the attrition has been particularly high.

threshold height of "not tall" to include taller individuals and then repeat the empirical exercise.

For BMI again we split the sample into two groups: "obese" (BMI greater than or equal to 30) and "not obese" (BMI below 30).[9] For the sample in 2004 the average BMI was 26.51 and by 2006 it had increased to 26.8.

We focus on men aged between 20-50, where we believe the marriage premium will be most relevant, although we investigate the impact of using different age groups as well.

As other regressors we include controls for education, number of children, household size, self-reported health (potentially another source of productivity), a regional dummy, year dummies and a range of job specific factors such as: experience, part-time vs full-time dummy, a dummy identifying sector of employment, social class occupational classification, number of employees, whether there is a union at the place of work, and markers of union status.

We only report results for the dummies related to marital status and anthropometric characteristics (height and weight). All other variables are included as controls and the results are available on request.

After the deletion of missing values on variables we are left with 1767 individuals (11,463 observations) for the height regressions and 1763 individuals (2498 observations) for the weight regressions.

5.2   Summary statistics

The summary statistics for the samples are given in Table 1 below:

TABLE 1 ABOUT HERE   (please see at the end of paper)

Looking at our samples grouped by height and by BMI, one can identify distinct differences in the characteristics of individuals.

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[9]There are potential difficulties in how to classify individuals with very low BMI, whether they are they attractive or not. For our models we removed individuals who are considered to be 'underweight' (BMI of less than 18.5).

Table 2 below summarises this.

<div align="center">TABLE 2 ABOUT HERE   (please see at the end of paper)</div>

From the table we can see that the two attractive groups (the "tall" and the "not obese") are, on average, younger and more likely to report excellent health than individuals in the less attractive groups. The average height for the "tall" group is nearly 1.80 metres.

Tall individuals earn, on average, more than those who are not tall. On the other hand, the average wage for the obese and not obese are quite similar. However, the latter may be due to the fact that the obese are typically older than the not obese men.

There are interesting differences in the proportion of married men. When comparing "tall" with "not-tall" the proportion of married men is quite similar at around 62% and 65%. However, there are larger differences in the proportion of married men when they are categorised by weight: 53% of not obese men are married, compared to 68% of obese men. Again, this may be the effect of age.

5.3   Empirical results for beauty premium

In what follows, we examine the wage differentials observed in our data. Our results show a significant and robust positive height premium.[10] On the other hand, the sign of the non-obesity premium depends on the specification of our model. Having said that, in general it is found to be quite small in magnitude and not significant. Given the afore-mentioned shortcomings of weight as a proxy for attractiveness, this is not surprising.

Using our sample (men aged 20-50)[11] we estimate models that are similar to the ones in Case et al. (2009). Our dependent variable is the log of wages

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[10]This result is similar to Case et al. (2009) who obtain, using the BHPS (waves 1996-2005), a height wage premium for individuals aged between 21 and 60.

[11]We also estimate the models with men aged 20-40 and 20-60 and we find similar results.

and on the right-hand side we include measures of height and weight, together with controls for age, region of residence, race, education and year dummies. For height we estimate pooled OLS models because height is time-invariant. For weight we estimate both pooled OLS and fixed effect models. Robust standard errors, clustered on the individual, are estimated in each case.

The results are shown in Table 3 below:

TABLE 3 ABOUT HERE   (please see at the end of paper)

Model 1 shows a clear and significant height premium.[12] For weight we estimate three separate models. Model 2 finds that increasing weight significantly increases wages, and therefore suggests a weight premium. However, once we use the augmented Model 3 that includes height as well as weight, the estimate on weight halves and becomes insignificant, while the height premium remains. Finally, Model 4 is estimated using fixed effects and in this case the impact of increases in weight is negative, although not significant.

Given that the coefficient for height was found to be significant, results consistent with Corollary 1 would have a positive observed marriage wage premium for the "not tall" group and a lower marriage wage premium (possibly zero) for the "tall" group. That is, a zero observed marriage premium for the shorter men would refute the theoretical model. Similarly, given the non-significant effect of weight on wages, if we then observe a positive premium for the "not obese" *or* a zero marriage premium for the "obese" men, that would contradict Corollary 2. We carry out these checks in the section below.

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[12]The estimated coefficient is different to that found in Case et al. (2009) because we use a larger sample and measure height in metres and centimetres rather than inches.

5.4   Empirical results for marriage premium

In order to estimate the marriage wage premium it is important to control for unobservable heterogeneity. Here, it is particularly important that we control for productivity. This is because productivity homogeneity is a crucial implicit assumption of our theoretical model. We control for productivity differences by including education as a regressor and using fixed effects estimation.

The basic regression equation is therefore:

$$\ln(w_{it}) = \beta M_{it} + \gamma' X_{it} + \alpha_i + \varepsilon_{it},$$

where the dependent variable is the log of hourly wages, X_{it} is a matrix of controls, α_i captures the individual's specific time-invariant heterogeneity, M_{it} is an indicator of an individual's marital status and ε_{it} is the standard idiosyncratic error term. In this case the coefficient of interest is β as this provides the estimate of the marriage premium.

Estimating this regression using pooled OLS assumes that α_i is zero, especially in our case where there are no productivity differences between individuals. It may be possible to control for potential productivity effects by including measures of education in the matrix of controls X_{it}. However, this may not completely ameliorate the problem of unobservable heterogeneity. Fixed effects estimation involves a within-individual transformation of the data that sweeps out the fixed effects and is the standard model for estimating marriage wage premium.[13]

First, we estimate the OLS model that includes education dummies as extra regressors. Table 4 below presents the regression results.

TABLE 4 ABOUT HERE   (please see at the end of paper)

The pooled OLS results on height show that the estimated marriage premium is positive and larger for men classified as "tall" than for "not tall" men. This would contradict the predictions of our model, but it may well be simply due to the fact that the OLS does not account for unobserved heterogeneity.

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[13]See Cornwell and Rupert (1995).

To overcome this problem, we estimate using fixed effects. The estimates for marriage wage premium are again positive. However, this time the relationship is reversed. The coefficient for the "tall" (above 1.70m) group is close to zero and insignificant, whereas the estimate for the "not tall" (less than 1.70m) group is positive, large and significant. This result is in line with the Theorem (part b) and - given the positive height premium - with Corollary 1.

When we relax the threshold to 1.75m the estimated marriage premium for the "not tall" group is now positive (but lower), and almost significant at the 10% level, whereas the corresponding estimate for the "tall" group is still close to zero (but higher) and insignificant. This again is in line with the predictions of the theoretical model. As some men - previously categorised as "tall"- move into the "not tall" group, their effect is to decrease the marriage premium for this group.

Next, we turn our attention to the effect of weight on wages. Once again, the pooled OLS yields a larger wage premium for the attractive ("not obese") group. As before, in order to overcome the shortcomings of OLS, we estimate a fixed effects regression. We obtain a positive and significant marriage wage premium for the not attractive ("obese") category and a non-significant coefficient for the attractive ("not obese") men. These results are again in line with the Theorem (part b) and - given the zero weight premium - with Corollary 2 as well.

In order to investigate whether the above results are sensitive to the defined age-groups we re-estimated the models for age-groups 20-60 and 20-40, with the findings reported in Table 5 below.[14]

TABLE 5 ABOUT HERE   (please see at the end of paper)

These results confirm our earlier findings. Although there is some variation in the estimated marriage premium, the magnitude is always larger (and often significant) for the unattractive group. For the attractive group the estimates are close to zero and not significant. These estimates demonstrate that our earlier results are robust to changes in the age-groups.

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[14]It was not possible to obtain estimates for the 20-40 year old "obese" groups because of the reduced sample size.

6 Conclusion

We have constructed a theoretical search model that examines how marriage market expectations and behaviour affect labour market outcomes (and vice versa). We have established the existence and analysed in detail a search equilibrium characterised by wage differentials and the so-called "beauty premium".

Our results rely entirely on the frictional nature of the two markets and on the natural assumption that physical attraction is important for successful marriage partnership formation. More specifically, we assume that some participants in the marriage market (women) rank the members of the opposite sex (men) in the same way in terms of attractiveness. With women being selective about whom they marry (both in terms of looks and wages), men might struggle to find wages that are high enough to be deemed acceptable by females. If physical attributes and socio-economic status are perceived as substitutes by women, this effect is stronger for less attractive men, and consequently their chosen reservation wage may be lower than that of their more attractive rivals. This leads to a gap between the average wages of the two types of men. Importantly, these results also allow us to conclude that male heterogeneity vis-a-vis the labour market is not necessary for the explanation of beauty premium as an equilibrium outcome.

We also show that the behaviour which leads to beauty premium lies at the heart of another phenomenon: the "marriage premium". We find a subtle link between the two types of premia. A positive beauty premium is only compatible with an outcome where the marriage premium for less attractive men is positive, and in turn higher than the one for attractive men. Conversely, a zero observed beauty premium is only possible if there is no marriage premium for attractive men and there is a positive marriage premium for less attractive men.

The predicted relationship between beauty premium and marriage wage premium provides a strong falsification test of our theory. We carry out an empirical analysis and we conclude that the data does not refute the validity of the model.

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TABLE 1   Summary Statistics

Variable	Obs (N*T)	Mean	Std. Dev.	Obs (N*T)	Mean
		Height sample			BMI sample
Log hourly wage	11370	-2.896	0.490	2498	-2.866
Married	11370	0.622	0.485	2498	0.557
Age	11370	34.451	7.782	2498	35.893
Household size	11370	3.276	1.324	2498	3.206
Number of children	11370	0.926	1.070	2498	0.825
Excellent health	11370	0.333	0.471	2498	0.327
Good health	11370	0.488	0.473	2498	0.499
Fair health	11370	0.146	0.354	2498	0.141
Poor health	11370	0.030	0.169	2498	0.030
Very poor health	11370	0.003	0.056	2498	0.003
London region	11370	0.053	0.224	2498	0.043
Job sector	11370	0.826	0.380	2498	0.845
Job part-time	11370	0.022	0.147	2498	0.027
Social class 1	11370	0.080	0.271	2498	0.069
Social class 2	11370	0.337	0.473	2498	0.356
Social class 3	11370	0.158	0.364	2498	0.160
Social class 4	11370	0.263	0.440	2498	0.253
Social class 5	11370	0.132	0.338	2498	0.131
Social class 6	11370	0.032	0.175	2498	0.031
Experience (days)	11370	1723.571	2038.133	2498	1828.580
Union member	11370	0.434	0.496	2498	0.436
Union at workplace	11370	0.647	0.478	2498	0.669
Height (metric)	11370	1.784	0.072		
Body Mass Index				2498	26.626

TABLE 2   Summary Statistics by Group

Variable		Tall			Not Obese	
	Obs	Mean	Std. Dev.	Obs	Mean	Std. Dev.
Log hourly wage	10374	-2.885	0.491	2041	-2.879	0.496
Married	10374	0.619	0.486	2041	0.530	0.499
Age	10374	34.398	7.797	2041	35.294	8.810
Excellent health	10374	0.337	0.473	2041	0.344	0.475
Good health	10374	0.487	0.500	2041	0.497	0.500
Fair health	10374	0.142	0.349	2041	0.125	0.331
Poor health	10374	0.030	0.170	2041	0.030	0.172
Very poor health	10374	0.003	0.056	2041	0.004	0.062
Height (metric)	10374	1.797	0.060			
BMI				2041	25.066	2.673
		Not tall			**Obese**	
Log hourly wage	996	-3.005	0.464	457	-2.807	0.456
Married	996	0.652	0.477	457	0.676	0.468
Age	996	34.995	7.604	457	38.565	7.548
Excellent health	996	0.292	0.455	457	0.249	0.433
Good health	996	0.488	0.500	457	0.510	0.500
Fair health	996	0.190	0.392	457	0.210	0.408
Poor health	996	0.028	0.165	457	0.031	0.173
Very poor health	996	0.003	0.055	457	0.000	0.000
Height (metric)	996	1.650	0.037			
BMI				457	33.595	4.135

TABLE 3   Effect of Height and Weight on Wages

		N		Coefficient	Std. Err.
Height (m)					
Model 1	OLS	11,370	Height (m)	0.4256***	0.1424
Weight (kg)					
Model 2	OLS	2,551	Weight (kg)	0.0016***	0.0006
Model 3	OLS	2,551	Weight (kg)	0.0009	0.0007
			Height (m)	0.3719**	0.1641
Model 4	Fixed Effects	2,551	Weight (kg)	-0.0003	0.0011

*, **, ***: 10%, 5% and 1% level of significance

The dependent variable in all models is log monthly wages.

All models include controls for age, region of residence, race, education and year dummies.

Data on weight is only collected in waves 14 and 16 meaning that the sample sizes are lower.

TABLE 4   Effect of Marital Status on Wages

Results AGE 20-50		Not tall (<1.70m)	Tall	Not tall (<1.75m)	Tall
OLS (including education)	Married	0.102**	0.193***	0.179***	0.187***
		(0.061)	(0.023)	(0.038)	(0.027)
Fixed Effects	Married	0.557***	0.010	0.187*	0.020
		(0.101)	(0.035)	(0.113)	(0.043)
N		996	10374	3138	8232
		Obese	**Not obese**		
OLS (including education)	Married	0.123**	0.140***		
		(0.055)	(0.029)		
Fixed Effects	Married	0.445*	-0.018		
		(0.235)	(0.115)		
N		457	2041		

*, **, ***: 10%, 5% and 1% level of significance

The models all show the estimates attached to the 'Married' variable. All models include a full range of controls: age, health, number of kids, household size, job sector, size of employer, job part-time, experience, union membership, whether there is a union at place of work and experience. The education dummies are degrees, higher school leaving qualifications (aged 18 A-levels or equivalents), lower school lever qualifications (aged 16 O-Level or equivalents) and no qualifications. Clustered standard errors are presented in brackets. Full results are available on request.

TABLE 5   Effect of Marital Status on Wages by Age Group

20-60		**Not tall**		**Tall**	
FE	Married	0.436***	(0.126)	-0.004	(0.039)
N		1650		13907	
		Obese		**Not obese**	
FE	Married	0.296**	(0.126)	-0.048	(0.102)
N		635		2628	
20-40		**Not tall**		**Tall**	
FE	Married	0.385***	(0.087)	-0.036	(0.040)
N		541		5486	
		Obese		**Not obese**	
FE	Married	NA		0.078	(0.215)
N				1250	

*, **, ***: 10%, 5% and 1% level of significance

The models all show the estimates attached to the 'Married' variable. All models include a full range of controls: age, health, number of kids, household size, job sector, size of employer, job part-time, experience, union membership, whether there is a union at place of work and experience. Clustered standard errors are presented in brackets. There were insufficient observations to estimate the model on the 20-40 year old obese group.