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A GOODS CHARACTERISTICS MODEL OF THE HEDONIC AGEING EQUATION: EVIDENCE FROM A FRENCH MARRIAGE BUREAU

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ABSTRACT:

The present paper adopts a modelling perspective derived from goods characteristics analysis [Lancaster (1971)] and the general ideas of transactions costs. This is implemented in estimated equations, which feature the age of partner sought as the dependent variable and own age and various other personal characteristics, and characteristics desired in a partner, as the right-hand side variables. The results show a very strong relationship between age and desired partner age. More interestingly, the coefficient on partner age is statistically significantly less than one. This implies a growing gap in the market as the participants grow older as they will be unable to find a suitable match unless they are able to bring a sufficiently increasing stock of other assets to compensate for their own increased age. We also find the male partner age coefficient to be significantly lower than that for females. This conforms to the findings of Cameron and Collins (1997) using a radically different data set.

JEL CLASSIFICATION: D2, J1.

KEYWORDS: Marriage, search, age, goods characteristics, hedonic equation.

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INTRODUCTION

> *"Some of my fellow students and I thought it was weird to analyze love with economic theories. I still remember how we giggled when we first read a mimeographed version of Becker's theory of marriage prior to its publication."*
>
> Grossbard-Schechtman (1995, p.92)

Social custom has been that a partner, for marriage, is generally sought as a joint product with some other social experience. People have tended to meet through work, night clubs, dinner parties, church, or for some cultures, 'arranged' marriages. Occasionally partner search takes place in explicit markets (Ahuvia and Adelman, 1993) where finding a partner is the only major item on the agenda such as the famous annual event at Lisdoonvarna in County Clare in the Republic of Ireland which has inspired plays, songs and films and now has a website at: http://www.lisdoonvarnamatchmaker.com. This is rare in modern market economies. Although considerable utility may be had from these joint products, there is still a substantial volume of partner-specific sunk costs in searching for a partner. These factors point the way to an economic approach to partner selection following on from the work inspired by Becker's analysis of marriage and marital search (see e.g. Becker, 1973, 1974; Bergstrom and Bagnoli, 1993; Grossbard-Schechtman, 1995; Bergmann, 1995; Bergstrom, 1996; Gale and Shapley, 1962; Hannan, 1982; Burdett and Coles, 1997). Although economic analysis suggests that advertising for a partner, or using an agency, may be efficiency enhancing, economists have tended to overlook the emergence of overt market mechanisms for selecting a partner for personal relationships with the exception of a few papers (Cameron and Collins, 1997 and Vaillant, 2004a, 2004b). These papers take an indirect econometric look at partner search by using, in the case of the former, data from personal advertisements and, in the case of the latter, data from a marriage bureau. The only paper to examine preferences directly is the very old paper by Kenneth May (1954), who examined the choice over 3 hypothetical marriage partners rated highly on two attributes of wealth and looks and low in the third-intelligence. He observed intransitivity in the pairwise rankings. There is also a long tradition of psychological research, of a statistical nature, on the characteristics sought by relationship partners (see, for example, Buss, 1994; Rajecki, Bledsoe and Rasmussen, 1991; Sitton and Rippee, 1986; Thiessen, Young and Burroughs, 1993; Wiederman, 1993).

The present paper adopts a modelling perspective derived from goods characteristics analysis (Lancaster, 1971) and the general ideas of transactions costs. This is implemented in estimated equations, which feature the age of partner sought as the dependent variable and own age and various other personal characteristics, and characteristics desired in a partner, as the right hand side variables. The results show a very strong relationship between age and desired partner age. More interestingly, the coefficient on partner age is statistically significantly less than one. This implies a growing gap in the market as the participants age unless they are able to bring a sufficiently increasing stock of other assets to compensate. We also find the male partner age coefficient to be significantly lower than that for females. This conforms to the findings of Cameron and Collins (1997) using a radically different data set.

1. An Economic Model of Partner Selection

The primary purpose of this paper is to model the 'demand' for partner age as a characteristic in the utility function and to look at the magnitude of compensation that might be offered by other characteristics for increasing age. The presence of age as a characteristic in partner selection is one that few sociobiologists would argue against. In females, they would see increasing age as a negative factor due to declining fecundity. For men, the decline is less important as the male role is to provide resources. Clearly, if a man is a great deal older than the woman, there is an issue of the risk of losing his support offers via death or illness. This can be compensated for, to some extent, if the man has a sufficient level of accumulated wealth. It thus follows that a wealthy older male can trade this for 'looks' of a younger female. The best known economist writing on sexual matters Richard Posner (1992), affirms the proposition of a negative relationship between utility and age of partner but he goes on to incorporate the cultural factors of the 'companionate' marriage which arose in conjunction with rising levels of affluence and cultural support for romantic love (Shorter, 1976). Posner argues that this may lead to a utility loss when there is a large age difference as:

"The difference in ages will reduce the companionability of the marriage. It will do this both directly, because people who are far apart in years tend to have different tastes and interests, and indirectly, because the older a spouse is at marriage, the sooner the marriage can be expected to be cut short by death." (Posner, 1992, p.245).

It can be seen in his second remark that he endorses the sociobiological argument. Posner goes on to point out that the ease of divorce will be negatively correlated with the amount of search effort made for partners as the opportunity cost of mistakes in matching is high. Of course, not everyone agrees with sociobiology and Posner and it seems possible that sufficiently wealthy females will be able to trade for the offer of 'looks' and/or youth from male partners. Some empirical support for this is found in the UK study by Cameron and Collins (1999).

To crystallize the above, we make the following assumptions:

(i) Utility maximization subject to the constraints of one's own stock of relationship assets and the costs of gathering information on potential partners.

(ii) Given tastes at the outset which are not subject to change by the search process.

(iii) Individuals know their own preferences.

(iv) Any bluffs or strategic misstatements can be regarded as random with respect to the other elements in the model

(v) An individual is planning to settle for one full-time exclusive partner after a period of search over alternate partner prospects.

Demand for partners can then be viewed in terms of Lancaster's (1971) theory of consumer behaviour with each partner regarded as a bundle of characteristics. This approach is visible in Elizabeth Hirschman's (1987) marketing analysis of dating advert users, which treats 'people as products'. We envisage individuals as searching for each other in order to embark on 'trading', in the form of what is traditionally viewed as 'courtship' or 'dating' with a view to establishing implicit, or formal longer term trading rights, i.e. what is generally called a 'relationship'. The underlying utility function may be characterized as follows:

$$U = f(A, S, M, L, X, R) \quad (1)$$

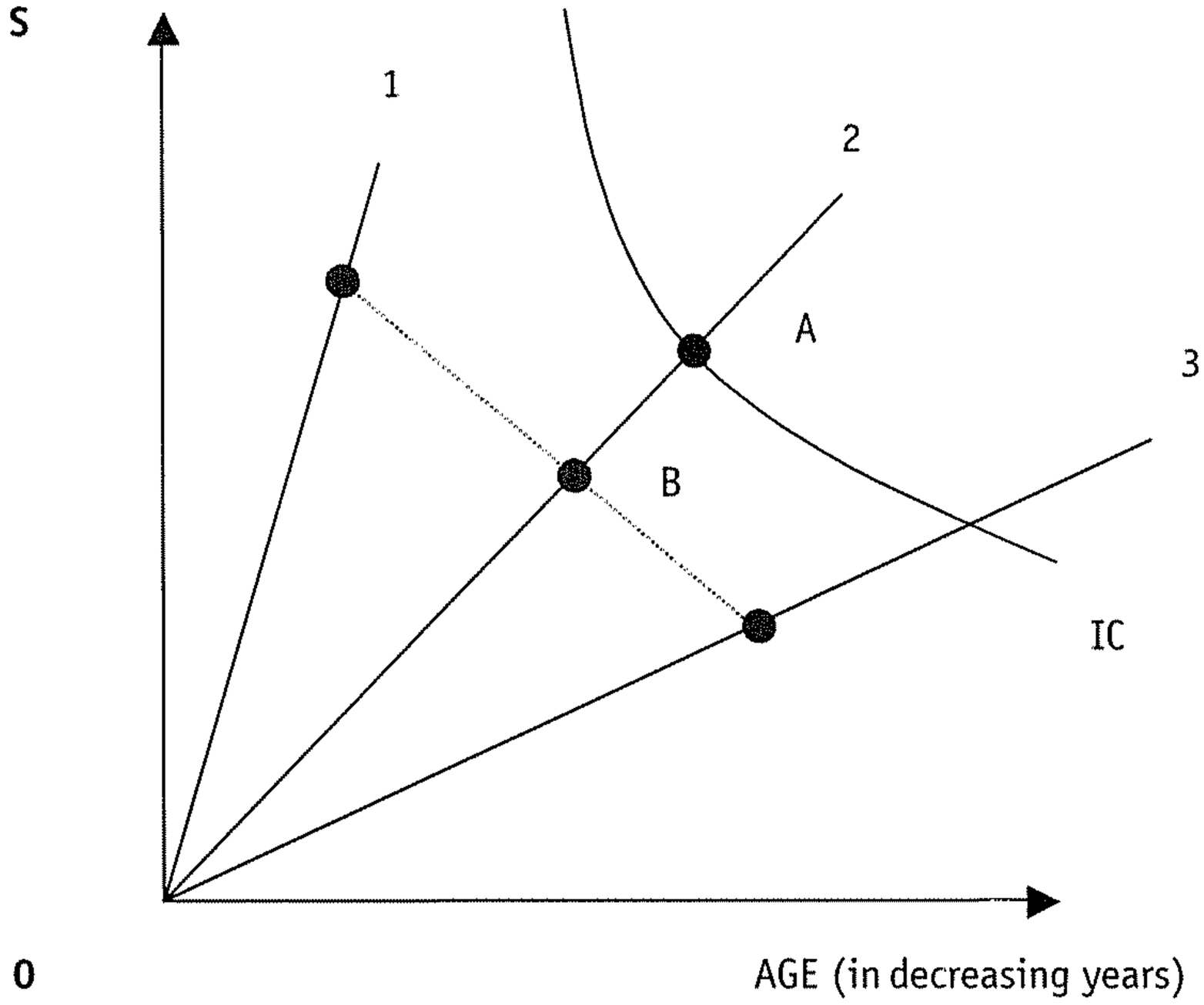
Where A = age, S = sexual services defined broadly to include any sexual arousal or gratification received from interaction with a partner, M = companionship broadly defined to include non-sexual exchange such as feelings of 'togetherness', abatement from loneliness and so forth, L represents characteristics which provide pure consumption benefits such as appearance, the ability to be amusing etc. The enduring importance of appearance for the male searcher is attested to in cross-national research by social psychologists (Furnham et al., 1997) on the importance of the waist-to-hip ratio. X is the composite variable representing all other things, which obviously spans private goods and public goods, which might bring scale economies in sharing. R is the stock of reputation of the individual, amongst those people whom they consider the appropriate reference group. There may be a production relationship between R and the other arguments due to the reference group members being impressed, or not, by the stock of assets embedded in a chosen partner.

There are thus a number of components of demand for partners. There are wealth effects in the form of transfers of income from partners, scale effects of joint consumption, benefits of specialization in household production as stressed in the Gary Becker approach, and complementarities, as Ivy Papps (1985, p.151) puts it: " leisure time is often more enjoyable (more productive) when shared: conversation is only one of many activities that cannot be carried out alone. There may be individual characteristics, which enhance complementarity. People of similar levels of education are likely to enjoy conversation with each other more than with people of differing education, while a game of tennis is more enjoyable when played with an opponent of similar skill and finesse." This would create a production relationship between M and A. As holding own age constant then the closer is to a strategic region around own age then the higher the utility that will be obtained from companionship provision.

One influence on S in the utility function, as argued above, is age. On a simple biological level, utility from S may, in some cases, be deemed a declining function of partner age. Age may also serve as a proxy, for the searcher, for other attributes. Social factors intervene through the M variable, as there are gains to having an own age range partner connected with the factors cited by Papps and Posner. It will tend to be easier to share tastes for cultural activities, which tend to have a generational component.

When joining a bureau an individual will declare their bundle of attributes possessed and sought. A simplistic presentation of the model is depicted in Figure 1, which shows an individual choosing between three individuals, denoted as 1, 2 and 3 who are differently endowed in terms of the assets of age, and the *S* characteristic. The 'price' of obtaining the combinations that each individual offers is regarded as a hedonic price incorporating search costs required to attract this person plus the discounted costs of any further investments which might be necessary. A traditional convex indifference curve (*IC*) is drawn on the assumption that both items are goods, with a diminishing marginal rate of substitution: to facilitate this representation age is shown, on the *x* axis, in units of decrement from some notional maximum rather than units of increment. For the prices and wealth levels assumed in the diagram, the optimal position is to choose position A i.e. partner 2. If we were to assume costless and riskless infidelity/adultery, or membership of a system of polyamoury, then a rise in the price of obtaining partner 2 to just above the level indicated by B on the diagram would induce the mixing of units of relationships with person 1 and 3, and the rejection of 2, to attain the optimum. With a taboo and/or high costs of adultery/infidelity then, this becomes infeasible and the individual will switch to either 1 or 3 depending on the preferences embodied in their utility function.

FIGURE 1. GOODS CHARACTERISTIC MODEL OF PARTNER CHOICE



2. Data and Estimation

The data used come from the files of a French introduction service. In France, the "Neiertz" act of 1991 regulates the conduct of the industry (1). The meetings must be between unattached people, for producing a durable and stable union. Thus, the file of an agency should contain only the currently unattached who have serious long run intentions with respect to relationship formation. Thus, search behaviour partakes of the nature of that or an investment decision rather than a consumption good. The clients fill out an information sheet, in which they reveal the characteristics, which they can offer, and those features they demand in a potential partner. The amount of bluffing, and distortion, in any such claims should be less than in the personal advertisement data studied by Cameron and Collins (1997) as the agency function of the bureau is to filter out some of the noise from the signals of the clients. It will do this by rejecting some clients. The agency used for this study is established in a provincial French town. The data are from the period of March 1993 to 31 December 1999 including 388 men and 343 women. Descriptive statistics and definitions are shown in Table 1 whilst Tables 2 and 3 give the distribution of ages at marriage of the general population in France to help place these data in context.

Table 1. Descriptive statistic

		MEANS	
		MALE	FEMALE
SEX	Female = 1 ; male = 0	.53	.47
AGE REQUIRED	Average age required	32.94 (8.70)	41.11 (11.47)
AGE	Own age declared	37.46 (11.74)	39.80 (13.28)
SINGLE	Single = 1: other=0	.57	.45
DIVORCED	Divorced = 1; other=0	.32	.38
PERSONSOU	Scale (1-5) of partner personal characteristics	1.42	3.14
PERSONSOUDUM	Seeks one or more partner personal characteristics = 1	.94	.99
PHYSOU	Scale (1-5) of partner physical characteristics	1.37	1.49
PHYSOUDUM	Seeks one or more partner physical characteristics = 1	.93	.94
RPHYSOU	PHYSOU / (PHYSOU+PERSONSOU)	.49 (.19)	.32 (.15)
HIGHSTUD	Higher studies = 1 ; other=0	.34	.40
INCOME	Reported monthly income (in Euros)	1601.82 (914.55)	1411.17 (775.93)
PROFSOU	Seeks a specific professional level = 1	.37	.71
WEIGHT/HEIGHT	Reported weight (in kg) /reported height (in cm)	74 / 175	59 / 164
WHDUM	Weight/Height > average (W/H) + St. Dev. (H/W) = 1;other=0	.52	.148
BELOW HEIGHT MALE	Height < 5.6 ft (i.e. < 171 cm) = 1;other=0	.152	*
ABOVE HEIGHT MALE	Height > 6 ft (i.e. > 182 cm) = 1; other=0	.175	*
BELOW HEIGHT FEMALE	Height < 5.1 ft (i.e. < 156 cm) = 1; other=0	*	.110
ABOVEHEIGHT FEMALE	Height > 5.6 ft (i.e. > 170 cm) = 1; other=0	*	.125
NUMBER OF CHILDREN	Number of dependent children offered	.52 (.88)	.59 (.94)
CHILDREN ACCEPTED	Accepts a partner with children = 1;other=0	.51	.56

All ages, given in years, may be compared with information given in Table A (Annex) about male and female age at marriage in France (in 1999). To be specific it appears that both men and especially women of the sample are older than the average age at marriage, which indicates that a majority of clients using the services of a matchmaking agency seek remarriage rather than marriage (Le Guirriec and Vaillant, 2005). Income is in Euros and is treated as current earned income. For the purposes of the regressions,

income is divided by 1,000 to rescale the coefficients due to their small numerical value. There is no additional information on asset holdings. The level of education is measured by a dummy coded as 1 if the client follows or has followed higher-level studies. We created dummies to capture deviation from the range of average heights and builds. For height, these are designated as 'above' and 'below' depending on whether the person is above or below a range around the average. The build dummy (WHDUM) was based on simply coding those who are 1+ standard deviations above the mean as 1. The medical literature on body mass index (BMI) distinguishes many gradations of overweight such as obesity, chronic obesity but for present purposes, we use the simple dummy variable as our focus is on deviation from modal attributes rather than health issues. Current possession of children is represented by the number of children (CHILD) and willingness to take on a partner's children is represented by a further dummy (CHILDACC).

The more subjective measures require a specific coding methodology. The approach has been well developed in the psychological literature on personal advertisements and is as follows. Physical characteristics sought are coded on a scale of 0 to 6 depending on the number of words used. On the same method, personal characteristics sought are also coded on a scale of 0 to 6. This concerns non-physical characteristics, which are categorised in these data as kindness, patience, good sense of humour etc. These two demand variables allow us to create a synthetic requirement measure, by dividing the number of words in the physical descriptions by the total number of words in the text. This procedure enables to control the verbosity of the clients. Professional characteristics sought are used to create a dummy based on the appearance of key phrases, e.g., "same professional level, profession with high income…".

Expectations of the coefficients on most of these variables are straightforward. The own age coefficient is expected to be positive and smaller, in absolute value, for men than women on grounds of both theory and past empirical work. Income is expected to have a negative coefficient due to the ability to trade it, ceteris paribus, for age. This coefficient is expected to be smaller for men than for women.

We do not have any direct measures of physical attractiveness in these data. This may not be a serious drawback, as it seems reasonable to assume that any such reported information is discounted by users of personal advertisements and partnering agencies as too subjective. We envisage that the characteristics in our model are used for 'prescreening' or extensive search to be followed by intensive search over the pool of potential partners selected during which search over physical attractiveness will be a joint product with other elements of search such as assessing mutual compatibility (2).

Our measures of physical appearance are then solely of height and weight. Any kind of deviation from modal population characteristics, in these areas, may be seen as potentially a negative factor, which an individual would, then, trade up in age to compensate for. The number of children (CHILD) from a previous relationship may be seen as a negative factor as it brings a number of possible disadvantages to the would-be partner. For one

thing, it leads to an expectation of investments of time and goods in a dependent in which the individual has not vested any genetic capital. Further, it may detract from the offers of S, X and M in any relationship as the parent of the child may withdraw time, effort and goods from these due to the drive to invest in one's own genetic stock. It follows that ceteris paribus, someone with children from a previous relationship must be younger to compete.

The equations to be estimated are therefore for men (2a) and for women (2b):

$$\begin{aligned} Age\,\mathrm{Re}quired = {} & \alpha_0 + \alpha_1.AGE + \alpha_2.PERSONSOU + \alpha_3.RPHYSOU \\ & + \alpha_4.HIGHSTUD + \alpha_5.(INCOME/1000) + \alpha_6.PROFSOU + \alpha_7.WHDUM \\ & + \alpha_8.BELOWMALE + \alpha_9.ABOVEMALE + \alpha_{10}.CHILD + \alpha_{11}.CHILDACC + u \end{aligned} \tag{2a}$$

$$\begin{aligned} Age\,\mathrm{Re}quired = {} & \beta_0 + \beta_1.AGE + \beta_2.PERSONSOU + \beta_3.RPHYSOU \\ & + \beta_4.HIGHSTUD + \beta_5.(INCOME/1000) + \beta_6.PROFSOU + \beta_7.WHDUM \\ & + \beta_8.BELOWFEMALE + \beta_9.ABOVEFEMALE + \beta_{10}.CHILD + \beta_{11}.CHILDACC + v \end{aligned} \tag{2b}$$

Subscripts have been suppressed. The u and v terms are assumed to be classical disturbance terms. (2a) and (2b) are in linear form purely for convenience. The main problem that might arise over the use of OLS to estimate the α's and β's is some form of endogeneity between the right hand side variables and the age required variable given that all 13 variables which are used in any particular estimating equation are characteristics of an individual. There are factors which would lead one to expect that endogeneity with some of the regressors is highly unlikely: for example age of partner required is not a determinant of height or build or children possessed (3). On a pragmatic level, it is doubtful whether one could obtain satisfactory instruments elsewhere in the bureaux data to generate instrumental variables estimates if such were deemed necessary.

3. Results

The results of estimating the goods characteristics hedonic ageing equation are shown in Table 2 and Table 3.

Table 2. Female hedonic ageing equation

Variable	Coef.	t ratio	Coef.	t ratio
AGE	.913	58.54	.913	64.63
RPHYSOU	-1.874	-1.94	-1.696	-1.82
HIGHSTUD	-.112	-.32		
INCOME/1000	-.037	-.18		
PROFSOU	.002	.01		
WHDUM	-.098	-.23		
BELOW HEIGHT FEMALE	-.761	-1.54	-.789	-1.65
ABOVE HEIGHT FEMALE	.432	.89		
NUMBER OF CHILDREN	-.126	-.75		
CHILDREN ACCEPTED	.976	2.78	.870	2.68
Constant	6.103	8.32	5.961	1.30
Adjusted R square	.9563		.9571	
F	523.63		1322.77	
White test (Chi-square)	11.878			
Box-Cox transform	.8368			

Table 3. Male hedonic ageing equation

	Dep. var.: Age required				Dep. var.: Square root of Age required			
Variable	Coef.	t ratio	Coef.	t ratio	Coef.	t ratio	Coef.	t ratio
AGE	.769	49.43	.779	53.37	.062	46.80	.062	52.44
RPHYSOU	.700	1.00			.056	.94		
HIGHSTUD	-.065	-.21			-.012	-.46		
INCOME/1000	-.361	-2.21	-.361	-2.30	-.014	-1.05		
PROFSOU	.388	1.36			.029	1.21		
WHDUM	.551	1.35			.056	1.63		
BELOW HEIGHT MALE	1.304	3.01	1.221	2.85	.077	2.11	.076	2.08
ABOVE HEIGHT MALE	.641	1.80	.671	1.89	.055	1.83	.054	1.79
NUMBER OF CHILDREN	-.107	-.61			.018	1.23		
CHILDREN ACCEPTED	.929	2.95	.828	2.86	.086	3.22	.097	3.97
Constant	4.332	6.86	4.536	8.61	3.364	62.85	3.364	76.86
Adjusted R square	.9297		.9295		.924		.9235	
F	381.61		760.66		351.26		870.42	
White test (Chi-square)	16.4252				13.2386			
Box-Cox transform	.4988							

Previous work by Cameron and Collins (1997) used only a linear functional form, which provides much stronger support for an economic model than non-linear results. The Box-Cox transform (1964) (4) of the dependent variable AGE REQUIRED indicates that $\theta = .499$ in the male equation (2a) and $\theta = .837$ in the female equation (2b). This implies that a square root-linear form is a suitable functional form for the male hedonic ageing equation, while a linear formulation is appropriate for the female hedonic ageieng equation (2b). Because of a risk of multicolinearity between regressors, two equations (obtained by stepwise estimation at the 10% significance level) are estimated for each functional form. White's heteroscedasticity test indicates that the residuals are homoscedastic.

Linear estimation results in Table 2 and 3 show that the age of partner sought coefficient can be simply treated as a year on year trade-off hence interest focuses on the divergence of this number from 1. In the root function form, the year on year trade-off parameter will be variable, as the coefficient will vary with the level of the age variables. The other main interest in our results is the extent of trade-off, or compensation, which exists between age of partner sought and other characteristics. For characteristics represented by dummy variables such as being overweight, the Table 2 and Table 3 results give the direct estimate in years of how much a searcher is prepared to go up in years of partner sought whilst the non-linear estimates will give a (biased) estimate of the percentage differential due to the characteristic. Interest in the results focuses on five areas: children, personal traits, income, body shape and age.

The number of own dependent children is not significant in any of the estimates. However, declaring a partner with child to be acceptable is statistically significant and adds around a year to partner sought, for both men and women, according to the linear results: neither coefficient is statistically significantly different from 1.

Explicit search for personal traits (profession, physical, personality) are generally insignificant. The body shape variables are statistically insignificant in the linear female equations indicating that women do not adjust their search preferences over age in response to their own height and weight. However, for men, we find significant positive responses to deviations from the modal height range in terms of age of partner sought. Although the magnitude of the effects is not large, viz. only just over 15 months is added for below average height males in the linear specification, it is significantly larger for smaller males than for taller males which is not entirely surprising. Height seems to be more important than build as none of the overweight dummy coefficients is statistically significant.

The income variable is not statistically significant for females but is statistically significant and negative for males, which conforms to conventional sociobiological notions (Pawlowski, 2000) especially when taken in conjunction with the differences in the age coefficients shown in Table 2 and Table 3. Looking at the point estimate of -0.361 from the male equation we can deduce that, ceteris paribus, a rise in income of 2,770€ would

be needed to produce a fall of one year in partner age stipulated. This might seem large, given that average male income in the sample is 1,602€, it implies that a male with double average income (3,204€) would seek a partner who is 1.112 years younger.

The age coefficients have enormous 't' ratios in all the estimated equations. They are all below 1 indicating that, other things being equal, individuals desire partners who are younger with respect to themselves the older they become. As the intercepts are significant and positive, there may be a crossover point where an individual reaches an age of switching from desiring partners older than themselves, to desiring one who is younger. Each coefficient is statistically significantly less than 1 by a considerable margin (5). The male equations show a lower age gradient than the female equations. This is not so marked as in the paper by Cameron and Collins (1997) which used personal advert data and found a female gradient of about 1 but a male gradient of about 0.5. Nevertheless, the estimated difference in the linear estimates is large enough to suggest that there is a substantial potential matching problem for marriage bureaux. For example, a man of 25 of average height, build and income (for the whole sample) who has zero for the other dummies would be seeking a partner of 24.304 - (0.053 x 10.491) = 23.747 years old (6). If the same individual was 40 they would seek a partner of 35.839 - (0.053 x 10.491) = 35.282 years old. A woman of 25 under the same assumptions would seek a partner around 27 and half years old. By the age of 40, they would seek a partner around 41 years old.

CONCLUSION

The present paper provides estimates of relationship/marital partner preferences through the indirect approach of using age of partner sought as the dependent variable in a single equation regression model which is founded on Lancaster's goods characteristics model of consumer choice. A data source previously unexplored by economists: the records of a (French) marriage bureau, was used to provide the variables deployed. The results are largely supportive of previous work by economists and social psychologists which could be interpreted as implying that people do adopt a 'commodity' perspective on choosing a partner. Further, the results for the age coefficients suggest that there is a potentially serious problem for operating any kind of partner matching agency, as a business, due to the imbalance of male and female clients with respect to the expectations, which clients hold.

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ANNEX

	Male age at marriage in France (34.93)				Female age at marriage in France (32.47)			
	TOTAL	SINGLE	WIDOWED	DIVORCED	TOTAL	SINGLE	WIDOWED	DIVORCED
< 20 years	**358**	355	1	2	**3121**	3108	3	10
20-24 years	**22498**	22451	2	45	**52833**	52561	22	250
25-29 years	**102044**	100871	31	1142	**105697**	102632	134	2931
30-34 years	**64016**	58824	108	5084	**48299**	40527	263	7509
35-39 years	**32367**	23586	230	8551	**25512**	15659	437	9416
40-44 years	**18952**	9303	285	9364	**15129**	5993	554	8582
45-49 years	**12634**	3432	417	8785	**9858**	2384	576	6898
50-54 years	**8638**	1435	536	6667	**6040**	1042	563	4435
55-59 years	**4214**	600	469	3145	**2378**	382	303	1693
>60 years	**5640**	795	1771	3074	**2494**	477	733	1284
TOTAL	**271361**	**221652**	**3850**	**45859**	**271361**	**224765**	**3588**	**43008**