EVIDENCE OF JOINT DECISION MAKING

Robert Bartels and Denzil G. Fiebig

Department of Econometrics, University of Sydney

Abstract: Economics abounds with models and empirical analyses that describe the behaviour and choices made by individual agents. Work is less plentiful on the behaviour and choices made by several interacting agents. Even when the analysis involves units containing several members, for example a household, the conventional approach is to treat the household as a single decision-maker. There is a growing recognition that this simplification may often lead to misleading conclusions and policy advice. As a consequence, it would be extremely useful to gain more evidence on whether a many-person household can be treated as a single decision-maker and, if not, how intra-household interactions impact on final household decisions. With the data typically available to economists, it may be difficult to empirically address these questions. We explore such issues in the context of the household decision to hold private health insurance or not.

1. INTRODUCTION

While standard microeconomic theory develops results for single agents, empirical workers typically face the analysis of data that relate to the behaviour of households. In order to match the theory with the practice, most empirical research proceeds by assuming (usually implicitly) that a many-person household systematically behaves as if it is the single agent of the microeconomic textbook. Thus, both theoretical and empirical work have typically adopted this "unitary" model and ignored the fact that households may contain several members with different preferences.

Browning, Bourguignon, Chiappori, and Lechene [1994] summarise a collection of empirical results that cast doubt on the validity of the standard approach. One prediction of the unitary model states that only household income should matter for the allocation of expenditures to different goods. Results presented by Browning et al. [1994], Schultz [1990], Thomas [1990] and Lundberg, Pollak and Wales [1997] provide empirical evidence that does not support this income-pooling hypothesis. For example, Lundberg, Pollak and Wales [1997] analyzed data from a natural experiment where UK policy changed so that a substantial child allowance was transferred away from husbands to wives. By comparing periods before and after this change, they identified an increase in the expenditure on women and children's goods under the new policy regime. It is important to continue this testing agenda because there is a growing recognition that the simplifications involved in the unitary model may often lead to misleading conclusions and policy advice.

Our primary aim is to provide further evidence on whether a many-person household can be treated as a single decision-maker. In particular, we consider the decision to hold private health insurance or not, using data from the 1989-90 National Health Survey conducted by the Australian Bureau of Statistics (ABS). Relative to existing studies of these data we pay more attention to household composition. The results suggest that males and females do have marked differences in preferences. Further, there is little evidence to support a unitary household where one person but not the other determines insurance choice. While we have been able to provide empirical support for taking into account the preferences of each member of a many-person household and not treating it as a single decision-maker, it remains a challenge to determine exactly how intra-household interaction impacts on final household decisions.

2. MODELLING PRIVATE HEALTH INSURANCE

There have been several previous studies of the demand for private health insurance in Australia based on survey data collected by the ABS. Cameron, Trivedi, Milne and Piggott [1988] analyzed the 1977-78 Australian Health Survey, Ngui, Burrows, and Brown [1990] used

the 1983 Australian Health Survey, while Savage and Wright [1999] analyzed the 1989-90 National Health Survey. Each of these econometric analyses included the insurance purchase decision as part of a more comprehensive investigation of the health care system. In the current work we concentrate on insurance choice and at this stage we ignore the type and level of insurance chosen as well as other aspects of the demand for health care, such as hospital choice and utilization of medical services.

Amongst the previous Australian studies, possibly the most general model specification for insurance choice is that chosen by Savage and Wright [1999]. Like its precursors they recognized that the three major determinants of the insurance purchase decision are (i) demographic characteristics such as age, education, location, country of birth and household composition; (ii) economic factors including income, occupation, and cost of insurance; and (iii) health status that can be proxied by presence of chronic medical conditions and consumption of cigarettes and alcohol. The version of the 1989-90 National Health Survey data used by Savage and Wright [1999] is utilized in our empirical work and interested readers are referred to this paper for specific details of how the data and variables were constructed from the original sample supplied by the ABS.

What would provide support for the unitary model? A natural starting point is to test whether the preferences of males and females are the same or not. This is accomplished by estimating separate choice equations for the subsample of single-person households. However, even if one rejects the hypothesis that males and females have the same preferences for holding private health insurance, this is not enough to reject the unitary model. In a many-person household it is possible for one household member to impose their preferences and act as a household dictator. This would be consistent with a unitary model. Such a possibility is explored using the subsample of households containing a couple but no dependants.

3. ECONOMETRIC ANALYSIS

The econometric analyses that follow involve estimating models of private health insurance choice that take on the following basic structure:

$$(1) \quad y_i^* = x_i'\beta + z_i'\delta + u_i \quad i = 1, \ldots, N$$

and $y_i = 1$ if $y_i^* > 0$ and $y_i = 0$ otherwise. y_i^* is a latent variable representing the households propensity to choose private health insurance, y_i is the observed choice, and x_i and z_i are vectors of exogenous explanatory variables. The tests to be performed are of the form, H_0: $\delta = 0$. Assuming that u_i is normally distributed with a mean of zero and variance of one yields the standard, univariate probit model. Savage and Wright [1999] have also used the probit specification but the other Australian studies have preferred the logit model. For most applications this choice is not an important one as the results are typically very similar.

The first set of results relates to the subsample of single-member households where the hypothesis to be tested is that males and females have the same preferences for choosing to purchase private health insurance. This test is accommodated by comparing estimates for a general specification that allows for parameters to vary by gender relative to a restricted specification that imposes equality of all parameters. Estimates for the subsamples of males and females, together with the restricted specification, are provided in Table 1. For the present purposes only the key results have been reported and only a brief description of these results will be given. (A more complete analysis is available on request.)

The likelihood ratio test of the null of no difference in the parameter values of males and females yields a chi-squared statistic of 203.9. When compared to a chi-squared with 66 degrees of freedom the p-value is less than 0.0001 indicating rejection of the null hypothesis at typical levels of significance. It is important to consider whether this statistical difference translates into differences that are substantial in an economic sense. This is especially relevant given the large sample size being used here. Anyone familiar with similar analyses is well aware that for a fixed significance level any null hypothesis will invariably be rejected given a sufficiently large sample. Casual perusal of the estimates indicates a number of substantial differences but it is easier to judge the economic significance if these differences are translated into a more familiar metric. For this purpose a

selection of comparisons are made in terms of predicted probabilities.

Consider a representative individual, who is born in Australia, has school qualifications, is in full-time employment, lives in metropolitan NSW, doesn't drink or smoke and has no chronic conditions. Predicted probabilities of choosing private health insurance are calculated for such a person for a range of incomes and ages, using the pooled, male and female estimates. Assuming the individual is less than 35, estimates are provided in Figure 1 for various income levels while in Figure 2 age is varied with income fixed at $18,500 which is close to the sample average.

At relatively low income, the predictions of the three models are similar but they start to diverge for larger incomes. Clearly employed females with relatively high salaries are much more likely to have private health insurance than a comparable male. For a fixed income, females are more likely to choose private health insurance at all age groups. The differences between males and females are more pronounced the older the individual. The fact that gender has an important role in explaining the decision to hold health insurance is consistent with the higher demand for medical services by females; see Sindelar (1982) for further discussion and evidence.

In both of the scenarios represented in Figures 1 and 2, the pooled estimates represent a compromise between the male and female results but tend to follow the male estimates more closely. Inferences based on pooled estimates are potentially misleading.

If we accept that preferences of males and females are different, how are household decisions made? What is the mechanism by which a couple decides on whether to purchase private health insurance? One possibility is that a household member imposes his or her own preferences on the entire household. If this were the case, differences in the preferences of males and females would not be relevant and many-person households could still be modelled as if there were one decision-maker.

Consider a general specification containing characteristics of both the husband and the wife and hence which nests within it two simpler specifications where characteristics specific to one member or the other are included. Using the subsample of households containing a couple but no dependants, the same set of variables as used for the sample of singles is included in the general model and where appropriate variables for both the head (taken to be the male) and the spouse are included. Once again our approach is to test a set of linear restrictions on a general model specification. In turn, we test whether the head-specific and spouse-specific variables are significant or not. Actual probit estimates are not provided but again are available on request.

The likelihood ratio test of the null that all of the parameters of the spouse-specific variables were jointly zero yields a value of 194.1. When compared to a chi-squared with 55 degrees of freedom the p-value is less than 0.0001 indicating rejection of the hypothesis at typical levels of significance. The hypothesis that all of the parameters of the head-specific variables were jointly zero is even less consistent with the data with a test statistic of 581.5. Thus the fit for the couples data is improved significantly by considering characteristics of both household members.

These results do not necessarily lead to the rejection of the male or female dictator hypotheses. What they do indicate is that somehow the characteristics of both household members are important in the prediction of insurance choice. However, the income effects are especially relevant. For a given household income, the source of the income should not matter to a male or female dictator. This is the income-pooling hypothesis discussed in Browning, Bourguignon, Chiappori, and Lechene [1994].

In the general specification the estimated coefficient for the head's income was 0.024 with a standard error of 0.002 while for the spouse's income it was 0.008 with a standard error of 0.003. To be consistent with income pooling these coefficients should be equal. Moreover, compare these two estimates with the income estimates for single males and females that were reported in Table 1. The male coefficients are qualitatively similar but those of the females are not.

To further highlight these differences recall our representative individual used to construct Figure 1 and suppose their income was $18,500. If that person was a single male, our results generate a predicted probability of choosing

health insurance of 0.32 and if they were a single female 0.36. Suppose these two representative individuals are now in a two-person household where household income is now $37,000 to ensure the same per capita income as for the singles. According to the general model estimated for couples, the predicted probability of the household choosing health insurance is 0.34 if the household income is solely earned by the male but only 0.22 if the sole income earner is the female.

4. DISCUSSION

Using data from the 1989-90 National Health Survey we have demonstrated that the preferences of males and females for private health insurance are different. In households comprising a couple we find evidence that the decision-making process is something more complicated than a family dictator imposing their preferences on their partner. In particular, the source of family income can make a substantial difference to the household preferences for private health insurance.

What is needed is a more general approach to modelling that allows for males and females to have different preferences for private health insurance and that would allow for these differences to be resolved when modelling family behaviour. Modelling such interactions remains a challenge for future work where it remains to be seen how far these issues can be explored with the type of data that is typically available.

5. ACKNOWLEDGEMENTS

Research for this paper was partially supported by a grant from the Australian Research Council. The authors are grateful to Elizabeth Savage and Don Wright who kindly made their clean version of the data available to us. The second author also acknowledges the hospitality of CHERE where much of this paper was written.

6. REFERENCES

Browning, M., Bourguignon, F., Chiappori, P.-A. and Lechene, V. (1994), "Income and outcomes: A structural model of intrahousehold allocation", *Journal Political of Economy* 102, 1067-1096.

Cameron, A.C., Trivedi, P.K., Milne, F. and Piggott, J. (1988), "A microeconometric model of the demand for health care and health insurance in Australia", *Review of Economic Studies* 55, 85-106.

Lundberg, S.J., Pollak, R.A. and Wales, T.J. (1997), "Do husbands and wives pool their resources", *Journal of Human Resources* 32, 463-480.

Ngui, M., Burrows, C. and Brown, K. (1990), "Health insurance choice: An econometric analysis of A.B.S. Health and Health Insurance Surveys", in *Economics and Health: Proceedings of 13th Australian Conference of Health Economists*, C. Selby Smith (ed.), 172-194.

Savage, E. and Wright, D.J. (1999), "Health insurance and health care utilization: Theory and evidence from Australia 1989-90", paper presented at the 21st Conference of the Australian Health Economics Society, Canberra 1999.

Schultz, T.P. (1990), "Testing the neoclassical model of family labour supply and fertility", *Journal of Human Resources* 25, 599-634.

Sindelar, J. (1982), "Differential use of medical care by sex", *Journal Political of Economy* 90, 1003-1019.

Thomas, D. (1990), "Intrahousehold resource allocation: An inferential approach", *Journal of Human Resources* 25, 635-664.

Table 1: Probit estimates for single person households*

VARIABLE	Pooled specification		Males		Females	
	Coefficient estimate	Standard error	Coefficient estimate	Standard error	Coefficient estimate	Standard error
INTERCEPT	-1.117	0.065	-1.060	0.099	-1.223	0.093
Income	0.023	0.001	0.020	0.002	0.035	0.003
Veteran card dummy	-0.636	0.078	-0.509	0.135	-0.721	0.100
Age dummies						
35 to 50	0.163	0.045	0.153	0.060	0.131	0.072
50 to 65	0.388	0.055	0.313	0.079	0.446	0.079
Greater than 65	0.464	0.068	0.352	0.117	0.521	0.092
Country of birth dummies						
NZ & UK	-0.426	0.048	-0.397	0.071	-0.447	0.067
Southern Europe	-0.350	0.080	-0.293	0.116	-0.402	0.114
Western Europe	-0.335	0.119	-0.167	0.179	-0.419	0.161
Asia	-0.356	0.087	-0.436	0.123	-0.211	0.130
Other	-0.323	0.069	-0.200	0.104	-0.383	0.095
Education dummies						
Bachelor degree	0.167	0.050	0.138	0.070	0.110	0.077
Diploma	0.248	0.035	0.067	0.060	0.281	0.047
Trade	-0.012	0.044	-0.022	0.051	0.246	0.106
Employment dummies						
Full-time employed	0.249	0.060	0.204	0.092	0.206	0.088
Part-time employed	0.110	0.083	-0.108	0.142	0.215	0.107
Unemployed	-0.361	0.094	-0.482	0.137	-0.254	0.137
Location dummies						
NSW country	-0.074	0.050	0.125	0.071	-0.257	0.072
VIC metro	0.056	0.040	-0.003	0.059	0.110	0.056
VIC country	0.151	0.057	0.204	0.083	0.125	0.081
QLD metro	-0.483	0.059	-0.609	0.089	-0.354	0.082
QLD country	-0.186	0.056	-0.358	0.083	0.000	0.078
SA metro	0.237	0.059	0.101	0.089	0.358	0.083
SA country	0.057	0.101	0.119	0.141	0.009	0.148
WA metro	0.062	0.057	0.052	0.083	0.082	0.080
WA country	-0.025	0.097	0.146	0.122	-0.233	0.171
TAS metro	0.236	0.131	0.214	0.201	0.269	0.177
TAS country	-0.153	0.119	-0.015	0.163	-0.260	0.180
NT	0.196	0.129	0.271	0.170	0.044	0.209
ACT	-0.175	0.114	-0.299	0.166	-0.059	0.162
Vice consumption						
Cigarettes	-0.009	0.001	-0.006	0.002	-0.013	0.002
Alcohol	-0.002	0.000	-0.002	0.001	0.001	0.001
Number of observations	10,350		5,191		5,159	
Log likelihood	-5981.34		-2878.03		-3001.35	
Pseudo R^2	0.103		0.114		0.115	

* Each of the specifications also included numerous health status variables represented by chronic condition counts. The results for these have not been reported here.

Figure 1: Probablity of choosing private health insurance for different incomes

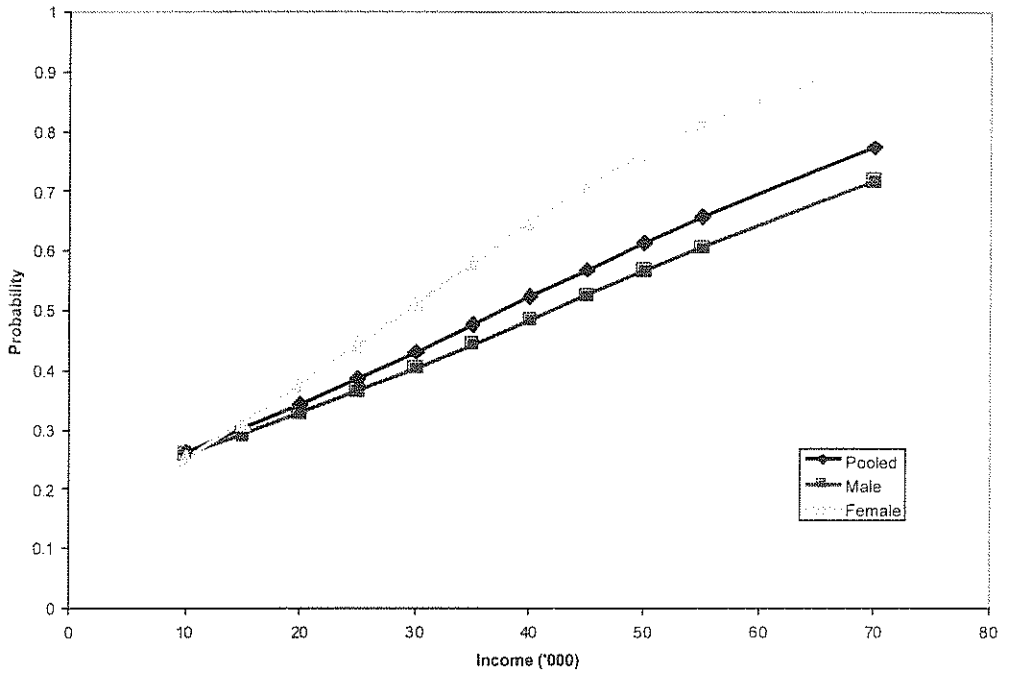

Figure 2: Probability of choosing private health insurance for different ages