Emotions and Insurance Decisions: experimental evidence of a two-step model

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Abstract

The aim of this paper is to go further in the understanding of the determinants of individual insurance choices. We propose a two-step model: the choice of insurance is primarily determined by a need of protection, and then by an assessment of the willingness to pay for insurance coverage. In standard models it is assumed that individuals make a unique evaluation of their subjective insurance value that determines both the willingness to insure, and the willingness to pay for insurance coverage. However, empirical evidence exists in favor of our model: variables explaining the decision to buy insurance or not are different from those explaining the amount of insurance coverage. Our hypothesis is that the willingness to insure is triggered by an emotional mechanism (emotions anticipated in case of loss and emotional sensitivity induce a need for protection), the assessment of the willingness to pay being then done according to the objective financial risk characteristics (probabilities of loss and amounts of loss). To verify this hypothesis we performed a laboratory experiment in which subjects had to make hypothetical insurance choices in different contextualized scenarios. We elicited simultaneously the anticipated individual discontent (or dissatisfaction), the willingness to insure, and the willingness to pay for insurance. We measured also some psychological individual characteristics (personality traits, risk attitudes measured from lottery choices

with financial incentives etc.). Our results confirm the dissociation of the factors driving willingness to take insurance and willingness to pay for insurance. We show that the willingness to insure depends on the anticipated dissatisfaction but the direction of the relationship depends on the individuals' emotional sensitivity: a high anticipated discontent in case of loss increases the willingness to insure for subjects with low emotional sensitivity, but the inverse relationship is observed for subjects with high emotional sensitivity. Concerning the willingness to pay for insurance, it strongly depends on the willingness to insure, but also on common factors as loss probabilities, loss amounts and insurance domain.

Keywords: insurance demand, emotions, risk aversion, context dependence
JEL classification codes: D81, G22

1 Introduction

In economics it is common to think of a single trait as governing risk-taking in all contexts, whereas in psychology there is more controversy on this point. In standard insurance economics models, individuals are assumed to choose their insurance contract by maximizing a value function that depends essentially on financial variables (risk and contract characteristics, individual wealth) and on risk attitude characterized by an utility function (and in more recent models, by a probability transformation function). Individual risk attitude is generally assumed independent on the decision domain (portfolio choice, house insurance, car insurance, health insurance etc.) but only on its financial consequences. This corresponds in fact to two different assumptions: a coherence of risk attitudes across contexts (an individual who is risk averse when choosing a health insurance contract will not reveal to be risk neutral in his auto insurance choices) and the possibility to fully characterize these risk attitudes from financial choices, namely lotteries.

The relative generality of risk preferences across different contexts has received considerable attention in the economics literature. Most of the existing studies use lab experiments, individual responses to hypothetical questions, or self-reported behaviors. Their results suggest that risk preferences contain a stable component, but it is not sufficient to completely explain risk choices and that a difference in attitudes across domains exists. Some of them moreover suggest that lottery choices are far from being the best predictors for real world risk attitudes. More precisely, several studies have addressed the stability of risk preferences by investigating individual responses to hypothetical questions regarding financial lotteries across different types of lotteries and over time (Choi et al.,2007; Andersen et al., 2008; Kimball, Sahm, and Shapiro, 2009). Cutler and Glaeser (2005) used a similar approach to investigate correlations in health-related behaviors, for which they use data on self-reported behaviors such as smoking and drinking rather than answers

to hypothetical lotteries. Barsky et al. (1997) has analyzed similar hypothetical questions and also validated the responses to some of these questions by investigating whether they are correlated with self-reported behaviors. In a more recent study Dohmen et al. (2009) use a large data set of survey responses to hypothetical financial lottery questions and validate these responses using self-reported behaviors of a subset of the respondents. Einav et alii (2010) examine the correlation between individual's actual insurance choices in five domains as well as investment choices and reject the assumption that there is no domain-general component of preferences. Another study using actual insurance choices is that of Barseghyan, Prince, and Teitelbaum (2009). The authors use data on three similar deductible choices made in the context of auto and homeowner insurance to estimate an individual's risk aversion in each domain and to test whether they can reject the null that risk aversion is completely general across domains. They reject the null of fully domain general risk aversion.

The aim of the present paper is to go further in the understanding of the determinants of individual insurance choices. We propose a two-step model: the choice of insurance is primarily determined by a need of protection, and then by an assessment of the willingness to pay for insurance coverage. In standard models it is assumed that individuals make a unique evaluation of their subjective insurance value that determines both the willingness to insure, and the willingness to pay for insurance coverage. However, empirical evidence exists in favor of our model (see for instance Kunreuther (1984)): variables explaining the decision to buy insurance or not are different from those explaining the amount of insurance coverage. Our hypothesis is that the willingness to insure is triggered by an emotional mechanism (emotions anticipated in case of loss and emotional sensitivity induce a need for protection), the assessment of the willingness to pay being then done according to the objective financial risk characteristics (probabilities of loss and amounts of loss). To verify this hypothesis we performed a laboratory experiment in which subjects had to make hypothetical insurance choices in different contextualized scenarios. We elicited simultaneously the anticipated individual discontent (or dissatisfaction), the willingness to insure, and the willingness to pay for insurance. We measured also some psychological individual characteristics (personality traits, risk attitudes measured from lottery choices with financial incentives etc.). Our experimental design allows to collects four types of data:

- Hypothetical insurance choices in 6 different domains (health, stay for holidays, travel, car, bicycle, language test);
- Lottery choices with financial incentives;
- Personality traits;

- Risk taking in general and in some specific contexts.

Our results confirm the dissociation of the factors driving willingness to take insurance and willingness to pay for insurance. We show that the willingness to insure depends on the anticipated dissatisfaction but the direction of the relationship depends on the individuals? emotional sensitivity: a high anticipated discontent in case of loss increases the willingness to insure for subjects with low emotional sensitivity, but the inverse relationship is observed for subjects with high emotional sensitivity. Concerning the willingness to pay for insurance, it strongly depends on the willingness to insure, but also on common factors as loss probabilities, loss amounts and insurance domain.
The paper is structured as follows. The second section reports the experimental design and some descriptive statistics on the willingness to pay for insurance. The third section identifies the factors that influence the willingness to insure and the willingness to pay decisions. In the fourth section, we study the impact of anticipated emotions on the willingness to take insurance.

2 Experimental design and descriptive statistics

2.1 Experimental design

106 volunteers, with a majority of students, participated to the experimental study that lasted for one hour in average. Subjects received a guaranteed payment of 5 euros for participating, in addition to the gains they might realize in the experiment. More precisely, one of the gain lotteries is randomly selected, and subjects receive the gain corresponding to the choice they made in this lottery.

The subjects had to answer to four groups of questions.

1. *Hypothetical insurance choices* The participants in the experiment are asked about their willingness to insure (WTI) and willingness to pay (WTP) for an insurance contract covering a financial loss resulting from different events in different domains. Six loss (and insurance) domains are considered: stay in Seychelles cancellation, trip for a professional internship cancellation, language test failure, supplementary private hospitalization expenses, bicycle theft and car theft. For each domain, a scenario is presented to the subjects giving details about the origin of the loss exposure, and about the risk realization circumstances. Concerning the loss origin, two scenarios are presented for all risks: one scenario in which the loss exposure results from a decision (choice) of the individual (is voluntary), and another, in which it is not voluntary.

Concerning the loss realization circumstances, they differ only for the stay cancellation and the trip cancellation. More precisely, two scenarios are considered: a "positive" circumstance (the stay (or the trip) is cancelled because of an attractive job offer) and a "negative" one (summons as a jury member). The following table summarizes the insurance scenarios characteristics.

Risk domain	**Loss exposure origin**	**Loss circumstances**	**Loss amount (L)**	**Loss probability**
Stay cancellation	chosen, not chosen	positive, negative	2000 euros	0,2
Trip cancellation	chosen, not chosen	positive, negative	1000 euros	0,2
Language test	chosen, not chosen	negative	500 euros	0,2; 0,5
Health expenses	chosen, not chosen	negative	1000 euros	0,05; 0,2
Bicycle theft	chosen, not chosen	negative	300 euros	0,05; 0,2
Car theft	chosen, not chosen	negative	2000 euros	0,05; 0,2

24 insurance scenarios are possible. 12 are randomly selected for each subject with some constraints.

For each scenario, the subjects are asked first of all to give, on a scale from 1 to 10, their level of discontent (or dissatisfaction) in case of realiozation of the loss. The value of 10 is associated to the higher possible discontent. Then, they are asked if an insurance contract covering the corresponding loss can be of interest for them (the corresponding binary variable is called "willingness to insure" WTI). They are then proposed 8 prices and for each of them they have to answer if they would accept to buy insurance at that price or not. The proposed prices go from 0,25pL to 2pL.

2. *Financial lottery choices* Attitudes towards risk are derived from choices made by the subjects between a financial two outcome lottery $L = (x_1, p; x_2, 1-p)$ and a certain amount. To measure risk aversion in gains, in losses, and loss aversion, the proposed lotteries differ by 4 parameters: p, x_1, x_2, E where E is an initial endowment given to the subjects. $p \in \{0.01, 0.05, 0.1, 0.2, 0.5\}$, $x_1, x_2 \in \{-1000, -100, -40, -20, 0, 20, 40, 100, 1000\}$, $E \in \{0, 20, 40, 100, 1000\}$. Subjects are informed that they can recieve a payment corresponding to their choice for some of the lotteries. At the end of the expermient, one of the lotteries in this subset is randomly selected and the subject is paid according to his choice for this lottery.

3. *Personality traits* The most widely used system of classification for broad personnality traits is the five factor model. The associated factors, called Big Five, are Neuroticism, Extraversion, Openness, Agreableness and Conscientiousness. Their measurement is based on scores obtained from answers to surveys, the questions being mostly derived from the Multidimensional Personnality Questionnaire (Partick et all (2002), Tellegen 1982). In our questionnaire, we build a score only for 2 of the 5 personnality traits:

Neuroticism and Conscientiousness because they seem to be (see for instance Anderson et alii (2011)) the most related to decision making under risk. We elaborate a score for any of these two traits from 8 standard questions with 5 possible answers (Strongly disagree, Disagree, Neither agree nor disagree, Agree, Strongly agree).

4. *Willingness to take risks in general and in different domains* Subjects are asked to make an assessment of their willingness to take risks in general and also in some specific domains. The general risk question is: " On a scale from 0 to 10, do you consider yourself as someone who takes risks in general or as someone who tries to avoid them? 0 corresponds to risk avoidance and 10 to a risk loving". Domain specific questions are also asked. They are formulated as follows: "On a scale from 0 to 10, with 0 corresponding to a very prudent behavior and 10 to risk loving, which value corresponds to your attitude in the domain of ...?". The domains are: Leisure and travels, Studies and career, Portfolio choice and investment, Family life and relations with peers, Health, Drinking, Smoking and drugs.

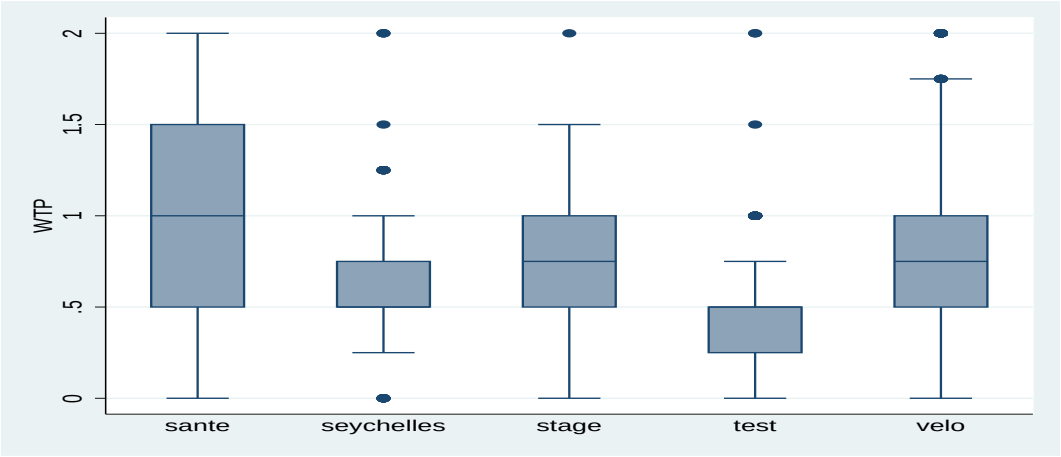
2.2 Some descriptive statistics

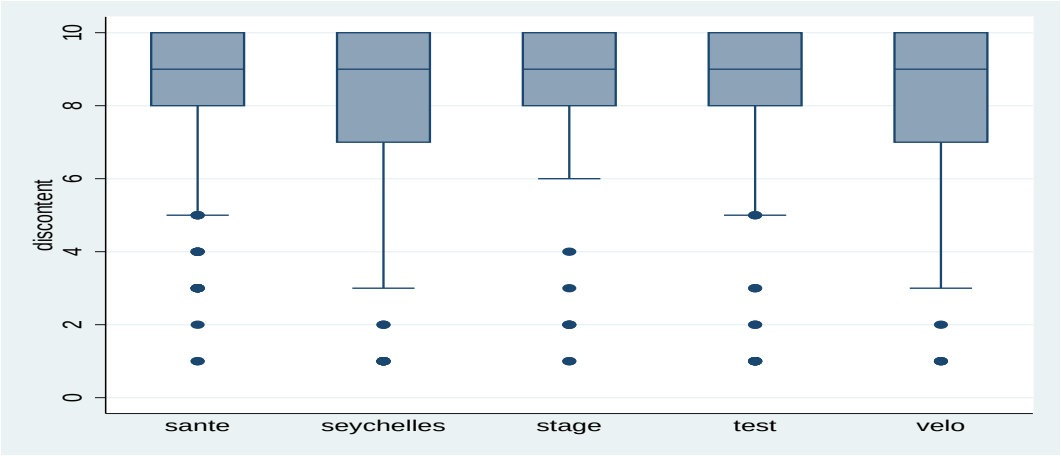
The subjects. 53% of women, aged from 18 to 48 with an average of 23 years, 83% of students. 54,16% with a bachelor's degree or more. 58% of the subjects have already subscribed a trip cancellation insurance, 14,6% have completed a claim report during the last 3 years.

In the following table are given some summary statistics for the main variables used in our study: the willingness to insure (WTI), the willingness to pay (WTP) for insurance, the anticipated discontent in case of loss and the Neuroticism. The WTP equals the maximal price that a subject declares being ready to pay for insurance. To allow comparison between the different scenarios and proposed domains, the WTP is given as a proportion of the expected loss. If a subject declares that he/she will not accept to buy insurance at the lower proposed price, his/her WTP is set to 0.

Variable	N Obs	Mean	Std Dev	Min	Max
WTI	109	0.7591	0.4277	0	1
WTP	109	0.7848	0.5337	0	2
Discontent	109	7.6667	2.6381	1	10
Neuroticism Index (bfi_N)	109	2.5768	0.7979	1	4.625

The following box plots illustrate the difference in WTP and Discontent by insurance domain. The domain will thus be used as an explicative variable both for the willingness to insur, and for the willingness to pay.





3 Willingness to insure and willingness to pay: two different decisions

In this section, we study the determinants of insurance choices. To determine if the decisions to insure or not and the willingness to pay are taken separately on simultaneously, we compare the variables that influence significantly the two decisions. We claim that if these variables are not the same, then the two decisions are taken separately.

3.1 The decision to take insurance (willingness to insure)

The willingness to insure being a binary variable, we estimate a logit model with the following predictors :

- Financial risk charactristics: probability of loss (variable prob), amount of loss (valeur)
- Risk domain (bien seychelles, bien stage, bien sante,...)

- Personality traits (variables BFI C (Conscientiousness index), BFI N (Neuroticism index));
- Self-declared willingness to take risks in general and in some specific domains (variables Risk Likert, Leisure, Prof, Sport, Finance, Family, Health, Smoking, Drinking, Chance);
- Risk attitudes from lottery choices (Variables RA Losses, RA Gains, Loss Aversion)
- Anticipated emotions (variable Discontent)

The results of the estimation are given in Appendix A. It appears that the probability of willing to buy insurance is (significantly) influenced only by the risk domain and the loss probability. The probability to be willing to buy insurance increases when loss concerns health and trip or stay cancellation, and decreases when it concerns a bicycle theft or language test.

3.2 The decision concerning the willingness to pay for insurance (WTP)

The willingness to pay for insurance being a continuous variable, we estimate a linear regression model with forward selection with the same predictors as for the willingness to insure. All the subjects are asked for their willingness to pay for insurance, even those who declare that they are not interested by insurance for the given risk. That is why we do not need to estimate a probit model. The results of the estimation are given in Appendix B. The variables that influence the willingness to pay are risk domain and loss probability, as for the willingness to insure, but also the anticipated discontent, as well as risk aversion and loss aversion. Consequently, we can reject the hypothesis that the two decisions (willingness to insure and willingness to pay) are taken simultaneously.

4 The impact of anticipated emotions on the willingness to insure and on the willingness to pay for insurance

In this section we concentrate our attention on the impact of anticipated emotions on insurance decisions. These emotions are captured in our experimental design by the variable Discontent. To take into account the potential difference in emotions that a perspective of loss can create, we introduced in our experiment different risk domains,

and different events (positive and negative) that can be at the origin of the financial loss that can be insured. In the previous section, we showed that insurance decisions seem to be taken in two steps. In this section we ask the following questions: are insurance decisions influenced by anticipated emotions and,if it is the case, which step of the insurance decision process is impacted? We first calculate the correlation coefficients between WTP, WTI and the variable Discontent in relation with the emotional sensitivity of the subjects. The variable measuring the emotional sensitivity is the Neuroticism. We consider as high emotionnaly sensitive the individuals with a Neuroticism coefficient higner than 2.5. It appears from the following table that the correlation between the variable Discontent and WTI is significant (and negative) only for high emotionaly sensitive subjects.

High emotional sensitivity (Neuroticism > 2.5)

	WTP	WTI	discon~t
WTP	1.0000		
	636		
WTI	0.2936	1.0000	
	0.0000		
	636	636	
discontent	-0.0225	-0.1897	1.0000
	0.5708	0.0000	
	636	636	636

Low emotional sensitivity (Neuroticism <= 2.5)

	WTP	WTI	discon~t
WTP	1.0000		
	672		
WTI	0.2271	1.0000	
	0.0000		
	672	672	
discontent	-0.0114	-0.0518	1.0000
	0.7690	0.1798	
	672	672	672

If we go further in the analysis and estimate the logit model of the previous section for the WTI separately for high and low emotionaly sensitive individuals, we obtain the following results (see appendix C). Introducing a distinction between high and low

emotionaly sensitive individuals improves the predictive power of our model (the pseudo-R^2 increases). The variable Discontent is significant in the two estimated models and the sign of its impact on the probability of choosing insurance changes according to the emotional sensitivity: a high anticipated discontent increases the willingness to insure for subjects with low emotional sensitivity, and the inverse relationship is observed for subjects with high emotional sensitivity.

Appendix A: Logit analysis of the Willingness to take insurance

Logistic regression — Number of obs = 1308
LR chi2(14) = 195.02
Prob > chi2 = 0.0000
Log likelihood = -624.54608 — Pseudo R2 = 0.1350

WTI	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
discontent	.0021359	.0332294	0.06	0.949	-.0629926	.0672643
bien_sante	1.001236	.2349715	4.26	0.000	.5407001	1.461771
bien_seychelles	1.457826	.313644	4.65	0.000	.8430955	2.072557
bien_stage	1.809426	.3500436	5.17	0.000	1.123354	2.495499
bien_test	-.8772752	.2575941	-3.41	0.001	-1.38215	-.3724001
bien_velo	-.4264976	.2014491	-2.12	0.034	-.8213306	-.0316646
bien_voiture	0	(omitted)				
bfi_n	.0757672	.0932701	0.81	0.417	-.1070388	.2585732
probability_1	-1.750727	.3504313	-5.00	0.000	-2.43756	-1.063894
probability_2	-1.164794	.3014249	-3.86	0.000	-1.755576	-.5740119
valeur_1	0	(omitted)				
bfi_c	-.0308622	.1095728	-0.28	0.778	-.245621	.1838965
risque_likert	.0236845	.0339707	0.70	0.486	-.0428969	.0902658
loss_aversion	-.032458	.0388611	-0.84	0.404	-.1086244	.0437085
ra_gain	-.0161841	.0141582	-1.14	0.253	-.0439336	.0115655
ra_perte	-.0036394	.0110091	-0.33	0.741	-.0252168	.017938
_cons	2.322393	.8230801	2.82	0.005	.7091855	3.9356

Appendix B: Linear regression model of the Willingness to pay for insurance

Source	SS	df	MS	Number of obs =	1308
				F(7, 1300) =	54.20
Model	84.1081614	7	12.0154516	Prob > F =	0.0000
Residual	288.184079	1300	.221680061	R-squared =	0.2259
				Adj R-squared =	0.2218
Total	372.29224	1307	.284844866	Root MSE =	.47083

WTP	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
probability_1	.3605596	.0336498	10.72	0.000	.2945457	.4265735
bien_test	-.2611854	.0388393	-6.72	0.000	-.33738	-.1849908
bien_sante	.1735702	.0375371	4.62	0.000	.0999302	.2472102
ra_perte	.0085145	.0019965	4.26	0.000	.0045979	.0124312
loss_aversion	.025095	.0065619	3.82	0.000	.012222	.037968
discontent	-.0163691	.0051741	-3.16	0.002	-.0265197	-.0062185
bien_seychelles	-.0955086	.0388889	-2.46	0.014	-.1718006	-.0192167
_cons	.518807	.0711634	7.29	0.000	.3791993	.6584146

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Appendix C: Logit analysis of the Willingness to take insurance in relation with emotional sensitivity

High emotional sensitivity (Neuroticism > 2.5)

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Logistic regression                             Number of obs   =        636
                                                LR chi2(14)     =     124.61
                                                Prob > chi2     =     0.0000
Log likelihood = -281.54465                     Pseudo R2       =     0.1812
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WTI	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
discontent	-.1217914	.0522989	-2.33	0.020	-.2242954	-.0192875
bien_sante	.6825996	.3392614	2.01	0.044	.0176595	1.34754
bien_seychelles	1.825678	.5364614	3.40	0.001	.7742329	2.877123
bien_stage	1.566379	.5102207	3.07	0.002	.5663652	2.566394
bien_test	-1.2161	.3766466	-3.23	0.001	-1.954313	-.477886
bien_velo	-.6012557	.3031935	-1.98	0.047	-1.195504	-.0070073
bien_voiture	0	(omitted)				
bfi_n	.6604123	.2222478	2.97	0.003	.2248146	1.09601
probability_1	-1.704727	.5241176	-3.25	0.001	-2.731978	-.6774753
probability_2	-1.450969	.450581	-3.22	0.001	-2.334091	-.567846
valeur_1	0	(omitted)				
bfi_c	-.2358943	.1795021	-1.31	0.189	-.5877121	.1159234
risque_likert	.1694976	.0565635	3.00	0.003	.0586351	.2803601
loss_aversion	-.1390392	.0737737	-1.88	0.059	-.283633	.0055547
ra_gain	.0060458	.0232424	0.26	0.795	-.0395085	.0516001
ra_perte	.013672	.0225314	0.61	0.544	-.0304888	.0578327
_cons	1.80183	1.321713	1.36	0.173	-.788681	4.392341

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Low emotional sensitivity (Neuroticism <= 2.5)

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Logistic regression                             Number of obs   =        672
                                                LR chi2(14)     =     123.29
                                                Prob > chi2     =     0.0000
Log likelihood = -316.24665                     Pseudo R2       =     0.1631
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WTI	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
discontent	.1030904	.0480887	2.14	0.032	.0088383	.1973426
bien_sante	1.399199	.3437118	4.07	0.000	.7255364	2.072862
bien_seychelles	1.393015	.4186954	3.33	0.001	.5723866	2.213642
bien_stage	2.12554	.5007555	4.24	0.000	1.144077	3.107003
bien_test	-.7163043	.3752033	-1.91	0.056	-1.451689	.0190806
bien_velo	-.3332437	.2862508	-1.16	0.244	-.8942849	.2277975
bien_voiture	0	(omitted)				
bfi_n	-.9888264	.311135	-3.18	0.001	-1.59864	-.379013
probability_1	-2.040018	.5020554	-4.06	0.000	-3.024028	-1.056007
probability_2	-1.126842	.4299422	-2.62	0.009	-1.969513	-.2841711
valeur_1	0	(omitted)				
bfi_c	-.0993301	.1657963	-0.60	0.549	-.4242849	.2256248
risque_likert	-.09841	.0487677	-2.02	0.044	-.1939929	-.0028271
loss_aversion	-.0500671	.0530099	-0.94	0.345	-.1539646	.0538304
ra_gain	-.0142404	.0208087	-0.68	0.494	-.0550247	.026544
ra_perte	-.0031653	.0136244	-0.23	0.816	-.0298686	.0235381
_cons	4.57998	1.481513	3.09	0.002	1.676268	7.483693

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