Determining Factors for Purchasing Life Insurance:
The Chilean Case

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Sumary

This study investigates whether a threshold exists at which a person perceives a greater need for a life insurance contract. The empirical analysis examines discrete choice for cross-sectional cohort data of Chile, a developing economy. The results show that the determining factors for purchasing life insurance include degree of risk aversion, whether the individual has been hospitalized, whether the individual has children, marital status, family group's own assets, and institutional elements.

Keywords: Binary choice models, risk aversion and life insurance.
JEL Classification: C25, H55 and D91

1. INTRODUCTION

One of the main sources of financial uncertainty is the risk of death (Merton, 1975). Thus, financial safeguards, such as life insurance contracts, are used to mitigate this risk to protect dependents. The decision to take out a life insurance policy represents a problem of discrete choice, where a rational individual will take the action that provides a higher level of utility. However, indirect utility is commonly considered in discrete choice analysis because it includes income constraints and other factors (Deaton and Muellbauer, 1980; Hensher et al., 1988). In addition, prior research suggests that a threshold exists at which people's belief that an unfortunate event may take place makes the decision to purchase a life insurance policy more likely because people do not differentiate low probability from null probability (Kunreuther and Pauly, 2005; Laury et al., 2009). Previous studies show that in the decision to taking out a life insurance policy, positive influences include having children (Lewis, 1989; Scholz and Seshadri, 2007), having a spouse (Lewis, 1989; Love, 2010), leave a bequeath (Bernheim, 1991), institutional factors (Beck and Webb, 2003; Cawley and Philipson, 1999; Outreville, 1996), individual beliefs about the future (Gollier, 2005), level of education (Beck and Webb, 2003; Brown and Kim 1990; Truett and Truett, 1990), risk aversion, and belief that assets of the group are insufficient (Cubeddu and Ríos-Rull, 2005).

This study provides evidence from Chile, an emerging economy that has developed successful public policies in the last decades (Claessens et al., 2010). We use both a theoretical static model and an empirical analysis with

cross-sectional cohort variables to determine which factors influence the decision to take out a life insurance policy. Analyzing the determining factors for purchasing a life insurance policy provides a better understanding of this market, making it possible to apply this knowledge in the implementation of business strategies, the design of advertising, and the provision of laws.

The remainder of the article is organized as follows. Section 2 reviews the existing literature. Section 3 defines the theoretical framework. Section 4 provides the empirical strategy. Section 5 describes the database. Section 6 gives the results of the estimates. Finally, Section 7 offers our conclusions and suggestions for future lines of research.

2. LITERATURE REVIEW

Yaari (1965) and Hakansson (1969) are the pioneers in shaping the demand of life insurance, mainly from the point of view of coverage for dependents and income for retirement. Both the empiric evidence and literature show that wealth accumulation negatively affects the demand for insurance; nevertheless, wealth in relation to human capital has a positive impact on the purchasing of insurance (Campbell, 1980; Economides, 1982). Specifically, Cubeddu and Ríos-Rull (2005) find that changes in the family structure affect wealth accumulation and need, which, in turn, affects the demand for life insurance (Hong and Ríos-Rull, 2012).

Friedman (1974) affirms a positive correlation between family coverage and risk aversion. After children leave home, individuals may maintain life insurance coverage mainly due to other financial dependency links not related directly to the family (Hong and Ríos-Rull, 2012; Scholz and Seshadri, 2007).

Fisher (1973) and Love (2010) both use discrete lifecycle models to examine life insurance decision making theoretically. To a lesser extent, lifecycle models can also be examined under considerations of continuity (Huang et al., 2008; Pliska and Ye, 2007; Yaari, 1965; Zaglauer and Bauer, 2008). This type of theoretical approach includes the intertemporal discount factor or impatience of present consumption, which can create disappointment effects in people who may act hyperbolically. In addition, some parameters are not constant through time and these variations may influence both the model and the estimates (Zaglauer and Bauer, 2008).

Comparative static models are much less complex in terms of temporality and have greater ability to set an intuitive basis with an expected utility (Campbell, 1980; Friedman, 1974; Kunreuther and Pauly, 2008). These models explain the influence of current family composition and their processes in the decision to take out an

insurance policy, especially if these decisions depend on an important and unexpected discrete jump (Laury et al., 2009). In addition, Finkelstein and Poterba (2006) find that geographical location correlates with the amount of insurance.

Furthermore, Guiso and Paiella (2006) show that risk aversion has considerable ability to predict a series of decisions inside the home. Although discussed in the literature (Kunreuther and Pauly, 2005), the relation between risk aversion and life insurance decision making has not been presented in models that explain life insurance demand. Thus, we present a theoretical model that suggests a functional form that links beliefs about the individual and his or her risk aversion in the decision of purchasing a life insurance policy.

To provide results about the possible existence of a threshold, we posit that risk tolerance positively relates to health perception (Hammitt et al., 2005). Specifically, we examine an event that may change the perception of security (e.g. a hospitalization) so that a person perceives a greater need for a life insurance contract.

3. THEORETICAL MODEL

We develop a statistical model of expected utility for the purchasing of a life insurance policy following Kunreuther and Pauly (2005), including suitable modifications to consider the influence of risk aversion and other factors that influence the demand. We assume two states of nature for a period of time: habitual situation (*H*) and loss of capital state (*L*).

Let's say that $E(u(\cdot))$ represents the expected utility in a moment of time, while $u(\cdot)$ corresponds to the utility[1], which we assume does not change between one state of nature and the other, and that $u'(C) > 0$ and $u''(C) < 0$. The utility function in each state is assumed to be iso-elastic (constant relative risk aversion) of the form $u(C) = \frac{1}{1-\sigma} C^{1-\sigma}$ for all $C > 0$. The aversion coefficient with regard to risk $\sigma > 1$ is such that the higher the sigma

1 We assume that the function satisfies the Inada conditions, and.

π_H value, the greater the level of risk aversion. In addition, is the probability that the individual believes will

$\pi_L = 1 - \pi_H$ C_H remain in their habitual state, and represents the probability of being in loss of capital state. and

C_L correspond to the consumptions of the habitual and loss of capital states, respectively. Then, the individual's expected utility is defined as

$$E(u(\cdot)) = \pi_H \times u(C_H \mid \sigma) + \pi_L \times u(C_L \mid \sigma) \tag{1}$$

.

w If represents the individual's initial income, the possible consumption in the unfortunate state would be

$w - L$ p . Now, let's assume that the individual has an insurance policy that has a premium rate equal to with

Q $p \cdot Q$ coverage equal to , so that the fair premium equals . In which case the available income for each state would be

$$w_H = w - p \cdot Q$$

$$w_L = w - L - p \times Q + Q = w - L + (1 - p) \times Q$$

,

w_H w_L $p \cdot Q$ where and , are the incomes available in each state in which a premium is paid .Then,

$$w - L < w_L \leq w_H < w \tag{2}$$

so that $w_H = w_L$ if the insurance coverage is equal to the loss of capital. Thus, budget line between these two states is

$$(1-p)\times w_H + p\times w_L = w - p\times L \quad . \tag{3}$$

In this way, if p also represents the frequency with which loss of capital events take place, the left side (right side) of equation (3) is the expected average income when a life insurance policy is (is not) taken out. Following from equation (3), the rate at which income can be exchanged between the two possible states corresponds to

$$\frac{dw_L}{dw_H} = -\frac{(1-p)}{p} = -\kappa \quad . \tag{4}$$

Because a single person does not impact the insurance market, this rate of substitution is a condition given for the individual. Considering that these states of nature are mutually exclusive, the maximization of utility presented in equation (1) is

$$V(w_H, w_L \mid \sigma, p, Q) = \pi_H \times u(w_H \mid \sigma) + \pi_L \times u(w_L \mid \sigma) \quad . \tag{5}$$

When a person takes out life insurance, he or she selects coverage that maximizes the indirect expected utility defined in equation (5), which can be written as

$$V(w_H, w_L \mid \sigma, p, Q) = \pi_H \times [u(w_H \mid \sigma) + \varphi \times u(w_L \mid \sigma)] = \pi_H \times \underbrace{\psi(w_H, w_L \mid \sigma, p, Q)}_{\psi(w_H, w_L \mid \sigma, p, Q)} \quad , \tag{6}$$

$\pi_L / \pi_H = \phi(h \mid a, \sigma)$

where represents the discount associated to the relative importance between the habitual situation (*H*) and loss of capital (*L*) states. Also, it can be interpreted as the conditional probability of the occurrence of an event that may endanger an individual's life, given that the individual has a certain level of perception that this event may happen. We refer to this conditional probability as impatience. Namely, a person's impatience for insuring his or her life depends on the level of uncertainty related to risk of death (h), the degree of importance assigned to the probable event (a), and the individuals' level of risk aversion (σ).

Because $\pi_H > 0$, following equation (6), the optimal coverage can be obtained both with $V(\cdot)$ and $\tilde{V}(\cdot)$ because they are equivalent transformations in front of the maximization of the portfolio. We use the second expression, which represents the modified indirect utility. Therefore, the optimal decision is

$$Q^* = \arg\max_{Q} \tilde{V}(w_H, w_L \mid \sigma, p, Q) = u(w_H \mid \sigma) + \varphi \times u(w_L \mid \sigma)$$
$$s.a. \quad \varphi \geq \varphi_0 \qquad (7)$$

The ad hoc form of the coverage optimization model of the life insurance illustrates the threshold, $\varphi_0 = \varphi(h_0 \mid a, \sigma)$, from which a person considers important the situation in which his or her life may be endangered. According to prior literature, people do not insure against great losses when they are associated with very low-frequency events. One explanation for this behavior is that people do not distinguish between a small and null probability (Laury et al., 2009). Therefore, if the level of importance $\varphi < \varphi_0$ (φ_0 threshold), an individual will refrain from taking out insurance because his or her level of impatience, or degree of uncertainty related to death, is very low to the point that it is considered nearly null. Thus, the individual's modified indirect utility is greater if he or she does not take out life insurance (Kunreuther and Pauly, 2005). Then,

$$Q^* = \begin{cases} 0 & \text{si } \varphi < \varphi_0 \\ \arg\max_{Q} V(w_H, w_L \mid \sigma, p, Q) & \text{si } \varphi \geq \varphi_0 \end{cases} \tag{8}$$

If the person faces an event that alerts him or her to the risk of death, impatience for taking out insurance is modified. In other words, loss of capital events may alter the degree of uncertainty and thus the level of impatience.

Let's assume that the impatience rate due to an unfortunate event changes an individual's perception of the risk of death and increases uncertainty, $\frac{\partial \phi}{\partial h}\Big|_{h \geq h_0} > 0$, and the level of risk aversion, $\phi_\sigma > 0$. This scenario illustrates that the more risk-averse a person is, the more sensitive to unexpected situations he or she likely is, acting more concerned and thus exceeding his or her threshold more easily. In the event that an external element triggers the necessary insecurity for the individual to take out a life insurance policy, for equation (7) the following equilibrium condition should be true:

$$-\frac{1}{\varphi} \times \frac{u'(w_H \mid \sigma)}{u'(w_L \mid \sigma)} = -\kappa$$

$$\frac{u'(w_H \mid \sigma)}{\varphi(h \mid a, h_0, \sigma) \times u'(w_L \mid \sigma)} = \kappa \tag{10}$$

.

Now, suppose that two individuals with the same capacities in the same state of nature, and yet one is more risk adverse than the other such that $0 < \sigma_0 < \sigma_1$; the individual represented by σ_1 is more risk-adverse than the individual represented by σ_0. Then, the constant relative risk aversion utility function and the conditions of the equation (2) give

$$\frac{u'(w_H \mid \sigma_1)}{u'(w_L \mid \sigma_1)} < \frac{u'(w_H \mid \sigma_0)}{u'(w_L \mid \sigma_0)}$$

.

Therefore, for the condition of the equation (10) to be true, we have

$$\frac{u'(w_H \mid \sigma_1)}{\varphi(h \mid \sigma_1) \times u'(w_L \mid \sigma_1)} = \frac{u'(w_H \mid \sigma_0)}{\varphi(h \mid \sigma_0) \times u'(w_L \mid \sigma_0)} = \kappa \quad . \qquad (11)$$

$$\varphi(h \mid \sigma_1) < \varphi(h \mid \sigma_0)$$

Then, it must be true for both individuals that , which means that the necessary impatience to ensure one's live (i.e., to consider taking out an insurance policy) is lower for individuals who are more risk averse. That is , the uncertainty threshold is lower in the case of the more adverse individual, $h_1 < h_0$.

However, the degree of importance that the individual may attribute to the phenomenon of uncertainty, a , can also be influential. We assume that this component is relatively constant because it is culturally related (Truett and Truett, 1990). Therefore, as an individual's risk aversion increases, his or her insecurity threshold declines. Therefore, risk aversion exacerbates the possibility of taking out a life insurance policy.

In conclusion, two relevant factors can affect whether an individual takes out a life insurance policy. First, unfortunate situations (i.e., loss of capital events) increase the perception of risk of death and increases the likelihood that an individual will take out insurance. Second, the more risk averse an individual is, the lower his or her uncertainty threshold will be, thus increasing the likelihood of taking out a life insurance policy.

4. METHOD

The hypotheses emerging from the model are not directly measurable in an econometric estimation. Therefore, we follow an empirical strategy that includes the features of the theoretical model in a simple and estimable manner. Specifically, the choice to take out a life insurance policy can be represented as a discrete choice problem, where a

rational individual will take the action that results a higher level of expected utility. Following prior literature, we consider indirect utility, which internalizes the constraints from income, household composition, schooling, and so on (Deaton and Muellbauer, 1980; Hensher et al., 1988) in the analysis of discrete choice. We assume that loss of capital events will cause individuals to modify their impatience to insure their life to the point (i.e., threshold) of deciding to take out a life insurance policy.

For the purposes of this study, we link loss of capital to hospitalization and measure the loss of capital event with a dummy variable. The dummy variable Y takes the value of 1 if the individual takes out a life insurance policy, and the individual will take out a life insurance policy if the modified latent indirect utility of having insurance ($\tilde{V}_S$) is greater than that of not having insurance ($\tilde{V}_N$) (see equation 6). Otherwise, the loss of capital dummy Y equals zero:

$$Y = \begin{cases} 1 & \text{si} \quad \tilde{V}_S \geq \tilde{V}_N \\ 0 & \text{si} \quad \tilde{V}_S < \tilde{V}_N \end{cases} \tag{12}$$

We use a latent variable as a modified indirect utility, which is represented for the individual i and the decision j, in the form

$$\tilde{V}_{ij}(\cdot) = u(w_H \mid \sigma_i) + \varphi_j(h_{ij} \mid a_i, h_0, \sigma_i) \times u(w_L \mid \sigma_i) \quad \forall\, i = 1,...,n;\ j = S, N \tag{13}$$

,

where h_0 is the threshold at which the individual becomes impatient about insuring his or her life (Kunreuther and Pauly, 2005). Thus, for any unsafe level below h_0 the necessary impatience for security, $\phi_j(\cdot)$, is equal to zero.

a_i

Given that the importance attributed to the loss of capital event, , is relatively similar within the same culture (Truett and Truett, 1990), we suppose an ad hoc form for the relative position of life put at risk under a loss of capital event:

$$\varphi_j(h_i \mid a_i, h_0, \sigma_i) = \varphi(h_i, \sigma_i \mid h_0^j, a_i) = [\exp(a_i \times h_{ij}^{\sigma_i}) - 1]\Big|_{h_i > h_0^j} \qquad \forall\, i = 1, \ldots, n;\ j = S, N;\ h_0^j > 1$$

$$\phi_j\left(H_i, \sigma_i\right) = \phi\left(H_i, \sigma_i \vee a_j\right) = 1 - H_i^{-a_j/\sigma_i} \quad . \qquad (14)$$

The functional form given in equation (14) shows that, for the same level of importance and a greater level of risk aversion, the threshold for greater impatience to insure one's life is lower in individuals with a higher level of risk reluctance, as shown in Figure 1. However, for the same degree of importance, with the same threshold, an individual who is more risk-averse will be more impatience to insure his or her life than an individual who is less risk-averse (see Figure 2).

(FIGURE 1 ABOUT HERE)

(FIGURE 2 ABOUT HERE)

So if we replace equation (14) in equation (13), we obtain a more extended indirect utility:

$$V_{ij}(\cdot) = \underbrace{u(w_H \mid \sigma_i) - u(w_L \mid \sigma_i)}_{(I)} + \underbrace{\exp(a_i \times h_{ij}^{\sigma_i}) \times u(w_L \mid \sigma_i)}_{(II)}$$

$$U_{ij}^{\dot{c}}(\cdot) = \underbrace{u\left(C_{ij,t}^{\dot{c}}, \sigma_i\right) + \delta \cdot u\left(C_{ij,t+1}^{\dot{c}}, \sigma_i\right)}_{(I)} - \underbrace{\delta \cdot H_i^{-a_j/\sigma_i} \cdot u\left(C_{ij,t+1}^{\dot{c}}, \sigma_i\right)}_{(II)} \quad , \qquad (15)$$

From equation (15), the component (*I*) represents the utility of being in the normal state together with the disutility of being in the loss of capital state. However, the disutility will be neutralized if the person is not impatient to insure his or her life (i.e., does not exceed the threshold). That is, the exponential of the component (*II*) will equal 1, and

this resulting utility will act as compensation, so that the individual may either perceive an ability to cope with a situation or simply fail to perceive it as a risk.

This jump in the threshold is not quantifiable in units because it is only observable based on whether the individual decides to take out a life insurance policy. Therefore, to estimate the model, and given that the components (*I*) and (*II*) of the equation (15) are separated additively, we define approximations for each component as

$$I_{ij}^{*}(\cdot) = \gamma_{ij} \times X_{ij} + \alpha_{ij} \times h_{ij} + \lambda_{ij} \times \sigma_i \qquad \forall\, i = 1,\ldots,n;\ j = S, N \quad , \tag{16}$$

where γ_{ij} represents the set of attributes that define the preferences of the individual (utility function), represented by the vector X, establishing a structure for the utility function. h and σ correspond to the individual's level of insecurity related to fear of death and risk aversion, respectively. The relation between h and σ is given as a dichotomy between being confronted with a situation may cause uncertainty related to one's life expectancy, which for the purposes of this study is hospitalization, disregarding all other cases involving other decision processes or that may skew the direction of causality, and an individual's risk aversion. α_{ij} represents roughly the possible existence of a threshold, thus generating greater impatience to insure one's life, and therefore the sign should be positive. λ_{ij} represents the influence of risk aversion on the individual's decision to contract a life insurance policy. Therefore, the sign should be positive.

Risk aversion not only affects the decision to take out a life insurance policy, but it also affects the utility function and preferences of the individual. Thus, the decision on whether to take out a life insurance policy is roughly represented as follows:

$$\Pr(Y_i = 1) \approx \Pr(I_S^{*} - I_N^{*} \approx \Gamma_i \times X_i + \mathrm{E}_i \times h_i + \mathrm{K}_i \times \sigma_i > \varepsilon_S - \varepsilon_N)$$

$$\Pr(Y_i = 1) \approx \Pr(\Gamma_i \times X_i + \mathrm{E}_i \times h_i + \mathrm{K}_i \times \sigma_i > \varepsilon_i) \quad Pr\left(Y_i = 1\right) \approx Pr\left(\Gamma_i \cdot X_i + Y_i \cdot h_i + \Lambda_i \cdot \sigma_i \cdot h_i > \varepsilon_i\right) \quad (17)$$

where $\Gamma_i = \gamma_i^S - \gamma_i^N$, $\mathrm{E}_i = \alpha_i^S - \alpha_i^N$ y $\mathrm{K}_i = \lambda_i^S - \lambda_i^N$. Because individuals who purchase life insurance policies have a level of uncertainty greater than the threshold compared to those who do not purchase life insurance (assuming all else is equal), then $\mathrm{E}_i > 0$. Likewise, the effect of risk aversion on the variability of the utility means that $\mathrm{K}_i > 0$, which shows ceteris paribus that as an individual's level of risk aversion increases, his or her propensity to purchase a life insurance policy also increases. This procedure allows us to determine roughly the existence of a threshold at which, once crossed, an individual will become more impatient to insure his or her life and thus more likely to purchase insurance.

5. DATABASE

We examine the empirical evidence in Chile by using the Encuesta de Protección Social (Social Protection Survey; EPS; Department of Economics at the University of Chile and the University of Pennsylvania, 2006), which has 16,443 respondents. This survey is unique in the Latin American economy because it includes socioeconomic, demographic, and other information provided by the interviewees. A panel of international experts participated in the design of the survey to ensure representative information at a national level. This survey, in its 2006 version, consists of respondents who are 18 years and older, representing a total population of about 12.5 million people, of whom 50.9% are women and 49.1% men. At the population level, 7.5% do not answer the question about holding insurance, which reduces our sample. Of those who do respond, 67.5% said that they do not have any insurance among those described in the survey, representing approximately 75% of the population by using expansion factor.

Following Ruiz-Tagle and Tapia (2011), we use three EPS questions on risk aversion to group respondents into four levels, ranging from 1 (low level risk-adverse) to 4 (high level risk-adverse). One EPS item related to risk asks respondents to consider him- or herself as the sole source of income and then to choose between two jobs. The

first guarantees a fixed and stable income level throughout life. In the second job the respondent has the possibility of earning double that income or earning only a quarter, half, or three-quarters of that income for life. The question is based on the same question asked in the survey Health and Retirement Study[2] in the United States and in Survey of Household Income and Wealth,[3] conducted by the Bank of Italy. They all offer the respondent a convergence toward risk neutrality, which indicates that if an individual prefers the alternative with the lowest expected value, they would also prefer those with higher expected value, creating a conditional order in the selection. Table 1 shows the percentage distribution of the different degrees of risk aversion. The results indicate that the greatest accumulation at the population level is at the highest levels of risk aversion, which is also reflected in the evidence for Italy (Guiso and Paiella, 2006).

(TABLE 1 ABOUT HERE)

Table 2 shows self-reported life insurance policy holders from the EPS 2006. The ability to take out a life insurance policy may be limited to some respondents due to age (60 years or older), budget constraints, nonacceptance from the financial system, existence of infectious or chronic conditions, or presence of degenerative diseases. For these and other reasons, our sample is reduced from 16,443 respondents in the EPS 2006 to 7,319.

As a strategy to expose the existence of a threshold, we speculate that being hospitalized may change an individual's perception of security with regard to his or her life. Assuming that the incident occurs at random, we construct a dummy variable that separates individuals who have been hospitalized from those who have not. We exclude hospitalizations such as pregnancy and plastic surgery because they are not random events. Respondents who have degenerative diseases such as cancer or HIV/AIDS are also excluded as well as those who suffer from chronic diseases and must often be hospitalized, because they have no access to life insurance contracts or, if they do, it would have been contracted prior to their illness, which would favorably skew our results. Table 3 shows the results of hospitalization over the last two years. The percentage of those with life insurance is higher among those who have been hospitalized than in those who have not, which was significant at 1%.

2 The University of Michigan surveys of more than 22,000 Americans over age 50 every two years to study the labor force participation and the transition in health that people experience at the end of their lives.

3 The Bank of Italy surveys about 8,000 households of working age to gather information on the income and savings of Italian households.

Table 4 shows the relation between hospitalization and risk aversion. Following the distribution of the sample for different levels of risk aversion, we find that respondents who have been hospitalized are on average a little more risk-averse, with a significance of 5%. This initial approximation suggests that suffering a loss of capital event can make the individual more aware that their life is at risk and thus increasing his or her desire to insure it.

Table 6 shows that respondents who have life insurance and those who have been hospitalized, on average, have a higher degree of risk aversion. Although this difference seems to be maintained when conditioning respondents on owning life insurance and having been hospitalized, the difference loses significance, reaching only 15%. However, these results support the notion that a loss of capital event can influence an individual's expectation of life expectancy, and, therefore, their demand for life insurance apparently, although not conclusively, goes in the direction proposed.

The participation levels of risk aversion as shown in Tables 4–6 suggests that the distribution between the average levels of risk aversion is sparsely populated, which can lead to problems of estimation. To avoid this problem, we group levels 1 to 3 into a medium-low risk-averse group, and level 4 is a high level of risk aversion, which contains all higher levels of reluctance to risk that the survey fails to reflect.

Variable definitions are included in the empirical strategy, but we add some control variables to ensure that comparisons are among similar individuals. Specific to the individual, we include control variables related to gender, age, schooling, and perception of health. Level of aversion serves as a parameter at the individual level. Related to characteristics of the home, we include head of household, marital status, children, income, assets, and ownership of the home. Finally, we include a control by geographical areas, which defines the Northern Chilean region from I to IV, the Central Chilean region from V to VII, and the Southern Chilean region from VIII to XII. Thus, we make comparisons with respect to the Metropolitan Regions.

6. RESULTS

We obtain estimates of the marginal effects for each of the parameters defined in the model, as detailed in Table 6. Table 7 provides the probit model results. We find that as risk aversion increases, the probability of taking out insurance also increases (parameter $K_i = 0{,}0289$ and significant at 5%); the results are maintained at the level of samples. This result allows us to establish that people who are most risk-averse consider their preferences in the

decision to take out a life insurance policy. We find a positive correlation between being hospitalized and the probability of purchasing a life insurance (0.0903, significant), which is in line with our main hypothesis. People who suffer this particular loss of capital review their likelihood of death and therefore are more likely to want to take out a life insurance.

We find evidence of an inverted U in the schooling variable. The value is maximized at 21 years of schooling, representing more than a college education. Most of the population having more education is associated with a greater likelihood of a life insurance contract, which has been reported in other studies (Beck and Webb, 2003; Browne and Kim, 1993; Truett and Truett, 1990). Being married (0.0751, significant) or living together (0.0467, significant) increases the probability of taking out a life insurance policy. Also, having children under 15 years old positively influences the decision to take out a life insurance policy, which is consistent with prior literature (Love, 2010; Scholz and Seshadri, 2007).

In line with previous studies (Browne and Kim, 1993; Campbell, 1980; Lewis, 1989; Outreville, 1996; Truett and Truett, 1990), we find that higher income is positively associated with the likelihood of purchasing life insurance (0.0168, significant). Being client of a bank is also positively associated with life insurance purchases (0.19, significant at 1%). This finding suggests that access restrictions to that sector are relevant in this economy, because people with low wages may not be offered an insurance policy for solvency issues. The estimates for the geographic areas of Chile compared to the metropolitan region show significant and increasing results as people move away from this region, which may be explained by cultural phenomena, as pointed out by Finkelstein and Poterba (2006).

7. CONCLUSIONS

We find significant evidence that a high level of risk aversion and a prior hospital stay increase the likelihood that an individual will take out a life insurance policy. This finding suggests that a threshold exists beyond which people increase their impatience to secure their lives, creating a greater need to purchase insurance.

We also find that being a couple (married or living together) and having children under 15 positively affects the probability of getting a life insurance. These findings are consistent with the notion that the individual is concerned for his or her spouse and dependents and therefore seeks compensation in financial terms in the case of his or her death. We find a positive and significant correlation with variables such as income and schooling. These

findings are consistent with the notion that people with higher incomes have greater incentives to leave their dependents protected. In turn, the literature suggests that people with a more education are more aware of risk and thus seek more insurance. Finally, the evidence suggests that the requirements for obtaining a life insurance policy influences the decision to purchase this insurance. Specifically, we show that individuals with a bank account or any link with a financial institution are more likely to purchase life insurance, which can be explained by an increase in the ability to pay the insurance premiums.

A natural extension of this work is to drive estimates over time and examine dynamic decisions to take out insurance, to establish consistency in the behavior of life insurance consumers, and to test the robustness of these results for which purpose this article establishes some conditions to do so.

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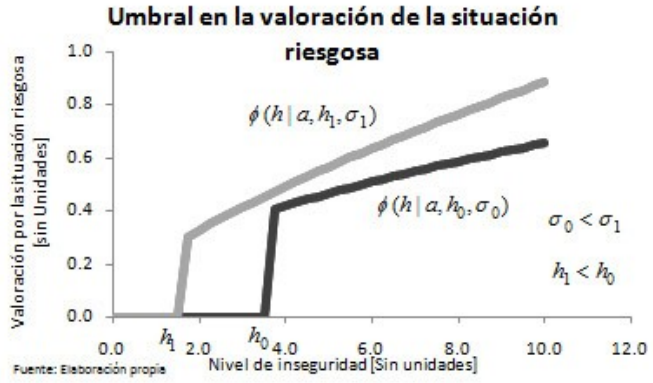
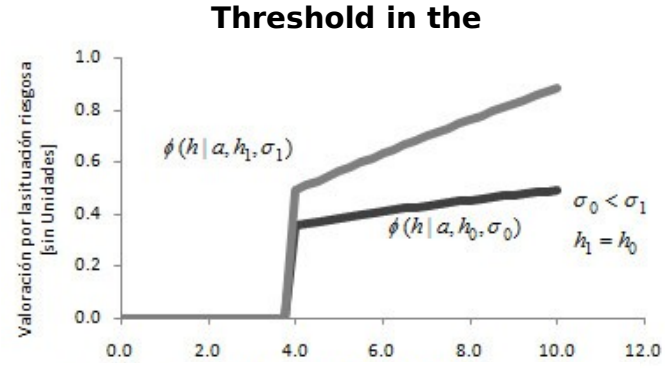
Figure 1. Behavior of impatience to insure life when facing a loss of capital event



Source: p Fuente: Elaboración propia

Figure 2. Impatience to insure life, with the same safety threshold



Source: prepared l

Table 1. Levels of risk aversion, among pensioners and nonpensioners

Level of aversion	Population		Survey	
Older than 18 years	*n*	%	*n*	%
Low 1	2,278,115	19.82	2,716	18.04
Medium Low 2	985,508	8.58	1,194	7.93
Medium High 3	750,826	6.53	852	5.66
High 4	7,478,283	65.07	10,290	68.36
Total	11,492,732	100.00	15,052	100.00

Notes: Data from Encuesta de Protección Social (Department of Economics at the University of Chile and the University of Pennsylvania, 2006).

Table 2. Share of the self-reported policyholders in the ESP 2006.

Owns life insurance	Population		Survey	
(self-reported)	*n*	%	*n*	%
Yes	2,114,590	17.1	3,097	19.0
No	10,224,680	82.9	13,216	81.0
Total	12,339,270	100.0	16,313	100.0

Notes: Data from Encuesta de Protección Social (ESP; Department of Economics at the University of Chile and the University of Pennsylvania, 2006). 0.8% of respondents did not provide information on the holding of life insurance

Table 3. Participation of those who have been hospitalized and have life insurance

Have been hospitalized in	Sample Have life insurance	
the last two years	Yes (%)	No (%)
Yes	11.2	7.8
No	88.8	92.2
Total	100.0	100.0

Notes: Data from Encuesta de Protección Social (ESP; Department of Economics at the University of Chile and the University of Pennsylvania, 2006).

Table 4. Participation of level of risk aversion by hospitalization and group

Level of aversion	Sample Have been hospitalized	
Older than 18 years	Yes (%)	No (%)
Low 1	18.1	19.1
Medium Low 2	6.5	8.7
Medium High 3	6.2	7.0
High 4	69.1	65.2
Total	100.0	100.0
Average	3.26	3.18

Notes: Data from Encuesta de Protección Social (ESP; Department of Economics at the University of Chile and the University of Pennsylvania, 2006). The sample represents 7,319; 9% have been hospitalized.

Table 5. Holders of life insurance hospitalized by level of risk aversion.

	Have life insurance (30%)		Do not have life insurance (70%)	
Level of aversion	Hospitalized (11%)	Not hospitalized (89%)	Hospitalized (7%)	Not hospitalized (93%)
Older than 18 years	(%)	(%)	(%)	(%)
Low 1	18.1	18.4	18.2	19.4
Medium Low 2	6.0	8.3	6.8	8.9
Medium High 3	4.8	7.5	7.1	6.9
High 4	71.1	65.9	67.9	64.9
Total	100.0	100.0	100.0	100.0
Average	3.29	3.21	3.25	3.17

Notes: Data from Encuesta de Protección Social (ESP; Department of Economics at the University of Chile and the University of Pennsylvania, 2006).

Table 6. Estimate of robust marginal effects, on the decision to take out a life insurance policy.

Variables	(i)	(ii)	(iii)	(iv)	(v)	(vi)
Gender (Male=1)	0.0234**	0.021*	0.0213*	–0.0014	–0.0265*	–0.0265*
	(0.011)	(0.0109)	(0.0109)	(0.0131)	(0.0138)	(0.0137)
Schooling (Years)	0.0278***	0.0274***	0.0277***	0.0256***	0.0307***	0.0305***
	(0.0073)	(0.0073)	(0.0073)	(0.0074)	(0.0075)	(0.0075)
Schooling ^{2} (Years^2)	0.0001	0.0001	0.0001	0.0002	–0.0007**	–0.0007**
	(0.0003)	(0.0003)	(0.0003)	(0.0003)	(0.0003)	(0.0003)
Age (Years)	0.0202***	0.0204***	0.0203***	0.0081*	0.0025	0.0019***
	(0.0043)	(0.0043)	(0.0043)	(0.0046)	(0.0047)	(0.0007)
Age^2 (years^2)	–0.0002***	–0.0002***	–0.0002***	–0.0001	0 (0.0001)	
	(0.0001)	(0.0001)	(0.0001)	(0.0001)		
K_i	0.0303***	0.0309***		0.0279**	0.0291**	0.0289**
High risk aversion (Yes=1)	(0.0114)	(0.0114)		(0.0114)	(0.0116)	(0.0116)
Health perception (Good = 1)	0.029*	0.0211	0.0262	0.0299*	0.0012	0.0021
	(0.0178)	(0.0175)	(0.0177)	(0.0178)	(0.0176)	(0.0176)
Health perception (Regular = 1)	0.0417***	0.036**	0.0411***	0.04***	0.0241*	0.0246*
	(0.014)	(0.0139)	(0.014)	(0.014)	(0.0142)	(0.0142)
E_i	0.0943***		0.0949***	0.0925***	0.0899***	0.0903***
Hospitalization (Yes=1)	(0.0204)		(0.0204)	(0.0204)	(0.0208)	(0.0208)
Householder (Yes=1)				0.0287**	–0.0073	–0.0092
				(0.0134)	(0.014)	(0.0139)
Marital Status (Married=1)				0.0987***	0.076***	0.0752***
				(0.0139)	(0.0142)	(0.0142)
Marital Status (Living together = 1)				0.0573***	0.0483**	0.0467**
				(0.0211)	(0.0211)	(0.021)
Children < 15 years in home (Yes = 1)				0.025*	0.0233*	0.0238*
				(0.0133)	(0.0135)	(0.0128)
Banking institution (Yes = 1)					0.1866***	0.1864***
					(0.013)	(0.013)
Labor income (MM$)					0.0164***	0.0168***
					(0.0029)	(0.0029)
Capital income (MM$)					–0.0029	
					(0.0021)	
Income from subsidies (MM$)					0.0035	
					(0.0052)	
Assets (MM$)					0.0019	
					(0.0013)	
Homeowner (Owner=1)					0.0066	
					(0.0134)	
Homeowner (Being paid=1)					0.0789***	0.0753***
					(0.0179)	(0.0153)
Occupationally Active (Yes=1)					0.0546***	0.0536***
					(0.0152)	(0.0151)
Northern Region (Regions I–IV = 1)					0.0739***	0.0736***
					(0.0192)	(0.0191)
Center Region (Regions V–VII = 1)					0.0348**	0.0343**
					(0.0154)	(0.0154)
Southern Region (Regions VIII–XII = 1)					0.041***	0.041***
					(0.0142)	(0.0142)
Number of observations	7319	7319	7319	7319	7319	7319
Log Likelihood	–4281.97	–4293.28	–4285.48	–4241.42	–4015.74	–4018.57
Pseudo – R^2	0.0471	0.0446	0.0464	0.0562	0.1064	0.1058
Obs. P	0.3037	0.3037	0.3037	0.3037	0.3037	0.3037
Pred. P	0.2946	0.2950	0.2948	0.2930	0.2861	0.2862

***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively. Standard deviations are in parentheses.

Table 7. Probit estimation on the decision to take out a life insurance policy (Robust).

Variables	(i)	(ii)	(iii)	(iv)	(v)	(vi)
Gender (Male=1)	0.0678**	0.0609*	0.0618*	–0.0042	–0.0778*	–0.0779*
	(0.0318)	(0.0317)	(0.0317)	(0.0381)	(0.0405)	(0.0404)
Schooling (years)	0.0806***	0.0794***	0.0805***	0.0745***	0.0901***	0.0896***
	(0.0212)	(0.0213)	(0.0212)	(0.0214)	(0.0221)	(0.022)
Schooling2	0.0002	0.0003	0.0002	0.0006	–0.0021**	–0.0021**
	(0.0009)	(0.0009)	(0.0009)	(0.0009)	(0.001)	(0.001)
Age (Years)	0.0587***	0.0592***	0.059***	0.0236*	0.0075	0.0057***
	(0.0125)	(0.0125)	(0.0125)	(0.0135)	(0.014)	(0.002)
Age2	–0.0006***	–0.0006***	–0.0006***	–0.0002	0 (0.0002)	
	(0.0002)	(0.0002)	(0.0002)	(0.0002)		
High risk aversion (Yes=1)	0.0886***	0.0904***		0.0818**	0.0863**	0.0856**
	(0.0336)	(0.0336)		(0.0338)	(0.0346)	(0.0346)
Health perception (Good = 1)	0.083*	0.0607	0.0751	0.0858*	0.0035	0.0062
	(0.0503)	(0.0499)	(0.0501)	(0.0504)	(0.0518)	(0.0518)
Health perception (Regular = 1)	0.1214***	0.1046**	0.1196***	0.1167***	0.071*	0.0723*
	(0.0409)	(0.0406)	(0.0409)	(0.0411)	(0.042)	(0.042)
Hospitalization (Yes=1)	0.2601***		0.2616***	0.2558***	0.2511***	0.2522***
	(0.054)		(0.054)	(0.0541)	(0.0558)	(0.0557)
Householder (Yes=1)				0.0836**	–0.0214	–0.027
				(0.0392)	(0.0412)	(0.0407)
Marital Status (Married=1)				0.2897***	0.2251***	0.2227***
				(0.0414)	(0.0425)	(0.0424)
Marital Status (Living together = 1)				0.1617***	0.138**	0.1337**
				(0.0578)	(0.0588)	(0.0586)
Children < 15 years in home (Yes = 1)				0.0726*	0.0684*	0.0698*
				(0.0386)	(0.0396)	(0.0376)
Banking institution (Yes = 1)					0.5294***	0.5288***
					(0.0361)	(0.0361)
Labor income (MM$)					0.0482***	0.0493***
					(0.0086)	(0.0085)
Capital income (MM$)					–0.0086	
					(0.0062)	
Income from subsidies (MM$)					0.0104	
					(0.0153)	
Assets (MM$)					0.0057	
					(0.0038)	
Homeowner (Owner=1)					0.0195	
					(0.0394)	
Homeowner (Being paid=1)					0.2236***	0.2136***
					(0.0491)	(0.0422)
Occupationally Active (Yes=1)					0.1646***	0.1615***
					(0.0472)	(0.0469)
Northern Region (Regions I–IV = 1)					0.2088***	0.2079***
					(0.0523)	(0.0522)
Center Region (Regions V–VII = 1)					0.1007**	0.0992**
					(0.0439)	(0.0439)
Southern Region (Regions VIII–XII = 1)					0.1187***	0.1188***
					(0.0406)	(0.0405)
Constant	–3.0526***	–3.0281***	–2.9937***	–2.5056***	–2.3339***	–2.2887***
	(0.2764)	(0.2756)	(0.2754)	(0.2856)	(0.2966)	(0.171)

Table 7 continues

Table 7 (*continued*)

Number of observations	7,319	7,319	7,319	7,319	7,319	7,319
Wald Chi2	386.74	367.52	382.03	457.76	843.11	838.67
Prob>chi2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
R^2	0.0471	0.0446	0.0464	0.0562	0.1064	0.1058
AIC	8,583.93	8,604.57	8,588.95	8,510.84	8,081.48	8,077.14
BIC	8,652.91	8,666.65	8,651.04	8,607.41	8,253.93	8,215.11

* Significant at 10%; ** Significant at 5%; *** Significant at 1%; ( ) Sample standard deviation.