

## THE DEMAND FOR LIFE INSURANCE IN OECD COUNTRIES

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### ABSTRACT

This article examines the determinants of life insurance consumption in OECD countries. Consistent with previous results, we find a significant positive income elasticity of life insurance demand. Demand also increases with the number of dependents and level of education, and decreases with life expectancy and social security expenditure. The country's level of financial development and its insurance market's degree of competition appear to stimulate life insurance sales, whereas high inflation and real interest rates tend to decrease consumption. Overall, life insurance demand is better explained when the product market and socioeconomic factors are jointly considered. In addition, the use of GMM estimates helps reconcile our findings with previous puzzling results based on inconsistent OLS estimates given heteroscedasticity problems in the data.

### INTRODUCTION

Life insurance demand has experienced a rapid growth over the last few decades, significantly outpacing worldwide income growth. Widespread socioeconomic changes have underpinned this development; particularly, the dramatic extension of life expectancy and the higher enrolment rate in tertiary education. All of these factors contribute to increasing the cost of dependence and provide the rationale for life insurance coverage. In addition, the limits of social welfare as tax pressure reaches a breaking point are now widely expected to stimulate life insurance consumption in the coming years, as households anticipate public institutions' covering fewer of their future financial needs. Market structure developments have similarly contributed to the increasing popularity of life insurance. The increasing openness of domestic markets to foreign competition following international trade agreements, especially the Uruguay round, have resulted in more attractive and better priced products that are better suited to customer demand. Furthermore, the development of financial savings

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in a retirement perspective is seen to bolster life insurance demand in rapidly aging economies.

Despite the increasing number of studies regarding the determinants of life insurance consumption, several issues remain unclear. In particular, what are the effects of social security expenditures? Likewise, is a longer life expectancy associated with a higher or lower demand for life insurance? Earlier papers concerned with micro-level determinants (e.g., Burnett and Palmer, 1984; Fitzgerald, 1987) and focused on the U.S. insurance market (e.g., Mantis and Farmer, 1968; Chen, Wong, and Lee, 2001) could not properly address these questions. In fact, only cross-country comparisons allow studying socioeconomic variables that change slowly over time, such as life expectancy, to have a measurable influence, which goes undetected in time series analyses. In addition, some economic variables assumed to have a theoretical influence, such as social security expenditures, cannot be disaggregated at the household level. Beenstock, Dickinson, and Khajuria (1986), Browne and Kim (1993), Outreville (1996), and, more recently, Beck and Webb (2003) illustrate the benefit of analyzing life insurance demand on a cross-country basis. However, the first of these studies relies on a limited number of developed countries, whereas the remaining three mix widely different economies. In other words, the study by Beenstock, Dickinson, and Khajuria (1986) is the only study that focuses on demand for life insurance in the OECD countries covering the years 1970 through 1981 and studying only 10 OECD countries. At the same time, the studies by Browne and Kim (1993) and Outreville (1996) focus on developing countries. However, the study by Beck and Webb (2003) cover both developed and developing countries in their sample. Although they separate developing countries from the whole sample that consists of both developed and developing countries, in their study, they did not conduct any specific testing exclusively for the OECD countries, and subsequently there is no attempt in their model to specify those determinants that could be more appropriate to reflect the characteristics of demand for life insurance in the OECD countries.

In other words, although Beck and Webb's (2003) study is the most comprehensive study of life insurance demand, the key determinants to assess demand for life insurance have been mainly those of developing countries, and hence, the variables that they chose were predominantly a reflection of this reality.

Thus, this study is the first study after Beenstock, Dickinson, and Khajuria (1986) that specifically identifies those factors that are most relevant to demand for life insurance and extends the coverage from 10 to 25 OECD countries. Furthermore, this is the first study in this area to use GMM estimation as a way of unraveling some of the statistical inconsistencies that one could have observed in the past studies owing to their use of OLS estimate. (The exception is Beck and Webb, 2003, who used the instrumental variables.) Furthermore, this study is the first study to conduct an empirical study of demand for life insurance for the OECD countries for the 1990s.

Thus, as the focus of this article is only on the OECD countries, it avoids mixing different country characteristics and heterogeneous consumer demand. The main conclusion of this article is that socioeconomic and product market factors play significant roles in isolation, but have equally important cross effects. Disposable income and financial development are positively associated with life insurance demand, whereas the level of social expenditure constrains its development. This article also finds

evidence that openness of markets has a positive effect on demand, suggesting that foreign competition is good for local consumers. Overall, the results support the rational purchase of insurance. Households across OECD countries appear to contemplate insurance consumption taking into account the expected loss of lifetime income as well as the attractiveness of the investment product.

The rest of the article is structured as follows: "Literature Review on Life Insurance Demand" reviews the literature regarding the demand for life insurance products; "Determinants of Life Insurance Demand" develops an empirical model of life insurance demand; the next section presents the data; "Empirical Result" provides and discusses the empirical results; the final section concludes.

### **LITERATURE REVIEW ON LIFE INSURANCE DEMAND**

Life insurance demand has generally been modeled in the life cycle framework in which households maximize the expected utility of their lifetime consumption. Yaari (1965), Håkansson (1969), Fischer (1973), and Campbell (1980) assume that households receive uncertain income streams owing to the wage earner's likelihood of premature death. Life insurance is used as a mechanism working toward reducing the volatility of household consumption. Uncertainty surrounding lifetime expectancy thus directs the consumption of life insurance. The models also suggest that risk aversion plays an important role. In a recent survey, Zietz (2003) lists several studies documenting the positive association between risk aversion and life insurance consumption.

Bequest appears to be another significant determinant of life insurance demand. Life insurance companies frequently articulate this viewpoint in their advertisement campaigns. Bernheim (1991) demonstrates that bequest represents a powerful motive for saving among U.S. households. Campbell (1980) emphasizes that bequest motives and risk aversion should not be confounded although they may have similar effects. To clarify the issue, Lewis (1989) analyzes the problem from the perspective of the insurance beneficiaries rather than the perspective of the wage earner, on whose life the insurance contract is written. The demand for life insurance still depends on the wage earner's chances of mortality, which affects the present value of the underlying income stream. However, the expected utility and risk aversion of the policy's beneficiaries become the new drivers of life insurance demand. Current wealth works as a self-insurance moderator and reduces the amount of life insurance purchased.

Many issues can affect individual demand. Burnett and Palmer (1984) examine psychographic and demographic factors and find that work ethic and religion as well as education and income, among other characteristics, are significant factors of life insurance ownership. Based on a cohort analysis, Chen, Wong, and Lee (2001) provide evidence of a gender effect, combined with a life cycle effect. Hammond, Houston, and Melander (1967) underline the importance of the household head's occupation. Financial market conditions play a significant role in short-term demand, as does the performance of alternative investments. Using a cost index developed in Babbel and Staking (1983), Babbel (1985) demonstrates that the price has a negative influence on insurance demand. Considering that life insurance products are typically packaged as investment products offering life insurance benefits, Fortune (1973) argues

that life insurance is a substitute for traditional financial assets such as equities and bonds. Headen and Lee (1974) document that short-term demand for life insurance is influenced by consumer sentiment, interest rates, and savings rates.

Although the above studies focus essentially on U.S. households, recent studies have taken advantage of cross-country differences to investigate the influence of socioeconomic factors. Using a set of 10 developed economies, Beenstock, Dickinson, and Khajuria (1986) show that dependency ratio, life expectancy, and disposable income have a positive influence, whereas social security expenses decrease insurance demand. In Browne and Kim's (1993) survey of a larger set of developed and developing countries, dependency ratio, national income, social spending, and anticipated inflation rate are found to influence the country's average life insurance consumption. In another cross-country analysis, Outreville (1996) underlines the importance of market structures and finds that monopolistic market conditions appear to prevent the growth of life insurance. Consistent with previous findings, households' disposable income and the country's level of financial development and inflation rate are positively associated with life insurance consumption. Beck and Webb (2003) confirm the positive influence of income and dependency. However, there appears to be no significant role for life expectancy and social security expenditures on their more heterogeneous sample.

## **DETERMINANTS OF LIFE INSURANCE DEMAND**

On the basis of the existing theoretical and empirical literature, we identify eight socioeconomic characteristics and product market conditions, for which data are available, that could affect the demand for life insurance. These factors are as follows: disposable income, life expectancy, number of dependents, level of education, social security expenditure, financial development, foreign market share, anticipated inflation, and real interest rates.

### **Disposable Income**

Income is a central variable in insurance demand models that positively affects life insurance consumption (see Fortune, 1973; Campbell, 1980; Lewis, 1989). In addition to increasing the affordability of life insurance products, a large income results in a greater loss of expected utility for the dependents in the event of the income earner's death. This effect increases the value of life insurance coverage, and therefore contributes to the positive relationship with income. Working on household-level data, Fitzgerald (1987) shows that insurance demand increases with the husband's future earnings (and decreases with the wife's future earnings). Most empirical works on cross-country data use nominal GDP per capita as a proxy for disposable income. It is known, in that case, that aggregate demand is biased by positive skewness in the income distribution as individual wealth affects insurance demand. However, this issue should pose fewer problems in our sample of developed countries. Beenstock, Dickinson, and Khajuria (1986), Truett and Truett (1990), Browne and Kim (1993), Outreville (1996), and Beck and Webb (2003) provide evidence of the positive relationship between life insurance demand and income.

### Life Expectancy

Following the theoretical development of Lewis (1989), in which the goal is to maximize the dependents' expected lifetime utility, life insurance consumption is hypothesized to increase with the wage earner's probability of death. Considering that life expectancy is inversely related to the probability of death, we expect to find a negative relationship between life expectancy and insurance consumption. Browne and Kim (1993), Outreville (1996), and Beck and Webb (2003) test this relationship. In all these studies, the effect of life expectancy is found to lack statistical significance. One explanation may be that a longer life expectancy also decreases the price of life insurance and therefore tends to stimulate its consumption.

### Number of Dependents

Campbell (1980) and Burnett and Palmer (1984) argue that the protection of dependents against financial hardships is the major force driving life insurance consumption. As shown in Lewis (1989), the demand for life insurance increases with the expected value of the dependents' lifetime consumption. This expected value obviously increases with the number of dependents. Hence, the greater need to safeguard them against the premature death of the wage earner. To capture this relationship on aggregate data, most studies use the dependency ratio defined as the ratio of dependents—under 15 and over 64—to the working-age population aged between 15 and 64. Beenstock, Dickinson, and Khajuria (1986) and Browne and Kim (1993) find a significant positive relationship. Beck and Webb (2003) suggest that aged dependency (above 64) is actually more important than young dependency (below 15).

### Level of Education

The level of education positively affects the demand for life insurance in two respects. Truett and Truett (1990) argue that a higher level of education is associated with a stronger desire to protect dependents and safeguard their standard of living. Browne and Kim (1993) explain that a higher level of education results in a greater awareness of life's uncertainties and hence highlights the benefit of life insurance coverage. Outreville (1996) also supports the view expressed by Browne and Kim (1993). In addition, the level of education is associated with the duration of the offspring's dependency, resulting in an increased need for protecting beneficiaries through life insurance. We measure a country's level of education by its tertiary gross enrollment ratio (GER), defined by the UNESCO Institute of Statistics as the total enrolment in tertiary education, regardless of age, expressed as a proportion of the eligible school-age population. Beck and Webb (2003) use the average years of schooling in the population over 25 years of age as an alternative method more appropriate for measuring educational level in developing countries.

### Social Security Expenditure

Social security is expected to decrease the demand for life insurance. Browne and Kim (1993) explain that social security expenditure is a proxy for national wealth, which can be viewed as a substitute for life insurance coverage (or self-coverage). Skipper and Klein (2000) indicate that generous social welfare programs reduce the cost of dependence. Following his theoretical development, Lewis (1989) argues that social security expenditure is a form of mandatory life insurance that can displace the

need for private insurance. Furthermore, given that social security benefits come from taxes, which reduce available income to purchase life insurance, high social security expenditure is hypothesized to reduce the consumption of life insurance. Beenstock, Dickinson, and Khajuria (1986) find strong evidence of a negative relationship between social security and life insurance demand among developed countries. The results of Browne and Kim (1993) suggest, however, that the relationship may not be robust to the inclusion of developing countries. As in previous studies, social security expenditure is measured by aggregate public social expenditure (since detailed expenditure by type of beneficiaries is unavailable for most countries).

### Financial Development

Financial development is associated with the widespread securitization of cash flows, which enables households to secure future income through the ownership of financial assets. By offering similar benefits, life insurance is expected to generate higher sales in countries with a high level of financial development. Focusing on developing countries, Outreville (1996) documents a positive relationship between life insurance consumption and the complexity of the financial structure defined as the ratio of quasi-money ( $M2-M1$ ) to the broad definition of money ( $M2$ ).

### Foreign Market Share

High levels of foreign participation in a domestic market may reflect the attractiveness of the market to foreign insurers, and suggests a high insurance consumption. A low level of foreign participation may also reflect the high degree of competitiveness of the domestic market, as well as its possible saturation. A high insurance consumption is thus expected from low levels of foreign participation. Given these two arguments, we hypothesize a U-shaped relationship between foreign market share and life insurance demand. To test this functional relationship, we use both foreign market share and its quadratic form, anticipating a negative sign for the first variable and a positive sign for the second variable. Foreign market share has not been used extensively in previous research, mainly due to data availability (a recent paper that uses this variable is Ma and Pope, 2003). Our analysis differs from Outreville (1996), who introduces a dummy variable to control for the presence of foreign insurers in developing markets. We use actual foreign market share figures, defined as the ratio of foreign-controlled undertakings and branches, and agencies of foreign undertakings to total domestic business on a gross premiums basis.

### Anticipated Inflation

The negative effect of inflation on life insurance demand is well documented. Fortune (1973) explains that inflation erodes the value of life insurance, making it a less attractive product. Browne and Kim (1993) and Outreville (1996) provide empirical evidence that anticipated inflation has a negative effect on life insurance consumption. As Babbel (1981) demonstrates, using Brazilian data over a period characterized by runaway inflation, even when inflation-adjusted life insurance products are used, demand for these products is affected by the deleterious effects of inflation. Consistent with Outreville (1996), we use average consumer price changes over 5 years as a proxy for anticipated inflation.

### Real Interest Rates

Real interest rates have not been systematically included in all studies. For example, Browne and Kim (1993) neglect the influence of this variable on life insurance demand. Outreville (1996) finds the correlation of real interest rates with life insurance demand to be almost insignificant. One theoretical justification for this outcome is that high real interest rates may decrease the cost of insurance, thus stimulating its demand. On the other hand, they may cause consumers to reduce their number of purchases given the anticipation of higher returns. Beck and Webb (2003) appear to detect a positive relationship using average lending rates. However, it can be noted that lending rates contain a credit risk premium that varies from one country to another, depending on its credit default experience. We use the yield on government bonds (which are virtually free from credit risk) less the country's rate of inflation to measure real interest rates. In some cases, such as Iceland and Turkey, where bond markets are nonexistent, bond yields are replaced by money market rates.

### A Model of Life Insurance Demand

Given the hypotheses specified above, the following model for life insurance demand is proposed with the expected sign for each variable:

$$\begin{aligned} \text{LFINS} = f(\text{INCOME}, \text{LIFEXP}, \text{NBDEPT}, \text{EDUC}, \text{SSEX}, \text{FINDEV}, \text{FMSHRE}) \\ (+) \quad (-) \quad (+) \quad (+) \quad (-) \quad (+) \quad (+/-) \\ \text{INFLN}, \text{REALINT}) \\ (-) \quad (+/-) \end{aligned}$$

where

- LFINS = demand for life insurance (per capita in U.S. dollars);
- INCOME = income (nominal GDP per capita in U.S. dollars);
- LIFEXP = average life expectancy;
- NBDEPT = dependency ratio (under 15 and over 64/15–64);
- EDUC = education level (tertiary gross enrolment ratio);
- SSEX = social Security expenditure (per capita in U.S. dollars);
- FINDEV = financial development (M2/GDP);
- FMSHRE = foreign participants' market share;
- INFLN = anticipated inflation (average of previous 5 years);
- REALINT = real interest rates (bond yields less inflation).

To account for nonlinearity in foreign participation (FMSHRE), the square of FMSHRE is included in the model.

The most common specification is the log-linear form used by Outreville (1996), Browne and Kim (1993), and Ma and Pope (2003). The log-linear form is indicated for demand functions specified on macroeconomic variables, which tend to display exponential growth. However, the log transformation presents some inconvenience

when variables are measured as proportions. To determine which variables should be specified in log form, the Box–Cox procedure is employed to suggest the following model:

$$\begin{aligned}\log(\text{LFINS}) = & \beta_0 + \beta_1 \log(\text{INCOME}) + \beta_2 \log(\text{LIFEXP}) + \beta_3 \log(\text{NBDEPT}) \\ & + \beta_4 \log(\text{EDUC}) + \beta_5 \log(\text{SSEX}) + \beta_6 \log(\text{FINDEV}) \\ & + \beta_7 \text{FMSHRE} + \beta_8 \text{FMSHRE}^2 + \beta_9 \text{INFLN} + \beta_{10} \text{REALINT} + \varepsilon.\end{aligned}$$

Furthermore, we investigate the specific contributions of socioeconomic factors and product market conditions by retaining INCOME, LIFEXP, NBDEPT, EDUC, and SSEXP in one model and INCOME, FINDEV, FMSHRE, INFLN, and REALINT in a second model.

## DATA

We use cross-section data for the 30 OECD countries from 1993 through 2000. Missing data for Greece, Italy, New Zealand, and Sweden (foreign market share) and the Slovak Republic (life expectancy) restricts the sample to the following countries: Australia, Austria, Belgium, Canada, Czech Republic, Denmark, Finland, France, Germany, Hungary, Iceland, Ireland, Japan, Korea, Luxembourg, Mexico, the Netherlands, Norway, Poland, Portugal, Spain, Switzerland, Turkey, United Kingdom, and the United States. Other missing annual data for the selected countries further reduces the sample from 240 to 152 observations.

Data for life insurance premiums are obtained from the OECD *Insurance Statistical Yearbook*. Life insurance premiums are expressed in U.S. dollars per capita and defined as premiums sold by both domestic and foreign-controlled companies. Data on foreign market share are obtained from the same source and defined as the ratio of the sum of foreign-controlled undertakings plus branches and agencies of foreign undertakings to total domestic business on a gross premiums basis.

Inflation figures (percentage change in the consumer price index of the respective countries) and M2 stock are obtained from the IMF's *International Financial Statistics* CD-ROM. M2 figures are converted into U.S. dollars. Population figures are from OECD *Economic Outlook: Annual and Semi-annual Data*, Vol. 2003, Release 01. Education levels (measured by tertiary GER) are obtained from the UNESCO *Statistical Yearbook*. Social Security data are from the OECD *Public Expenditure*, Vol. 2001, Release 01. Average life expectancy figures are from the *World Competitiveness Yearbook*, various issues. GDP figures and exchange rates are taken from the OECD Annual National Accounts (volume 1) Main aggregates, Vol. 2002, Release 04. The GDP figures are on a per capita basis and are expressed in U.S. dollars. The exchange rates for countries that switched to the Euro in 1999 have those years adjusted by using the fixed exchange rate between the Euro and the domestic currency as obtained from the European Central Bank. Real interest rates are based on benchmark government bond yields obtained from Datastream, with missing values replaced by average overnight interbank lending rates (also from Datastream).

Table 1 presents the summary statistics for the regression variables. Life insurance consumption in OECD countries appears to represent a substantial portion of per

**TABLE 1**  
Summary Statistics

| Variables | Mean      | Std. Dev.  | Lower Quartile | Median    | Upper Quartile | N   |
|-----------|-----------|------------|----------------|-----------|----------------|-----|
| LFINS     | 1,266.58  | 1,989.43   | 299.21         | 785.95    | 1,341.13       | 152 |
| INCOME    | 21,499.51 | 11,780.93  | 10,902.47      | 23,380.16 | 29,882.36      | 152 |
| LIFEXP    | 76.57     | 2.69       | 75.50          | 77.40     | 78.50          | 152 |
| NBDEPT    | 0.54      | 0.28       | 0.46           | 0.49      | 0.53           | 152 |
| EDUC      | 46.90     | 18.81      | 37.30          | 47.55     | 57.70          | 152 |
| SSEX      | 74,359.11 | 145,026.40 | 3,611.04       | 7,766.50  | 42,934.54      | 152 |
| FINDEV    | 85.81     | 66.67      | 57.12          | 67.97     | 92.77          | 152 |
| FMSHRE    | 19.72     | 19.09      | 6.43           | 13.94     | 30.32          | 152 |
| INFLN     | 8.76      | 17.51      | 2.17           | 3.03      | 5.42           | 152 |
| REALINT   | 2.81      | 7.92       | 1.51           | 3.16      | 4.19           | 152 |

*Notes:* LFINS = life insurance sales per capita (in U.S. dollars); INCOME = nominal GDP per capita (in U.S. dollars); LIFEXP = average life expectancy (in years); NBDEPT = dependency ratio (under 15 and over 64/between 15 and 64); EDUC = tertiary gross enrollment ratio; SSEXP = Social Security expenditure per capita (in U.S. dollars); FINDEV = M2/GDP; FMSHRE = market share of foreign life insurers (in %); INFLN = average inflation rate in previous 5 years; REALINT = government bond yield minus inflation rate.

capita income, with an average of 5.9 percent corresponding to average purchases of about US\$1,267 over an average income of US\$21,500. Average demand exhibits a large dispersion across OECD countries. One quarter of the sample presents an average demand less than US\$300, whereas another quarter presents an average demand higher than US\$1,340. Average income is slightly less dispersed, the higher quartile being only 3 times the lowest quartile. On the other hand, social security expenditure exhibits a very large dispersion. Sociodemographic characteristics such as life expectancy and dependency ratio are seen to be quite similar across the sample.

OECD countries present significant variations in their levels of financial development. Foreign participation in a country's life insurance market can vary substantially, with one-fourth of the sample displaying foreign market share below 6.4 percent and one-fourth having foreign market share above 30.3 percent. Inflation rates are seen to be generally moderate, with a median around 3 percent, close to the median and average of real interest rates.

## EMPIRICAL RESULT

### Univariate Analysis

Table 2 presents the average values of the explanatory variables classified by life insurance consumption quartiles. Differences between the upper and lower quartiles are also provided with *t*-test statistics in the last column. The first observation is that income is highly correlated with life insurance purchases. Average income also increases monotonically across life insurance quartiles. There appears to be a combination of wealth and preference effects as life insurance consumption almost doubles over the two central quartiles, whereas little difference is observed in terms of average income. On the other hand, the difference between the upper and lower quartiles reflects a strong wealth effect. In fact, average demand in the upper quartile is 3 times higher

**TABLE 2**  
Explanatory Variables by Life Insurance Sales Quartile

| Variables | Quartiles |            |           |           | DIFF 4-1  | t-Statistics |
|-----------|-----------|------------|-----------|-----------|-----------|--------------|
|           | 1         | 2          | 3         | 4         |           |              |
| LFINS     | 71.80     | 560.73     | 1056.59   | 3377.21   | 3305.41   | 6.61***      |
| INCOME    | 7,730.39  | 22,044.98  | 23,361.04 | 32,861.62 | 25,131.23 | 14.17***     |
| LIFEXP    | 73.82     | 77.30      | 76.76     | 78.40     | 4.58      | 8.29***      |
| NBDEPT    | 0.72      | 0.49       | 0.45      | 0.48      | -0.25     | -2.98***     |
| EDUC      | 30.31     | 54.62      | 62.22     | 40.45     | 10.15     | 2.92***      |
| SSEX      | 85,786.28 | 123,018.47 | 9,632.21  | 78,999.48 | -6,786.80 | -0.19        |
| FINDEV    | 53.24     | 81.19      | 63.81     | 145.02    | 91.78     | 5.56***      |
| FMSHRE    | 15.81     | 24.14      | 15.45     | 23.48     | 7.66      | 1.51         |
| INFLN     | 26.53     | 3.15       | 3.17      | 2.19      | -24.34    | -5.26***     |
| REALINT   | 1.28      | 3.36       | 4.10      | 2.50      | 1.21      | 0.47         |

\*\*\*Statistically significant at the 1% level.

than in the next quartile for average incomes only 50 percent higher. Likewise, life insurance demand falls to an average of only US\$71.8, revealing a high income elasticity at low income levels.

Contrary to expectations, life expectancy exhibits a positive relationship with life insurance demand, whereas the dependency ratio appears to influence life insurance demand negatively. This pattern is likely to reflect a wealth (income) effect. As income increases, so does life expectancy while the number of children tends to decrease. Controlling for wealth (income) effect appears necessary in order to reestablish the right direction of influence produced by these two variables. Increases in life insurance demand do not seem to be related to differences in social security expenditure and real interest rates. Education level and financial development present the postulated positive influence on insurance sales. In the opposite direction, high inflation rates appear to restrain the demand for life insurance. Finally, foreign participation displays a nonlinear relationship with life insurance that seems to warrant the inclusion of the squared form of foreign participants' market share in the regression models.

### Multivariate Analysis

Table 3 presents the regression results using pooled data. We use both OLS and GMM estimation methods. GMM corrects estimates for possible heteroscedasticity of residuals and cross-correlation among regressors (see Greene, 2000). The difference between the two methods is more likely to be seen in Models 1 and 2, given that all independent variables can be used as instruments in the GMM procedure. All regressions appear to produce a reasonably good fit, with adjusted  $R^2$  between 66 and 85 percent. In addition, the coefficients usually have the predicted signs. Both the White and Breusch-Pagan tests indicate significant heteroscedasticity problems that justify the use of the GMM estimators.

As suggested in the univariate analysis, the income variable has a positive and significant influence on life insurance demand. However, the income elasticity of life insurance demand displays significant variations across models, depending on

**TABLE 3**  
Socioeconomic and Financial Determinants of Life Insurance Consumption

|                         | OLS Regressions        |                       |                        | GMM Regressions      |                       |                       |
|-------------------------|------------------------|-----------------------|------------------------|----------------------|-----------------------|-----------------------|
|                         | 1                      | 2                     | 3                      | 1                    | 2                     | 3                     |
| Constant                | -25.2273<br>(-1.42)    | 0.0877<br>(0.07)      | 39.6207***<br>(2.76)   | -43.9430*<br>(-2.00) | -2.0624<br>(-1.23)    | 39.6082**<br>(2.13)   |
| INCOME                  | 1.0974***<br>(7.48)    | 0.7340***<br>(5.85)   | 0.6360***<br>(4.84)    | 1.2842***<br>(6.83)  | 0.9521***<br>(5.91)   | 0.6359***<br>(3.64)   |
| LIFEXP                  | 4.5693<br>(1.05)       |                       | -10.0767***<br>(-2.89) | 8.8775<br>(1.62)     |                       | -10.0737**<br>(-2.22) |
| NBDEPT                  | -0.8518***<br>(-2.64)* |                       | 1.5540***<br>(4.78)    | -0.4457*<br>(-1.93)  |                       | 1.5540***<br>(4.09)   |
| EDUC                    | -0.1128<br>(-0.60)     |                       | 2.1295***<br>(7.94)    | -0.2337<br>(-1.38)   |                       | 2.1296***<br>(5.53)   |
| SOCIAL                  | 0.0885**<br>(2.35)     |                       | -0.1361***<br>(-3.68)  | -0.0256<br>(-0.60)   |                       | -0.1362***<br>(-4.28) |
| FINDEV2                 |                        | 1.2506***<br>(5.63)   | 2.7163***<br>(10.09)   |                      | 0.7470***<br>(3.09)   | 2.7162***<br>(6.98)   |
| FMSHRE                  |                        | -1.9180*<br>(-1.88)   | -4.3163***<br>(-4.17)  |                      | -2.5949***<br>(-2.71) | -4.3171***<br>(-3.41) |
| FMSHRE2                 |                        | 1.2732<br>(0.92)      | 6.0830***<br>(3.93)    |                      | 2.6451<br>(1.63)      | 6.0844***<br>(3.16)   |
| INFLN                   |                        | -0.0330***<br>(-4.97) | -0.0298***<br>(-4.04)  |                      | -0.0316***<br>(-4.27) | -0.0298***<br>(-3.59) |
| REALINT                 |                        | -0.0225**<br>(-2.48)  | -0.0276***<br>(-3.42)  |                      | -0.0309***<br>(-5.18) | -0.0276***<br>(-4.43) |
| Adjusted R <sup>2</sup> | 0.6927                 | 0.7831                | 0.8571                 | 0.6675               | 0.7685                | 0.8571                |
| White's test            | 110.3***               | 106.4***              | 134.1***               | 116.0***             | 111.2***              | 133.9***              |
| Breusch-Pagan           | 45.85***               | 41.06***              | 46.93***               | 68.37***             | 65.91***              | 46.93***              |
| Number of observations  | 152                    | 152                   | 152                    | 152                  | 152                   | 152                   |

\*\*\*Statistically significant at the 1% level.

\*\*Statistically significant at the 5% level.

\*Statistically significant at the 10% level.

whether product market conditions are considered or not. Adopting a conservative interpretation, the results suggest that a 1% increase in aggregate income is associated with an increase of about 0.6 percent in life insurance sales. The results are consistent with the models of Campbell (1980) and Lewis (1989). Truett and Truett (1990), Browne and Kim (1993), Outreville (1996), and Beck and Webb (2003) obtain similar income elasticity coefficients.

Socioeconomic variables appear to play a less significant role in total insurance sales in comparison with product market characteristics. Consistent with Browne and Kim (1993) and Outreville (1996), we find that life expectancy is not always significant although it displays the postulated negative influence in Model 3. One reason may be the difficulty to separate the positive wealth effect associated with a higher life expectancy from the negative effect associated with the lower probability of the income earner's premature death. The results do not necessarily contradict the theoretical premise that protecting the dependents' expected future consumption motivates life insurance purchase. In fact, demand for life insurance displays a significant correlation with the number of dependents. The results are robust across estimation methods for Model 3. The negative influence suggested by the first OLS regression is considerably reduced when the more consistent GMM method is used. The result supports the insight of Campbell (1980) and Lewis (1989) that the number of dependents increases the value of the dependents' future consumption, which in turn stimulates the demand for life insurance. The results are also consistent with the findings of Browne and Kim (1993) and Outreville (1996), who find coefficients only slightly higher. Similarly, the education level is a positive and significant contributor to the demand for life insurance. The higher demand appears to reflect the increased level of risk aversion suggested by Browne and Kim (1993), which may reveal a greater awareness of life's uncertainties as well as the higher disutility associated with the dependents' loss of future consumption.

Reflecting the conflicting indications of previous studies that have sought to determine its effect, social security expenditure appears to have a mixed influence on life insurance demand. The OLS regression on Model 1 suggests that life insurance demand is positively related to social security expenditure. Hence, it would appear as in Browne and Kim (1993) that social security expenditure reflects the high level of wealth of a country and should therefore be associated with higher life insurance demand. In a longitudinal survey of U.S. households, Bernheim (1991) finds similarly that social security payments stimulate the purchase of life insurance. However, the equivalent GMM regression underlines the lack of robustness of this relationship. In addition, the inclusion of product market characteristics in Model 3 supports the opposite view that higher social security expenditure acts as indirect compulsory life insurance consumption and, consequently, induces lower voluntary life insurance consumption. This result is consistent with Lewis (1989) and confirms the findings of Beenstock, Dickinson, and Khajuria (1986), who also focus on developed economies.

The country's level of financial development appears to be a strong determinant of its life insurance consumption. As they accumulate more financial assets, households also purchase more life insurance. Acting as a proxy for financial wealth accumulation, the M2/GDP ratio displays a positive and significant correlation with aggregate life insurance consumption. The results indicate that life insurance presents an attractive

alternative to standard investment products (stocks and bonds) as suggested by Fortune (1973) and Headen and Lee (1974).

Foreign market share variables (FMSHRE and its square) appear to suggest that high foreign life-insurer participation stimulates the sales of life insurance products. The negative effect of foreign participation, coupled with a positive effect of its square, indicates a lower influence at intermediate levels and a high influence at low and high levels of foreign participation. The rationale for this pattern may be that low foreign market shares are associated with highly saturated markets, where life insurance consumption is already high. On the other hand, high foreign market shares suggest highly competitive markets, which stimulates the sales of life insurance. This view is consistent with studies that evidence the positive effect of sales force and marketing effort in promoting insurance sales

Finally, inflation and real interest rates are seen to have a statistically significant negative influence on life insurance consumption. The negative impact of inflation confirms the findings of Babbel (1981) that anticipated inflation depresses the value of financial assets and therefore reduces the attractiveness of life insurance products. Although macroeconomic conditions in OECD countries largely differ from those in developing countries, the same negative influence is observed. The negative influence of real interest rates stands in contrast to Beck and Webb (2003). The result suggests that households are not attracted by lower prices to increase their purchase of life insurance, but appear to take advantage of higher real rates to reduce their investment in life insurance without giving up future benefits. Another explanation is that real rates measure the preference for immediate as opposed to deferred consumption. Higher real rates are therefore associated with a lower demand for life insurance, which converts the policyholder's current consumption into future consumption in favor of the policy's beneficiaries.

## CONCLUSION

In this article, we have analyzed the determinants of aggregate life insurance demand on a cross-section of developed economies. Our sample of OECD countries exhibits structural similarities, yet also exhibits enough differences to draw interesting observations compared with other international studies (e.g., Browne and Kim, 1993; Outreville, 1996; Beck and Webb, 2003).

Consistent with previous research, we find that income plays a major role in the consumption of life insurance products. An increase of 1 percent in aggregate income can be expected to induce at least a 0.6 percent increase in aggregate life insurance demand. All the socioeconomic factors considered play a significant role in the demand for life insurance. Most important, they are consistent in each and every point with the dependents' expected lifetime utility theory developed by Lewis (1989). In particular, the demand for life insurance decreases with the average life expectancy (lower probability of death) and increases with the dependency ratio (number of dependents). Furthermore, education level is positively related to life insurance demand, whereas the influence of social security expenditure is significantly negative. Overall, households in OECD countries appear to evaluate the expected benefits of life insurance in terms of derived benefits conditional on the income earner's death as well as the risk of the income earner deceasing prematurely.

There is also evidence to suggest that product market characteristics play a significant role in the demand for life insurance. High level of financial development and high degree of competition in the life insurance sector both stimulate life insurance consumption. On the other hand, inflation significantly decreases the demand for life insurance. High real interest rates do not persuade households to purchase more insurance, but actually stimulate them to reduce their purchase either because of higher expected benefits for the same invested amount or because of higher preference for immediate consumption relative to deferred consumption. All considered, aggregate life insurance demand is better explained when both product market and socioeconomic factors are jointly taken into account. The article also shed light on some inconsistencies reported in previous studies. By using the more robust GMM estimation technique, we find that some coefficients, estimated via OLS regression having the opposite sign to that suggested by theory, lack statistical significance. We also show that failing to control for product market conditions may result in biased estimates. For example, life expectancy displays a positive and significant influence on life insurance demand in the model excluding product market variables. Similarly, the dependency ratio is found to have a negative association with life insurance demand. However, when product market variables are included in the regression to account for the financial attractiveness of life insurance products, both life expectancy and dependency ratio recover the appropriate signs suggested by Lewis (1989).

Our findings explain why aggregate life insurance demand has outpaced GDP growth in recent years and underline the main reasons for that performance. Most evident is the rapid growth in the stock of financial assets in absolute value as well as in percentage of GDP. Sociodemographic factors such as education level and dependency ratio also have a positive and economically significant effect on life insurance sales. The results also imply that the rapid growth in life insurance consumption is likely to continue if not accelerate into the near future. First, runaway social security expenditure is likely to be constrained, leaving households to undertake private life insurance. Second, increased competition in the financial services sector and in the distribution of life insurance, in particular, is likely to stimulate household demand. Finally, the continuing growth in asset securitization is expected to fuel the demand for investment products of which life insurance is obviously an integral part.

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