DETERMINANTS OF THE DEMAND FOR LIFE INSURANCE: EVIDENCE FROM SELECTED CIS AND CEE COUNTRIES

by

Daria Nesterova

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Abstract

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Head of the State Examination Committee: Mr. Volodymyr Sidenko,
Senior Economist
Institute of Economy and Forecasting,
National Academy of Sciences of Ukraine

Life insurance market of transition economies had experienced a rapid growth over the last decade, indicating the increased importance of this sector as a financial intermediary. However, the factors that drive life insurance demand across countries still remain unclear. The main purpose of the study is to identify and investigate the impact of the determinants of life insurance demand in Ukraine and several other countries of the region, both CEE and CIS. Using panel data analysis techniques for 14 countries over the period 1996-2006, I find that countries with higher life expectancy at birth, income level, old dependency ratio and countries-members of the European Union have higher levels of life insurance consumption, while financial development indicator, inflation and real interest rate reduce the demand for life insurance across countries.

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GLOSSARY

Life insurance penetration – ratio of life insurance premiums volume to GDP

Life insurance density – life insurance premiums per capita

CIS - Commonwealth of Independent States

CEE – Central and Eastern Europe

EU – European Union

Chapter 1

INTRODUCTION

The insurance culture of Ukrainian society is significantly less mature compared to the western developed countries, where the life insurance business, for instance, substantially increased its importance as a financial intermediary over the last 40 years and became one of the leading sources of investment in the capital market. Many developing countries, however, have small life insurance sector, and Ukraine is not an exception. While the Ukrainian life insurance market shows the highest premiums' growth rate among other kinds of insurance (similar to other developing countries of the region) compared to western European countries (40.3% versus 4.4% respectively in 2006), yet the share of this sphere of insurance reached only 2.3% of total insurance premiums in Ukraine in 2005 (for comparison: 10.3% in Latvia, 38.8% in Czech Republic, 62.2% - average for EU 15 most developed economies).

The possible reasons for such a low figure in Ukraine (the same phenomenon is also observed in most Post-Soviet countries) can be:

- low standard of living,
- people's distrust in insurance after the collapse of Gosstrach (USSR unique state insurance company) and the rapid devaluation of people's life insurance savings,
- negative experience of consumers, associated with investing money in different financial structures in the beginning of 1990th,
- lack of long-term financial instruments, in which the life insurance companies could invest their funds. For instance, Ukrainian government bonds are not yet regarded to be a reliable instrument,

while investing in the companies' equities incurs high risk, even for so-called "blue-chips",

- political and economic instability.

However, the service of such a kind is a vital necessity in our country where there is a low level of social protection from the government.

This paper aims to investigate the determinants of life insurance demand in Ukraine and several other countries of the region, both: former Soviet Union and Central and Eastern European former socialist countries (Bulgaria, Czech Republic, Estonia, Georgia, Hungary, Kazakhstan, Latvia, Lithuania, Moldova, Poland, Romania, Slovenia, Slovak Republic, Ukraine – 14 countries overall) over the late transition period (1996-2006) and to explore the behavior and sensitivity of this demand in response to changes in selected explanatory factors. Namely, do economic, demographic or institutional factors affect the demand for life insurance in transition countries?

The choice of CEE countries in line with Ukraine is not accidental. The CEE region is representative for Ukrainian insurance market. Not long ago these countries were the members of socialist camp, and during the last years they completed the process of EU entrance. May 1, 2004 - Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Slovenia, Slovak Republic entered the European Union. Obviously, these countries achieved a material improvement in their economies, including the insurance sector.

No unique model of life insurance demand exists in the economic theory, however, several of them were constructed and tested empirically (a thorough discussion of this issue can be found in Lewis, 1989, and Sen, 2007). The variation in the models was motivated by the existence of different patterns which influence the life insurance purchase in each particular country. This paper embraces 14 countries mentioned above as we could expect some of these countries to have similar determinants of life insurance consumption due to alike historical development.

The life insurance markets of CEE countries (now members of the EU) started to grow rapidly in 1990's due to improved economic conditions and introduced reforms, which had to be conducted prior to the EU entrance. Nevertheless, this growth did not raise the CEE countries on the same level with developed western economies in terms of life insurance penetration. On the other hand, these countries show higher expectations of life insurance markets, as regards to growth and profitability, than the developed markets of Western Europe. Same tendency for the high growth is observed in CIS market.

Ukraine is believed to approach the period of life insurance leap. What leads to this suggestion is the continuing rise of GDP since 1999 and associated with it economic development and income rise of society. The growth of people's savings is also observed. At the same time country experiences a credit boom – mortgage's, consumer's, auto credits. Thus rise of income level, mass crediting and consequent insurance of debtors' lives (the insurance that banks require the debtors to purchase, usually for long-term credits such as mortgage) – all serve as catalysts to the life insurance market development in the country.

The structure of the paper is the following: Chapter 2 highlights literature on theoretical research and empirical findings relevant to the demand for life insurance. Chapter 3 presents methodology and model, which I incorporate in the analysis. Chapter 4 describes the data used for empirical estimation. Chapter 5 proceeds with the estimation and interpretation of the results. Conclusions are stated in Chapter 6.

Chapter 2

LITERATURE REVIEW

In this section I first present the theoretical research and highlight the most relevant findings in the field of life insurance demand. The theoretical frameworks usually are followed by the empirical investigation of the developed models, so in the first part of literature review I will highlight both the models and the empirical findings, where they are present. Then I proceed to the empirical studies which for the most part evaluate factors' impact on life insurance demand in particular countries and across them.

2.1. Theoretical studies:

Demand for life insurance has usually been explained through the life-cycle models where households or individuals maximize their expected utility of life-time consumption.

The issue of life insurance demand is not new for western researchers and was brought to light beginning from Yaari (1965), who was the first to work out a theoretical background to explain the demand for life insurance. Yaari was the first researcher who pointed out the issue of uncertainty in the life insurance demand, namely, the uncertainty of life span of a consumer. He developed the life-cycle utility model of a consumer together with deducing the optimal consumption and optimal saving plans of a consumer and his results show that individual increases his expected utility by buying the insurance. In his paper Yaari highlighted the models of utility functions developed by Fisher (1930) and Marshal (1920), who as he said "were both aware of the uncertainty of survival, but for one reason or another they did not expound on how a consumer might

be expected to react to this uncertainty if he is to behave rationally" (Yaari, 1965). Thus the distinguishing feature of his paper is the fact that he included the lifetime uncertainty of a consumer in his model, disregarding all other uncertainties that a consumer must face (like an uncertainty of future income). Previously researchers paid very little attention to this aspect. As insurance is regarded to be a mechanism of reducing the consumption volatility of a household, the uncertainty of a life expectancy determines the life insurance consumption.

Later Karni and Zilcha (1986) implemented the measure of risk aversion in the model. They followed Fisherian model, which was used by Yaari (1965) in his derivations, because it does not account for bequests, so the individual is free in accumulating debt, which helps to properly model the improvement in borrowing conditions, which in chain leads to higher consumption of life insurance.

A bunch of papers were written on the base of household surveys' data, where the theoretical life-cycled models were developed and empirically supported to investigate the behavior of households in the demand for life insurance (e.g. Lewis (1989), Bernheim et al. (2001), Lin and Grace (2006)).

Lewis (1989) used the life insurance framework developed by Yaari (1965) in his paper extending it in the sense that he included in his model the preferences of other members of the household, which is empirically reasonable, because while making a decision about insurance the insured explicitly takes into account the dependent members of the family. So the total amount of life insurance purchased by the insured (assuming a husband is a primary wage earner) is derived from the maximization of the consumption level of wife and offsprings (beneficiaries), who in turn maximize their utility of the consumption by choosing the optimal level of expenditures on life insurance. According to the developed model, life insurance purchase increases with the present value of beneficiaries' consumption, risk aversion and probability of policy holder's (husband's) death.

Interesting is the fact that nearly all authors, who investigated the life insurance demand, related to the theoretical framework developed by Yaari (1965) as to initial point.

Rudolf Enz (2000) argued in his paper that models with constant income elasticity of life insurance demand are artificial in the sense that they do not take into account different restrictions in insurance penetration growth. He studied the relationship between demand for insurance and economic development. As the constraints for insurance penetration he analyzed tax system, regulation etc. Thus allowing the income elasticity to vary Enz (2000) showed an S-curve relationship between insurance penetration and income per capita level. S-curve relationship indicates that the consumption of life insurance tends to grow as the economic level of the developing country rises, but as the time passes and the economic level of that country is reaching the level of developed countries the insurance consumption slows down. Using his model it is possible to build a long-term forecast for insurance demand and investigate the reasons for countries (so-called outliers) to be located away from the S-curve on the plot.

The main reason of purchasing the life insurance is to handle the possible future risks of lifetime, of earnings etc. Papers of Bernheim et al. (2001) and Lin and Grace (2006) both highlighted the issue of the linkage between the life insurance demand and financial vulnerability of the households of an older age. Vulnerability indicates the degree of household sensitivity to the loss of income as a result of death of a spouse. Based on developed models they found different results, namely: Bernheim et al. (2001) did not find any significant relationship between demand for life insurance and financial vulnerability. What they found is a surprising result that people with greater vulnerabilities tend to insure less, and those who experience smaller vulnerabilities purchase larger amounts of insurance. Comparing to the earlier researches of the topic Bernheim et al. (2001) extended their model with various factors that affect the purchase of life

insurance such as household composition, economies of living together in household, details of tax system of the country etc.

However, Lin and Grace (2006) went further in their research and introduce several changes to the Bernheim's study (like a decomposition of the overall demand into demand for term life and whole life insurance, addition of index of financial vulnerability etc.) and as a result they found the relationship between demand for life insurance and financial vulnerability. They conclude that the elder the household the less life insurance it demands to cope with the certain level of financial vulnerability.

2.2. Empirical studies:

Usually empirical studies take into account the demand side factors of life insurance as well as the supply side factors. The studies, which aimed to investigate the differences in life insurance purchase between countries, have traditionally used cross-sectional analysis or panel data analysis. Outreville (1996), Ward and Zurbruegg (2002), Beck and Webb (2002), Sen (2007), Li et al. (2007) show the benefits of investigating the life insurance demand across countries. The above mentioned researchers used various sets of different countries.

Beck and Webb (2002), for instance, explored the differences between 68 countries all over the world using unbalanced panel data for 1961-2000. The countries included in this study were both developed and developing; however, they only partially covered the CEE region (Bulgaria, Czech Republic, Hungary, Poland, Slovenia) and did not include the former USSR countries in the sample. Same applies to other researches. Ward and Zurbruegg (2002) performed pooled cross-section OLS regressions and panel regressions on two samples: OECD (countries-members of Organization for Economic Cooperation and Development) and Asian countries. The study of Li et al. (2007) focused on 25 solely OECD countries. Consequently, these studies pay no special attention to the factors which are more corresponding to the demand for life insurance in

CEE and CIS countries. Sen (2007) investigated the life insurance sector in 12 selected Asian countries over 11 years. Outreville (1996) used cross-sectional analysis to examine 48 developing countries for the year 1986.

The burgeoning life insurance market cannot be completely explained by rise in income level of the society, but also by important changes in values that enhance the motives to own life insurance. Following early researchers (Yaari (1965), Fortune (1973)) the demand variable should depend on such core indicators as wealth, income level, interest rates and prices. Peter Fortune (1973) investigated the US insurance market for 1964-1971 and found a high degree of sensitivity between the optimal amount of life insurance, wealth and the real interest rate. He was first to focus on the sensitivity relationship between life insurance purchase and financial variables, and linked his implications with the monetary policy and capital markets.

Outreville (1996) in his study of 48 developing countries highlights the fact that financial development of the country influences the life insurance demand in it and he found the significantly positive relationship between life insurance purchase and the financial development. Another important finding, supported also by other researchers (Lewis (1989)), has shown the significant positive relationship between the use of life insurance and income level. However, no relationship was found between human development indicator and life insurance demand, even thought HDI correlates with financial development. Outreville also takes into account the level of competition on the domestic market and its openness to the foreign participants.

Beck and Webb (2002) made a comprehensive research over 68 countries of the world, paying attention to the question what causes the variance in life insurance consumption between different countries. They use four different measures of life insurance consumption and incorporate various economic, demographic and institutional factors in their research. As a result, they find that countries with higher income per capita level, more developed banking sector and

lower inflation tend to consume larger amounts of life insurance. In addition, life insurance consumption is observed to be positively influenced by private savings rate and real interest rate. Such demographic factors as education, life expectancy, young dependency ratio appear not to have any robust influence on the life insurance consumption. Beck and Webb (2002) following Outreville (1996) also highlight the role of financial development and price stability in the insurance market of the country.

Another prominent research was conducted by Ward and Zurbruegg (2002), who, as was mentioned above, analyzed the life insurance demand in 37 OECD and Asian countries for 1987-1998 and in particular focused on political and legal factors in determining the life insurance demand. Previously little empirical attention was paid to this issue. The research is made over Asian and OECD countries and shows that with the improvement in political stability and civil rights the life insurance consumption increases in both regions. However, some differences are found between the developed and Asian emerging regions. That is income elasticity is higher in Asian countries (increase in income by 10% leads to the increase in life insurance consumption by 13.13%; in OECD region – approximately three times less income elastic), but the magnitude of this difference is tent to shrink as legal and political factors are controlled for. The results of the study are consistent with the S-curve relationship proposed by Enz (2000), because in the countries with initially high income level the insurance consumption is less sensitive to income increase.

The results that support foregoing S-curve relationship could also be found in earlier papers. For instance, Truett and Truett (1990) compared the demand for life insurance in Mexico with such in the United States. And in particular they found three times higher income elasticity in Mexico comparing to the USA.

Different researchers while explaining the variation in demand for life insurance tend to include different variables in the model. One of the most detailed quantity of variables I found is in the paper of Sen (2007), who evaluated

the impact of GDP per capita, GDS (gross domestic savings) per capita, financial depth, urbanization, dependency ratio, adult literacy, population, life expectancy at birth, crude death rate, inflation, real interest rate and insurance price on the demand for life insurance. He supports the previous findings by showing the significant positive relationship between life insurance consumption and income, financial development, gross domestic savings, and negative to inflation. Real interest rate was shown to be insignificant in a cross-country analysis, however, Sen also incorporated time-series analysis on India for the period 1965-2004 and real interest rate there appeared significant. Comparing to Beck and Webb (2002) results such demographic factors as life expectancy and young and old dependency ratio turned to be significant, together with adult literacy rate and rate of urbanization.

So, basically, there is no one "right" quantity of determinants to include in the model, because as was mentioned above the determinants depend on the particular country's environment and vary due to different socio-economic systems across countries. For example, the presence of influence of banking sector development on the demand depends on whether savings and investment function of life insurance is completely fulfilled in the country (Beck, 2002).

Summing up the previously mentioned theoretical and empirical researches, life insurance demand is determined by such macroeconomic variables as income level, interest rate, wealth, inflation and financial development, various demographic and social factors.

Although several researches discussed above were conducted on developing countries, none of them focus on the CIS and CEE countries in particular; moreover, only Beck and Webb (2002) include some of the former socialist countries of the region (Bulgaria, Czech Republic, Hungary, Poland, Slovenia) in their study, Ukraine was not included in any sample. Giving this, my focus is completely on the selected countries of interest among CIS and CEE countries: Bulgaria, Czech Republic, Estonia, Georgia, Hungary, Kazakhstan,

Latvia, Lithuania, Moldova, Poland, Romania, Slovenia, Slovakia and Ukraine.

The significance and impact of the determinants of life insurance vary from paper to paper depending on the chosen countries under the study. Thus in order to mark out the factors, which influence the demand for life insurance in Ukraine, I conduct this research, expanding it for 14 countries, which are assumed to have similar developing path.

Chapter 3

METHODOLOGY

For my research I intend to follow the model, developed in the paper of Francois Outreville (1996), whose research focuses on 48 developing countries, however, it does not include the countries of the former Soviet camp. This study reveals and emphasizes the demand and supply side of life insurance purchase, while other researchers do not distinguish it explicitly.

Let me present the intuition lying behind the model. Since the supply of life insurance is also an important determinant of life insurance consumption, we will first build the model with respect to both supply and demand sides (Outreville, 1996) and construct the simultaneous equation model:

$Qd = f[GDP_c, P_I, LIFEXP, Inf, R, AD, EU]$

$Qs = f[P_I, R, FD, AD, EU]$

Where:

Qd – quantity of life insurance demanded on the market; depends on income level (GDP per capita), price of life insurance, life expectancy at birth, inflation, real interest rate, additional variables, EU dummy.

Qs – quantity of life insurance supplied on the market; depends on life insurance price, interest rates, financial development, level of monopolization, presence of foreign companies on the country's market, additional variables.

GDPc – GDP per capita, income level,

P_I – price of life insurance,

LIFEEXP – life expectancy at birth,

Inf – inflation,

R – real interest rate,

EU – EU accession dummy,

FD – level of financial development,

AD – additional determinants, such as political and legal factors, urban population, education level, dependency ratio.

The brief explanation for each variable as well as its expected impact on the demand for life insurance (based on empirical investigation of previously mentioned studies) is stated in Table A1.

Simultaneous equation model is built in order to give an intuition of how the particular factors influence the quantity of life insurance purchased. However, it is difficult to distinguish the pure impact of the determinants on either supply or demand side. Usually, the factors represent the combined influence. Obviously, price and quantity of insurance policies are endogenous variables and are affected by the supply-side factors as well as by demand-side ones.

Since market makes supply equal demand we equate:

$Qd = Qs = Q$.

The previous attempts to distinguish demand from supply did not succeed because the available data do not allow us to separate them. The data for price of life insurance is not available as such. One can make an attempt to extract it from the existing policies or to find a relevant proxy to value price of life insurance, for instance, the ratio of insurance premiums to life insurance in force (Beck, 2002). However, usage of such proxy needs an assumption that the set of insurance policies is constant over time and across the countries, which is unlikely the case. On the other hand, to observe the quantity of insurance purchased one has to make an assumption that insurance types and coverage do not vary across countries and time, which is also hardly true.

There are also other relevant proxies to value price of life insurance, for instance, the ratio of insurance premiums to life insurance in force (Beck, 2002). However, usage of such proxy needs an assumption that the set of insurance policies is constant over time and across the countries, which is unlikely the case.

Since we can present the whole demand for the life insurance on the market as the average unit price of insurance policy (P_I) multiplied by the quantity of life insurance policies purchased in the country for the period (Q), then the following reduced-form model is presented:

$$Demand_{it} = \beta_0 + \beta_1 GDPc_{it} + \beta_3 Inf_{it} + \beta_4 LIFEEXP_{it} + \beta_5 R_{it} + \beta_6 QuasiMon/M2_{it} + \\ + \beta_6 M2/GDP_{it} + \beta_7 YoungDep_{it} + \beta_8 OldDep_{it} + \beta_9 Urban_{it} + \beta_{10} EducYears_{it} + \\ \beta_{11} Pol\_Stab_{it} + \beta_{12} Rule\_of\_Law_{it} + \beta_{13} Corrup\_Control_{it} + \beta_{14} EU_{it} + \varepsilon_{it}$$

where:

QuasiMon/M2 – ratio of Quasi Money to M2, determinant of financial development,

M2/GDP – ratio of M2 to GDP, determinant of financial development,

YoungDep – young dependency,

OldDep – old dependency,

Urban – level of urbanization,

EducYears – level of education,

Pol_Stab – indicator of political stability,

Rule_of_Law – Rule of Law, indicator of legal environment,

Corrup_Control – control for corruption, indicator of legal environment.

There is evidence that less developed countries experience the supply-leading pattern in their development rather than demand-following (Jung, 1986). The supply-leading behavior implies that financial sector development forgoes the real economic growth of the economy through increasing efficiency of capital accumulation and rise in savings and investment rates (Reddy et. al, 2004). This corresponds to reality until the real growth occurs in the economy, which is the case for the observed countries. Then the demand-following pattern neutralizes the supply-leading one and becomes more important. So initially governments of the observed countries established the insurance institutions, which previously

were under state control at most, to stimulate its development and growth, and consequently demand began to prevail upon the supply.

The structural simultaneous equation model is presented in order to give an insight to the reader of the supply and demand sides of impact. However, in my research I will focus on a reduced form equation without return to a structural form.

The base theoretical model determines such key variables to explain the fluctuations in the life insurance demand: real personal income (measures as GDP per capita), real interest rates (R), inflation level (Inf), and the price of insurance (P_I).

According to the studies (Beck, 2002) demand for life insurance can be measured in several ways: "life insurance penetration" (ratio of insurance premiums volume to GDP), "life insurance density" (insurance premiums per capita in constant dollars), ratio of "life insurance in force to GDP" and "life insurance in private savings" (relating insurance premiums to private savings instead of income). Life insurance density is more applicable for cross-country analysis as here adjusting for income level of the economy is not needed. Lin and Grace (2006) also suggest taking the "net amount at risk" – difference between the policy reserve and the face amount (the sum that company pays to the beneficiary when the insured dies), as a proxy for the demand for life insurance.

The dependent variable in my model is life insurance demand for which I incorporate the former two measures: *life insurance penetration* and *life insurance density*, which are different in the following sense: life insurance penetration shows the relationship between life insurance consumption and the size of the economy, that is the share of GDP; while life insurance density shows life insurance consumption across countries without binding it to economy size (income level), but instead representing a pure average quantity of insurance purchased by each individual in a country in constant dollars.

Based on theoretical and empirical studies, we identify the following factors

that may influence demand for life insurance and for which data is available. Determinants of life insurance demand are divided into:

- economic: income level, inflation, real interest rate, level of financial development;
- demographic: life expectancy, dependency ratio, level of education and urbanization;
- institutional: political stability, Rule of Law, control for corruption, European Union membership.

Determinants of life insurance demand:

Income level:

The level of income in the economy (GDP_c) is definitely the most important and indisputable factor influencing the life insurance demand. The significant positive impact of this variable was found by all the researchers in the field (see Fortune (1973), Lewis (1989), Outreville (1996), Beck and Webb (2002) etc.). The larger is level of income, the more of life insurance consumer can afford to purchase. In addition to this relationship, having the presence of dependent members of family implies that higher income level increases the loss in expected utility of the dependents in case of policy holder's (i.e. primary wage earner's) death (Lewis, 1989). This relationship stimulates the larger purchase of life insurance with higher income level. Moreover, treating insurance coverage as a normal good also suggests its rise with the rise in income.

Inflation:

A rise in inflation (Inf) discourages people's incentives to save, leading to monetary uncertainty for the long-run, thus making negative impact on the demand for life insurance. The negative impact of inflation had been widely documented in previous researchers (see Outreville (1996), Beck and Webb (2002), Ward and Zurbruegg (2002), Li et al. (2007) etc.).

Interest rate:

Real interest rates (R) are taken in order to reflect the real return of invested

money of insurance company. Thus, the following relationship is assumed: the higher is the interest rate (external interest rate – the rate on invested funds by insurers), the higher is the profitability of insurers, which in turn creates an opportunity for larger profits of consumers of life insurance (assuming the proportional rise in rates of return for insured with the rise in rates of return for insurer) (Beck and Webb, 2002). But the impact of real interest rate is ambiguous and there is some disagreement over its effect on purchase of life insurance following the logic: the rise in interest rates might reduce the purchase of life insurance as higher returns on alternative assets may switch consumers from savings in life insurance to another type of money accumulation (Lenten and Rulli, 2006). Not all the researchers paid attention to this factor. Browne and Kim (1993), for instance, disregard its impact on life insurance demand.

Financial development:

Outreville (1996) also suggests using the level of financial development (FD) as a determinant of life insurance demand and two proxies are usually regarded in this aspect: one is the ratio of quasi-money (M2-M1) to the broad definition of money (M2) – shows the complexity of the financial structure (higher ratio indicates higher level of financial development), another is the ratio of M2 to the nominal GDP – financial deepening (demand for money per unit of output). Sound financial system is assumed to prompt the investment activity of life insurance companies, as a result enhance the investment profits that go as bonuses to insurants. On the other hand, this factor is suspended to have endogenous relationship with the dependent variable, arguing that stable life insurance sector development spurs financial development of the country (Outrevile, 1996; Masci, 2007). Insurance companies initiate their business activity with equity capital, further raise funds by issuing the insurance policies and subsequently act as institutional investors on the market, helping to improve capital allocation and stimulate the investment activity.

Life expectancy:

Life expectancy at birth is the average time span a human has before death, calculated from the time of birth. The insurance companies base their actuarial estimations of commercial price for life insurance on the life expectancy at birth, which implies that price is fair and breakeven. But the impact of life expectancy is ambiguous. On the one hand, longer life duration reduces the price for life insurance and gives stimulus to purchase more of it, to accumulate more capital through savings, thus to increase the demand for life insurance products. Outreville (1996) has found a significant positive relationship between life expectancy at birth and demand for life insurance. But on the other hand, following Lewis (1989) life insurance consumption increases with the policy holder's probability of death. Giving that life expectancy is inversely related to death probability the expected relationship between demand and life expectancy is ambiguous.

Dependency ratio:

Dependency ratio together with education level of a society are key deterministic demographic variables considered in the previous researches. Dependency ratio shows the structure of the household in terms of a number of people, dependent on the main source of income. Numerically, young dependency is usually defined as the share of total number of children under the age of 15 to the working population, that is people in the range 15-64 years old, while old dependency is a share of people elder than 65 to the working population. Supporting Lewis (1989), who developed the life-time utility framework including the preferences of the dependent members of family, we also expect to find a positive relationship between life insurance demand and dependency ratio. It is worth mentioning that higher young dependency ratio is more likely to increase demand for mortality risk coverage of life insurance, while larger aged population stimulates the purchase of savings and annuities components of life insurance. Truett and Truett (1990), Browne and Kim (1993)

confirm the positive impact of dependency ratio, while Beck and Webb (2002) do not find young dependency to be a robust determinant of life insurance demand.

Education:

The level of education has a positive effect on the demand for life insurance. The reasoning for such a statement is that higher level of education increases the ability of a person to understand the importance and benefits of savings through life insurance and protection against mortality risk (Beck and Webb, 2002). Additionally, Li et al. (2007) point out that larger duration of education, measured in average years of schooling, leads to a longer pressure of offsprings' dependency, which contributes to a higher demand for life insurance products to protect the dependents. On the other hand, the more people are involved in education process, the less labor force is presented on the market, therefore reducing overall GDP of the country. The expected sign thus is ambiguous, however, Outreville (1986), Browne and Kim (1993), Truett and Truett (1990) all find the positive relationship, while Beck and Webb (2002) show education to be insignificant.

Urbanization:

Higher concentration of population simplifies the provision of life insurance products and information about them to the potential consumers, as it reduces costs for the companies. Therefore, countries with higher share of urban population are expected to have higher demand for life insurance products.

Political stability, Rule of Law, Corruption control:

Political and legal stability is proved to be important by Ward and Zurbruegg (2002), indicating the evidence to include these factors in the model. As life insurance is considered to be a long-term relationships between a consumer and a company, the more stable is the legal system and, therefore, a political system in the country the higher is the willingness of contracting parties to initiate the business relationships. In this aspect such indicators as Political

Stability (political part), Rule of Law and Corruption control (legal part) are considered, taken from World Bank statistics

European Union membership:

Another exogenous variable I include in the model is a dummy which reflects the accession process to the European membership (EU). I assume EU status to influence the demand for life insurance as, it is known, that joining the EU leads to the increasing openness of the financial markets of the countries, inflow of foreign companies on the internal markets, rise in competition between companies and thus to more favorable conditions for consumers of life insurance. Also EU dummy can partially explain people's confidence in the financial stability of the economy. Therefore, the positive correlation between EU dummy and the demand for life insurance is expected. This variable will reflect the importance of joining the EU for non-members included in the research (Ukraine, Kazakhstan, Moldova, Georgia). Together with the demand side membership in European Union can have an impact on suppliers of life insurance, increasing the diversity of products offered, reducing the prices due to rise in competition.

Chapter 4

DATA DESCRIPTION

Aggregate annual life insurance premiums are collected from CEA annual reports (European Committee of Insurance)[1] for CEE countries for period 1996-2005, figures for the year 2006 are taken from International Insurance Fact Book[2], figures for CIS countries are collected from working papers, official sites of state statistic committees of the selected countries and local insurance organizations (cited in Bibliography), evaluated in local currencies and expressed in USD (converted by the exchange rates of base year 2000 and adjusted to inflation). Data sources for the rest of the variables are stated in Table A1 of Appendix A. Penetration level is measured as nominal Life Premiums to nominal GDP (as it is ratio, the adjustment to inflation is not needed). Density level is measured as real Life Premiums divided by population of the country in that year. The fact that data for life premiums was collected from various sources can lead to some distortions in estimation, because numbers reported by one organization do not always equal to the ones reported by another organization. I attempted to find several sources on each number to compare and rely on the better known and more credible ones.

The income level is measured as real GDP per capita in USD again based on the exchange year of 2000, that is the same base year as for CPI. It should be noted that GDP for Ukraine, as well as for Romania and some other countries of the region, might be underestimated since it does not include the total revenues from the shadow economy. The inflation variable is measured as annual

[1] http://www.cea.eu/index.php?page=european-insurance-in-figures

[2] http://www.iii.org/international/overview/

consumer price index at the end of the year.

Real interest rates are measured according to the following formula:

$(i - \pi)/(1 + \pi)$,

where: i – lending rate, π – inflation. Lending rate is taken for most countries, except Kazakhstan (refinancing rate is implemented) and Romania (bank rate is implemented), for which data on lending rate was not available. Several other traditional measurements of interest rates are either deposit rate and government bond yield (Outreville, 1996; Li et. al, 2007), lending rate is less common, but still is in use by the previous researchers (Beck and Webb, 2002). Lack of complete data on deposit or government bond rates causes the usage of lending rate in the model, based on assumption of its high correlation with the deposit rate. Data for lending rate is taken from IFS statistics. However, it is difficult to obtain a unified measurement of interest rate because of differences in maturities of the reported rates. As life insurance implies medium or long-term relationship between the company and the insurant, lending rate reflects this relationship.

In order to estimate the level of financial development two proxies are used, as it was stated in the previous section: ratio of Quasi Money to M2, and ratio of M2 to GDP. I am taken annual data for Quasi money, M2 (Money + Quasi money) in millions of national currency from IFS. Since this is a ratio, currency does not affect it.

Life expectancy at birth is measured in years and the data for it is taken from World Bank Development Indicators database. Young dependency is defined as the share of total number of children under the age of 15 to the working population, that is people in the range 15-64 years old. Old dependency is a share of people elder than 65 to the working population. Urbanization is measured as ratio of urban population to total population of the country. Data on dependents and urbanization is taken from World Bank's HNP statistics. Education is

expressed in average years of schooling, data on which was kindly provided by Oleksandr Shepotylo[3].

Political stability, Rule of Law and Corruption control indicators were constructed by World Bank (Worldwide Governance Indicators, 1996-2006). Indicators are measured as percentile rank and higher value of indicator refers to better political and legal environment in the country. Governance is difficult to measure, thus, as WB states, the measures of governance can not be precise. The data for the indicators is available for 1996, 1998, 2000 and 2002-2006 years. The values for intermediate years were extrapolated in order not to decrease the number of observations.

EU dummy takes the following values: 0 – never a member, 1 – becomes a member eventually, 2 – candidacy but not negotiations, 3 – negotiations forecast to happen soon, 4 – negotiations ongoing, 5 – membership. These dummies[4] were constructed by Peter Muller[5] based on the paper of Bevan and Estrin (2004). Since the precise information on how the dummies were constructed is unavailable, I can not say for sure that the relative difference between each adjacent value, which dummy takes, is the same. Therefore, I incorporate two measures of EU accession in the model: 1) the overall EU dummy discussed above; 2) construct 6 different dummies (EU1-EU6 respectively) not to be tied up to their measurement.

Table 1. Descriptive statistics.

Variable	Obs	Mean	Std. Dev.	Min	Max
Dependent Variables:					
Penetration	127	0.601827	0.542914	0	1.775

[3] Assistant Professor and Senior Researcher, KSE and KEI, Kyiv, Ukraine. www.eerc.kiev.ua/~oshepotylo.
[4] Data is provided by Oleksandr Shepotylo, Assistant Professor and Senior Researcher, KSE and KEI, Kyiv, Ukraine.
[5] Professor of Economics, Chair of Economics Department at University of Maryland. Email: murrell@econ.umd.edu.

Real Density	127	33.74304	41.31663	0	216.249
Economic Determinants:					
Real GDP per capita	154	3525.097	2629.979	353.3786	12182.75
Inflation, annual average CPI	154	1.052961	0.329544	0.065	2.469
Real interest rate, based on CPI	154	6.389805	12.50827	-73.04	75.36
Ratio of Quasi Money to M2	154	51.27883	16.32872	10.3	83.91
Ratio of M2 to GDP	154	36.87779	17.40142	0.03	74.81
Demographic Determinants:					
Life expectancy	154	71.3026	2.896311	64.1	77.7
Young dependency ratio	154	27.54182	5.834205	19.61946	46.3326
Old dependency ratio	154	19.66846	3.496979	10.37999	24.93773
Urbanization level	154	61.37792	8.131835	46.1	74.48
Education, years	154	9.353312	0.706494	7.23	10.79
Institutional Determinants:					
Political stability	154	60.35122	21.06603	3.1	95.47
Rule of Law	154	53.15247	21.19885	9	82.39
Control of corruption	154	51.45737	23.18264	5.19	84
EU accession	154	2.532468	1.97755	0	5

The overall maximum number of observations is 154 for 14 countries during 1996-2006 years period. However, missing annual data on life insurance premiums of some intermediate years for Georgia, Kazakhstan, Moldova and Romania reduces the number of observations from 154 to 127.

Minimum values for penetration and density of life insurance correspond to the early years of CIS countries (Georgia and Kazakhstan here, see Figure 1 and 2) and Lithuania, which had zero values of life insurance premiums in 1996. The highest density and income level of the sample is observed in Slovenia (216.25 and 12182.75 USD per capita respectively), the highest share of life insurance

industry (penetration) also belongs to Slovenia (1.775% of GDP in 2006), while the highest financial development level, calculated as ratio of Quasi money to M2, is observed in Romania – 83.91% of M2 in 1999. The Slovenians are also expected to have longer lives according to life expectancy statistics (77.7 years). Life expectancy has an upward trend in all of the observed countries, therefore the lowest values correspond to the early years, namely to Kazakhstan, Moldova and Ukraine. Evolution of these countries did not change the situation; they continued to be in the lowest niche till 2006. Inflation pattern is common for all of the selected countries, being significantly higher in mid-late 1990's with the largest pick in Bulgaria, 1997, with respect to the annual change. Institutional environment (political and legal factors) is developed the most in Estonia and Slovenia with the lowest percentile rank in CIS countries (namely, Georgia and Ukraine).

We do not include Russia in the sample because, as it was seen from the data, Russia is an obvious outlier from the sample. Beginning from 1999 it had a tremendous growth rate in life insurance premiums indicating the penetration level of 1.7% to GDP, comparing to the highest 1.36 for this year in Slovak Republic. Such a rise is associated not with the improvement and development of life insurance sector in Russia, but with a high level of tax avoidance schemes of the companies – corporate consumers of life insurance. In 2004 share of real insurance comprised only 3% in total life insurance premiums in Russia, the rest 97% were due to the tax avoidance schemes. This pattern can lead to a distortion in results.

In the study we run the following types of regressions: OLS in linear terms, proceeding with the panel estimations for fixed and random effects. Simple OLS regressions for cross-country data do not allow us to control for country-specific effects, which does panel analysis. Economic and demographic forces can have different impact on life insurance demand across countries than within countries over time.

Chapter 5

ESTIMATION AND INTERPRETATION

Panel data analysis allows us to control for (time-invariant) unobservable variables that influence our dependent variable and could not be captured in OLS estimation. In panel estimations the error term consists of usual disturbance term and unobserved fixed effect factor.

Suppose $v_{it} = u_{it} + a_i$,

where v_{it} – error term, u_{it} - traditional error component that varies over time and countries, a_i - "fixed effect" error component.

If we assume that $corr(x_{it},u_{it})=0$, then for the coefficients to be unbiased and consistent under OLS estimation $corr(x_{it},a_i)=0$ should also be true. However, often it is more preferable to have unobserved effects correlated with independent variables. Analyzing the economic situation across countries it is a common thing to expect country-specific factors that influence the economy and can not be captured explicitly in the model. Even within the sample of countries chosen for this research under assumption of their similarity in the development path, some differences can still be distinguished between them. For instance, shadow economy: ceteris paribus GDP of a country with larger share of shadow economy is more likely to be underestimated. Thus $corr(x_{it},a_i) \neq 0$ results in biased estimators via OLS, that can be corrected with panel estimation techniques.

To be able to estimate the effects of our determinants on life insurance demand, there is a need for a variation in the determinants over time and

between countries within a year (Verbeek, 2004). Therefore, except the combined standard deviation of a variable presented in a descriptive statistics table (Table 1, Ch. 4) over time and across countries, I checked each variable for deviation separately to verify that variation is indeed present in the variables (see Table A3, A4)

I run the model in two variants: the first one includes EU variable as one dummy (with values from 0 to 5), the second one divides it into 6 dummies (as was described in the previous section). Results of estimation of both Penetration and Density equations are presented in the Appendix B (Table B1 and Table B2).

Financial development proxies (namely, ratio of quasi money to M2, ratio of M2 to GDP) are suspended to have endogenous relationship with the dependent variable. Therefore, the tests for endogeneity were conducted and the following conclusions made:

- the ratio of quasi money to M2 has endogenous relationship with penetration of life insurance under 10% level of confidence, however, it is exogenously determines the density of life insurance. Despite the latter fact, in order to purely correct for endogeneity lagged ratio of quasi money to M2 is taken as an instrumental variable in both penetration and density measures of life insurance.
- the ratio of M2 to GDP is an exogenous determinant of both life insurance penetration and density.

Following the discussion above I run OLS, fixed effects and random effects models. In spite of the fact that under OLS estimation we observe a higher number of significant coefficients (Table B1, B2), the signs of some of them contradict to the theory, thus making the OLS estimation less reliable. Further, the usage of fixed effect regression is supported by F-test, statistics for which is reported at the bottom of the table. To verify, whether fixed effect estimation is better than random effect, Hausman test is usually applied. However, Hausman

fails to test the hypothesis fitted on these data, because the model does not meet the asymptotic assumptions. Relatively law number of observations in the model could lead to this problem. In order to overcome this problem generalized Hausman test can be applied instead, but it is not applicable to the "xtreg" command (that is fixed and random estimation techniques in STATA), because it is not possible to generate scores, needed to conduct the test, for the fixed model. However, comparing the random effect estimation with OLS estimation with the help of Breusch-Pagan test, it suggests using OLS. Thus we can conclude that while OLS is "better" than random effect regression, but "worse" than fixed effects regression, the latter is more appropriate in explaining the variation between the countries of the sample. According to the tests discussed above, fixed effects estimation better explains the model than OLS estimation and random effects estimation.

Fixed effects estimation procedure gives us the following results:

Penetration regression (Table B1, Appendix B):

Life insurance penetration significantly and positively depends on life expectancy at birth and level of education in the country, which is consistent with the previous findings, and negatively on ratio of quasi money to the broad definition of money (M2) under both incorporated measures of EU accession, contradicting to previous researchers. There is also a 10% negative significant impact of inflation on life insurance demand in the country in case when we include EU factor as one dummy with values from 0 to 5, as it was constructed by Peter Muller. EU dummy is also significant in this case under 10% level of confidence and indicates that moving forward the status of EU member increases the penetration level of the country by 0.045 percentile.

The rise in CPI by 1 indicates the reduction of life insurance share in GDP of a country by 0.14 percentage points, which is not economically large meaning that inflation is measured as annual consumer price index (1 for base year 2000).

So increase by 1 implies a 100% increase in CPI, therefore 1% increase in CPI would reduce life insurance penetration by only 0.0014 percentage points.

Life expectancy significantly positively impacts life insurance penetration, which does not contradict to the previous findings and our expectation. It reflects the fact that longer life expectancy tends to reduce the price for life insurance, thus making it more attractive to consumers. Additional explanation includes the wealth (income) effect: the rise in income level improves life conditions of a person, leading to an increase in life length. Thus 1 year increase in life expectancy leads to 0.084 percentage points rise in life insurance penetration under both specifications of EU dummy.

The level of education positively determines the demand for life insurance, indicating that the rise in average years of schooling by 1 year improves life insurance penetration by 0.98-1.027 percentage points (significant under both specifications of EU dummy). This is relatively large impact of this socioeconomic factor comparing to other researchers, which emphasizes the importance of education in the observed countries.

The lagged value of quasi money to M2 ratio, which is an indicator of a complexity of a financial structure of a country (Outreville, 1996), produces an unexpected negative sign in both penetration and density regressions. It indicates that the uprise in the ratio by 1% decreases the life insurance penetration by 0.009%.

Previous researchers (Beck, 2002; Outreville, 1996) document a significant positive impact of this determinant on life insurance demand in the country. The pattern gives rise to an issue whether financial development of the observed economies associates with the life insurance sector. Countries of the sample have a large presence of banking sector in the economy. While the links between the two sectors, for instance, in Baltic countries were observed going back to the end of 1990th (several life insurance companies were the bank subsidiaries in Estonia, Lithuania and Latvia), the cooperation between the two sectors in CIS countries

is still in its initial stage. The mentioned cooperation is known as bancassurance – expressed in acquiring the existing life insurance companies by banks or, what is more common, selling of insurance and banking products mutually through bank branches. The upward trend for this kind of services is justified by the positive experience of Western economies. 35% of sales in European life insurance market are accounted for bancassurance, which became a prevailing distribution channel for a number of Western economies including France, Spain, Italy and Belgium (Milliman, 2005). Ukraine bancassurance sphere still lacks experience (Groshkova, 2006), however, it shows a high potential regarding the mortgage boom in our country. Therefore, the possible reason for the negative relationship between financial development and life insurance demand can be observed due to the fact that sound banking sector, as an indicator of financial strength of the country, can draw away the consumers' attention (meaning funds) from insurance industry.

Density regression (Table B2, Appendix B):

Now, proceeding to the density regression, the results indicate the following relationship: income level, life expectancy and old dependency have a significant positive impact on the demand for life insurance, while share of quasi money in M2 and real interest rate influence negatively. Life expectancy and quasi money ratio mirrors regression with penetration level as a dependent variable. Namely, 1 year increase in life expectancy leads to a 10.76-11.15 US dollars increase in annual expenditures on life insurance per person, while 1 percentage point rise in quasi money ratio reduces these expenditures by 0.64-0.75 US dollars (the range corresponds to different specifications of EU dummy).

The important advantage of density regression is the significant impact of real personal income, which is highly supported by previous findings and shows that 100 US dollars increase in income level of a person pushes life insurance density up by 1 US dollar.

Real interest rate appears to be significant under 10% level of significance

and shows the reduction in life insurance density by 0.43 US dollars with the rise in interest rate by 1 percentage point. This result supports the finding of Li et al. (2007), although macroeconomic conditions in transition countries vary from those in OECD countries. The possible explanation is that consumers in the observed countries prefer investing in assets other than life insurance policies.

The coefficient of old dependency ratio is also significantly different from zero and, supporting previous findings, postulates that 1 percentage point increase in elder population results in 8.56 US dollars increase in life insurance expenditures per capita. This supports also the view of Beck and Webb (2002) who suggest that old dependency is more important than young dependency ratio.

Such economic, demographic and institutional factors as share of M2 in GDP, young dependency ratio, urbanization level, political stability, Rule of Law and control for corruption do not explain variation in the demand for life insurance across the CEE and CIS countries.

Chapter 6

CONCLUSIONS

The main purpose of this study was to investigate the change in demand for life insurance in Ukraine and several other countries of the region, both: former Soviet Union and Central and Eastern European, in response to changes in the selected explanatory factors. I analyzed the determinants of life insurance demand in panel of 14 countries over the 11-year period from 1996 till 2006, using two deterministic proxies of life insurance – life insurance penetration and density.

Panel estimation shows that countries with higher life expectancy at birth, income and education level, old dependency ratio and countries-members of the European Union have higher levels of life insurance consumption, while financial development indicator, inflation and real interest rate reduce the demand for life insurance across countries. Whereas other factors, such as young dependency ratio, urbanization level and institutional indicators, do not have robust link to life insurance demand.

Higher levels of life expectancy at birth and education lead to a higher life insurance penetration in the market. Therefore, it is worth noticing that improved living conditions will not tend to reduce demand for life insurance, and desire to accumulate capital through savings weights relatively more than scare of mortality risk for a consumer. This finding also suggests a need for elevating the education level of population. Particularly, it would be useful to enhance the understanding of financial products presented on the market and possible benefits from using them by potential consumers.

In addition, progress in negotiations with the European Union towards its membership increases consumers' confidence in the stability of the market, thus

stimulating the demand for life insurance products. Prior to becoming a member of the EU countries-newly entrants had to conduct a number of reforms in order to improve their economic environment and measure up the EU standards. Regarding the insurance market, these reforms were aimed mostly on deregulation and liberalization of the markets. Poland and Hungary kept the path of adjusting their legislation to the EU standards. Therefore, we can mark the importance of working on joining the EU by non-members included in the research (Ukraine, Kazakhstan, Moldova, Georgia).

Relatively low per-capita income and insurance culture of people in the selected economies (although CEE and CIS countries are both post-socialistic, the last statement refers more to the CIS) determine the attitude towards the life insurance. The results indicate that life insurance is still regarded to be a luxury good among potential consumers of the transition countries. Therefore, increase in income level does not appear to robustly impact the life insurance penetration. But as overall income level and the share of middle class rises, we can expect demand for life insurance to rise too. Thus income level enters significantly only the density regression, indicating the immaterial positive effect on life insurance consumption. Whereas studies over developed countries claim income to be one of the most robust positive factors of life insurance demand.

Inflation appears to have negative influence on life insurance penetration, which is widely supported by previous researchers. Therefore, macroeconomic stability plays an important role in the development of life insurance market. However, inflation factor is less significant in the selected transition countries than in OECD (Li, 2007) or combined sample of developed and developing countries (Beck and Webb, 2003).

Unexpected relationship is observed between financial development indicator and life insurance penetration and density in the selected economies. The possible reason for this might be the sound bank activity, which draws off the funds of consumers from the insurance sector. On the other hand, as

bancassurance will continue growing in the CEE and, more important, in the CIS countries and occupy its share in the life insurance products, the change in this relationship is expected. Although bancassurance is in its initial stage in CIS countries, the tendency towards its growth is observed due to increase in consumers' crediting activity of the banks.

Negative impact of real interest rate on the demand for life insurance in the selected countries confirms the preferences of population towards alternative financial assets. Higher returns on alternative assets switch consumers from savings in life insurance to another type of money accumulation. This pattern also may indicate the unawareness of potential consumers about the benefits of life insurance and negligence to the mortality risk coverage.

Such demographic variable as old dependency ratio appears to have significant positive impact on life insurance demand. Therefore, taking into account the increase in aged population across transition countries, middle-aged and old people should be regarded as a target group for life insurance companies. Larger aged population leads to a higher demand for savings and annuities components of life insurance.

The study can be proceeded further by investigating the demand for life insurance in Ukraine solely to explore the country specific determinants of life insurance. This can be alternatively done on the micro level, taking into account that 65 life insurance companies were operating on the Ukrainian market at the end of 2007. Incorporating additional indicators into the model, such as market concentration level and presence of foreign participants on the market, may help to reflect the industry's liberalization, level of competition and attractiveness of the national life insurance market to foreign insurers.

CEE and CIS countries are regarded to be a highly potential region with dynamic and fact-growing insurance markets. And as far as insurance sector development serves as an indicator of overall economic development, the increase of life insurance sector should be viewed as inevitable part of stable

economic development. Hopefully, findings highlighted in the study may be useful for life insurance companies in developing their strategic policies on the market. And as a result transition countries may reduce differences between life and non-life insurance sectors to the ones of the developed counties.

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APPENDIX A

Table A1. Variable explanation

Variables	Explanation	Source	Expected sign
Penetration	Life insurance penetration in the market. Ratio of life insurance premiums volume to GDP, %.	CEA reports (European Insurance Committee), working papers, state statistic committees, national insurance associations.	
Density	Life insurance premiums per capita. Life premiums, taken in real terms, divided by population, USD.	CEA reports (European Insurance Committee), working papers, state statistic committees, national insurance associations)	
Real GDP per capita	Real personal income in USD, based on official exchange rates of 2000.	IMF (International Financial Statistics - IFS) CD-ROM 2007.	+
R	Real interest rate. Lending rate is taken for most countries, except Kazakhstan (refinancing rate) and Romania (bank rate). Computed as $(i- \pi)/(1+ \pi)$, where i – interest rate, π – inflation rate (CPI).	IMF (International Financial Statistics - IFS) CD-ROM 2007.	+/-
Inflation	Inflation. Average consumer price index. Base year - 2000.	IMF (International Financial Statistics - IFS) CD-ROM 2007.	-
LIFEXP	Life expectancy at birth, years.	WDI (World Development Indicators). http://ddp-ext.worldbank.org/ext/DDPQQ/ showReport.do?method=showReport	+/-
Financial development measures:	Ratio of Quasi money to M2, %.	IMF (International Financial Statistics - IFS) CD-ROM 2007.	+

1)Quasi money / M2			
2) M2 / Nom GDP	Ratio of M2 to Nominal GDP, %	IMF (International Financial Statistics - IFS) CD-ROM 2007.	+
Young dependency	Ratio of people aged 0-14 to working population, %.	HNPStats – the World Bank's comprehensive database of Health, Nutrition and Population (HNP) statistics.	+
Old dependency	Ratio of people aged 65 and above to working population, %.	HNPStats – the World Bank's comprehensive database of Health, Nutrition and Population (HNP) statistics.	+
Education	Average years of schooling in a country.	Provided by Peter Muller, Professor of Economics, Chair of Economics Department at University of Maryland.	+/-
Urbanization	Level of urban population in the country, % to total.	HNPStats – the World Bank's comprehensive database of Health, Nutrition and Population (HNP) statistics.	+
Political stability	Country scores for political stability, percentile rank.	Worldwide Governance Indicators, Worldbank.	+
Rule of Law	Country scores for Rule of Law, percentile rank.	Worldwide Governance Indicators, Worldbank.	+
Corruption control	Country scores for corruption control, percentile rank.	Worldwide Governance Indicators, Worldbank.	+
EU	EU accession dummy. Values: 0 – never a member, 1 – becomes a member eventually, 2 – candidacy but not negotiations, 3 – negotiations forecast to happen soon, 4 – negotiations ongoing, 5 – membership.	Constructed by Peter Muller, Professor of Economics, Chair of Economics Department at University of Maryland, based on the paper of Bevan and Estrin (2004).	+

Table A2. Correlation matrix.

	Penetration	DensityR	GDPc_real	Inf	LIFEXP	R cpi	QuasiMon_M2	M2_GDP	YoungDep_WP	OldDep_WP	Urban	EducYears	Pol_stab	Rule_of_law	Corruption_control	EU
Penetration	1.0000															
Density	0.8696*	1.0000														
GDPc_real	0.6721*	0.8618*	1.0000													
Inf	0.1489	0.2034*	0.0966	1.0000												
LIFEXP	0.7750*	0.8026*	0.7554*	0.1612*	1.0000											
R_cpi	-0.0095	-0.0343	-0.1501	-0.1079	-0.0139	1.0000										
QuasiMon_M2	0.4242*	0.4498*	0.4011*	0.2020*	0.4804*	-0.1490	1.0000									
M2_GDP	0.7065*	0.5908*	0.5974*	0.1463	0.6510*	-0.1514	0.4548*	1.0000								
YoungDep_WP	-0.4292*	-0.5015*	-0.5388*	-0.3673*	-0.7000*	0.1238	-0.3537*	-0.6318*	1.0000							
OldDep_WP	-0.0508	0.0646	0.2595*	0.1345	0.4318*	-0.0360	-0.0093	0.2303*	-0.7898*	1.0000						
Urban	-0.0865	-0.1731	0.1165	-0.1013	0.1277	-0.1196	-0.2936*	0.3119*	-0.4306*	0.5568*	1.0000					
EducYears	-0.3466*	-0.5600*	-0.5791*	0.1093	-0.3195*	0.0212	-0.3528*	-0.0917	-0.0914	0.1876*	0.4748*	1.0000				
Pol_stab	0.4673*	0.4837*	0.7410*	-0.0608	0.4766*	-0.3397*	0.2512*	0.5636*	-0.4279*	0.2865*	0.3578*	-0.3122*	1.0000			
Rule_of_law	0.6352*	0.5932*	0.7937*	-0.0392	0.6919*	-0.2721*	0.3668*	0.6710*	-0.5705*	0.4257*	0.3623*	-0.2960*	0.8707*	1.0000		
Corrup_control	0.6176*	0.5797*	0.7842*	0.0394	0.7385*	-0.2675*	0.3568*	0.6370*	-0.5981*	0.4698*	0.3314*	-0.2970*	0.8345*	0.9646*	1.0000	
EU	0.6268*	0.5723*	0.6678*	0.2872*	0.6802*	-0.2207*	0.2568*	0.5997*	-0.6763*	0.4878*	0.3644*	-0.0683	0.6951*	0.7556*	0.7868*	1.0000

* indicates 5% level of significance.

Table A3. Variation in standard deviation across countries.

code	Penetr~n	DensityR	GDPc_r~l	Inf	LIFEXP	R_cpi	QuasiM~2	M2_GDP	YoungD~P
BGR	.1422433	2.737088	251.8304	.3601545	.7138876	33.37234	4.81588	15.03836	2.17137
CZE	.3615639	27.77087	621.3413	.1130284	.8605496	1.351861	9.593297	3.929018	2.103831
EST	.2057405	16.62227	1373.746	.1432321	.9980884	3.715135	5.109042	7.645401	3.180829
GEO	.002	.0235018	158.9569	.2288948	1.151838	10.96767	11.25867	4.160189	2.826113
HUN	.2888042	22.30721	763.0696	.2542899	1.004988	1.160317	3.314209	2.401759	1.24588
KAZ	.0066261	.2017	694.0334	.2800408	.7256349	5.436429	20.41364	8.676076	3.989643
LTU	.1732696	9.367705	902.8488	.0651559	.5700086	4.210319	6.585835	9.517202	3.71528
LVA	.0709969	2.377451	1190.649	.1349536	.8764591	3.905177	6.016478	9.224014	3.151475
MDA	.3226442	1.23124	78.42888	.4648809	.5854297	7.779417	8.820374	9.25773	4.871074
POL	.3143349	20.43005	495.3923	.1673752	1.008329	2.928579	9.223417	4.138827	3.650647
ROM	.1497136	4.461695	446.19	.8441447	1.105687	14.03659	4.452614	3.380414	2.646234
SVK	.3386509	15.63051	308.4136	.2368617	.5872902	4.394388	9.522806	2.3762	3.37261
SVN	.3929599	54.94396	1178.643	.2128682	1.237959	2.389035	5.637986	6.60877	1.872985
UKR	.0268751	.3637753	260.7177	.3664155	.3580237	12.53825	7.896007	12.8521	3.156023
Tota	.5429137	41.31663	2629.979	.3295443	2.896311	12.50827	16.32872	16.94174	5.834205

code	OldDep~P	EducYe~s	Urban	Pol_stab	Rule_o~w	Corrup~l	EU
BGR	.6474684	.1525958	.7357626	8.358577	1.914873	9.163807	1.30035
CZE	.1954032	.1128072	.3426111	5.549527	2.594158	2.678278	1.420627
EST	1.188217	.1658313	.2640932	7.240839	6.384349	7.475172	1.420627
GEO	1.36456	.1658312	.5189853	6.576136	8.250491	11.91449	0
HUN	.3898754	.1920843	.6917698	8.817858	2.23177	2.265388	1.420627
KAZ	.5101459	.1658312	.5377056	5.629708	3.696518	4.60442	0
LTU	.9904556	.1128071	.2356426	10.93875	1.782134	4.517026	1.439697
LVA	1.173571	.1128072	.2876232	11.32976	2.541601	10.54708	1.439697
MDA	.5427563	.1128071	.2698822	8.178917	8.553785	10.23325	0
POL	.6590177	.1128071	.2298615	5.761856	4.706388	5.971711	1.420627
ROM	1.099867	.1128072	.4105422	3.300861	2.131218	4.205489	1.30035
SVK	.0235511	.1326653	.0831204	6.939618	1.53185	4.575254	1.439697
SVN	1.343544	.0994987	.1580564	5.67898	2.532826	3.286987	1.420627
UKR	1.21463	.1658312	.3483471	1.93533	7.639947	8.634818	0
Tota	3.496979	.7064937	8.131835	21.06603	21.19885	23.18264	1.97755

Table A4. Variation in standard deviation over time.

year	Penetr~n	DensityR	GDPc_r~l	Inf	LIFEXP	R_cpi	QuasiM~2	M2_GDP	YoungD~P
1996	.2887071	18.77017	2203.996	.2458196	2.798547	20.23192	21.81606	22.31877	6.059785
1997	.3444792	20.33586	2314.717	.1695798	2.770408	28.31907	21.53566	17.43754	5.982908
1998	.3568484	22.25528	2386.42	.1536399	2.74131	14.89997	20.10358	16.92979	5.862475
1999	.4463892	26.60376	2488.799	.0896951	2.603095	7.569723	18.57228	16.47345	5.705102
2000	.5280593	30.81866	2549.316	0	2.819087	7.867018	16.68734	16.79162	5.515369
2001	.5720226	35.57912	2608.992	.0795018	2.826025	7.011244	14.72929	17.44671	5.293553
2002	.6056235	40.33243	2704.446	.1510035	2.880171	7.696404	13.22432	16.19646	5.049198
2003	.6352028	44.83179	2777.287	.2134893	2.892327	6.390074	13.11353	16.01962	4.803099
2004	.6587918	53.94903	2874.259	.2650294	3.011881	5.771917	13.35595	13.68204	4.576043
2005	.663808	55.50922	2959.458	.3115725	3.222218	3.206864	12.55429	13.62801	4.379744
2006	.6951069	64.0719	3136.526	.3523986	3.244344	2.389763	12.65492	13.01116	4.215935
Total	.5429137	41.31663	2629.979	.3295443	2.896311	12.50827	16.32872	16.94174	5.834205

year	OldDep~P	EducYe~s	Urban	Pol_stab	Rule_o~w	Corrup~l	EU
1996	3.043848	.7142906	8.409075	17.90813	18.9172	24.31963	.4688072
1997	3.189645	.7154392	8.405426	20.91285	23.48038	25.01008	.4688072
1998	3.350352	.7156693	8.403393	19.37094	22.28408	21.60232	1.691933
1999	3.49428	.7159719	8.402981	22.35609	24.03342	26.6323	1.691933
2000	3.595794	.7158754	8.404186	19.00248	21.73892	23.39199	1.875229
2001	3.64241	.7159506	8.405182	25.88212	23.8652	25.90663	1.875229
2002	3.650085	.7185211	8.408846	23.22522	23.30907	25.26832	1.875229
2003	3.650216	.7193454	8.415175	24.04105	23.7996	25.20305	1.875229
2004	3.671142	.721066	8.424162	22.90566	21.08451	25.16541	2.277458
2005	3.720142	.7216525	8.435798	20.10001	17.69561	19.18816	2.277458
2006	3.795543	.722409	8.404792	18.70458	19.06168	19.217	2.277458
Total	3.496979	.7064937	8.131835	21.06603	21.19885	23.18264	1.97755

APPENDIX B

Table B1. Results of Penetration regression.

	Penetration					
	Fixed effects		Random effects		OLS	
	EU0-5	EU	EU0-5	EU	EU0-5	EU
Real GDP per capita, USD	0.0000314 [0.0000509]	0.0000147 [0.0000466]	-0.0000623 [0.0000379]	0.0000005 [0.0000332]	-0.0000623* [0.0000329]	0.0000005 [0.0000275]
Inflation	-0.1448412 [0.0913736]	-0.1413119* [0.0731350]	-0.2079156** [0.0933300]	-0.1927278** [0.0976085]	-0.2079156* [0.1101297]	-0.1927278* [0.1105772]
Life expectansy, years	0.0842903** [0.0366407]	0.0835359** [0.0361000]	0.0632034** [0.0281004]	0.0260868 [0.0225009]	0.0632034** [0.0254640]	0.0260868 [0.0234291]
Real interest rate	-0.0005361 [0.0031731]	-0.0000239 [0.0031094]	0.0070935** [0.0028045]	0.0095283*** [0.0025122]	0.0070935* [0.0037315]	0.0095283*** [0.0032588]
Share of Quasi Money in M2, lagged value, %	-0.0089641*** [0.0028876]	-0.0072230*** [0.0021646]	0.003787 [0.0035559]	-0.0033147 [0.0022811]	0.003787 [0.0035551]	-0.0033147 [0.0026270]
Share of M2 in GDP, %	0.0001227 [0.0043626]	-0.0000895 [0.0044914]	0.0033909 [0.0033192]	0.0049859 [0.0037128]	0.0033909 [0.0031667]	0.0049859 [0.0032299]
Young dependency, %	0.0119374 [0.0240331]	0.0146752 [0.0220549]	-0.0458283** [0.0221483]	-0.0638924*** [0.0209752]	-0.0458283** [0.0176214]	-0.0638924*** [0.0173016]
Old dependency, %	0.0055214 [0.0488619]	0.0115799 [0.0462773]	-0.1047237*** [0.0276027]	-0.1277465*** [0.0256790]	-0.1047237*** [0.0225524]	-0.1277465*** [0.0220609]
Education, years	1.0274843* [0.5509155]	0.9852255* [0.5339848]	-0.0717468 [0.0769129]	-0.0238712 [0.0801123]	-0.0717468 [0.0744078]	-0.0238712 [0.0736237]
Urbanization, %	-0.0283357 [0.0632784]	-0.0311458 [0.0651530]	0.0053074 [0.0073682]	-0.003227 [0.0075451]	0.0053074 [0.0061176]	-0.003227 [0.0056879]

BGR dummy for 1996, 1997	0.4070428 [0.2703547]	0.3367593 [0.2665224]	0.6322478*** [0.2289207]	0.9369048*** [0.2079066]	0.6322478 [0.3813815]	0.9369048** [0.3677640]
Political stability	-0.0026994 [0.0031181]	-0.0021651 [0.0027475]	-0.0014577 [0.0033528]	-0.0075703*** [0.0028182]	-0.0014577 [0.0034146]	-0.0075703** [0.0030001]
Rule of Law	-0.0063402 [0.0067819]	-0.0055567 [0.0065284]	0.0119381 [0.0090287]	0.0133402 [0.0094619]	0.0119381 [0.0072605]	0.0133402* [0.0074668]
Corruption control	0.0009392 [0.0053905]	0.0001863 [0.0050549]	0.0065878 [0.0060645]	0.0031492 [0.0062293]	0.0065878 [0.0063520]	0.0031492 [0.0063690]
EU0	dropped		0.4359545** [0.2038973]		0.4359545** [0.2185719]	
EU1	-0.1233414 [0.1407229]		-0.0179407 [0.1336132]		-0.0179407 [0.1672390]	
EU2	0.0202553 [0.1418062]		0.1180513 [0.1338713]		dropped	
EU3	-0.0052766 [0.1283869]		0.190564 [0.1334176]		0.1180513 [0.1867752]	
EU4	0.0279976 [0.0922927]		0.5171726** [0.2068381]		0.190564 [0.1647476]	
EU5	dropped				0.5171726** [0.2121046]	
EU (overall dummy)		0.0453990* [0.0271783]		0.0599301** [0.0257025]		0.0599301** [0.0278096]
Constant	-12.7295707*** [4.2959170]	-12.4872119*** [4.2378057]	-1.4068673 [3.0275277]	2.9095156 [2.5185271]	-1.4068673 [2.5434115]	2.9095156 [2.2534482]
Observations	115	115	115	115	115	115
Number of codenumber	14	14	14	14		
R-squared	0.65	0.65	overall =0.85	overall=0.83	0.85	0.83
Standard errors in brackets (robust for fixed and random effects)						
* significant at 10%; ** significant at 5%; *** significant at 1%						

Table B2. Results of Density regression.

	Density					
	Fixed effects		Random effects		OLS	
	EU0-5	EU	EU0-5	EU	EU0-5	EU
Real GDP per capita, USD	0.0100177* [0.0054073]	0.0096270* [0.0048531]	0.0077309** [0.0033777]	0.0113732*** [0.0030633]	0.0077309*** [0.0023162]	0.0113732*** [0.0019256]
Inflation	-4.6835059 [7.1692171]	-8.8823432 [6.7478091]	-7.7798623 [5.8227999]	-8.4539676 [5.4366060]	-7.7798623 [7.7576499]	-8.4539676 [7.7547685]
Life expectansy, years	11.1533532*** [3.2090129]	10.7633921*** [3.0970646]	5.9129783** [2.3385776]	3.5226359** [1.5808946]	5.9129783*** [1.7937143]	3.5226359** [1.6430791]
Real interest rate	-0.4253363* [0.2220872]	-0.3536915 [0.2145026]	0.0319286 [0.2457568]	0.1879663 [0.1576523]	0.0319286 [0.2628532]	0.1879663 [0.2285415]
Share of Quasi Money in M2, lagged value, %	-0.7217409*** [0.2172982]	-0.6417564*** [0.1500911]	0.2011037 [0.2268361]	-0.2111565* [0.1233749]	0.2011037 [0.2504230]	-0.2111565 [0.1842315]
Share of M2 in GDP, %	-0.2636752 [0.3774001]	-0.4595183 [0.3725431]	0.1209626 [0.2236861]	0.2201602 [0.2369356]	0.1209626 [0.2230640]	0.2201602 [0.2265140]
Yaoung dependency, %	1.3642173 [1.1988394]	1.1149913 [1.1517472]	-1.0007632 [1.4991784]	-2.0986746 [1.4029872]	-1.0007632 [1.2412690]	-2.0986746* [1.2133612]
Old dependency, %	7.1036167 [4.4474962]	8.5620620* [4.3123465]	-2.3397254 [1.8893390]	-3.5252344** [1.7565449]	-2.3397254 [1.5886157]	-3.5252344** [1.5471318]
Education, years	-1.724385 [45.8382075]	-1.9349379 [44.9409885]	-5.4625584 [5.4516808]	-3.1146099 [5.7767617]	-5.4625584 [5.2413633]	-3.1146099 [5.1632211]
Urbanization, %	6.2882955 [5.6618517]	6.4444059 [5.8002840]	0.2965754 [0.3823830]	-0.27507 [0.3952851]	0.2965754 [0.4309272]	-0.27507 [0.3988946]
BGR dummy for 1996, 1997	14.6642909 [17.6584119]	7.7197683 [16.2483678]	18.2949956 [19.8704094]	31.5474833*** [11.6671835]	18.2949956 [26.8649161]	31.5474833 [25.7912495]

Political stability	-0.2281416 [0.2283536]	-0.2482793 [0.2038236]	-0.0498018 [0.2178598]	-0.4529140*** [0.1634137]	-0.0498018 [0.2405291]	-0.4529140** [0.2103940]
Rule of Law	-0.7826362 [0.5988136]	-0.6352279 [0.5755054]	0.0493295 [0.6099279]	0.1490942 [0.6212385]	0.0493295 [0.5114401]	0.1490942 [0.5236468]
Corruption control	0.123905 [0.4706809]	0.0071643 [0.4406385]	0.1305045 [0.4134734]	-0.1970459 [0.3848841]	0.1305045 [0.4474390]	-0.1970459 [0.4466583]
EU0	dropped		27.0815092* [15.5195506]		27.0815092* [15.3964341]	
EU1	-5.131521 [11.0885193]		-11.5607794 [8.0331576]		-11.5607794 [11.7804919]	
EU2	13.2096019 [12.0017020]		-2.8514149 [8.1118628]		dropped	
EU3	2.565253 [10.2471139]		-6.1679482 [7.4885874]		-2.8514149 [13.1566378]	
EU4	0.80123 [7.8672509]		11.2019099 [11.9828989]		-6.1679482 [11.6049914]	
EU5	dropped				11.2019099 [14.9408740]	
EU (overall dummy)		1.2983427 [2.1471103]		0.9091242 [1.8320540]		0.9091242 [1.9502814]
Constant	-1252.126*** [342.2008496]	-1255.218*** [338.5988859]	-333.1394215 [231.0776172]	-52.1960744 [170.7828240]	-333.1394215* [179.1605800]	-52.1960744 [158.0340764]
Observations	115	115	115	115	115	115
Number of codenumber	14	14	14	14		
R-squared	0.72	0.71	overall = 0.87	overall = 0.86	0.87	0.86

Standard errors in brackets

* significant at 10%; ** significant at 5%; *** significant at 1%

Figure 1. Life Insurance Penetration dynamics across countries.

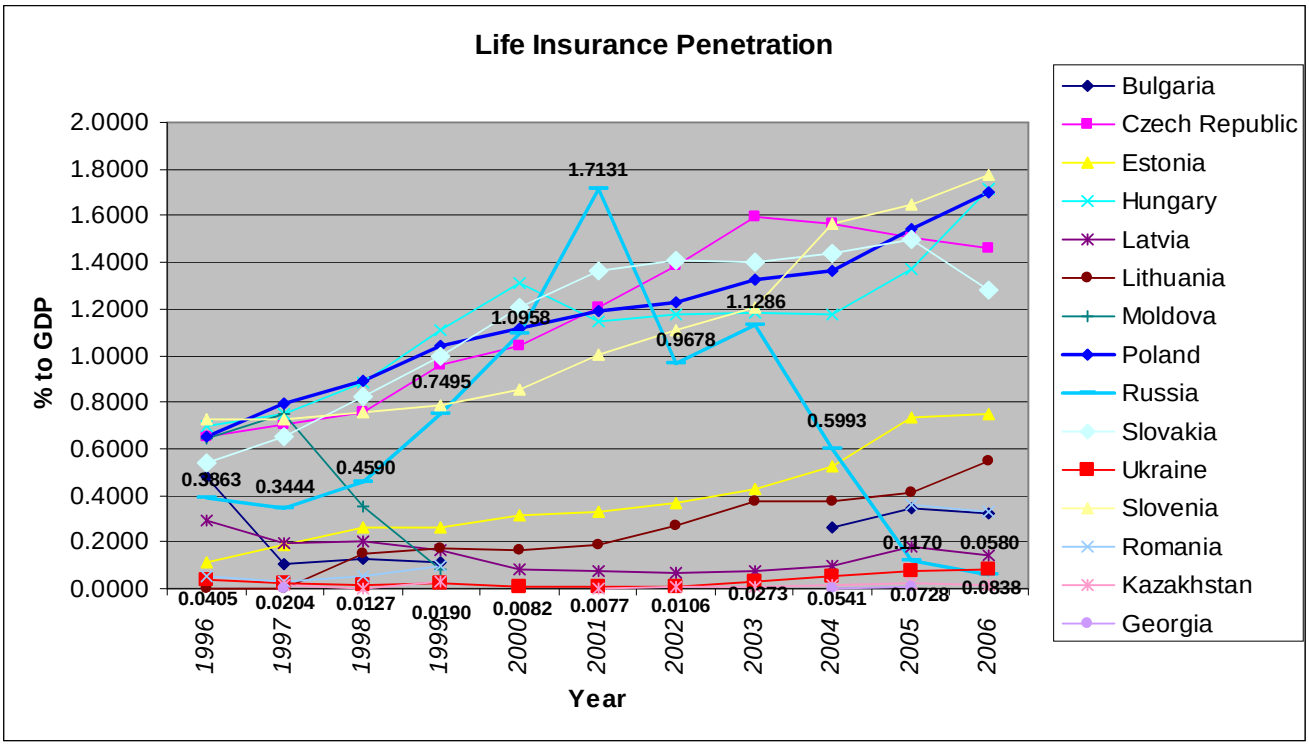

Figure 2. Life Insurance Density dynamics across countries.