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The Relationship of Insurance and Economic Growth – A Theoretical and Empirical Analysis

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Abstract

The role of insurance companies, though growing in importance in financial intermediation, has hardly been investigated with regard to the direction and causality vis-à-vis GDP growth. We fill this gap by providing a literature review on the insurance-growth-nexus and identify respective channels of influence. We conduct a cross-country panel data analysis using annual premium data over 1992 to 2004 for 29 OECD countries. We find a positive impact of life insurance on GDP growth in EU-15 countries, Switzerland, Norway and Iceland and a short-run impact for the CEE/NMS countries for non-life insurance consumption. But the overall picture is mixed. We conclude that the analysis of the finance-growth nexus hitherto limited to the banking and capital markets should be widened to include the insurance sector. Similar to banking, the impact of insurance depends on the level of economic development.

EFMA Classifications: 740, 620, 630, 570

JEL Classifications: E44, G22, O11, O16

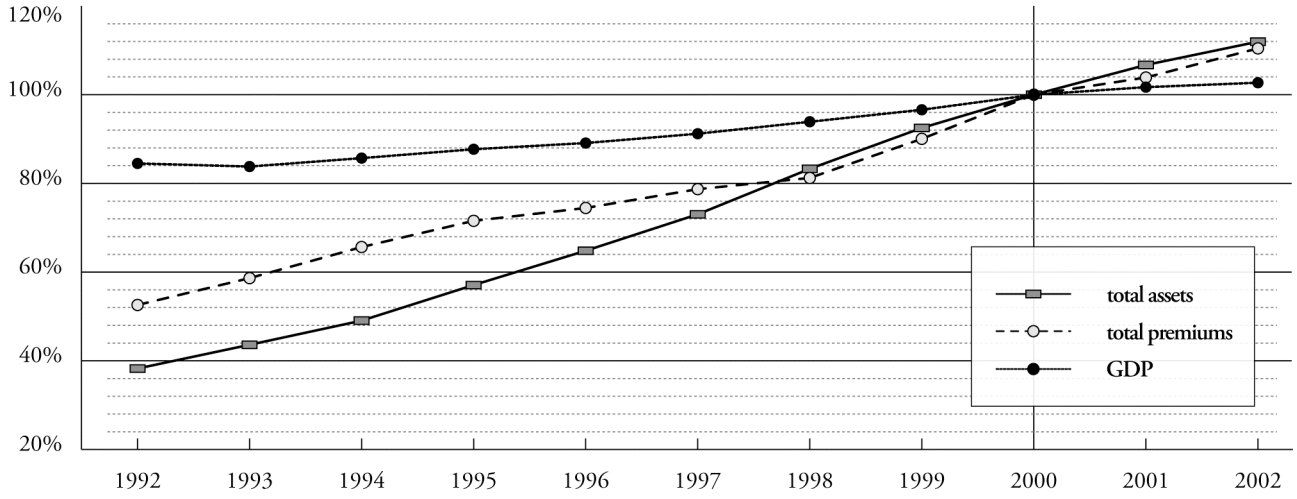
Keywords: Insurance, financial intermediation, economic growth, finance-growth-nexus, emerging markets

I. INTRODUCTION

Theoretical studies and empirical evidence have shown that countries with better-developed financial systems enjoy faster and more stable long-run growth. Well-developed financial markets have a significant positive impact on total factor productivity, which translates into higher long-run growth. Based upon Solow's (1956) work, Merton (2004) notes that "… in absence of a financial system that can provide the means for transforming technical innovation into broad implementation, technological progress will not have significant and substantial impact on the economic development and growth…". This article's objective is to investigate the link between insurance sector development and economic growth and hence to fill a gap in the current finance-growth nexus literature.

The importance of the insurance-growth nexus is growing due to the increasing share of the insurance sector in the aggregate financial sector in almost every developing and developed country. Figure 1 illustrates the parallel and rapid growth of total insurance premiums and total bank assets relative to GDP growth. Insurance companies, together with mutual and pension funds, are one of the biggest institutional investors into stock, bond and real estate markets and their possible impact on the economic development will rather grow than decline due to issues such as ageing societies, widening income disparity and globalisation. The growing links between the insurance and other financial sectors also emphasize the possible role of insurance companies in economic growth (Rule, 2001). Cross-shareholdings and bank-assurance as a major form of financial conglomerates and assure-finance play a rising role. Via credit default swaps (CDS) and other risk pass-through vehicles, insurance companies increasingly enter the market for credit risk, hitherto the sole domain of banks and capital markets[1].

FIGURE 1: TOTAL ASSETS, PREMIUMS AND GDP (EUROZONE, INDEX: 2000 = 100; SOURCE: CEA 2004)



Literature dealing with the interaction between the financial sector and economic growth, however, is merely concerned with bank and stock markets. The role of the financial sector for economic growth became a major topic of empirical research in the last decade, vastly elaborating on the seminal work of King and Levine (1993a, 1993b) and Rousseau and Wachtel (1998). An impressive number of empirical studies relying on large

[1] ON CHANGES IN THE FINANCIAL SECTOR, SEE FOR INSTANCE ALLEN & SANTOMERO (1999) OR VAN DER BERGHE (1999)

country samples for the 1960s to the 1980s show that financial sector development can have an economically important impact on growth.[2] The role of bank sector and stock market development vis-à-vis GDP growth was explored via cross-section methodology (e.g. Levine and Zervos (1998) and via panel data techniques (e.g. Beck and Levine (2001, 2002a). Both bank sector and stock market showed an independent, significant and positive effect on economic growth. Fink et al (2003, 2005a, 2005b) and De Fiore and Uhlig (2005) recently investigate the impact of the bond sector on economic growth. Khan and Senhadji (2000) construct a comprehensive financial sector development indicator comprising the bank sector, stock markets and also bond markets. Again a positive finance-growth link was found.

Apart from sectoral issues, followers of the law-and-finance-view (e.g. La Porta et al, 1997, and Levine, Loayza and Beck, 2000) emphasize the important role of legal and accounting status for economic growth. A related strand of literature, e.g. Beale et al (2004) and Giannetti et al. (2002), provide evidence that financial deepening and integration can boost economic output. Rousseau and Wachtel (2005), however, find that the bank/stock-finance-growth-relationship that had seemed so robust in earlier studies using data from the 1960s to the 1980 does not carry over to data from the past fifteen years. One of the reasons for this seemingly less robust finance-growth-relationship since the 1990ies may be the rising importance of the insurance sector in financial intermediation and its neglect in the finance-growth-research.

Insurances are similar to banks and capital markets as they serve the needs of business units and private households in financial intermediation. The availability of insurance services is essential for the stability of the economy and can make the business participants accept aggravated risks. By accepting claims, insurance companies also have to pool premiums and form reserve funds. So insurance companies are playing an important role by enhancing internal cash flow at the assured and by creating large amount of assets placed on the capital market and hence may contribute to economic growth. The amount and complexity of the ties of an insurer to other institutions and the environment are equal to those of banks. Literature on insurance-growth nexus, however, is rare and mainly due to the lack of appropriate data sources the significance of econometric analysis is weak.

As Wachtel (2001) and Favara (2003) note, research efforts so far have not examined the impact of other financial markets or instruments on economic growth in similar depth. Compared to the vast literature focusing on bank, stock and bond markets and their respective environment, the insurance sector has hardly been investigated in its role vis-à-vis economic growth. The few research efforts on the insurance-growth nexus, while emphasizing the importance of the topic, concentrated on a few countries over fairly short or distant time horizons (e.g. Catalan et al, 2000; Ward and Zurbruegg, 2000), dealt with specific subsectors (Beenstock et al , 1988; Browne et al,2000) only, are concerned with contagion and other possible negative effects the insurance sector can transmit onto the economy (e.g. Das et al 2003) or treats the insurance-growth-link rather as a side issue (e.g. Holsboer, 1999). Given the growing importance of the insurance sector and the increasing number of interlinks to other financial sectors, the evolving role of insurance companies vis-à-vis economic growth and stability should be of growing relevance for policy makers and supervisors. With regard to emerging and transition economies, the sequencing of reforms and the role of the insurance sector should also be a major concern in efforts towards catching up in economic growth and systemic stability.

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[2] For recent reviews, see Blum et al (2002) or Wachtel (2003). Lead effects of financial markets on economic growth were identified in several countries with Granger causality tests by Fink, Haiss and Hristoforova (2005). For a critique, see Rousseau and Wachtel (2005).

The European Commission (2005a, 2005b) already assumes a linkage between GDP per capita growth and, equally, development of banking and insurance sector and traces institutional, legal and market changes with increasing interest. This fact in mind and the market opportunities in the CEE, which will and have to be exploited, make it even more imperative to search for the pros and cons of insurance services to avoid negative side effects and to facilitate desired advances.

The remainder of the paper is organised as follows. Section two discusses spheres of influence of the insurance sector within the economy (risk transfer, saving substitution, investment, institutional linkups, and contagion). We then review the literature with regard to models on the insurance-growth-nexus and on empirical studies. We broaden the discussion by emphasising social and legal aspects. Section four introduces the theoretical model following endogenous growth theory and the estimation results are presented in section 5. Conclusions are drawn in the final section.

II. THE INSURANCE-GROWTH CHANNEL

The role of the financial sector is to channel resources from savers to investment projects. The financial sector (1) improves the screening of fund seekers and the monitoring of the recipients of funds, thus improving resource allocation; (2) mobilizes savings; (3) lowers cost of capital via economies of scale and specialisation; (4) provides risk management and liquidity (Wachtel, 2001). Insurance companies play a major role in these functions and thus should also play a major role in economic growth.

In analogy to other financial sectors (Blum et al 2002), the link between the insurance and the real sector can be classified in terms of causality with respect to five possible hypotheses: (1) no causal relation; (2) demand-following, e.g. economic growth leads to a rise in demand for insurance; (3) supply-leading, e.g. growth in insurance smoothes short-term economic volatility and thus induces economic growth in the long run, plus growth in investment by insurance companies induces economic growth; (4) negative causal link from insurance to growth (e.g. growing insurance causes more reckless behaviour ("moral hazard"), resulting in a less efficient and more volatile economy; (5) interdependence. In the following, we discuss the various functions performed by the insurance sector and its possible link to economic growth.

The organization of the subchapters was revised several times, due to the complexity of topic, the great number of cross-links and the indistinct borders of each function described. Since we don't follow the segmentation according to the function perspective on a financial intermediary[3], it may be helpful to explain the approach in short: Starting with the client side of an insurance company, the next five subchapters describe the flow of money from the assets of the policyholder to the capital markets or the asset side of the insurance company. Each subsection and at each stage we explain the positive and negative implications for the acting parties and the results for economic growth.

II.1 Risk Transfer

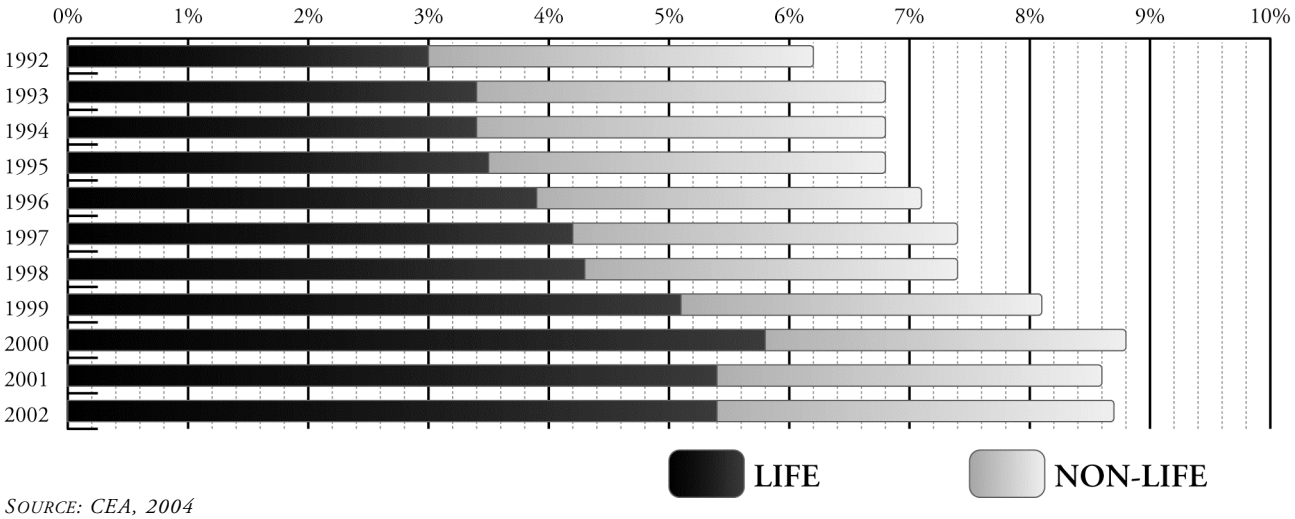
The major functionality of the insurance on the client side is risk transfer. Usually the insured pays a premium and is secured against a specific uncertainty. Measured in terms of insurance premiums paid relative

[3] SEE, FOR INSTANCE, ALLEN & SANTOMERO, 1996

to GDP, the importance of insurance-based risk transfer grew by about 1/3 between 1992 and 2002 in Europe (see figure 2). This measure could be used to depict the insurance sector's impact on the economy.

By reducing uncertainty and volatility, insurance companies smoothen the economic cycle and reduce the impact of crisis situations on the micro and aggregate macro level. First of all, there is demand for protection against losses of property caused by natural disaster, crime, violence, accidents, etc. Purchase, possession and sale of goods, assets and services are facilitated by the indemnification of the insurance. Therefore the assured safety of the property for example enhances trade, transportation and capital lending and many sectors are heavily reliant on insurance services. Besides relieving the fear of risk-averse individuals in buying cars or real estate and hence increasing national consumption, insurances aid companies to resist threats accruing from their business activity, like receivables, equipment brake down, transport risk and more, which all represent loss of property.

FIGURE 2: PREMIUMS IN % OF GDP FOR EU-15



SOURCE: CEA, 2004

Insurances also protect against possible negative outcomes of activities carried out by individuals or companies threatening themselves, others and the future abilities of both. This reduces concerns about dangerous leisure-time activities, jobs bearing safety risks, venturous investments and the like. As mentioned in Ward and Zurbruegg (2000) "… without access to product liability insurance, firms, particularly pharmaceuticals, would be unwilling to develop and market highly beneficial products". In these cases the growth supporting aspect derives from a possible efficiency improvement, development of new products and services and the additional profits achieved by the compensation of extra business venture.

Since insurers provide a risk pass-through mechanism, one of their main objectives is the management and measurement of risks, which they should master at least better then their clients. So insurers can use premiums as an indirect influence on resource dissipation and as well for lowering the total risk the economy faces[4]. High risk-taking individuals and companies accordingly should bear much higher insurance costs than risk-aware and risk preventing customers. The tendency of those exposed to higher risk to seek more insurance coverage than those at a lower risk could also lead to "adverse selection", for example with regard to flood protection or environmental pollution and the resulting losses. Insurance companies thus may refuse protection against these

[4] DAS, DAVIES AND PODPIERA, 2003

risks or limit indemnification. Some companies also form conglomerates or JUAs (Joint Underwriting Associations) to be able to write high limits[5]. Governments can support access to insurance coverage for especially imperilled citizens via "FAIR Plans" or other programs[6].

To summarize, insurances increase the possibilities of their clients, which – in the short run – may result in higher expenditure, and – in the long run – can increase income and economic efficiency, due to new products and services. A signal effect derives from the company's will to bear the risks offered to take over. All these aspects may spur economic growth. For our econometric modelling approach we will use yearly premium income, as total amount and split into life and non-life resembling a fairly accurate measure for the effects of the insurance services to the economy at large.

Finally, some negative outcomes in connection with the risk transfer and indemnification should be mentioned. Possible negative influences from insurances to the economy can derive from the tendency of the policyholder to change his behaviour due to insurance coverage. Risk transfer not only enables the insured to cover his losses in case of the secured event, it also dispenses him from taking precautionary actions against the occurrence of the secured event and the extent of the resulting damage. A survey about the influence of workers compensation insurance by Butler, Gardner and Gardner (1998) shows that due to the beneficial insurance coverage productivity is lower, the number of severe injuries is higher and the periods of illness are longer than in companies not offering this benefit.

II.2 Saving Substitution

The appearance of insurance companies adds an additional competitor to the financial market, which enables the customer to diversify his portfolio or substitute different investments. Since the indemnification of possible losses is assured by the insurance, the dependence on precautionary savings held by companies or households is reduced. The size of the substitution depends on how the premiums are financed. Insurance premiums may result from an additional flow from income to the financial market (no substitution) or may be a simple shift from one intermediary's assets (i.e. by bank account withdrawal) to insurance income/assets[7]. So offering insurance services can result in an increased consumption of the households and/or may increase market competition and hence market efficiency.

The "saving substitution effect" of the insurance sector is most clearly linked to life insurance. Within the market for intermediated savings, mainly the life insurance companies gained ground and reduced the market share of the banks (Van den Berghe, 1999 or Allen & Santomero, 1999). So insurance companies also try to exploit this effect to gain market share from neighbouring market competitors. The volume of premiums paid for life insurance relative to GDP nearly doubled over the 1990ies in Europe (see figure 2), providing insurance companies with a more prominent role in financial intermediation. By concatenating insurance and investment elements, insurers use the attractiveness of the "saving message" to acquire new clients or increase premium income. The entry in complementary markets involves services such as bank type, finance and

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[5] Van den Berghe, 1999, a special treatment in the glance of 9/11 for JUAs is for example provided in Kunreuther, 2002.

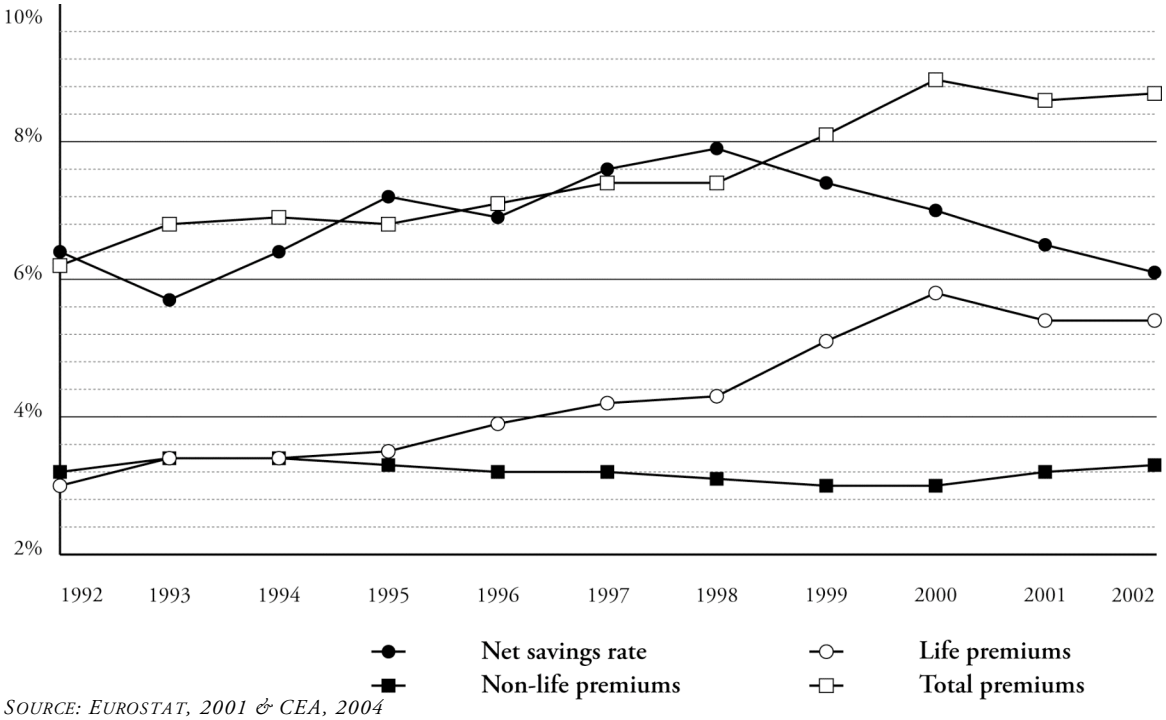
[6] See, for example: California Natural Hazard Disclosure Law (AB 1195), Beach and Windstorm Plans provided by several states of the US or Brussels convention on civil liability for nuclear damages.

[7] The direction and impact of this nexus seems quite unclear and varying depending on several externalities. for a discussion, see: Engen & Gruber (2001), Ranade & Ahuja (2001) and Poterba, Venti & Wise, 1996.

investment activities and as a consequence thereof includes all positive and negative side effects[8]. Especially life insurers and pension funds are substitute saving vehicles and hence also increase competition in the investment and banking sector.

The metamorphosis of both banks and insurances sometimes include quite revolutionizing steps, since the client's image of the company has to be altered quite heavily. This involves new distribution channels, focus on client advice and service and setting up additional branches. Positive effects can arise from synergies achieved in the finance sector, increasing competition and convenience for the client. As Van den Berghe (1999) notes "… financial firms act as true financial supermarkets, offering a very broad range of products", making substitution across historic-sectoral boundaries easy and strengthening the client's position.

FIGURE 3: LIFE, NON-LIFE AND TOTAL PREMIUMS IN COMPARISON TO SAVINGS RATIO AS % OF GDP



SOURCE: EUROSTAT, 2001 & CEA, 2004

In short, insurance intermediation increases market competition, enables customers to access diversified portfolios and hence reduces the average risk the economy has to face[9]. This may result in a reduced need to save and a decreasing domestic saving rate[10]. The development of the substitution can be depicted in a bank assets/insurance assets rate and the economic impact could be measured by comparing life insurance premiums and the savings rate relative to GDP. While both – total premiums and savings rate - used to develop in parallel up to 1998, life premium and hence total premium income have grown since then while the savings rate declined (both relative to GDP; see figure 3). But the findings may be misleading due to the decline of interest rates at the beginning of the millennia resulting in lowered will to save.

[8] FOR AN OVERVIEW ABOUT CONVERGENCE IN THE FINANCIAL SERVICES INDUSTRY WE RECOMMEND VAN DEN BERGHE (1999). THE NEGATIVE ASPECTS OF ENTERING COMPLEMENTARY MARKETS ARE DISCUSSED IN THE LATER SECTIONS.

[9] DAS, DAVIES AND PODPIERA, 2003

[10] WARD AND ZURBRUEGG, 2000

II.3 Investment and Insurance Assets

At a first glance the inside of an insurance company seems to be quite simple. As an intermediary the insurance aids the unfortunate who suffer losses by compensating them from funds collected from many policyholders. According the "law of large numbers" and actuarial theory the sum of the supposedly few compensations paid are smaller or equivalent to the large number of premiums received. In the ideal model the premium inflow is quite steady over time and cumulative amount big enough to fulfil the claims. By selling different types of contracts the insurer can diversify his income risk and manage his income stream.

So these earnings found the capital basis of the company from which the compensations are paid and can be separated into two parts[11]. The first and most important portion is the technical reserve, which forms the counterpart to the premiums collected and is defined by a certain percent of the future liabilities of the insurer dependent on the contracts sold. The host countries regulations further may alter/define the size and quality of the technical reserves. The second part of the capital basis is denoted as the sur-plus and may derive from different sources like insurance provision, investment sur-plus, etc plus a possible regulatory minimum.

Since the insurance policy entitles the policyholder to receive a certain amount of money in future and this is the main burden of the insurer, it is corollary that not the capital inflow, but rather the future obligations define the characteristics of the insurer's assets. So to understand the nature of insurance assets it is important to know the peculiarities of the insurer's liabilities[12]. The value of the liabilities can be indefinite (e.g. product liability insurance) or defined in nominal or real terms or can be linked to labour earnings (e.g. defined benefit contract) or other indexation and the contracts can include a guaranteed minimum. Furthermore policy loans that are common in the life insurance business may raise capital needs during contract term. The maturity can be indefinite (e.g. for non-life business) and floating between setup and withdrawal (e.g. point of retirement for pension plans).

To meet the appreciation needs, to match maturity of assets and liabilities and to prevent the company from liquidity bottleneck premiums collected have to be managed in professional ways. Illiquidity can occur because the receipt of the premiums and the payment of insurance liabilities are temporally independent and the sudden appearance of a disaster can cause a peak demand for financial coverage. Where aloud liquidity requirements are mainly satisfied by the usage of derivatives. The increase in value is achieved by the insurers investment capabilities and hence by the yields obtained through the activities performed on the financial market. So insurance companies are major investors within the economy, and increasingly so: aggregate investment by insurance companies grew by 1/3 relative to GDP in Europe 1992-2002; investment by life insurance companies nearly doubled over the same period (figure 4). An interesting endeavour might be to depict the impact of insurance investments onto the economy.

The manner of how the investment activity is accomplished influences the overall performance of the insurance companies and carries over onto the economy at large. Depending on their will to bear entrepreneurial risks, insurers can implement their investment activities in two different ways. First, they can act as a simple funds manager, preventing assets from devaluation, fulfilling claims of those entitled and collecting

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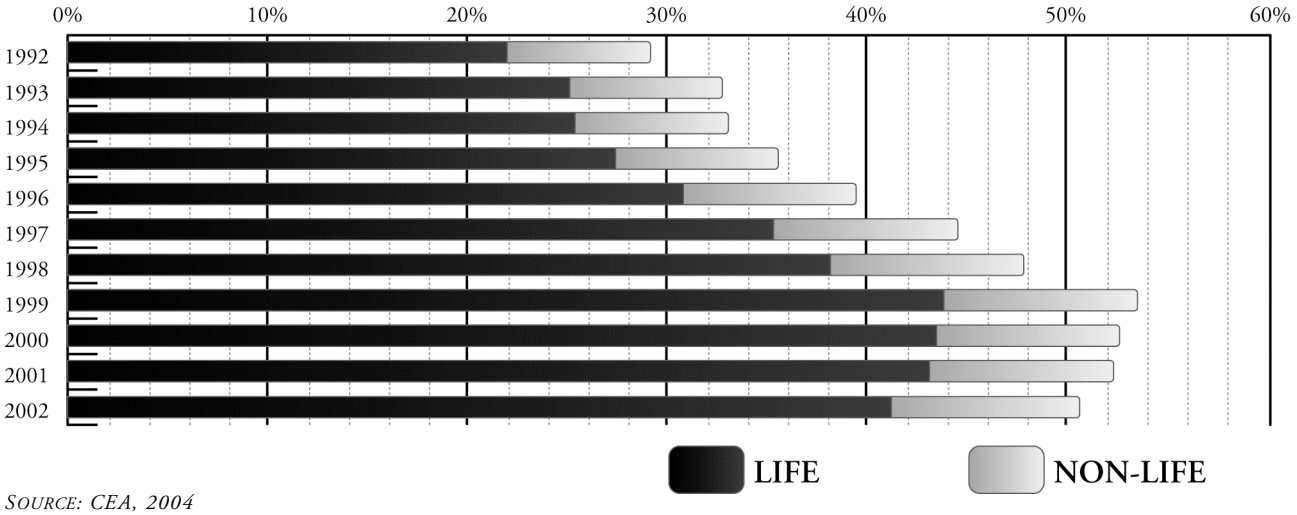
[11] DICKINSON, 1998

[12] FOR THIS SHORT DESCRIPTION WE FOLLOWED THE FINANCIAL ECONOMICS PERSPECTIVE OF DAVIS (2000) AND EXTENDING THE DESCRIPTION ONTO NON-LIFE INSURERS WHERE APPROPRIATE.

premiums to maintain a satisfactory financial basis[13]. The insurers profits´ could be a percentage of the premiums collected, dependent on the annual average of assets managed or the company could be set up as a mutual insurance company. Second, the insurance companies could be established as a venture selling titles of compensation on occurrence of a certain event. The insurers can achieve additional pay-offs from the difference between the moral hazard of the policyholder and the physical hazard calculated on actuarial basis[14].

FIGURE 4: INVESTMENT IN % OF GDP FOR EU-15



SOURCE: CEA, 2004

So an essential part of the contribution of insurance companies to GDP growth derives from their assets, their utilization on the financial markets via investment and the company's setup: what they invest in (e.g. real estate vs. stock markets; which industries´ stocks), where they invest in (e.g. domestic vs. abroad), and at what maturity; finally the ability to exploit the difference between moral hazard and physical hazard defines the company's efficiency and contribution to growth.

Since 1990 total assets of insurance companies have grown much faster than those of banks (Raikes, 1996). So besides insurance investment growth, insurance asset growth could be investigated with regard to the interaction with economic growth. But in contrast to assets held by banks and bank liabilities insurance assets/liabilities have some differing peculiarities and likely impact on the economy:

- *Broadening the investment spectrum*: Bank deposits usually define the banks´ liabilities and coverage can be limited to a certain value[15]. The number of clients is smaller than those of insurers and the average deposit is higher than the average premium paid for insurance contracts[16]. Liabilities of an insurance company depend on the probability of the insured risk and on the unpredictable resulting losses. According to the description of the liabilities above and by Raikes (1996), "Banks tend to have assets which are difficult to value, whereas insurance companies have uncertain liabilities." So the financial risks are more uncertain and

[13] HANEKOPF, 1998

[14] A SHORT INTRODUCTION WITH REFERENCES TO FURTHER LITERATURE AND DISCUSSION OF PROS AND CONS REGARDING MUTUALS AND PLCS IS – FOR EXAMPLE – PROVIDED BY DRAKE & LLEWELLYN, 1997.

[15] KASHYAP, RAJAN AND STEIN, 1999

[16] HANEKOPF, 1998

fluctuation can be higher for insurers than for banks. The investment policy is focusing on stability and assets are usually more liquid[17].

- *Expanding the investment horizon (maturity):* Assets held by a company usually reflect the maturity of its liabilities. Insurance liabilities are usually of longer term than those of banks[18]. This is especially true for life insurers or specific risks such as product liability, where the arising liabilities continue for many years and can sometimes not even be covered by an appropriate investment element. So insurances have to rely on long- term investments and hence are particularly qualified to play a large role in financial markets trading long-term assets.

  Furthermore the "savings substitution effect" enters again when spreading the observation focus onto the customers. Bank customers, who turn from bank deposit to saving products offered by the insurance sector, increase the maturity of their assets as well. It may be not obvious to the customer, but the households' direct holdings, which are usually concentrated in shorter maturities, are transformed into long term managed maturities when incorporated into the insurers technical reserves.
- *Increasing investment volume*: Insurance companies are major investors into shares, bonds and loans and real estate (see figures 5 and 6) in Europe. Thus relating total investment by the insurance sector to GDP growth should be a major avenue for analysing the insurance-growth-nexus. Directly and indirectly insurers provide funds for investment and add to demand for the respective financial market instruments. By providing liquidity and depth to the respective markets, they improve the overall performance of the respective markets. Due to higher liquidity it is much easier for private and institutional investors to access diversified investment portfolios and to invest in high-risk, high-productivity projects. The possible early monetary realization of asset holdings relieves investors from the struggles of selling risky assets in tight markets. On the one hand this intensifies the pressure on the economy to limit the waste of resources due to the increased competition in the market and on the other hand aids economic growth by smoothening the flow of funds to capital-intensive projects[19].
- *Deepening capital markets*: Given that insurance companies play a major role on stock and bond markets, growth effects attributed to them in the finance-growth-literature may at least partly be derived from insurance companies´ investment. So analysing the impact of insurance investment by category (stock, bond, loan, real estate) on the economy is a further area to explore. For example, Catalan, Impavido and Musalem (2000) found evidence for the causal relationship between the development of contractual savings and market development by analyzing the progress of market capitalization and value traded in stock markets and the assets of pension funds and life insurances.
- *Improving financial market efficiency:* In line with discussions about other intermediaries holding assets the positive influence of the increased capital mobilization, the pressure on the domestic interest rate and the advantages of institutions of scale monitoring companies[20] apply to insurance companies as well. Efficiency improvement in the insurance market can put additional pressure onto other financial intermediaries and improve the contribution of the financial sector to real growth (Pagano, 1993; Bosworth and Triplett,

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[17] DAS, DAVIES AND PODPIERA, 2003; FOR DATA SEE, FOR INSTANCE: FINANCIAL & NON-FINANCIAL ACCOUNTS FROM ECB MONTHLY BULLETIN ON EURO AREA STATISTICS (HTTP://WWW.ECB.INT/STATS/ACC/NONFIN/HTML/INDEX.EN.HTML);

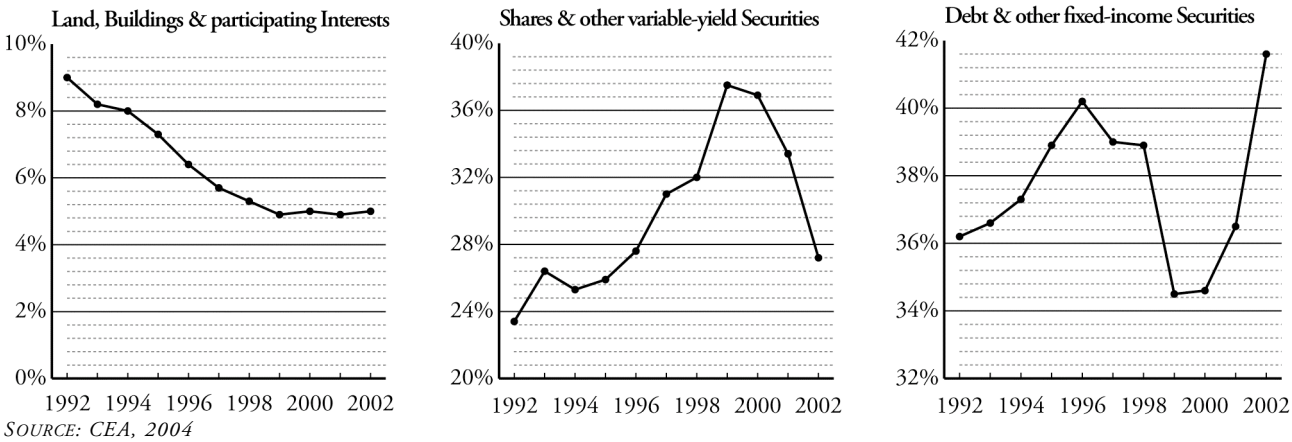
[18] WILLIAM MILES, 2003 OR CATALAN, IMPAVIDO AND MUSALEM, 2000

[19] LEVINE AND ZERVOS, 1996, ARESTIS AND DEMETRIADES, 1997 AND LEVINE AND ZERVOS, 1998

[20] GRACE & REBELLO (1993) AND LEUNG & YOUNG (2002)

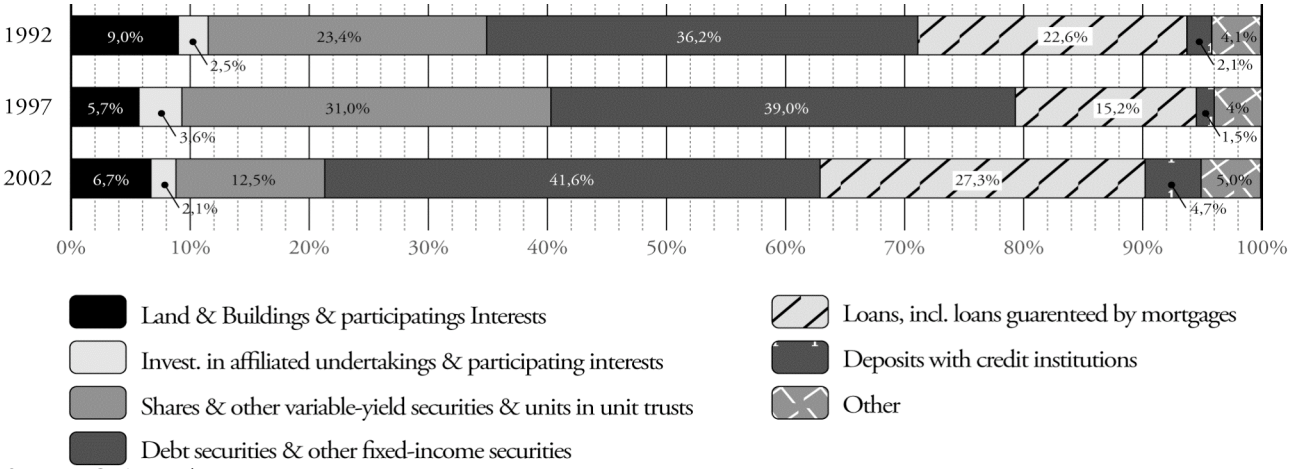
2004). However, as shown in figures 7 and 8, average yields and labour productivity for insurers varies substantially across countries.

FIGURE 5: INVESTMENT PER CATEGORY IN % OF THE TOTAL INVESTMENTS - CEA COUNTRY AVERAGE



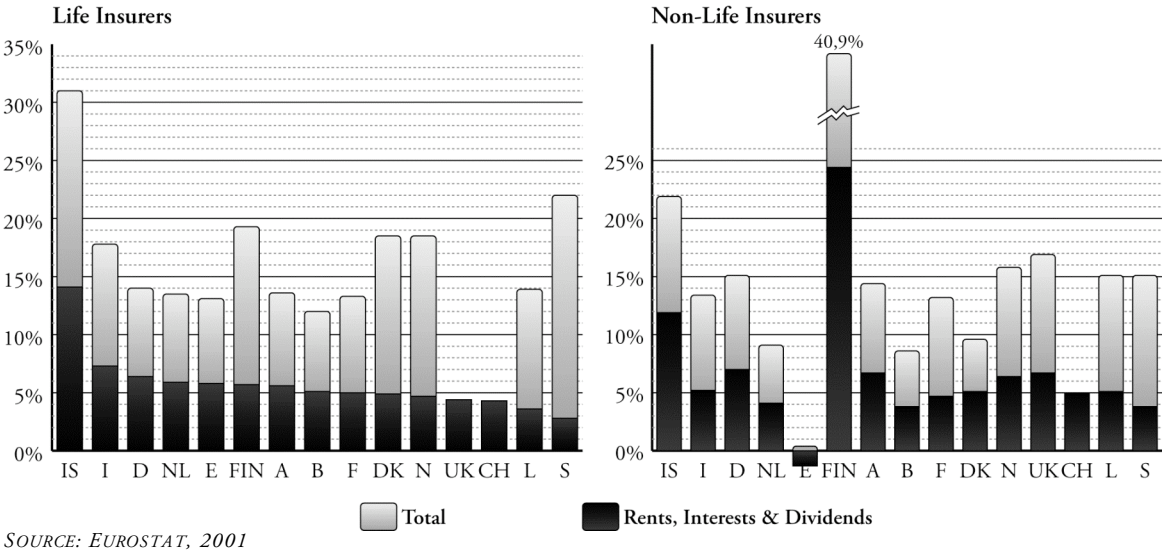
SOURCE: CEA, 2004

FIGURE 6: INVESTMENTS PER CATEGORY IN % OF TOTAL INVESTMENT - CEA COUNTRY AVERAGE



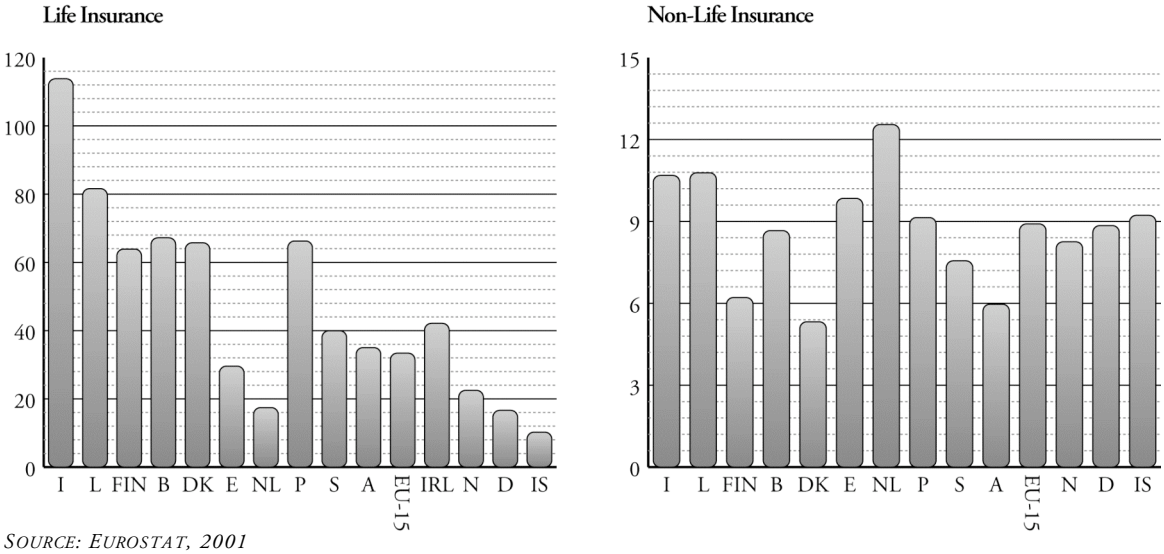
SOURCE: CEA, 2004

FIGURE 7: AVERAGE YIELDS FOR INSURERS, 1999



SOURCE: EUROSTAT, 2001

FIGURE 8: LABOUR PRODUCTIVITY/COSTS IN 1999



SOURCE: EUROSTAT, 2001

To sum up, the investment activities of insurance companies have various effects onto the capital markets and further onto the economy at large: market development by deepening and widening and knowledge transfer by calculating accurate risk levels. Furthermore hurdles and regulations of investment activity may extremely alter the strength and size of the Insurance-Growth Nexus. For measuring the impact, total insurance assets may be an adequate figure to estimate the quality of capital managed and provided by insurances in the endogenous growth model. Catalan, Impavido, and Musalem (2000) investigated capital market development and insurance asset/GDP ratio impact and they found some evidence for positive effect for market capitalization and value traded.

II.4 Institutional Aspects

The growth of the insurance sector relative to the banking sector (Raikes, 1996) has been facilitated by recent liberalizations, privatizations, and financial consolidations. Bank-type activities, especially by life-insurers increased the significance of the insurance sector for the capital market. The corresponding organizational-institutional models of financial conglomerates are the banc assurance and the assurfinance. Within the euro area, most cross-border transactions between financial intermediaries were initiated by insurance companies looking for bank outlets to distribute their products and diversify their income streams (ECB, 2005).

Supervisory institutions react accordingly and bundle bank, capital market and insurance supervision increasingly under one branch. In Europe the Financial Conglomerates Directive of December 2002 is already addressing this issue. In the US first the Glass-Steagall Act (1933) and then the Bank Holding Company Act (1956) tried to prevent banks and insurances from engaging in cross holdings and by prohibiting or reducing actions like selling and buying securities as an agent (for banks) or to accept deposits (for insurers) or to even share directors and employees. But the regulations were weakened by various decisions of courts and regulators and the Gramm-Leach-Bliley Act finally gave way for so-called “financial holding companies”, which are comparable with banc assurance and assurfinance. However these companies are kept under tight control and have to be certified and registered with the Federal Reserve Bank.

Total Merger & Acquisition activity in banking and insurance sectors reached around € 950 Billion in the period of 1990 to 2003 (see Table 1). Although mainly consisting of same-sector, same-country deals, a substantial number of cross-sector and/or cross-country M&As have taken place. For a more details and

information on cross-sectional M&A, the consequential policy implications and measures EU and US authorities have implemented see, for instance, Dierick (2004).

TABLE 1: VALUE OF M&AS IN THE EU IN BILLION € (PERIOD 1990-2003)

Acquirer	Target							
	Domestic		Intra – EU		Outside EU		Total	
	Bank	Insurer	Bank	Insurer	Bank	Insurer	Bank	Insurer
Bank	446,3	40,7	75,1	4,3	60,0	5,1	581,4	50,1
Insurer	52,3	115,3	20,2	36,9	3,9	73,3	76,5	225,6

SOURCE: DIERICK, 2004

Although the tenor of the explanations above sound quite negative, one aspect always connected with financial intermediaries should be kept in mind: "Economies of scale" can monitor and influence large companies borrowing money much better than smaller institutions. So the formation of conglomerates in the financial sector may be just a reaction to developments in other sectors of the economy. The efficiency improvement within the company may be questionable at this size, but – for linking back to financial intermediary terminology – may be only conglomerates have the strength to force efficiency increase in the big companies they monitor. Smaller companies may lack the financial background to withdraw committed credit lines and hence put the pressure onto inefficient big sized clients.

Conglomerates seem to be more dependent on the legal background than of "simple" or "normal" financial institutions. Adding to increased focus of supervisors, firstly, this supports the importance of the "Law and Finance" view developed by La Porta et al. (1996, 1997, 1999) and secondly makes investigation of the insurance growth nexus valuable independent from the insurers economic significance.

II.5 Threats and Supervision

In this chapter we try to outline the threats implicit in the system and in the actions undertaken by insurers and the response of regulators to minimize these dangers. Assuming steady frameworks the reasons for insurance failure can either derive from the liability side or from the asset side. Although the liabilities are hard to evaluate, the technical reserves should be adequate to prevent illiquidity and runs against insurance companies are much more unlikely than against banks, since payments/withdrawal are usually bound to the occurrence of a specific case. So on the liabilities side actuarial miscalculations are the main threat which are summarized under the term "technical risks":[21]

- **Technical risks:** under pricing of premiums, reinsurance failure, deviation risks, etc.;
- **Investment risks:** asset risks affecting value, performance or liquidity and market risks, etc.;
- **Other risks:** risks accruing from group contagion, legal risks, management risks, etc.;

[21] LIST IN ACCORDANCE TO LEFLAIVE, 2000

Threats accruing from the asset side mainly define the investment risks but are substantial for the success of an insurance company. As already noted above insurers have a special interest in enhanced activities in international capital markets[22]. This development is not only based on the attraction of investment activities, but also imperative by the nature of certain liabilities[23] and furthermore facilitated by recent liberalizations, privatisations and financial consolidations (see table 1 above). Finally, in the recent years insurance companies were encouraged by a sustained period of low interest rates to improve their returns by acquiring higher yielding, but more risky assets (EU, 2005). So a shift of the investment focus to less secure investments can be noticed, which subsequently leads us to the description of credit defaults swaps and a like as representatives of new high yielding, risky and slightly unfathomable investments. Other risks - as listed above - derive from the environment the company resides in and are connected to the legal framework and the socio-economic setup of the current country. These determinants are discussed later.

Instruments such as credit insurance are well-established means to transfer credit risk. During the past few years, a rapidly growing amount of credit risk has been transferred across the financial system via the credit derivatives market (Rule, 2001; Stulz, 2004). Credit default swaps (CDS) and collateralised debt obligations (CDOs) and other instruments allow credit risk to be stripped out, isolated from underlying assets, and sold on separately (Chaplin, 1999; Effenberger, 2004). The banking sector is mainly a buyer of protection, while the insurance sector is mainly a protection seller for investment or portfolio management purposes (Rule, 2001). At the end of 2003, the insurance sector – particularly financial guarantors – had reported a net position of USD 460 billion (EU, 2005). Roughly 65% of net sold credit positions derived from the corporate sector, 17% from financial institutions and the remainder by sovereigns. Thus credit risk has been transferred on a massive scale from banks onto insurance companies, providing them with a more pivotal role vis-à-vis banks and the economy at large. The net credit derivative position of the insurance sector relative to GPD might be an interesting measure to watch on a global level, but may be rather difficult to follow on a domestic level due to its international character and the fact that issuance is centred on certain favourable jurisdictions (ECB, 2003).

The exposure of the banking sector to the performance and stability of the insurance sector could inherit negative implications to the economy at large. For example, the failure of one dominant insurer might not only have negative consequences for each policyholder, but can also have systemic implications to the whole financial sector and the economy at large. The insurer as seller of CDS can take large risks without appearance on the balance sheet and hence profit by interests paid for invisible loans[24]. CDS markets are tight between the convert dates (event dates) and CDS contract involve a third counterparty (in contrast to normal loan/credit contracts), which is also exposed to default making contagion more likely. As a last resort CDS include a delivery option for the seller making the buyer vulnerable to an asset-liability mismatch since the offer could consist of cheapest-to-deliver bonds, e.g. 20-year 0% convertibles neglecting the current liquidity needs.

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[22] IMF, 2002 AND DAVIS, 2000

[23] AS ALREADY MENTIONED ABOVE THE OBLIGATIONS OF THE INSURER CAN EITHER BE DEFINED IN NOMINAL OR REAL TERMS OR BOUND TO SOME INDEX OR AVERAGE WAGES. TO BE ABLE TO BEAR THESE FUTURE PAYMENTS THE INSTITUTION HAS TO COMPETE WITH INFLATION/INTEREST RATES OR REAL GROWTH. EVEN FUTURE NOMINAL VALUES HAVE TO BE DISCOUNTED TO THE CURRENT REAL VALUE. FOR DETAILED EXPLANATION SEE DAVIS, 2000 OR BLAKE, 1999.

[24] CAREY & STULZ, 2005

The ties between banks and insurances are not only possible via financial market instruments, but also – and more visibly – by the appearance of bancassurance and other conglomerates[25]. This development further increased the ties between short-term assets and long-term liabilities throughout the whole group and the growth of credit risk offloading onto insurance companies. Dangerous entanglements can be hidden inside the group. An additonal threat implied in conglomerates, which can be carried out with CDS as well, is the loss of capital adequacy, when capital is used by different group entities. These issues are to be watched with regard to possible negative effects for the policyholder and systemic stability (Effinger, 2004; Stulz, 2004; Dierick 2004;). To summarize, we illustrated the contagion paths in table 2.

TABLE 2: POSSIBILITIES OF RISK TRANFER/CONTAGION BETWEEN BANKS, INSURANCES AND CAPITAL MARKETS

Contagion Channel / Direction of risk transfer	Credit Channel	Market Channel	Insurance Channel
Banks to Insurance companies	Bank equities and bonds, trade credit insurance, ABSs, CDOs and portfolio CDSs, financial guarantees, residual value insurance, other forms of credit insurance and surety bonds.	Bank equities and bonds, insurers writing options and buying bonds width embedded options (e.g. callable bonds)	Insurance on bank property, legal liability, etc.; insurance provided to borrowers to facilitate loans, insurances for operational and political risks
Insurers to banks and others	Letters of credit, liquidity facilities;	Hedging of embedded options in portfolios of life insurance and pension products	Catastrophe bonds

SOURCE: STULZ, 2001:141

No matter how the connection was established (either through market instruments, conglomeration or simply by sighting an insurance contract) the policyholder has to bear the risk of an insurance failure because of the replacement of his own security reserves with the coverage of the insurance contract. This makes him vulnerable and can be interpreted as a reserve risk transfer[26]. The possible losses of the single customer may not be relevant to the economy at large, but this threat adds to the implicit dangers of whole financial system. Corollary governments felt urged to develop adequate frameworks to prevent collapses and hence implications on macro level.

Regulatory frameworks are differing from country to country; numerous literatures on this topic are available from the most important organizations and by each countries regulatory organization itself and a detailed description would go beyond the scope of this papers. So we just want to outline some principles contained in the most common regulatory regimes to give an impression how these rules can effect insurance companies and hence their possibly positive impact on the economy.

The regulations depend on the development stage of the business, accompanying the business entity during its setup (i.e. **licensing principles**), normal operation (i.e. **on-going supervision**) and at **liquidation** or when in financial difficulties[27]. The licensing principles restrict the entrance of new institutions and restrict the underwriting business to insurance companies. Usually life and non-life business has to separated in some kind

[25] IMF, 2003B OR IAIS, 2003

[26] DAS, DAVIES AND PODPIERA, 2003

[27] STERLING, 2000

of way, cross-sectoral activities can be regulated and various formal requirements have to be met including the approval of the business plan/the risks the company intends to cover. These regulations have a bearing on the insurance business by influencing the number of competitors, the number of equivalent products and by setting standards for the managerial quality.

The on-going supervision process mainly focuses on the financial supervision to maintain an adequate capital base to meet the insured liabilities. In all OECD countries the minimum capital required at licensing must be available the whole time and some countries require adaptation to the current development of the business. In EU Member countries insurance companies have to meet solvency margins, which describe an asset to liabilities ratio with careful consideration given to the reinsurance ratio. The US RBC-System[28] also incorporates the risks included in the assets. Financial soundness and macro prudential indicators (e.g. the ratio of capital to technical reserves) developed around the IMF and World Banks´ Financial Sector Assessment Program (IMF, 2000; IMF, 2003a,b) are used to calculate risks incorporated into each institutions investment and the economy at large.

When speaking about solvency margins, it is worth mentioning the two different types of portfolio regulations usually adopted since portfolio regulations may also affect solvency[29]:

- **Quantitative regulations** dictate a specific diversification of the assets, can prohibit certain investments (i.e. asset class, domestic or foreign investments) and are suitable to channel funds due to political intentions. The advantages of these kinds of regulations are simple calculability, easier enforcement and comparability whereas the companies' investment possibilities are reduced and this may influence overall efficiency.
- **Prudent man regulations/prudential investment rules** decree a certain way of management, but don't codify specific margins, values or procedures. This guarantees the insurance companies the maximum freedom of movement in their investment decisions but can raise problems in evaluation and in jurisdiction. Depending on former legal rulings insurance companies may alter their investment strategies and focus on assets easier to justify and not on assets with the best return/risk ratio.

These two principles are the corner pillars of portfolio regulation and country regulations are somewhere in between, where EU supervision tend to adopt more quantitative restrictions and US/UK countries stick to prudential investment rules.

Determinants, such as insurance assets at risk, net positions of insurance companies to GDP or the regulatory system represent potential variables to be included into growth models. But the first figure is still influenced by differences in national legislation and accountancy rules, so results may be misleading. The second may represents an indicator of "economic freedom" offered by the insurers to the economy at large, and despite difficulties in measuring, it would also be a heavily discussed figure, favoured during economic growth and stability and demonised during periods of downturn or in cases of failure with systematic implications. Davis (2000), Ranade & Ahuja (2001), Das, Davies and Podpiera (2003) and others investigate the implications of the regulatory regime and the legal framework and the results are mixed. La Porta et al (1996, 1997, 1999) extends this topic to an overall examination of how law may influence economic growth.

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[28] RISK BASED CAPITAL

[29] STERLING, 2000 OR DAVIS, 2000

III. INSURANCE-GROWTH MODELS AND EMPIRICAL EVIDENCE

While we reviewed the importance and role of the insurance sector in financial intermediation and vis-à-vis the economy in the previous section, in the following we summarize theoretical models that touch on the topic by investigating specific elements of the intermediation process, like focusing on the legal framework, or papers which can help to trace back performance figures to attributes of insurers that contribute to growth, such as efficiency measures. The review of some empirical analysis on the insurance-growth nexus provides information on sample coverage in time and space, methodology and variable usage and dependency.

III.1 Papers with a Theoretical Focus

Holsboer (1999) is concentrating on the recent changes in the external environment for insurance companies in Europe. He argues that the change of importance of insurance services in the economy is dependent on the growing amount of assets and the increasing competition between the financial sectors, but the author emphasis the prominent role in the services industry and denotes insurance sector development as a determinant for economic growth. Holsboer (1999) builds on a model based on Aaron (1966):

> interest rate (r), growth of the working population (n), the economic growth rate (g); superior benefits of the pay-as-you-go pension system if r < n+g; superior benefits of the funded pension system if r > n+g; and both pension systems providing equal benefits if r = n+g;

As population aging and the move from a pay-as-you-go (PAYG) system to privately funded schemes favours the growth of the insurance industry and facilitates capital market development with increasing supply of long-term savings, Holsboer (1999) sees the interaction between the insurance and economic growth as bi-directional.

Catalan, Impavido & Musalem (2000)[30] explore the development of contractual savings and their effect on other financial intermediaries and markets. Due to the nature of contractual savings institutions these face a lower possibility of runs against their assets, but on the other hand they have to bear long-term liabilities in their model. These two factors enable them to seek long-term investments, so that the maturity of the assets can be balanced against the liabilities and an additional advantage on banks could be taken. As a second participant the policyholder (household) enters the system and his intention to keep his direct liquid assets on a specific level forces him to restore his liquidity position and to sell illiquid assets in favour of liquid, while maintaining his engagement for contractual savings. So contractual savings and the rigid liquidity level of the households drive the capital market development. Catalan et al (2000) support the insurance-growth nexus by emphasising the institution's intermediary function, either by direct channel usage (portfolio setup) or by using other channels, mainly capital market development, connected to the insurance nexus.

Ranade & Ahuja (2001) analyse the development of the Indian insurance sector over time under the impact of softening regulatory constraints. In the initial setting, the Indian subcontinent's insurance sector was controlled by the state monopoly, hence competition was nonexistent and the price barrier thwarted access to insurance services for private households. Deregulation measures included the abolition of the insurance monopoly, promoting competition, and developing a regulatory framework defining statutes for financial supervision. The new regulatory framework was following the recommendations of McKinnon (1973) and

[30] ALTHOUGH THIS PAPER BELONGS TO THE GROUP OF EMPIRICAL WORKS, THE SIZE AND INDEPENDENCE OF THE THEORETICAL PART PROVOKE THE AUTHORS TO INCLUDE IT ALSO IN THIS SECTION – PRESENTING THE THEORETICAL DISCOURSE IN THIS CHAPTER AND THE EMPIRICAL WORK IN THE NEXT.

Shaw (1973) to increase savings, improve assets allocation and hence to promote growth. The authors try to validate the results of the transition by searching for evidence for two estimations which are both part of McKinnons and Shaws theory: (1) an additional accessible financial service for the private households should increase asset allocation, and (2) enhanced competition on the insurance sector is facilitating efficiency. Examining a two-period model tests estimation 1 and the validation of estimation 2 is conducted by comparing the bankruptcy and insolvency characteristics of insurers and banks. In the short run, where no income or efficiency improvement have emerged yet, savings (asset allocation) decline and due to lesser credit constrains resource dissipation rises. Estimation 1 and 2 is negated and results may include implications for policymakers because the equations suggest that insurance bankruptcies cause more volatility, and funds intermediation and consumer welfare is lower than those of banks - according to their model.

The main purpose of the model by **Das, Davies and Podpiera (2003)** is to identify contagious functions and properties of insurances. They further develop new financial soundness indicators for insurance companies by joining their experiences gained under the Financial Sector Assessment Program[31] (FSAP) and from a review of recent failures in the sector. In their model, the insurances´ role as a risk pass-through mechanism, the asset allocation and the insurers ability to alter the behaviour of clients and the public contribute to economic growth. Das et al (2003) argue that (1) financial deregulation and liberalisation that allowed bank-type activities, (2) large macroeconomic fluctuations in output and price, and (3) close linkage between banks and insurers could be the main indicators for a possible insurance failure with repercussions to the economy at large.

Kong & Singh (2005) focus on the asset allocation and management process of life insurers and their intention to match the assets against the company's liabilities. The paper compares the possibilities in emerging and mature markets (EMs & MMs) and differentiates between local domestic companies, local subsidiaries of global players and insurers only acting in mature markets and participating in emerging markets' growth by investment products[32]. The subsidiaries of MM institutions usually adopt the business strategy of the holding company – i.e., issuance of local liabilities matched with local assets – and so they drive the local securities market together with domestic competitors. Furthermore, in the majority of EM countries the regulations require the investment in local assets to a certain degree and hence facilitate market development, but on the other hand this leads to restrictions in investment, making portfolio diversification imperfect and this may result in higher insurance costs.

The regulatory framework is playing a major role when addressing the problems the insurers have to face. On the liability side, policymakers try to enforce insurance companies and pension funds to offer products with guaranteed minimum return. On the asset side restricted free movement makes it difficult to achieve the necessary surplus. Companies operating in EM countries further have to overcome obstacles like illiquid bond and equity markets and the small amount of long-term investment possibilities merely matching their liabilities duration. The solvency requirements differ between EM countries implementing either EU or US based frameworks and the requirements create a bias toward fixed-income instruments. The difference between internal investment policy and the local regulations or corollary the differences between the regulations of the motherland and the EM country can be a sore spot for the foreign insurer when it comes to financial turbulences. The local companies may achieve additional payoffs in the short run by switching to tactical

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[31] For more Information visit the IMF Site on FSAP and FSSA at: http://www.imf.org/external/np/fsap/fsap.asp

[32] The commitment of MM life insurance companies without a global presence in EM countries is stable around 5% of their portfolio according to Kong & Singh (2005)

decision-making, while the foreign insurers are bound to their internal investment policies. On the other hand, global players mainly have better diversified portfolios, more sophisticated risk management and better financial backing to withstand financial crises, making it possible to extend market share while the domestic competitors struggle.

The authors suggest to facilitate insurance companies growth by providing more long-term investment possibilities, lessening regulatory constraints to help portfolio diversification and including the calculation of investment at risk into supervisory programs. They identify the institutions as investors of quality due to their long-term investment focus and the continuously rising capital base. But Kong & Singh (2005) agree to the recommendations of Ranade & Ahuja (2001) to favour banks over insurances when addressing economic stability. They note that insurance companies are much more vulnerable to financial downturns because they have to face pressure on both the liability and the asset side of the balance sheet.

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III.2 Empirical Studies

Beenstock, Dickinson and Khajuria (1988) apply pooled time series and cross-section analysis on 1970-1981 data, covering mainly 12 countries. They regress premiums for property liability insurance (PLI) onto gross national product (GNP), income and interest rate development. They find that premiums are correlated to interest rate and GNP; marginal propensity to insure (short- & long-run) rises with income per capita and is always higher in the long run. Beenstock et al (1988) argue that insurance consumption is not affected by economic cycles or cyclical income variations.

Outreville (1990) conducts a cross-section analysis on PLI premiums for the years 1983 and 1984 for 55 developing countries onto GDP, insurance price and other macroeconomic figures. The results are similar to Beenstock et al (1988) and support the significance of income and financial development (M2/GDP). Other explanatory variables don't seem to be important. Problems in the investigated countries are the insufficient demand for insurance services and the hence resulting unbalanced portfolio of the insurer.

Browne & Kim (1993) analyse life insurance consumption per capita for 45 countries for the years 1980 and 1987. They regress cross-sectional data onto various country figures, such as income or inflation rate. Income, dependency and social security expenses are positively, inflation is negatively correlated and significant in both years. The religious origin – i.e. being a Muslim country – is always negatively connected to insurance consumption and so the findings support the works Hofstede (1995, 2004) and Fukuyama (1995) in their reasoning that social backing influences insurance demand.

Outreville (1996) investigates the correlation of life insurance premiums to GDP and other factos for the year 1986 for 48 developing countries. The results of the cross-sectional analysis contradict his former work (Outreville 1990) by showing no significance for real interest rate or financial development (M2/GDP). Only the income elasticity is similar to those found in former works (Beenstock et al, 1988, Outreville, 1990 & Browne & Kim, 1993). Country indicators such as rural population or education level cannot explain demand.

Zhi Zhuo (1998) is focusing on china and conducts a cross-regional study for 1995 and a time series analysis for the period 1986 to 1995. In accordance with other findings both the cross-regional and the time series analysis show that GDP per capita and consumer price index are significantly correlated with insurance consumption. Further the children dependency ratio is important, whereas the education level is not causally related.

Browne, Chung & Frees (2000) apply a pooled cross-sectional panel model to motor vehicle and general liability insurance in the OECD over the 1986-1993 period. They regress liability insurance consumption on a variety of factors, including income, wealth and the legal system. Income and the legal system are positively correlated to insurance consumption, while loss probability and wealth are negatively correlated with insurances consumption. Foreign firms in the market and risk aversion are positively connected to motor vehicle insurance consumption and hence contrary to general liability consumption. Browne et al (2000) argue that income is affecting insurance consumption. The correlation with risk aversion is statistically insignificant for motor vehicle insurance consumption and negatively connected in the cross-sectional model for general liability insurance consumption.

Catalan, Impavido and Musalem (2000) analyse Granger causality of insurance assets for 14 OECD and five developing countries over the 1975-1997 period vis-a-vis GDP growth (among others). According to their analysis, **c**ontractual savings seem to have some connection to market capitalization (MC) and value traded (VT) in the majority countries. The correlation between MC and pension funds is showing similar links as its connection to contractual savings, but the nexus of pension funds – VT is mixed. In the Catalan et al (2000) analysis, nine OECD countries support the life insurance – MC link, the results for the developing countries are mixed. Evidence for the connection life insurance to VT is not so strong in OECD countries, whereas the majority of non-OECD countries show this linkage. The impact of the non-life business is almost equal to the impact of the life business for MC and less for VT. The linkage proposed by the authors between contractual savings and MC or VT seems to hold for OECD countries, especially for countries with small and tight markets but enabling regulatory environment. The results of the small set of non-OECD countries are mixed and maybe due to their different regulatory restrictions. The second proposition – to favour contractual savings institutions over other institutional investors (e.g. non-life insurance) – is also supported by the results and induces the authors to recommend an appropriate sequencing of the financial institutions' development.

Ward and Zurbruegg (2000) analyse Granger causality between total real insurance premiums and real GDP for nine OECD countries over the 1961 to 1996 period. For two countries (Canada, Japan) the authors found the insurance market leading GDP and for Italy they found a bidirectional relationship. The results for the other countries showed no connection. Results from the Error-Correction model depict similar results and adding Australia and France to the group of countries giving evidence for some kind of connection. In interpreting the findings, the authors refer to cultural predispositions towards uncertainty avoidance (Hofstede, 1995; Fukuyama, 1995) and resulting propensity for insurance and the effects of regulation. Furthermore they offer differing insurance density and its dynamic growth as another possible explanation.

Beck & Webb (2002) apply a cross-country and a time-series analysis for the relation between life insurance penetration, density, and percentage in private savings and in force to GDP as the dependent variables and GDP, real interest rate, inflation volatility and others the explanatory figures. Strong evidence was found for GDP, old dependency ratio, inflation and banking sector development. From the group of additional explanatory variables anticipated inflation, real interest rate, secondary enrolment and the private savings rate were found to be significant. The results for the other dependent variables and the time-series and cross-country analysis confirm the findings. When analysing the share life insurance in private savings, the results suggest that the ratio decreases with an increasing saving rate although the saving rate has a positive coefficient. This could be due to behaviour of the household to limit life insurance expenses and transferring additional income to other saving vehicles. The cross-country analysis shows a negative coefficient for a country being of Islamic origin and adds institutional development to the indicators connected positively to insurance demand.

Park, Borde & Choi (2002) concentrate in their research work on the linkage between insurance penetration and GNP and some socio-economic factors adopted from Hofstede (1983). The results of analysis of the cross-sectional data from 38 countries in 1997 show significance for GNP, masculinity, socio-political instability and economic freedom. All other factors lack importance and masculinity has to be dropped after checking for heteroscedasticity of unknown form. Deregulation was found to be a process able to facilitate growth in the insurance industry and supports the expectations of Kong & Singh (2005). Socio-political instability was found to be more a proxy for poverty than an indicator for the need to insure.

Szablicki (2002) conducts a cross-sectional analysis and a panel regression for causality between three different life insurance figures and income and socio-economic country variables for the time period from 1960 to 1996. The analysis of the data from 63 developing and developed countries is one of the few to find education level to enter significantly. Furthermore the findings emphasise the importance of banking sector development and the results for the role of the income level are in line with the results of previous works. The panel data regression mainly confirms the results of the cross-section estimation.

Webb, Grace & Skipper (2002) use a Solow-Swan model and incorporate both the insurance and the banking sector, with the insurances divided in property/liability and life products. Their findings indicate that financial intermediation is significant. When split into the three categories banking and life sector remain significant for GDP growth, while property/liability insurances loose their importance. Furthermore results show that a combination of one insurance type and banking has the strongest impact on growth.

Lim & Haberman (2003) concentrate on the Malaysian life insurance market. While the interest rate for savings deposits and price enter significantly in the equation, the positive sign for the interest rate puzzles the authors. This could be inline with findings of Webb et al (2002), who found the best results when insurance and banking sector are combined in the estimates. Price elasticity is found to be more than even.

TABLE 3: EMPIRICAL STUDIES ON THE INSURANCE-GROWTH-NEXUS

Author	Year	Sample Coverage: Region	Sample Coverage: Time	Dependent Variable	Explanatory Variable	Other Variables	Methodology
Beenstock, Dickinson, Khajuria	1988	12 countries and 45 countries	1970-1981 and 1981	Property Liability Insurance Premiums	income, interest rate, GNP	unemployment	OLS on pooled time series & cross-section data
Outreville	1990	55 developing countries	1983/1984	Property Liability Insurance Premiums	GDP, M2/GDP, M1/M2, price of insurance	monopolism, agricultural labour force, education	OLS on cross-sectional data
Browne & Kim	1993	45 Countries	1980 & 1987	Life Insurance per capita[33]	dependency, Muslim country, national income, social security expenses per capita, expected inflation rate34 , education35 ,avg. life expectancy, price (only 1987)		OLS on cross-sectional data
Outreville	1996	48 developing countries	1986	Gross Life Insurance Premiums	GDP, interest rate, life expectancy, inflation, financial development, market structure variables	rural population, education level, health, Muslim population, & other country indicators	OLS on cross-sectional data
Zhi Zhuo	1998	29 Regions & 14 big cities for 1995, otherwise whole china	1995, 1986-1995	Life insurance premiums per capita	GDP per capita, dependency ratio of old and young, 3rd level school enrolment, consumer price index, social security and welfare per capita	-	OLS on cross-section and on time series
Browne, Chung & Frees	2000	OECD countries	1986-1993	Motor Vehicle & General Liability	Income, Foreign Firms in the Market, Risk Aversion, Loss Probability	Wealth, Legal System	Fixed-effects and pooled cross-

[33] MEASURED AS TOTAL PREMIUMS AND LIFE INSURANCE IN FORCE

[34] AVERAGE INFLATION RATE OVER THE PREVIOUS 8 YEARS FOR EACH COUNTRY

[35] NUMBER OF TOTAL THIRD-LEVEL ENROLMENT / TOTAL POPULATION AGED 20 TO 24

Author	Year	Sample Coverage: Region	Sample Coverage: Time	Dependent Variable	Explanatory Variable	Other Variables	Methodology
				Insurance Consumption[36]			sectional panel data model.
Catalan, Impavido, Musalem	2000	14 OECD & 5 developed countries	1975-1997	insurance assets (contractual, pension, life & non-life), market capitalization, stock value traded	GDP, insurance assets (contractual, pension, life & non-life), market capitalization, stock value traded	-	OLS model for Granger causality in both directions
Ward & Zurbruegg	2000	9 OECD countries	1961-1996	Total real premiums, real GDP	real GDP, total real premiums	population, savings	bivariate VAR for Granger causality
Beck & Webb	2002	68 Countries, incl. 14 EU Countries	1961-2000	life insurance penetration, density, life insurance in private savings & in force to GDP	GDP, young & old dependency, life expectancy, schooling, inflation, banking sector dev.	urbanization, social security, revolutions, inflation volatility, real interest rate, etc.	OLS and fixed-effects estimation, cross-country and time-series analysis
Park, Borde & Choi	2002	38 countries (12 EU countries)	1997	Insurance Penetration	GNP, uncertainty avoidance, individualism-collectivism, power distance, masculine-feminine, SPI index, index of economic freedom	-	OLS on cross-sectional data
Szablicki	2002	63 developing & developed countries	1980-1996 1960-1996 for panel data	Life Insurance Penetration (LIP), Density (LID) & as in Force to GDP (LIFGDP)	income, young dependency, average years of schooling, life expectancy, inflation, banking sector development	urbanization, social security, corruption, regions (Asia, Africa, Latin America), religion, old dependency	OLS on cross-sectional data and panel regression
Webb, Grace & Skipper	2002	55 countries, incl. 17 EU countries	1980-1996	GDP & GDI per capita	Bank Credit, Life & Property Liability Insurance premiums in % of GDP	primary education 1980,	OLS on panel data and cross-country for bi-directional model

[36] Measured as insurance density in constant (1985) U.S. dollars per capita

Author	Year	Sample Coverage: Region	Sample Coverage: Time	Dependent Variable	Explanatory Variable	Other Variables	Methodology
Lim & Haberman	2003	Malaysia	1968-2001	Life Insurance demand	fin. Development, income, inflation, interest rate, price, stock market return,	Birth, death and fertility rate, life expectancy	OLS on time series
Davis & Hu	2004	18 OECD and 20 EME countries, incl. 10 EU countries	1960-2003 depending on country and data type	Output per worker (OW)	pension fund assets (PFA), capital stock per worker (CS)		dynamic OLS, GMM, co-integration test, dyn. heterogeneity
Zou & Adams	2004	China, 235 PLCs	1997 – 1999	Property insurance propensity & Premium	leverage, growth opportunities, state & managerial ownership	firm size, foreign ownership, asset structure, etc.	het. Fixed-effects estimation on panel data
Esho, Kirievsky, Ward & Zurbruegg	2004	44 countries (12 EU countries)	1984 – 1998	Property-Causality Insurance Consumption (PCI)	legal origin, Real GDP, property rights, price of insurance	Risk aversion, loss probability	OLS, fixed-effects estimation and GMM on panel data
Boon	2005	Singapore	1991 – 2002	real GDP, real gross fixed capital formation	total insurance funds, stock market capitalization as % of nom. GDP, loans to nom. GDP	-	Vector error correction model on time series

The work of **Davis & Hu (2004)** is special in terms of the direction of the regression and the variable setup. The authors test for causality between output per worker (OW) as the dependent variable and pension fund assets (PFA) and capital stock per worker (CS) on the explanatory side with data spanning over 43 years from 1960 to 2003 and for 18 OECD countries and 20 East & Middle East European (EME) countries. The ordinary least square (OLS) regression results give evidence for PFA and CS to have a positive and significant effect on OW. The dynamic heterogeneity models' findings support the OLS results in the long run. The co-integration test suggests that PFA and CS are co-integrated with OW. The findings also show that PFA development has a stronger impact on OW in EME countries than in OECD countries and the shock response is decreasing in the long run but stays positive.

Zou & Adams (2004) provide insight into the Chinese property insurance market for the years 1997 to 1999. Due to market regulation and specialities of the Chinese market this work is more suitable to provide evidence for the law-and-finance view of La Porta (1998) or the socio-political decision model of Hofstede (1995). The results show a tendency for companies that are highly leveraged or have physical assets intensive production to consume property insurance, while partly state owned or a possible tax-loss carry-forward decreases demand. Increased managerial or foreign ownership and better growth options facilitate demand, while the size of the company enters inversely.

Esho, Kirievsky, Ward & Zurbruegg (2004) focus on the legal framework besides the GDP - Property-Causality Insurance Consumption (PCI) link. The causality analysis is based on data from 44 countries over a time period from 1984 to 1998 and includes OLS and fixed-effects estimations and GMM estimation on panel data. No matter which methodology is used, real GDP and the strength of the property rights in a country are positively correlated to insurance consumption. The insurance demand is significantly connected to loss probability, but the link with risk aversion rather weak. The price only shows a slight negative impact if investigated with GMM estimator. Although the data set showed big differences between the developments of countries of different legal origin (PCI per capita, GDP, PCI price, etc.), no evidence was found for the legal origin being a significant indicator for PCI consumption. In contrast to other sectors the importance of the property rights suggests that the legal environment facilitates insurance demand.

Boon (2005) investigates the growth supportive role of commercial banks, stock markets and the insurance sector. The author's findings show short and long run causality running from bank loans to GDP, and a bi-directional relationship between capital formation and loans. GDP growth seems to enhance stock market capitalization in the short run and the market capitalization enters significantly when determining the capital formation in the long run. Total insurance funds affect GDP growth in the long and capital formation in the short and the long run.

III.3 Strong Point, Weak Evidence

While, from a theoretical point of view the insurance sector should contribute to economic stability and growth, empirical evidence is mixed at best. The role of the insurance sector in economic growth has hardly been investigated empirically, compared to the vast literature focusing on banking and stock markets. The few papers devoted to the insurance-growth nexus, which concentrated on a few countries over fairly short or distant time horizons (e.g. Catalan et al, 2000; Ward and Zurbruegg, 2000), are concerned with contagion and other possible negative effects the insurance sector can transmit onto the economy (e.g. Das et al 2003) or relate to specific insurance product lines only (e.g. Beenstock et al, 1988; Browne et al, 2000) or treat the insurance-

growth-link rather as a side issue (e.g. Holsboer, 1999). The predominant methodology to search for correlation and to calculate dependency factors is to implement an ordinary least square model to be used on a cross-sectional data set. As many authors noted, this is due to lack of appropriate time series for a sufficient number of countries. The majority of researches face problems when trying to find an appropriate proxy for insurance expenses per year, insurance assets and disposable income per capita to avoid biases. Total gross premiums and GDP per capita are the most frequently used indicators.

The strength of the link between the insurance sector and economic growth, however, is not static. As the relationship between bank and capital market finance and economic growth varies with the level of economic development (e.g. Rousseau and Wachtel, 1998, and Rioja and Valev, 2004), so does the insurance-growth nexus. The insurance sector in developed countries offers a whole bunch of specialized products, service educated and experienced clients and insurance coverage is recognized as an important value. Financial interlocking between institutions is high and sophisticated and international investment and relationships are taken for granted. The potentiality of growth contribution is much higher than in developing countries where the insurance sector hardly reaches the same importance and evolutionary stage.

Overall, income or GDP per capita seems to bear the most significant impact on insurance consumption, followed by interest rate and inflation rate. The importance of the insurance price for insurance demand is ambiguous, but the majority of papers found insurance to be a superior good, implying an income elasticity of more than unity. Given that there is only a small number of papers explicitly investigating the insurance-growth nexus, and most results are not tested on co-integration, causality or interdependence, the general inference that insurance services cause GDP or income growth is only backed by weak empirical evidence. To acknowledge the pioneering works of Catalan, Impavido and Musalem (2000), Ward & Zurbruegg (2000) or Davis & Hu (2004) further investigation should be conducted to comprehend the meaning of the insurance sector for the general economy.

III.4 Demography and Risk Attitude

So far we've dealt with causalities running from the insurance sector to economic growth and vice versa. To compare demand for and supply of insurance services across markets (and thus respective influences to and from the economy at large), additional factors have to be taken into consideration. Changes in client population and cross-country differences in risk attitude are the most prominent features to watch. The relationship between insurance sector growth and demographic development is examined by Browne, Chung and Frees (2000). They find a positive correlation between insurance growth and income per capita, wealth and legal system features. Other correlations, like urbanization, third-level education enrolment, etc. depend on the examined insurance type, countries and other figures. Pye (2003) shows in his descriptive study how income per capita and country specific effects can alter insurance consumption. Not only contemporary factors, but also history and political developments can influence the insurance sector.

Outreville (1990) assumes "[that,] there exists a positive relationship between financial development and the individual's ability and/or willingness to buy insurance." Other research investigates the influence of the social environment, which could especially explain differences between countries having equal demographic setup. Fukuyama (1995, 2001) argues that differences in risk attitudes (which should influence the demand for insurance) are rooted in the cultural context of the given country. Hofstede (1995, 2004) and Fukuyama

(1995) developed frameworks to describe a society's culture, which can be applied to analyse influences on the insurance market. Besides the cultural dimensions "uncertainty avoidance/tolerance for ambiguity" and "temporal orientation" (short vs. long-term) which are directly related to risk attitudes, further characteristics like "individualism/collectivism" or "power distance"[37] seem to have major influence on the societies demand for insurance coverage.

So societies may have low scores for "uncertainty avoidance", like in Anglo, Nordic and Chinese cultures and hence be indifferent to risk. On the other hand, risk transfer to external institutions is not common in certain regions because society is more collectively organised and emphasise the importance of family and friendship. Economic transactions beyond this horizon are rare and insurance coverage obsolete in these cultures. Focusing on influences on the insurance sector, Hofstede (1995) divides cultures into low- and high- uncertainty avoidance group societies, where the earlier term denotes groups emphasising individualism and hence are heavily reliant on private insurance services, as is the case in the U.S. and the U.K. The later term addresses countries where market-based means of dealing with risk is uncommon or struggle with low acceptance and here the government has to provide basic insurance services. Finally a society's attitude to authority, government and the rule of law is also important to examine the possible success of insurance services. In developing countries where authority is weak, government not recognized and rules and claims are not enforceable security based upon family or the sip is much more effective.

III.5 The Law-and-Insurance-View

Besides social aspects like risk attitudes and the economic environment, the legal framework constructed by the government mainly defines the environment of insurance companies[38]. The legal environment not only consists of rules directly effecting to insurance regulation, but also includes the elements of private law effecting consumer rights[39]. The intention to build a close legal corset can be found in the need to retort threats arising from the heavy weight of the institutions in the financial system and to ensure the risk transfer for the less equipped policyholders/clients. The regulation of insurance activities has major impact on both risk transfer via insurance companies and their ability to influence the economy via investment. Browne, Chung & Frees (2000) apply the La Porta et al (1998) law-and-finance-view to insurance and find higher insurance penetration related to the strength of the legal system. Pye (2003) addresses this view by separating Central and East European (CEE) countries and the Newly Independent States (NIS) of the former Soviet Union into three groups, depending on the evolutionary stage of the legal system and supervision. A significant correlation between quality of supervision and openness can be stated.

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[37] ALL CATEGORY NAMES DERIVE FROM HOFSTEDE'S (1995) WORK AND ARE LISTED EXEMPLARY; FUKUYAMA DEVELOPED A DIFFERENT FRAMEWORK WITH OTHER SEGMENTATION;

[38] FOR AN IN DEPTH ANALYSES OF LEGAL FRAMEWORK INFLUENCING INSURANCE ACTIVITIES, FOR EXAMPLE PLEASE REFER TO CROOKS GORA (1997), MORE GENERAL WORKS ON LAW AND FINANCE ARE LA PORTA ET AL. (1996,1997,1999).

[39] REES & KESSNER (1999) COMPARE THE CROSS-BORDER ACTIVITIES OF BRITISH AND GERMAN INSURANCE COMPANIES AFTER THE EU-WIDE HARMONIZATION OF THE REGULATORY SYSTEMS IN 1994 AND ARGUE THAT SEVERAL OTHER NOT INSURANCE BUSINESS CONNECTED RULES AVERT BRITISH COMPANIES FROM ENTERING AND SUCCESSFULLY WORK THE PROFITABLE MARKET. FOR INSTANCE GERMAN CUSTOMERS WOULD HAVE TO PURSUE LEGAL DISAGREEMENTS THROUGH A BRITISH COURT.

With regard to the influence of laws and regulations, the range of country approaches is wide, spanning from liberal market advocacy leading to poor reserve coverage like in the UK[40] to market protectionism in Japan resulting in decreased sector efficiency[41]. The continuous development of the legal framework and introduction of new insurance activities/products[42] are the driving force of this match. Since the link between the legal framework and insurance's performance is very tight and product specialization high, fast uneven changes of the framework can lead to heavy turbulences and can cause insurers to stumble with repercussion to the financial market at large. According to Das, Davies and Podpiera (2003), "Financial deregulation caused insurance companies to employ more bank-type products […] and made their liabilities more liquid. The need to achieve competitive returns […] induced insurers to invest in risky assets such as commercial mortgages and junk bonds. As a result, insurers became more vulnerable to economic shocks."[43] So a sound and even adjustment of the legal framework is important, which also has to catch up with the recent development of new insurance products and founding of conglomerates bearing uncertain risks for clients and financial system.

On the other hand the performance and strength of the insurance sector can affect governmental behaviour via supplement of equivalent products. Similar to banks relieving the pressure on governmental indebtedness, insurances reduce the demand for public social security programs, life insurance, pension funds or trade indemnity insurance[44].

IV. ANALYTICAL FRAMEWORK

IV.1 Indicators recognized

In section two we analyzed the fundamental functions of insurances and their implications for the economy. According to these findings some useful determinants were found, which are candidates for incorporation into our endogenous production function.

- **Premiums (in total, and split into life and non-life sector):**
  Premium income of insurance companies directly depicts the interest of the economy in insurance coverage, may be a fairly accurate measure for the payouts to clients and can roughly represent influx of capital into the insurers assets. Although in some cases insurance coverage is not voluntary (e.g. automobile insurance) and policy pricing may be subject to restrictions (e.g. Japan), most premiums are determined by actuarial theory, the companies pricing policy and supply and demand.
- **Insurance indemnification:**
  The amount of indemnification paid is a direct measure of the additional income of the policyholder and may reflect the volume of precautionary savings the customer dared to free in exchange for the insurance coverage. Or, to put it the other way, at the time of payment the indemnification represents the value of compulsory depreciation and an indicator for future investments to replace the lost value. Due to the

[40] IN THE UK THE DETERMINATION OF PREMIUMS, COVERAGE, ETC., IS UP TO MARKET MECHANISM AND IS UNDER NO OR LITTLE REGULATION;

[41] SEE: HAYAKAWA, FISCHBECK AND FISCHHOFF (2000)

[42] LATEST INVENTIONS CAN BE DIVIDED INTO THREE DIFFERENT CATEGORIES (DAS, DAVIES AND PODPIERA (2003)): SECURITIZATION/BOND STRUCTURES, INSURANCE DERIVATIVES, CONTINGENT CAPITAL ARRANGEMENTS; MOST KNOWN ARE CATASTROPHE OPTIONS AND BONDS;

[43] DAS, DAVIES AND PODPIERA, 2003

[44] DAS, DAVIES AND PODPIERA, 2003

ambiguity of this indicator in terms of what value it does represent, at what time point and when the payment takes effect and the lack of appropriate data, this indicator was skipped during the modelling considerations.

- **Total capital under insurance coverage**:
  The sum of values covered by insurance is an adequate measure for the secured assets in the economy, but may not be an adequate determinant of the insurer's beneficiary role. Differences in legal and accountancy rules, the problem of correct valuation of assets at a certain point in time and the question of accurate capital adequacy make this figure a blurry measurement of the possible influence of insurance services. Furthermore sufficient time series were not available.
- **Insurance assets (in total and split into life and non-life sector):**
  Although facing the same problems in terms of capital adequacy like the above mentioned capital under coverage, the volume of insurance assets is an appropriate indicator for economic engagement and weight. As already utilized and shown by Catalan, Impavido and Musalem (2000), the amount of insurance assets is a valid determinant for the development of financial markets capitalization and value traded.
- **Bank assets/Insurance asset ratio:**
  As an alternation of the above, the bank/insurance asset ratio, besides tracking an supposed "savings substitution", could shed some additional light on whether bank assets or insurance assets are more valuable. But in contrast to discussions about whether banks or stock markets are better in facilitating growth[45], we argue that the differences in management performance may vary much more significantly within each sector from company to company and from each country-to-country than between the two sectors and hence no accurate prediction can be made.
- **Net position to GDP, Asset risk profile:**
  As already described above, the value of both determinants for growth detection is not clear enough, due to their double-edged character. Furthermore several interlinked problems arise when adopting these to figures. Besides problems of calculating the investment risk, the measurement of risks is only meaningful when also quantifying possible earning which is not included in the net position to GDP variable. When incorporating the risk exposition into a growth model and making predictions about elasticity and significance, this would also anticipate, that a specific risk level is ideal for the economy and investments, which might be quite questionable to state.
- **Determinants of Legal System & Regulation:**
  Determinants of legal origin, economic freedom and market regulation are often used when running growth regressions. As a banner-bearer we like to mention works by La Porta et al. (1996, 1997, 1999), Beck et al. (2003) and followers, who investigated various aspects of legal systems' influence on finance and economic performance.

After investigating the possible determinants of insurance engagement – for the first estimates – total premium income, and for a separated focus life and non-life premium figures will be used. As side indicators we will add the interest and inflation rate.

[45] SEE, FOR INSTANCE LEVINE & ZERVOS, 1998

IV.2 Cross-Country Growth Accounting

Most papers reviewed utilize simple OLS Regressions or Granger Causality Tests and mainly test for the determinants of insurance demand. Since the main focus of this paper is to test for insurance services as a main indicator for economic growth, we had to vary from the standard approach and adopted a framework mainly used in other finance-growth nexus analysis. Following Eller (2005), Fink (2004, 2005) or Webb, Grace & Skipper (2002) we adopted a endogenous growth model with a modified Cobb-Douglas production function assuming constant returns to scale and perfect competition:

(1) $Y = AK^{\alpha}H^{\beta}L^{1-\alpha-\beta}$

where Y represents the output (GDP), A denotes to technological progress, K resembles is physical capital, H stands for human capital and finally L is the used labour force. After transforming equation 1 into the intensive form (2)

(2) $y = Ak^{\alpha}h^{\beta}$

(3) $\Delta \ln(y) = \Delta \ln(A) + \alpha \Delta \ln(k) + \beta \Delta \ln(h)$

and taking logarithms on both sides and differentiating (3) we can estimate the two factor shares (α, β), an initial technological efficiency is not required anymore and subsequent values of A can be estimated as well.

To incorporate our main figure of interest into (3), we decided to split expression $\Delta \ln(A)$ into two separately observable parts:

(4) $\Delta \ln(A) = \gamma_{A0} + \gamma_{A1} \Delta PREM$

(5) $\Delta \ln(y) = \gamma_{A0} + \gamma_{A1} \Delta PREM + \alpha \Delta \ln(k) + \beta \Delta \ln(h)$

Although it might be quite devious to understand insurance services, in this case premium income, as part of technological progress, this approach can be interpreted in various ways (6). Since premiums are a flow variable they can resemble an input factor securing the performance of physical and human capital. Furthermore, the accumulation and transformation of premiums into assets adding to physical capital is uncertain and the separation of the physical capital instead of the technology term would not make any difference in the equation. At least premium income can be seen as a factor influencing the output of the two main inputs (physical & human capital) and labour.

(6) $Y = e^{\gamma_{A0} + \gamma_{A1} PREM} K^{\alpha} H^{\beta} L^{1-\alpha-\beta}$

Alternative interpretations of the influence are depicted in (7) and (8) where (5) was extended into the cross-country and time dimension. In (7) the premiums collected in the previous period take effect in the following and in (8) the insurance density rate varies output. Equation 9 is a combination of both possibilities.

(7) $\Delta \ln(y_{it}) = \gamma_{A0} + \gamma_{A1} \Delta PREM_{it-1} + \alpha \Delta \ln(k_{it}) + \beta \Delta \ln(h_{it})$

(8) $\Delta \ln(y_{it}) = \gamma_{A0} + \gamma_{A1} \Delta \left(\frac{PREM_{it}}{y_{it}} \right) + \alpha \ln(k_{it}) + \beta \ln(h_{it})$

(9) $\Delta \ln(y_{it}) = \gamma_{A0} + \gamma_{A1} \Delta \left(\frac{PREM_{it-1}}{y_{it}} \right) + \alpha \ln(k_{it}) + \beta \ln(h_{it})$

In the following section we will summarize the results of our estimates utilizing equation (5) and (7) for total premium income and for life and non-life premium income separately.

V. ESTIMATION

V.1 Methodology

While searching the data for estimation, it was getting obvious, that due to the short time series available and due to the intention to use lagged variables as well, the total number of observations has to be increased somehow. By using a panel data for the regression the data series was expanded to the cross-section dimension, resulting in the total of more than 160 observations usable – hence improving estimation efficiency[46], reducing the impact of short-run fluctuations and results addressing long-run effects may be more convincing.

On the downside, when applying a panel data approach with short annual time series, shifts and short-run movements in the time dimension are to be considered and time-specific dummies should be incorporated. Country specific shocks may distort results as well and should be inhibited by the implementation of country dummies. In return these additional figures may shed light on omitted variables explaining differences in time and between countries.

A dynamic panel may be favourable for testing for omitted variable bias and possible endogeneity bias, but for this first estimation we like to stick to the equations selected, which contain no lagged dependent variable and the implementation of lagged premium data is still possible. Due to the short time period covered we also assume the slope coefficients in the growth equation to be independently distributed and hence homogenous per year. Country differences are explained by varying intercepts between countries. Adding control variables and judging their additional explanatory power will increase model efficiency.

The countries selected for investigation are all from the same area and strongly connected to each other since the sample includes all 15 "old" EU member countries, the majority of the new members and countries like Croatia and Turkey. With a sample period of 12 years and a homogenous country group we assume the country-specific intercepts to be fixed constants over time. Tests for redundant fixed effects and specific country dummies were carried out, but have shown no evidence of incorrect assumptions. Possible autocorrelations between the dependent variable and the explanatory variables were included to prevent misjudging of the results.

To gain more insight and to accommodate possible criticism of using such a mixed panel, we conducted the same tests for two country groups, one consisting of the EU-15, Norway, Switzerland and Iceland and the other pooling the CEE/NMS Countries and Turkey and Croatia.

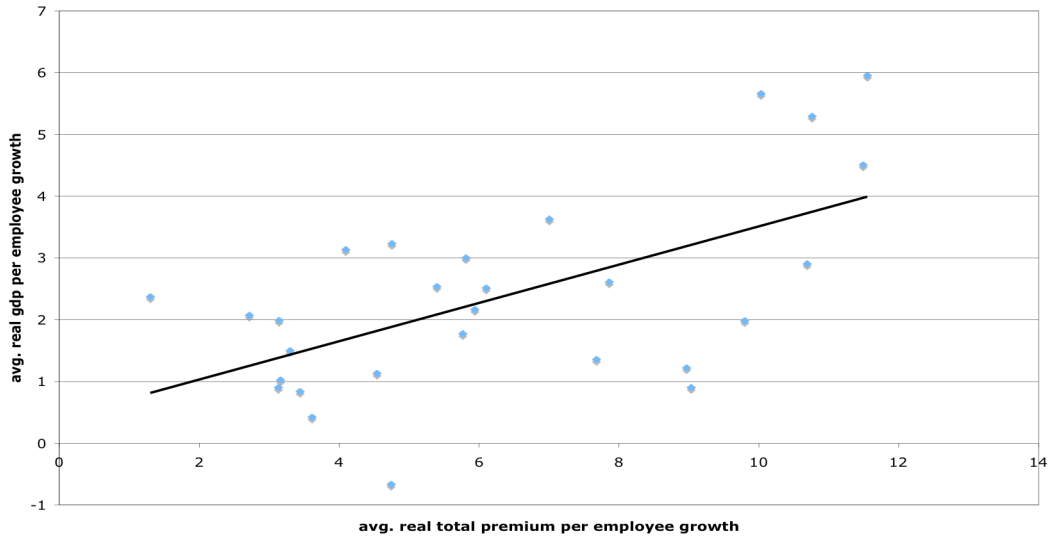
V.2 Data Description

The panel data consists of 29 countries belonging to the European economic region. From the EU Member states Lithuania was omitted due to lack of data and only few data was available for Croatia and Latvia. The rest of the countries are EU membership candidates (Croatia and Turkey) and Switzerland, Norway and Iceland. The data available ranges from 1992 to 2004. Depending on the variable scope outliner (such as Luxembourg) were omitted to guarantee better regression results.

[46] HSIAO, 2003

Some scatter plots of the relation between real GDP per employee and real premium income per employee show the supposed relationship and let's us assume a positive influence of premium income on real growth. Sector specific plots are available in the Annex.

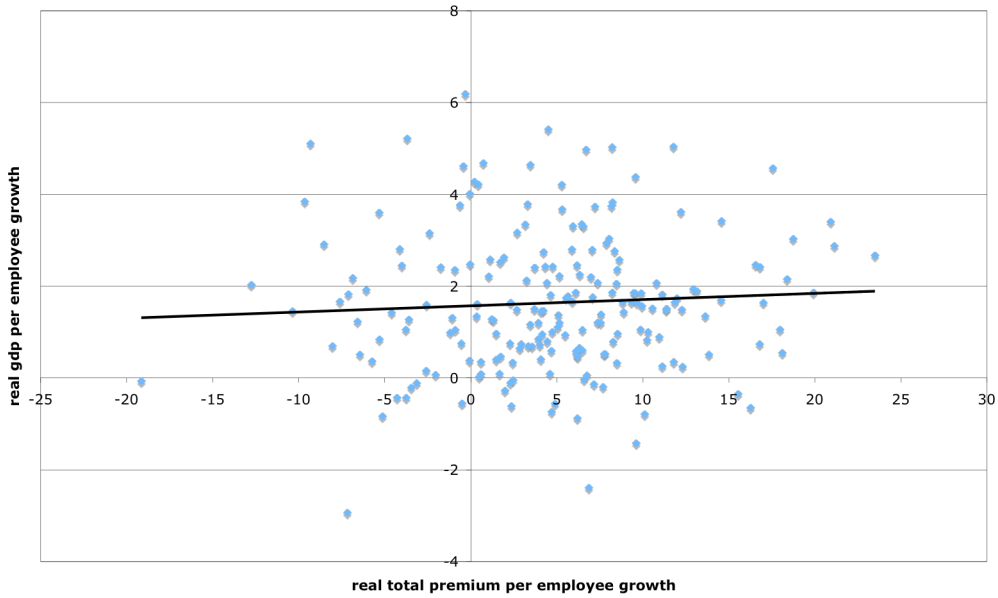
FIGURE 9: AVERAGE GROWTH RATES FOR WHOLE GROUP BETWEEN 1993 AND 2004



SOURCE: CEA, 2004 AND OWN CALCULATIONS

The relationship between average growth rate of real total premium income and real GDP per employee shows a steady upward tendency. No outliners were detected; only Malta had slightly negative growth rate of 0.67% in average.

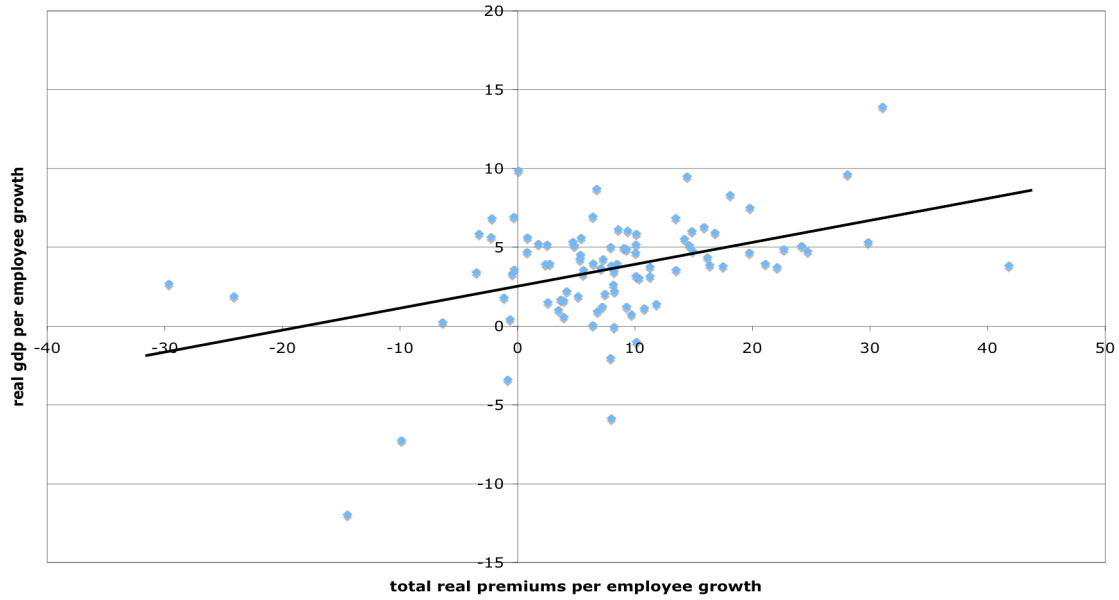
FIGURE 10: YEARLY GROWTH RATES OF REAL GDP AND REAL TOTAL PREMIUMS PER EMPLOYEE IN THE EU15+ GROUP



SOURCE: CEA, 2004 AND OWN CALCULATIONS

In the EU15+ group the relationship between real total premium income and real GDP per employee could be slightly positive. The data pairs are homogenously distributed after omitting two years from Luxembourg data, where premium growth rates were extraordinarily high (above 70%) without adding to real growth.

FIGURE 11: YEARLY GROWTH RATES FOR CEE/NMS GROUP



SOURCE: CEA, 2004 AND OWN CALCULATIONS

The CEE/NMS group seems to have a much steeper relationship between premium income and real growth. The data pairs seem to be evenly distributed and only a few observation points had to be removed, mainly concerning data from accession countries shortly after the collapse of the communist regime, where the accuracy of the statistics is low and growth rates can be disproportionately high due to low base values.

In the following we provide a short description of the data used for the variables introduced in equations (5) and (7) from above:

- **Real GDP per employee (RGDP_EMP)**: real GDP at constant year 2000 prices in constant 2000 US Dollars per employee
- **Physical capital stock (k)**: real physical capital stock at constant year 2000 prices in constant 2000 US Dollars per employee[47].
- **Human capital stock (h)**: constructed index using weighted employee education figures[48] and R&D expenditure as utilization of the employee's knowledge[49].
- **Interest rate (INT)**: 10-year government bond yields, secondary market, annual average;
- **Inflation rate (INF)**: annual average inflation according to Harmonized Indices of Consumer Prices (HICP) from EUROSTATS.
- **Gross premium income (PREM_TOT, PREM_LIFE & PREM_NON)**: Gross premium income as total sum and split into premium income from life and non-life insurance business calculated in constant year 2000 prices and US Dollars.

Due to missing data in some series (especially Croatia, Estonia, Luxembourg, Switzerland and Turkey) some gaps had to filled by interpolation, but the panel still stayed unbalanced having implications on the general

[47] THE TIME SERIES OF THE PHYSICAL CAPITAL STOCK WERE CALCULATED USING PERPETUAL INVENTORY METHODS. INITIAL CAPITAL STOCK WAS CALCULATED ACCORDING TO EASTERLY & LEVINE (2001).

[48] EDUCATION LEVEL WEIGHTS ACCORDING TO ISCED-CLASSIFICATION: 0-2 = 1, 3-4 = 1.4, 5-6: 2;

[49] R&D EXPENDITURE AS % OF REAL GDP

possibilities of the estimation. But because the variance between countries over time is assumed to be absorbed by the country-specific intercepts and accordingly a fixed-effect approach was chosen, the lack of data had no effect on the methodology.

V.3 Estimation Results

The estimation output is summarized in the following Tables 4 to 12 beginning with the results for the whole sample for total premiums. With all three groups calculations with the current and the lagged values of real total premiums, life and non-life premiums were carried out. Furthermore each equation was extended step by step with variables for inflation and interest rate. Since the amount of results is somewhat confusing, the tables were reduced to show only figures relevant for the current discussion, all additional data can be retrieved from the annex. The peculiarities of the result are discussed following each table and an overall summary at the end of the section.

NOTES: ESTIMATION METHOD: LSDV, STATIC VARIABLE-INTERCEPT PANEL DATA MODEL WITH COUNTRY-FIXED AND TIME-FIXED EFFECTS. T-STATISTICS ARE IN PARENTHESES. ASTERISKS INDICATE VARIABLES WHOSE COEFFICIENTS ARE SIGNIFICANT AT THE 10%(*), 5%(**), AND 1% (***) LEVEL, RESPECTIVELY. TIME-FIXED EFFECTS ARE INCLUDED PER ASSUMPTION IN EACH EQUATION BECAUSE OF THE LIKELIHOOD OF SHORT-RUN BUSINESS CYCLE FLUCTUATIONS.

TABLE 4: ESTIMATION OUTPUT – WHOLE GROUP – TOTAL REAL PREMIUM INCOME PER EMPLOYEE

	Dependent Variable: $\Delta \ln(RGDP\_EMP_{it})$							
Explanatory Variables:	$PREM_{it} = PREM\_TOT_{it}$				$PREM_{it} = PREM\_TOT_{it-1}$			
$\Delta \ln(PREM_{it})$	**0.0190** (1.128)	**-0.0104** (-0.876)	**-0.002** (-0.130)	**-0.011** (-1.024)	**-0.0260**** (-2.157)	**-0.0022** (-0.255)	**-0.0211*** (-1.925)	**-0.0001** (-0.017)
$\Delta \ln(INT_{it})$		**-0.0019***** (-3.868)		**-0.0022***** (-3.669)		**-0.0013**** (-2.275)		**-0.0003** (-0.529)
$\Delta \ln(INF_{it})$			**-0.0206***** (-6.266)	**-0.0005** (-0.932)			**-0.0019***** (-5.803)	**-0.0020***** (-3.101)
Adj. R2	0.5860	0.7540	0.6680	0.7749	0.6087	0.7536	0.6793	0.7691
F-Value	7.733	1.547	1.047	1.682	8.420	1.524	1.099	1.608
Prob > F	0.000	0.0002	0.0001	0.0005	0.000	0.0004	0.0012	0.0001

SOURCE: FOR THE VARIABLE DEFINITIONS AND SOURCES SEE DATA DESCRIPTION ABOVE. ALL REGRESSIONS ARE CALCULATED WITH EVIEWS 5.1.

When investigating the impact of insurance consumption for the whole panel-countries the estimates suggest a negative influence for the current and for the lagged value. The current value never enters significantly when extending the model with inflation and interest rate as control variables. Lagged premium income losses significance whenever the interest rate is added. The increasing adjusted R^2 suggests that adding the control variables enhances model efficiency, so the complete versions of the models were tested for autocorrelation. For the current premiums no autocorrelation was found, whereas the lagged model has some kind of autocorrelation. So we neglect the significance determined of total premium income in both equations. The negative sign for inflation meets our assumptions, but the interest rate enters to the contrary. If we analyse the valid current form of the model more closely some possible explanations might be drawn. In the first model of the current form the premiums enter positively but not significant. In the second development stage though, both the premiums and the interest rate turn negative. If both variables are coupled this would suggest that first year returns on premiums fall behind the interest rate. This would be in line with Davis' (2000) findings that insurance companies cannot achieve appropriate yields due to portfolio regulations.

TABLE 5: ESTIMATION OUTPUT - WHOLE GROUP - TOTAL REAL LIFE PREMIUM INCOME PER EMPLOYEE

	Dependent Variable: $\Delta \ln(RGDP\_EMP_{it})$							
Explanatory Variables:	$PREM_{it} = PREM\_LIFE_{it}$				$PREM_{it} = PREM\_LIFE_{it-1}$			
$\Delta \ln(PREM_{it})$	**-0.0026** (-0.282)	**-0.0130** (-1.989)	**-0.0030** (-0.363)	**-0.0100** (-1.581)	**-0.0126*** (-1.663)	**-0.0033** (-0.614)	**-0.0115*** (-1.668)	**-0.0016** (-0.304)
$\Delta \ln(INT_{it})$		**-0.0019***** (-4.029)		**-0.0007** (-1.124)		**-0.0013**** (-2.291)		**-0.0003** (-0.556)
$\Delta \ln(INF_{it})$			**-0.0020***** (-6.394)	**-0.0020***** (-3.409)			**-0.0019***** (-5.899)	**-0.0020***** (-3.063)
Adj. R2	0.582	0.7597	0.7387	0.7773	0.6038	0.7542	0.6773	0.7693
F-Value	7.644	1.592	1.048	1.704	8.268	1.529	1.090	1.610
Prob > F	0.000	0.0003	0.0013	0.0001	0.000	0.0004	0.0012	0.0001

SOURCE: FOR THE VARIABLE DEFINITIONS AND SOURCES SEE DATA DESCRIPTION ABOVE. ALL REGRESSIONS ARE CALCULATED WITH EVIEWS 5.1.

Life insurance premiums seem to have no significant impact on ecomonic growth in current and a slightly negative in the lagged form. Both models show the same peculiarities as the total premium model, besides lacking the turn in sign, and have to be neglected due to autocorrelation. This time inflation is dominant to the interest rate and keeps significance even if interest rate is added to the model.

TABLE 6: ESTIMATION OUTPUT - WHOLE GROUP - REAL TOTAL NONLIFE PREMIUM INCOME PER EMPLOYEE

	Dependent Variable: $\Delta \ln(RGDP\_EMP_{it})$							
Explanatory Variables:	$PREM_{it} = PREM\_NONLIFE_{it}$				$PREM_{it} = PREM\_NONLIFE_{it-1}$			
$\Delta \ln(PREM_{it})$	**0.07673***** (3.146)	**0.0253** (1.231)	**0.0271** (1.127)	**0.0213** (1.075)	**-0.0882***** (-4.560)	**-0.0241** (-1.252)	**-0.0670***** (-3.862)	**-0.0147** (-0.781)
$\Delta \ln(INT_{it})$		**-0.0018***** (-3.756)		**-0.0005** (-0.874)		**-0.0014**** (-2.359)		**-0.0004** (-0.638)
$\Delta \ln(INF_{it})$			**-0.0019***** (-5.532)	**-0.0021***** (-3.573)			**-0.0017***** (-5.332)	**-0.0019***** (-2.946)
Adj. R2	0.6078	0.7553	0.6707	0.7751	0.6464	0.7564	0.7018	0.7703
F-Value	8.371	1.558	1.059	1.684	9.718	1.546	1.210	1.618
Prob > F	0.000	0.0003	0.0001	0.0004	0.000	0.0003	0.0009	0.0002

SOURCE: FOR THE VARIABLE DEFINITIONS AND SOURCES SEE DATA DESCRIPTION ABOVE. ALL REGRESSIONS ARE CALCULATED WITH EVIEWS 5.1.

The main difference of the estimation output for non-life premium models is the inverse behaviour of the lagged value to the current. First of all direct non-life premium expenditure seems to add to GDP when inflation and interest rate are ignored, but the lagged amount decreases it in the same breath and even more if inflation and interest rate are considered. Secondly, when turning back to the results from aggregate form of the premiums, non-life insurance premiums influence the effect of the total more than life insurance expenditure in the same period. But estimation results have to be handled with due care because both regressions show autocorrelation between the dependent variables and the resulting.

TABLE 7: ESTIMATION OUTPUT - EU15+ GROUP - REAL TOTAL PREMIUM INCOME PER EMPLOYEE

	Dependent Variable: $\Delta \ln(RGDP\_EMP_{it})$

Explanatory Variables:	$PREM_{it} = PREM\_TOT_{it}$				$PREM_{it} = PREM\_TOT_{it-1}$			
$\Delta \ln(PREM_{it})$	**-0.0058** (-0.395)	**-0.0041** (-0.303)	**-0.0100** (-0.747)	**-0.0057** (-0.419)	**-0.0048** (-0.363)	**-0.0032** (-0.244)	**-0.0055** (-0.425)	**-0.0030** (-0.229)
$\Delta \ln(INT_{it})$		**-0.0018***** (-3.680)		**-0.0007** (-0.989)		**-0.0010** (-1.638)		**-0.0005** (-0.743)
$\Delta \ln(INF_{it})$			**-0.0028***** (-4.767)	**-0.0020**** (-2.254)			**-0.0019**** (-2.466)	**-0.0010** (-1.089)
Adj. R2	0.6031	0.6353	0.6695	0.6497	0.6490	0.6471	0.6646	0.6478
F-Value	7.940	8.900	1.011	9.123	9.355	9.330	9.814	8.951
Prob > F	0.000	0.0000	0.0011	0.0000	0.000	0.000	0.000	0.000

SOURCE: FOR THE VARIABLE DEFINITIONS AND SOURCES SEE DATA DESCRIPTION ABOVE. ALL REGRESSIONS ARE CALCULATED WITH EVIEWS 5.1.

The findings for the impact of total premiums of the EU15+ group resemble the results from the whole panel. But in contrast to that the switch in the sign for the current version cannot be found. This may result from a bigger weight of the life insurance industry in the total figure of the EU15+ group countries. Both regressions are again concerned with autocorrelation and results should be interpreted cautiously.

TABLE 8: ESTIMATION OUTPUT - EU15+ GROUP - REAL LIFE PREMIUM INCOME PER EMPLOYEE

	Dependent Variable: $\Delta \ln(RGDP\_EMP_{it})$								
Explanatory Variables:	$PREM_{it} = PREM\_LIFE_{it}$				$PREM_{it} = PREM\_LIFE_{it-1}$	$PREM_{it} = PREM\_LIFE_{it-3}$			
$\Delta \ln(PREM_{it})$	**-0.0099** (-1.115)	**-0.0077** (-0.911)	**-0.0119** (-1.469)	**-0.0087** (-1.049)	**-0.0044** (-0.539)	**0.0164**** (2.044)	**0.0140** (1.605)	**0.0131*** (1.680)	**0.0148*** (1.802)
$\Delta \ln(INT_{it})$		**-0.0019***** (-3.730)		**-0.0007** (-0.987)			**0.0005** (0.539)		**0.0035**** (2.578)
$\Delta \ln(INF_{it})$			**-0.0028***** (-4.834)	**-0.0020**** (-2.300)				**-0.0028***** (-2.947)	**-0.0042***** (-3.354)
Adj. R2	0.6071	0.6380	0.6744	0.6530	0.6496	0.7078	0.6976	0.7302	0.7319
F-Value	8.056	8.992	1.032	9.241	9.375	1.131	1.069	1.233	1.202
Prob > F	0.000	0.0000	0.0014	0.0000	0.000	0.0015	0.0021	0.0009	0.0010

SOURCE: FOR THE VARIABLE DEFINITIONS AND SOURCES SEE DATA DESCRIPTION ABOVE. ALL REGRESSIONS ARE CALCULATED WITH EVIEWS 5.1.

Life insurance premiums in current model are negatively correlated with GDP growth but lack any significance and results are reflected by the findings from the model with one lag. Since both models are again concerned to be auto correlated we move on to describe the impact of premiums lagged three periods. Premium expenditure enters positively in every form of the model and stays significant at the 10% level in the extended version. This suggests that there is some positive influence of the investment activities carried out due to premium income. This interpretation is facilitated by the positive and significant influence of the interest rate. Inflation enters negatively as assumed and the model is not affected by autocorrelation.

TABLE 9: ESTIMATION OUTPUT – EU15+ GROUP – REAL NONLIFE PREMIUM INCOME PER EMPLOYEE

	Dependent Variable: $\Delta \ln(RGDP\_EMP_{it})$	
Explanatory Variables:	$PREM_{it} = PREM\_NONLIFE_{it}$	$PREM_{it} = PREM\_NONLIFE_{it-1}$

$\Delta \ln(PREM_{it})$	**0.0126** (0.532)	**0.0251** (1.091)	**0.0114** (0.525)	**0.0216** (0.958)	**-0.0039** (-0.219)	**0.0079** (0.358)	**0.0013** (0.072)	**0.0121** (0.539)
$\Delta \ln(INT_{it})$		**-0.0018***** (-3.659)		**-0.0007** (-1.012)		**-0.0009** (-1.563)		**-0.0004** (-0.604)
$\Delta \ln(INF_{it})$			**-0.0027***** (-4.712)	**-0.0019**** (-2.173)			**-0.0019**** (-2.437)	**-0.0011** (-1.166)
Adj. R2	0.6035	0.6393	0.6686	0.6523	0.6487	0.6474	0.6640	0.6487
F-Value	7.953	9.038	1.0008	9.217	9.344	9.339	9.791	8.982
Prob > F	0.000	0.000	0.0023	0.000	0.000	0.000	0.000	0.000

SOURCE: FOR THE VARIABLE DEFINITIONS AND SOURCES SEE DATA DESCRIPTION ABOVE. ALL REGRESSIONS ARE CALCULATED WITH EVIEWS 5.1.

Results for the non-life sector of the EU15+ group again show a positive relation of insurance expenditure and GDP in the current form but no significance of this impact is found. The lagged form does not differ much, despite the fact that insurance expenses are decreasing the current GDP when inflation and/or interest rate are neglected in the model. In both models premiums and GDP are suggested to be auto correlated so conclusion drawn should be considered carefully.

TABLE 10: ESTIMATION OUTPUT – CEE/NMS GROUP – TOTAL REAL PREMIUM INCOME PER EMPLOYEE

	Dependent Variable: $\Delta \ln(RGDP\_EMP_{it})$							
Explanatory Variables:	$PREM_{it} = PREM\_TOT_{it}$				$PREM_{it} = PREM\_TOT_{it-1}$			
$\Delta \ln(PREM_{it})$	**0.0454** (0.948)	**-0.0543*** (-1.985)	**0.0030** (0.067)	**-0.044** (-1.659)	**-0.0365** (-1.443)	**0.0064** (0.429)	**-0.0284*** (-1.237)	**0.0080** (0.566)
$\Delta \ln(INT_{it})$		**-0.0024** (-1.036)		**-0.0009** (-0.398)		**-0.0026** (-1.035)		**-0.0007** (-0.297)
$\Delta \ln(INF_{it})$			**-0.0019***** (-2.960)	**-0.0020*** (-1.835)			**-0.0018***** (-3.068)	**-0.0025**** (-2.142)
Adj. R2	0.3363	0.7618	0.4514	0.7832	0.3797	0.7313	0.4972	0.7662
F-Value	2.444	8.462	3.233	8.986	2.836	7.564	3.810	8.467
Prob > F	0.0090	0.000	0.0009	0.000	0.0037	0.000	0.0003	0.000

SOURCE: FOR THE VARIABLE DEFINITIONS AND SOURCES SEE DATA DESCRIPTION ABOVE. ALL REGRESSIONS ARE CALCULATED WITH EVIEWS 5.1.

When turning to the CEE/NMS group and considering the impact of total premium income, the picture is not clear. Depending on the model total insurance expenditure enters negatively if interest rate is incorporated and turns positive but insignificant when no control variable is used or only inflation is added. Overall lower inflation seems to be more a proxy for GDP growth than the interest rate and insurance expenditure is negatively correlated when it reaches significant levels. In the lagged form premium income turns negative when adding the inflation rate and vanishes again upon incorporation of the interest rate, whereas the current form behaves inversely. No autocorrelation was observed.

TABLE 11: ESTIMATION OUTPUT – CEE/NMS GROUP – REAL LIFE PREMIUM INCOME PER EMPLOYEE

	Dependent Variable: $\Delta \ln(RGDP\_EMP_{it})$							
Explanatory Variables:	$PREM_{it} = PREM\_LIFE_{it}$				$PREM_{it} = PREM\_LIFE_{it-1}$			
$\Delta \ln(PREM_{it})$	**-0.0092** (-0.391)	**-0.0292**** (-2.452)	**-0.0016** (-0.076)	**-0.0212** (-1.480)	**-0.0186** (-1.160)	**-0.0003** (-0.035)	**-0.0144** (-0.996)	**0.0019** (0223)
$\Delta \ln(INT_{it})$		**-0.0026** (-1.188)		**-0.0016** (-0.685)		**-0.0037** (-1.072)		**-0.0008** (-0.354)
$\Delta \ln(INF_{it})$			**-0.0018***** (-3.108)	**-0.0013** (-1.006)			**-0.0018***** (-3.102)	**-0.0024***** (-2.115)
Adj. R2	0.3230	0.7782	0.4514	0.7783	0.3674	0.8415	0.490	0.7635
F-Value	2.359	9.188	3.234	8.763	2.742	7.496	3.727	8.354
Prob > F	0.0116	0.000	0.0009	0.000	0.0048	0.000	0.0003	0.000

SOURCE: FOR THE VARIABLE DEFINITIONS AND SOURCES SEE DATA DESCRIPTION ABOVE. ALL REGRESSIONS ARE CALCULATED WITH EVIEWS 5.1.

The results for life insurance income in relation to GDP growth differ severely from the results for the aggregate value. Life premiums seem to be connected negatively and despite one occasion never reach significant levels. Current premium income is not being absorbed by the capital stock in the same period and the possibly positive impact may not arrive after just one period. Maybe the less developed financial markets in the CEE/NMS countries can't produce similar positive results as the more mature systems in the EU15+ group.

TABLE 12: ESTIMATION OUTPUT – CEE/NMS GROUP – REAL NONLIFE PREMIUM INCOME PER EMPLOYEE

	Dependent Variable: $\Delta \ln(RGDP\_EMP_{it})$							
Explanatory Variables:	$PREM_{it} = PREM\_NONLIFE_{it}$				$PREM_{it} = PREM\_NONLIFE_{it-1}$			
$\Delta \ln(PREM_{it})$	**0.1869***** (3.294)	**0.0598** (1.062)	**0.1198** (1.663)	**0.0465** (0.871)	**-0.1792***** (-3.968)	**-0.0715** (-1.518)	**-0.1556***** (-3.728)	**-0.0596** (-1.327)
$\Delta \ln(INT_{it})$		**-0.0027** (-1.111)		**-0.0010** (-0.406)		**-0.0031** (-1.303)		**-0.0014** (-0.577)
$\Delta \ln(INF_{it})$			**-0.0011** (-1.474)	**-0.0023*** (-2.012)			**-0.0015***** (-2.959)	**-0.0022*** (-1.982)
Adj. R2	0.4744	0.7351	0.4905	0.7650	0.5435	0.7529	0.6244	0.7798
F-Value	3.572	7.475	3.613	8.195	4.571	8.352	5.725	9.069
Prob > F	0.0003	0.000	0.0003	0.000	0.000	0.000	0.000	0.000

SOURCE: FOR THE VARIABLE DEFINITIONS AND SOURCES SEE DATA DESCRIPTION ABOVE. ALL REGRESSIONS ARE CALCULATED WITH EVIEWS 5.1.

The non-life insurance sector in the CEE/NMS countries seems to add to the current GDP growth like in the EU15+ countries, but results seem to be more robust. Expenditure of the previous period turns to be negative, especially when accompanied by higher inflation and hence findings do not reflect those from the EU15+ group. Since EU15+ findings are auto correlated comparison is not totally valid, but a certain difference in the financial system can be attested. The interest rate does not enter significantly but has a slight negative influence.

Concerning the overall picture we think it is possible to state a slightly positive influence of the insurance sector onto the economy at large. Although simple estimations may be misleading, the step-by-step building of the regression models and the separation into two different country groups provided some additional insight. The estimation results have shown a significant positive contribution of life insurance services to the real GDP growth in the EU15+ group and an influence running into the same direction of non-life insurance expenditure for the CEE/NMS countries, albeit being a short-run effect. As supposed, capital formation is the main indicator for growth. The reason for the negative effect of the human capital input may be found in the

special construction used for the index. In addition to the setup developed by Eller et al. (2005) we also incorporated the R&D expenditure into the figure, resembling costs in the current time point and creating positive returns some periods later.

When comparing our findings to those listed in the literature review above we can support Webb, Grace & Skipper (2002) stating non-life insurance income being not significant if examining the whole panel and focusing on the long-run effects. The results for EU15+ group containing only countries with well-developed financial systems are similar to the findings of Catalan et al. (2000), Davis & Hu (2004) and Boon (2005). Additionally we can support Davis (2000) and La Porta (1996, 1997) in terms that regulation and the legal environment may be essential indicators of efficient financial systems and hence influence growth. But the question raised in the work of Rousseau and Wachtel (2005) may not be answered sufficiently since results are not strong enough to state that the lose of significance of banks in recent years is caused by the rise of the insurance sector.

VI. CONCLUSION

The main intention of this article is to add to the understanding of the role of the insurance sector in the finance-growth-nexus, i.e. whether and how insurance influences economic growth. The rationale behind this notion is twofold: On the one hand, the importance of the insurance sector within total financial intermediation has risen over time, and the magnitude and intensity of links between insurance, banking and capital markets has also risen; thus the likely impact of insurance onto the economy should have gone up. On the other hand, the strength of the bank/stock finance-growth-relationship found in empirical studies, which used mainly pre-1990ies data seems to have volatilized in more recent years. Could the weakening of this seemingly robust finance-growth relationship that drove so much of policy recommendations be caused, among others, by the very growth of the insurance sector and its respective role? If there is a causal and strong relationship running from the insurance sector onto economic growth, and/or if the insurance muscle weakens formerly important bank and capital market channels for growth, this would lead to numerous policy recommendations, for example in sequencing of reforms in transition and emerging markets and in priorities for financial market development.

So we analysed the various domains of influence of the insurance sector vis-à-vis economic growth: risk transfer (bearing risk for other economic agents which might stabilise their income streams, dampen volatility and enhance economic activity), substitute savings (broadening the investment range might make intermediation more efficient and thus aid in economic growth), investment (e.g. increasing over-all investment volumes and deepening capital markets), institutional spheres of influence (e.g. bancassurance) and possible threats, sources of contagion and repercussions to the economy. A short description of supervisory methodology sheds some light on legal influences on insurance companies. We also provide descriptive evidence on the magnitude and development of the insurance sector vis-à-vis other financial sectors. Next, we review the literature for models on the insurance-growth-nexus and for empirical investigations. Although the number of empirical analyses is quite low and lags miles behind the multitude of studies about other growth channels, there seemed to be at least weak evidence that GDP, interest rate and inflation rate are correlated to insurance consumption.

After identifying various possibilities to measure the impact of the insurance sector, we develop a modified production function to represent our endogenous growth model. The empirical analysis of a panel data of 29

Countries for the period from 1992 to 2004 is used to estimate the coefficients and the significance of each input factor. With a step-by-step approach and a division of the panel into less developed countries and ones with more mature financial markets increased insight. Results showed slight evidence for a correlation between life premium income and GDP growth for countries with mature financial markets in the long run and a short-run connection of non-life expenditure and GDP for the CEE/NMS countries. Our findings add to the mixed picture found in the literature review and resemble the same weak link found in the bank/stock finance-growth-relationship in recent year. So we can deny the assumption that an expanding insurance sector is weakening the bank/stock finance-growth-nexus.

We conclude that there is a good theoretical point for the insurance sector influencing economic growth (and vice versa), but little and only weak evidence as of yet. Our empirical findings suggest that there are differences between less developed countries and countries with mature financial markets which are worth to be observed and may point to future possibilities in investigating the nexus further by using different indicators for insurance engagement and model setup and longer time periods. Given the huge body of research on the relationship between bank/capital market-finance and economic growth, there is definitely a need for more empirical work on the insurance-growth-nexus, both solely on insurance and by including insurance in broader investigations. Neglecting this topic neither facilitates better understanding of the overall nexus, nor acknowledges the increasing importance of insurance services for the public and exposition of the GDP to insurance failure. The disparity between the importance of the insurance sector for the finance-growth nexus and acknowledgement received from researchers up until now prompts us to recommend conducting further investigation, which would help to eliminate essential knowledge gaps in macroeconomic theory and answer why the finance-growth-nexus seems to be have become less robust on more recent data.

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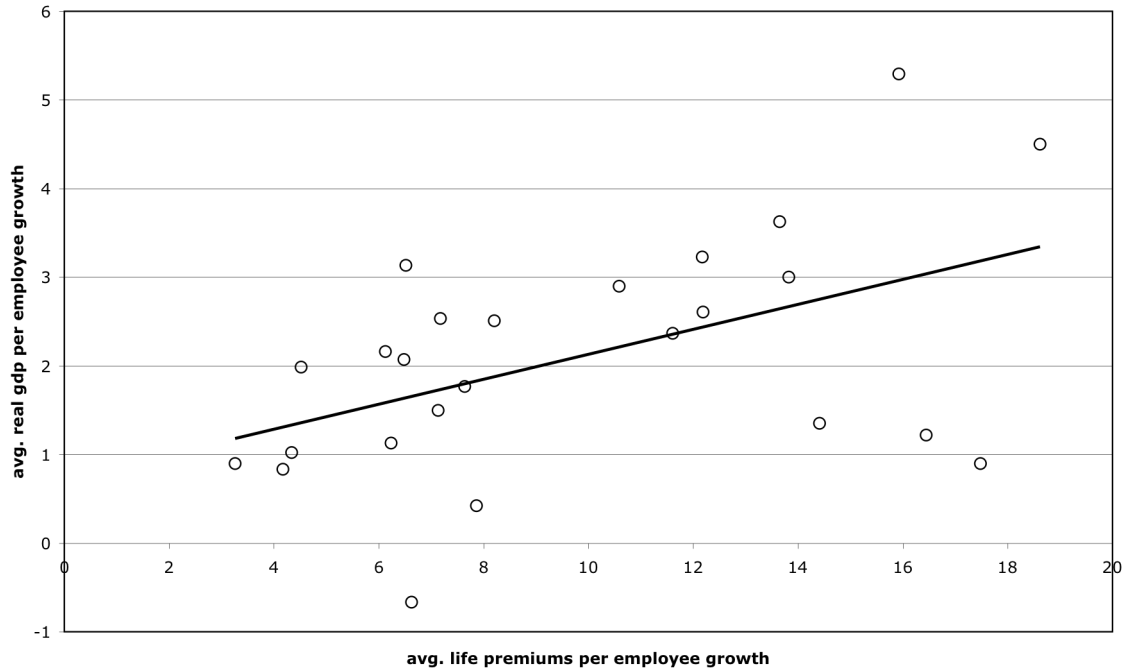
APPENDIX

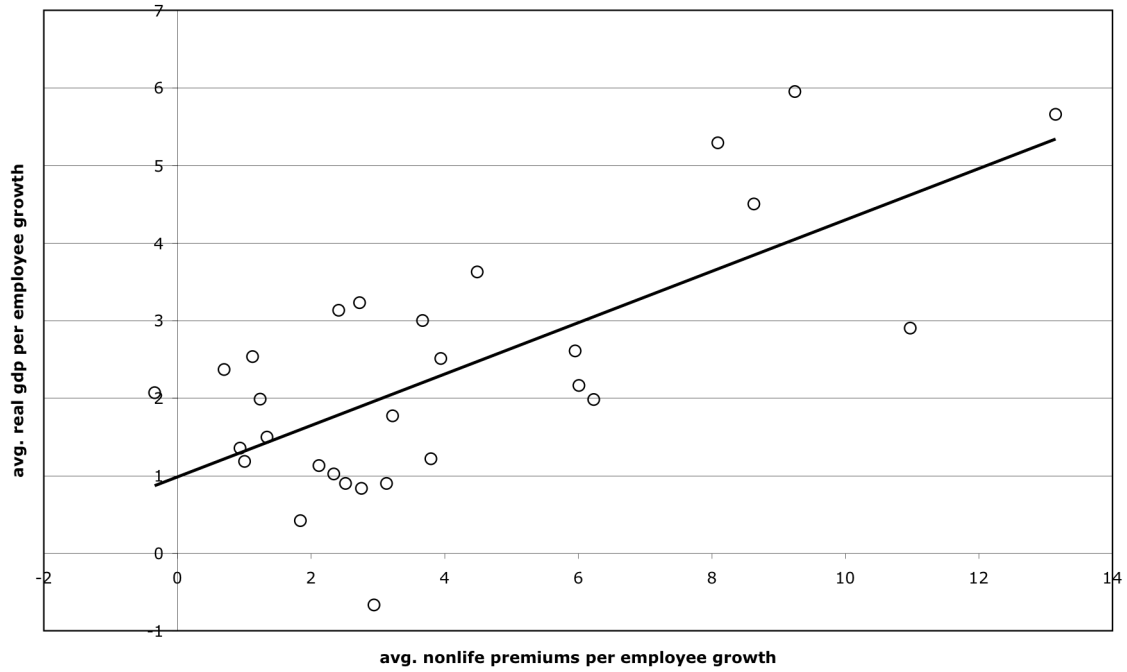
I. Additional Scatter Plots

FIGURE 1: AVERAGE REAL LIFE PREMIUM GROWTH RATE (1993-2004) FOR WHOLE PANEL



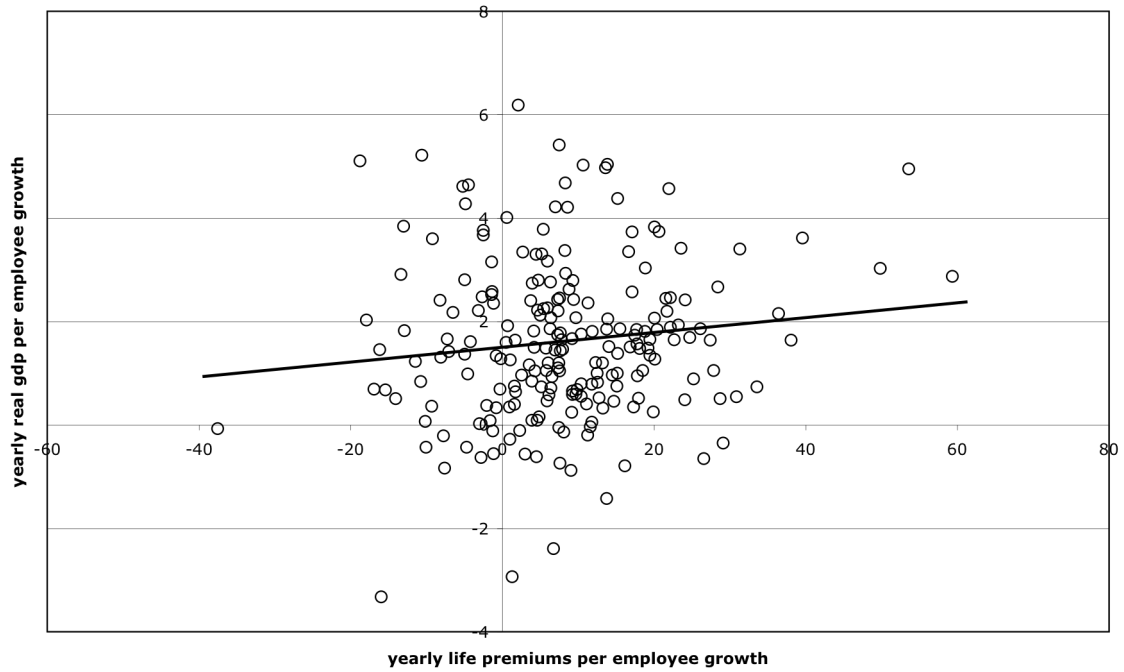
SOURCE: OWN CALCULATIONS BASED ON DATA FROM CEA, 2004
NOTES: CYPRUS, LATVIA AND LUXEMBOURG OMITTED;

FIGURE 2: AVERAGE REAL NONLIFE PREMIUM GROWTH RATE (1993-2004) FOR WHOLE PANEL



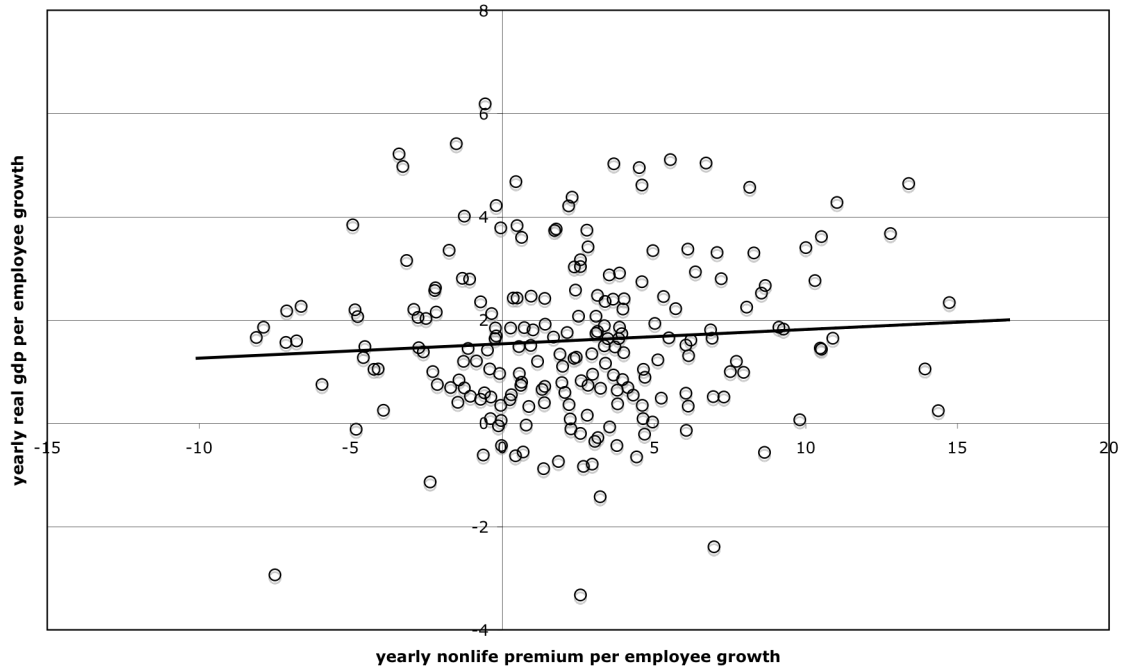
SOURCE: OWN CALCULATIONS BASED ON DATA FROM CEA, 2004

FIGURE 3: YEALRY LIFE PREMIUM GROWTH RATE SCATTER PLOT FOR EU15+ GROUP



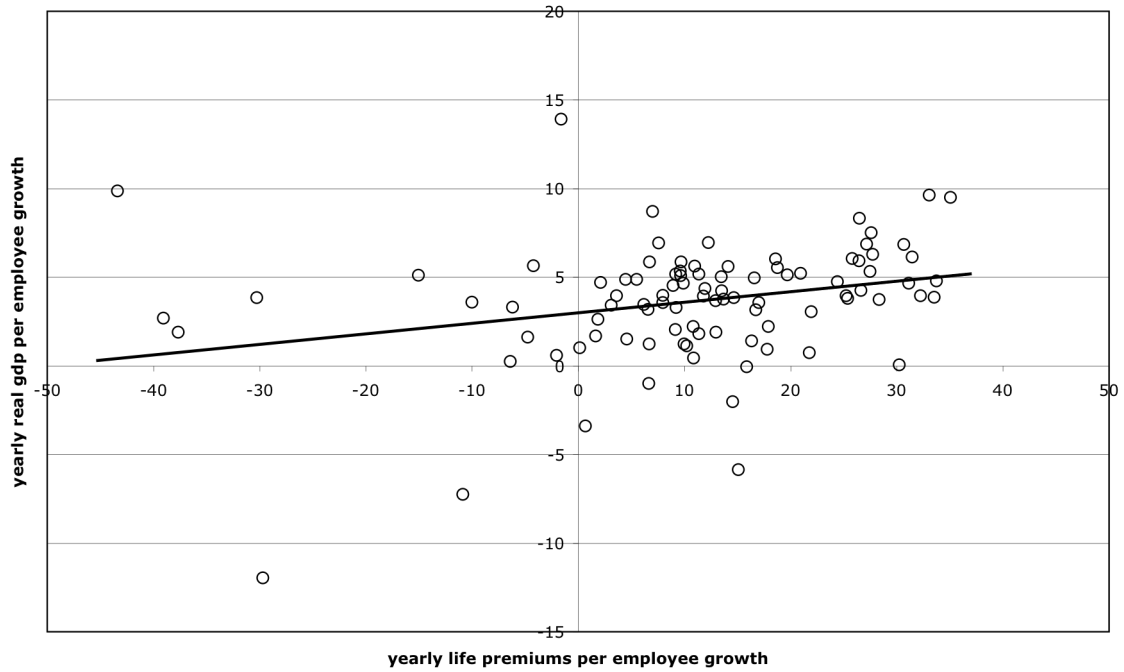
SOURCE: *OWN CALCULATIONS BASED ON DATA FROM CEA, 2004*

FIGURE 4: YEARLY NONLIFE PREMIUM GROWTH RATE SCATTER PLOT FOR EU15+ GROUP



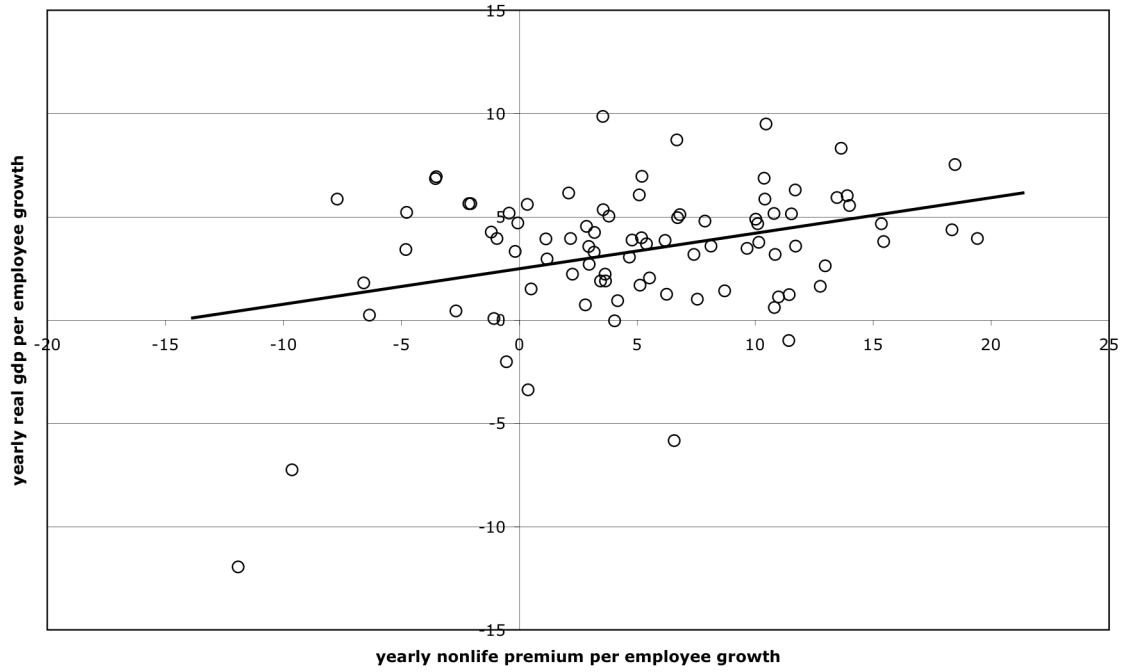
SOURCE: *OWN CALCULATIONS BASED ON DATA FROM CEA, 2004*

FIGURE 5: YEARLY LIFE PREMIUM GROWTH RATE SCATTER PLOT FOR CEE/NMS GROUP



SOURCE: *OWN CALCULATIONS BASED ON DATA FROM CEA, 2004*

FIGURE 6: YEARLY REAL NONLIFE PREMIUM GROWTH RATE SCATTER PLOT FOR CEE/NMS GROUP



SOURCE: *OWN CALCULATIONS BASED ON DATA FROM CEA, 2004*

II. Complete Estimation Results

*TABLE **ERROR! UNKNOWN SWITCH ARGUMENT.**: ESTIMATION OUTPUT FOR WHOLE PANEL - TOTAL REAL PREMIUMS*

	Dependent variable: $\Delta \ln(RGDP\_EMP_{it})$							
Explanatory variables:	$PREM_{it} = PREM\_TOT\_EMP_{it}$				$PREM_{it} = PREM\_TOT\_EMP_{it-1}$			
C	**0.0094***** (4.014)	**0.0200***** (5.541)	**0.0167***** (6.919)	**0.0170***** (4.779)	**0.0125***** (5.522)	**0.0168***** (4.162)	**0.0177***** (7.846)	**0.0152***** (3.856)
$\Delta \ln(PREM_{it})$	**0.0190** (1.128)	**-0.0104** (-0.875)	**-0.0020** (-0.130)	**-0.0116** (-1.024)	**-0.0260**** (-2.157)	**-0.0022** (-0.255)	**-0.0211*** (-1.925)	**-0.0001** (-0.017)
$\Delta \ln(k_{it})$	**0.5373***** (6.730)	**0.5849***** (10.292)	**0.6100***** (8.410)	**0.6444***** (11.360)	**0.5284***** (6.527)	**0.5749***** (9.828)	**0.6087***** (8.151)	**0.6275***** (10.617)
$\Delta \ln(h_{it})$	**-0.0324**** (-2.157)	**-0.0089** (-0.809)	**-0.0291**** (-2.157)	**-0.0027** (-0.259)	**-0.0369**** (-2.446)	**-0.0132** (-1.164)	**-0.0293**** (-2.138)	**-0.0051** (-0.454)
INT_{it}		**-0.0019***** (-3.868)		**-0.0022** (-0.931)		**-0.0013**** (-2.275)		**-0.0003** (-0.529)
INF_{it}			**-0.0020**** (-6.266)	**-0.0005***** (-3.669)			**-0.0019***** (-5.803)	**-0.0020***** (-3.101)
Adj. R2	0.5860	0.7540	0.6680	0.7749	0.6087	0.7536	0.6793	0.7691
F-Statistik	7.7333	1.5473	1.0472	1.6820	8.4203	1.5246	1.099	1.6087
Probability	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Observations	196	171	194	171	187	164	185	164

SOURCE: OWN CALCULATIONS

TABLE 2: ADDITIONAL ESTIMATION OUTPUT FOR WHOLE PANEL - TOTAL REAL PREMIUMS

Durbin-Watson	1.8075	1.7295	2.2179	1.8438	1.8246	1.7858	2.1839	1.8594
Akaike info criteria	-5.5622	-6.3735	-5.7784	-6.4583	-5.6186	-6.3775	-5.8129	-6.4384
Schwarz criteria	-4.8597	-5.6938	-5.0710	-5.7602	-4.9274	-5.6971	-5.1166	-5.7390
Residual test				**-0.0184** (-0.3065)				**0.1683**** (2.0085)
Wald test: -0.5 + C(1)				-0.5184				-0.3316

SOURCE: OWN CALCULATIONS

TABLE 3: ESTIMATION OUTPUT FOR WHOLE PANEL - REAL LIFE PREMIUMS

	Dependent variable: $\Delta \ln(RGDP\_EMP_{it})$							
Explanatory variables:	$PREM_{it} = PREM\_LIFE\_EMP_{it}$				$PREM_{it} = PREM\_LIFE\_EMP_{it-1}$			
C	**0.0106***** (4.484)	**0.0211***** (5.870)	**0.0168***** (7.199)	**0.0177***** (4.947)	**0.0123***** (5.329)	**0.0170***** (4.240)	**0.0177***** (7.736)	**0.0154***** (3.926)
$\Delta \ln(PREM_{it})$	**-0.0026** (-0.281)	**-0.0130** (-1.989)	**-0.0030** (-0.363)	**-0.0100** (-1.581)	**-0.0126*** (-1.663)	**-0.0032** (-0.614)	**-0.0114*** (-1.668)	**-0.0015** (-0.017)
$\Delta \ln(k_{it})$	**0.5320***** (6.589)	**0.5702***** (10.073)	**0.6068***** (8.308)	**0.6288***** (11.006)	**0.5187***** (6.335)	**0.5720***** (9.753)	**0.6009***** (7.980)	**0.6254***** (10.617)
$\Delta \ln(h_{it})$	**-0.0331**** (-2.177)	**-0.0110** (-1.003)	**-0.0296**** (-2.184)	**-0.0048** (-0.445)	**-0.0345**** (-2.276)	**-0.0130** (-1.148)	**-0.0272*** (-1.975)	**-0.0051** (-0.454)
INT_{it}		**-0.0019***** (-4.029)		**-0.0006** (-1.124)		**-0.0013**** (-2.291)		**-0.0003** (-0.529)
INF_{it}			**-0.0020**** (-6.394)	**-0.0020***** (-3.409)			**-0.0019***** (-5.899)	**-0.0019***** (-3.101)
Adj. R2	0.5828	0.7596	0.6682	0.7773	0.6038	0.7542	0.6773	0.7693
F-Statistik	7.6449	1.5928	1.0483	1.7041	8.2686	1.5292	1.090	1.610
Probability	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Observations	196	171	194	171	187	164	185	164

SOURCE: OWN CALCULATIONS

TABLE 4: ADDITIONAL ESTIMATION OUTPUT FOR WHOLE PANEL - REAL LIFE PREMIUMS

Durbin-Watson	1.7982	1.7521	2.2185	1.8416	1.8370	1.7812	2.1988	1.8540
Akaike info criteria	-5.5545	-6.3969	-5.7792	-6.4691	-5.6061	-6.3800	-5.8067	-6.4391
Schwarz criteria	-4.8520	-5.7172	-5.0717	-5.7709	-4.9149	-5.6995	-5.1104	-5.7397
Residual test				**0.1750***** (2.131)				**0.1720**** (2.0532)
Wald test: -0.5 + C(1)				-0.3249				-0.3279

SOURCE: OWN CALCULATIONS

TABLE 5: ESTIMATION OUTPUT FOR WHOLE PANEL - REAL NONLIFE PREMIUMS

	Dependent variable: $\Delta \ln(RGDP\_EMP_{it})$							
Explanatory variables:	$PREM_{it} = PREM\_NONLIFE\_EMP_{it}$				$PREM_{it} = PREM\_NONLIFE\_EMP_{it-1}$			
C	**0.0090***** (4.178)	**0.0189***** (5.360)	**0.0156***** (6.742)	**0.0159***** (4.572)	**0.0121***** (5.905)	**0.0172***** (4.333)	**0.0168***** (8.026)	**0.0156***** (4.011)
$\Delta \ln(PREM_{it})$	**0.0767***** (3.146)	**0.0253** (1.231)	**0.0271** (1.127)	**0.0213** (1.075)	**-0.0881***** (-4.560)	**-0.0240** (-1.252)	**-0.0699***** (-3.862)	**-0.0147** (-0.780)
$\Delta \ln(k_{it})$	**0.4788***** (6.009)	**0.5597***** (9.323)	**0.5848***** (7.736)	**0.6216***** (10.342)	**0.6326***** (7.913)	**0.6026***** (9.709)	**0.6838***** (9.221)	**0.6421***** (1.039)
$\Delta \ln(h_{it})$	**-0.0357**** (-2.433)	**-0.0100** (-0.904)	**-0.0305**** (-2.257)	**-0.0038** (-0.354)	**-0.0382***** (-2.667)	**-0.0141** (-1.249)	**-0.0311**** (-2.353)	**-0.0061** (-0.539)
INT_{it}		**-0.0018***** (-3.756)		**-0.0005** (-0.874)		**-0.0014**** (-2.359)		**-0.0004** (-0.638)
INF_{it}			**-0.0019**** (-5.532)	**-0.0021***** (-3.573)			**-0.0017***** (-5.332)	**-0.0019***** (-2.946)
Adj. R2	0.6078	0.7553	0.6707	0.7751	0.6463	0.7564	0.7018	0.7702
F-Statistik	8.3717	1.5580	1.0589	1.6836	9.718	1.5468	1.2103	1.618
Probability	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Observations	196	171	194	171	187	164	185	164

SOURCE: OWN CALCULATIONS

TABLE 6: ADDITIONAL ESTIMATION OUTPUT FOR WHOLE PANEL - NONREAL LIFE PREMIUMS

Durbin-Watson	1.8822	1.7446	2.2084	1.8586	1.7136	1.7671	2.0579	1.8499
Akaike info criteria	-5.6163	-6.3791	-5.7867	-6.4591	-5.7198	-6.3892	-5.8856	-6.4431
Schwarz criteria	-4.9138	-5.6993	-5.0792	-5.7610	-4.0286	-5.7088	-5.1893	-5.7438
Residual test				**0.1595*** (1.9376)				**0.1763**** (2.0851)
Wald test: -0.5 + C(1)				-0.3404				-0.3236

SOURCE: OWN CALCULATIONS

TABLE 7: ESTIMATION OUTPUT FOR EU15+ GROUP – REAL TOTAL PREMIUMS

	Dependent variable: $\Delta \ln(RGDP\_EMP_{it})$							
Explanatory variables:	$PREM_{it} = PREM\_TOT\_EMP_{it}$				$PREM_{it} = PREM\_TOT\_EMP_{it-1}$			
C	**0.0062***** (3.325)	**0.0191***** (4.823)	**0.0129***** (5.821)	**0.0157***** (3.748)	**0.0083***** (4.461)	**0.0149***** (3.351)	**0.0122***** (5.043)	**0.0140***** (3.102)
$\Delta \ln(PREM_{it})$	**-0.0057** (-0.395)	**-0.0041** (-0.303)	**-0.0099** (-0.747)	**-0.0056** (-0.418)	**-0.0047** (-0.362)	**-0.0032** (-0.243)	**-0.0055** (-0.424)	**-0.0030** (-0.229)
$\Delta \ln(k_{it})$	**0.5911***** (7.093)	**0.4867***** (5.860)	**0.6050***** (7.937)	**0.5507***** (6.389)	**0.5214***** (6.247)	**0.4643***** (5.403)	**0.5480***** (6.651)	**0.4951***** (5.478)
$\Delta \ln(h_{it})$	**-0.0265**** (-1.994)	**-0.0244*** (-1.908)	**-0.0209*** (-1.711)	**-0.0203** (-1.603)	**-0.0399***** (-3.148)	**-0.0336**** (-2.614)	**-0.0294**** (-2.242)	**-0.0295**** (-2.205)
INT_{it}		**-0.0018***** (-3.679)		**-0.0007** (-0.988)		**-0.0006** (-1.638)		**-0.0005** (-0.743)
INF_{it}			**-0.0027***** (-4.767)	**-0.0019**** (-2.254)			**-0.0019**** (-2.466)	**-0.0010** (-1.089)
Adj. R2	0.6031	0.6352	0.6695	0.6497	0.6490	0.6471	0.6646	0.6478
F-Statistik	7.9397	8.9002	1.0116	9.1231	9.3550	9.2205	9.8144	8.951
Probability	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Observations	138	128	136	128	132	122	130	122

SOURCE: OWN CALCULATIONS

TABLE 8: ADDITIONAL ESTIMATION OUTPUT FOR EU15+ GROUP - REAL TOTAL PREMIUMS

Durbin-Watson	1.2807	1.4575	1.7976	1.6926	1.5451	1.5931	1.7819	1.6965
Akaike info criteria	-6.3793	-6.5243	-6.5570	-6.5593	-6.5332	-6.5949	-6.5737	-6.5912
Schwarz criteria	-5.7218	-5.8782	-5.8931	-5.8908	-5.8781	-5.9513	-5.9119	-5.9246
Residual test				**0.1717*** (1.7679)				**0.2026**** (2.0458)
Wald test: -0.5 + C(1)				-0.3284				-0.2973

SOURCE: OWN CALCULATIONS

TABLE 9: ESTIMATION OUTPUT FOR EU15+ GROUP - REAL LIFE PREMIUMS

	Dependent variable: $\Delta \ln(RGDP\_EMP_{it})$								
Explanatory variables:	$PREM_{it} = PREM\_LIFE\_EMP_{it}$				$PREM_{it} = PREM\_LIFE\_EMP_{it-1}$	$PREM_{it} = PREM\_LIFE\_EMP_{it-3}$			
C	**0.0066***** (3.579)	**0.0196***** (4.983)	**0.0134***** (6.083)	**0.0160***** (3.887)	**0.0084***** (4.498)	**0.0044*** (2.006)	**0.0020** (0.314)	**0.0106***** (3.545)	**-0.005***** (-0.777)
$\Delta \ln(PREM_{it})$	**-0.0099** (-1.115)	**-0.0077** (-0.910)	**-0.0119** (-1.469)	**-0.0087** (-1.049)	**-0.0044** (-0.538)	**0.0163*** (2.044)	**0.0139** (1.605)	**0.0131*** (1.680.)	**0.0147*** (1.802)
$\Delta \ln(k_{it})$	**0.5857***** (7.084)	**0.4842***** (5.849)	**0.6004***** (7.935)	**0.5489***** (6.398)	**0.5177***** (6.172)	**0.5679***** (5.614)	**0.5250***** (5.009)	**0.5854***** (5.999)	**0.5885***** (5.857)
$\Delta \ln(h_{it})$	**-0.0271*** (-2.049)	**-0.0251*** (-1.969)	**-0.0215*** (-1.776)	**-0.0210*** (-1.667)	**-0.0398***** (-3.149)	**-0.036***** (-2.730)	**-0.0363**** (-2.520)	**-0.0279**** (-2.136)	**-0.039***** (-2.872)
INT_{it}		**-0.0018***** (-3.730)		**-0.0007** (-0.987)			**0.0005**** (-0.538)		**0.0034**** (2.578)
INF_{it}			**-0.0028**** (-4.834)	**-0.0019**** (-2.299)				**-0.003***** (-2.947)	**-0.004***** (-3.354)
Adj. R2	0.6071	0.6379	0.6744	0.6530	0.6496	0.7078	0.6976	0.7302	0.7319
F-Statistik	8.0565	1.4612	1.0323	9.241	9.3750	1.1317	1.0690	1.233	1.2029
Probability	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Observations	196	171	194	171	123	187	164	185	164

SOURCE: OWN CALCULATIONS

TABLE 10: ADDITIONAL ESTIMATION OUTPUT FOR EU15+ GROUP - REAL LIFE PREMIUMS

Durbin-Watson	1.2866	1.4612	1.8245	1.7073	1.5477	1.7352	1.7325	1.8921	2.0711
Akaike info criteria	-6.3894	-6.5317	-6.5720	-6.5687	-6.5348	-6.6969	-6.435	-6.7697	-6.8578
Schwarz criteria	-5.7319	-5.8856	-5.9081	-5.9002	-5.8796	-6.0322	-6.0902	-6.0977	-6.1793
Residual test				**0.2019*** (2.0424)					**-0.0418** (-0.3552)
Wald test: -0.5 + C(1)				-0.2980					-0.5418

SOURCE: OWN CALCULATIONS

TABLE 11: ESTIMATION OUTPUT FOR EU15+ GROUP - REAL NONLIFE PREMIUMS

	Dependent variable: $\Delta \ln(RGDP\_EMP_{it})$							
Explanatory variables:	$PREM_{it} = PREM\_NONLIFE\_EMP_{it}$				$PREM_{it} = PREM\_NONLIFE\_EMP_{it-1}$			
C	**0.0059***** (3.365)	**0.0187***** (4.850)	**0.0124***** (5.841)	**0.0153***** (3.734)	**0.0080***** (4.679)	**0.0143***** (3.314)	**0.0119***** (5.177)	**0.0133***** (3.005)
$\Delta \ln(PREM_{it})$	**0.0126** (0.531)	**0.0251** (1.091)	**0.0114** (0.525)	**0.0216** (0.957)	**-0.0039** (-0.219)	**0.0079** (0.357)	**0.0012** (0.071)	**0.0120** (0.539)
$\Delta \ln(k_{it})$	**0.5742***** (6.474)	**0.4558***** (5.222)	**0.5890***** (7.246)	**0.5215***** (5.739)	**0.5270***** (6.223)	**0.4588***** (5.216)	**0.5495***** (6.586)	**0.4883***** (5.345)
$\Delta \ln(h_{it})$	**-0.0276**** (-2.050)	**-0.0259**** (-2.022)	**-0.0219*** (-1.764)	**-0.0216*** (-1.704)	**-0.0397***** (-3.137)	**-0.0336**** (-2.616)	**-0.0292*** (-2.222)	**-0.0292**** (-2.185)
INT_{it}		**-0.0018***** (-3.659)		**-0.0007** (-1.012)		**-0.0009** (-1.563)		**-0.0004** (-0.603)
INF_{it}			**-0.0027***** (-4.712)	**-0.0018**** (-2.173)			**-0.0019**** (-2.437)	**-0.0011** (-1.166)
Adj. R2	0.6035	0.6392	0.6686	0.6523	0.6478	0.6474	0.6640	0.6487
F-Statistik	7.9533	9.0382	1.0080	9.2177	9.3445	9.2298	9.7912	8.9828
Probability	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Observations	138	128	136	128	132	122	130	122

SOURCE: OWN CALCULATIONS

TABLE 12: ADDITIONAL ESTIMATION OUTPUT FOR EU15+ GROUP - REAL NONLIFE PREMIUMS

Durbin-Watson	1.3065	1.5072	1.8135	1.7261	1.5427	1.5926	1.7736	1.7038
Akaike info criteria	-6.3805	-6.5354	-6.5543	-6.5668	-6.5324	-6.5956	-6.5719	-6.5937
Schwarz criteria	-5.7230	-5.8892	-5.8904	-5.8984	-5.8772	-5.9521	-5.9102	-5.9272
Residual test				**0.1649**** (1.7145)				**0.2071**** (2.0983)
Wald test: -0.5 + C(1)				-0.3350				-0.2929

SOURCE: OWN CALCULATIONS

TABLE 13: ESTIMATION OUTPUT FOR CEE/NMS GROUP - TOTAL REAL PREMIUMS

	Dependent variable: $\Delta \ln(RGDP\_EMP_{it})$							
Explanatory variables:	$PREM_{it} = PREM\_TOT\_EMP_{it}$				$PREM_{it} = PREM\_TOT\_EMP_{it-1}$			
C	**0.0100** (1.175)	**0.0250** (1.590)	**0.0227**** (2.563)	**0.0274** (1.647)	**0.0168*** (1.966)	**0.0243** (1.427)	**0.0267***** (3.203)	**0.0234** (1.470)
$\Delta \ln(PREM_{it})$	**0.0454** (0.947)	**-0.0543*** (-1.985)	**0.0030** (0.067)	**-0.0442** (-1.659)	**-0.0365** (-1.443)	**0.0064** (0.429)	**-0.0283** (-1.237)	**0.0079** (0.566)
$\Delta \ln(k_{it})$	**0.6967***** (3.270)	**0.7717***** (6.508)	**0.7806***** (3.987)	**0.7645***** (6.755)	**0.6742***** (3.179)	**0.7501***** (5.912)	**0.7495***** (3.893)	**0.7469***** (6.311)
$\Delta \ln(h_{it})$	**-0.0507** (-1.280)	**0.0203** (0.711)	**-0.0476** (-1.321)	**0.0309** (1.109)	**-0.0421** (-1.036)	**0.0124** (0.405)	**-0.0388** (-1.062)	**0.0281** (0.948)
INT_{it}		**-0.0024***** (-1.036)		**-0.0009** (-0.397)		**-0.0026** (-1.035)		**-0.0007** (-0.297)
INF_{it}			**-0.0018***** (-2.960)	**-0.0020*** (-1.835)			**-0.0018***** (-3.068)	**-0.0024**** (-2.142)
Adj. R2	0.3363	0.7618	0.4514	0.7832	0.3797	0.7313	0.4972	0.7662
F-Statistik	2.4443	8.4626	3.2339	8.9863	2.8363	7.5649	3.8109	8.467
Probability	0.0090	0.000	0.0009	0.000	0.0037	0.000	0.0003	0.000
Observations	58	43	58	43	55	42	55	42

SOURCE: OWN CALCULATIONS

TABLE 14: ADDITIONAL ESTIMATION OUTPUT FOR CEE/NMS GROUP - TOTAL REAL PREMIUMS

Durbin-Watson	1.9670	2.3724	2.4119	2.2448	1.8925	2.0043	2.3261	2.0041
Akaike info criteria	-4.5327	-5.9133	-4.7162	-6.0035	-4.5573	-5.7719	-4.7592	-5.9062
Schwarz criteria	-3.7867	-5.1351	-3.9346	-5.1843	-3.8639	-5.0272	-4.0293	-5.1201
Residual test				**-0.1367** (-0.7674)				**-0.0441** (-0.2396)
Wald test: -0.5 + C(1)				-0.6367				-0.5441

SOURCE: OWN CALCULATIONS

TABLE 15: ESTIMATION OUTPUT FOR CEE/NMS GROUP - REAL LIFE PREMIUMS

	Dependent variable: $\Delta \ln(RGDP\_EMP_{it})$							
Explanatory variables:	$PREM_{it} = PREM\_LIFE\_EMP_{it}$				$PREM_{it} = PREM\_LIFE\_EMP_{it-1}$			
C	**0.0128** (1.4910)	**0.0274*** (1.809)	**0.0230***** (2.742)	**0.0267*** (1.758)	**0.0157*** (5.329)	**0.0256** (1.519)	**0.0261***** (3.113)	**0.0248** (1.573)
$\Delta \ln(PREM_{it})$	**-0.0092** (-0.3913)	**-0.0292**** (-2.452)	**-0.0016** (-0.076)	**-0.0212** (-1.480)	**-0.0185** (-1.663)	**-0.0003** (-0.035)	**-0.0143** (-0.995)	**0.0019** (0.223)
$\Delta \ln(k_{it})$	**0.7132***** (3.3235)	**0.7398***** (6.494)	**0.7821***** (4.023)	**0.7404***** (6.501)	**0.6654***** (6.335)	**0.7481***** (5.821)	**0.7438***** (3.800)	**0.7489***** (6.235)
$\Delta \ln(h_{it})$	**-0.0526** (-1.2917)	**0.0075** (0.277)	**-0.0480** (-1.310)	**0.0163** (0.573)	**-0.0357** (-2.276)	**0.0099** (0.326)	**-0.0338** (-0.909)	**0.0249** (0.854)
INT_{it}		**-0.0026** (-1.188)		**-0.0016** (-0.685)		**-0.0027** (-1.072)		**-0.0008** (-0.353)
INF_{it}			**-0.0018***** (-3.108)	**-0.0013** (-1.006)			**-0.0018***** (-3.102)	**-0.0025**** (-2.115)
Adj. R2	0.3230	0.7782	0.4514	0.7783	0.3674	0.7292	0.4897	0.7635
F-Statistik	2.3599	9.1884	3.2341	8.7632	2.7426	7.4969	3.7274	8.3547
Probability	0.0116	0.000	0.0009	0.000	0.0048	0.000	0.0003	0.000
Observations	58	43	58	43	55	42	55	42

SOURCE: OWN CALCULATIONS

TABLE 16: ADDITIONAL ESTIMATION OUTPUT FOR CEE/NMS GROUP - REAL LIFE PREMIUMS

Durbin-Watson	1.9805	2.3268	2.4148	2.1452	1.9205	1.9305	2.3603	1.9549
Akaike info criteria	-4.5129	-5.9847	-4.7162	-5.9814	-4.5378	-5.7643	-4.7444	-5.8945
Schwarz criteria	-3.7668	-5.2065	-3.9347	-5.1622	-3.8443	-5.0195	-4.0144	-5.1084
Residual test				**-0.0693** (-0.4096)				**-0.0291** (-0.1601)
Wald test: -0.5 + C(1)				-0.5693				-0.5291

SOURCE: OWN CALCULATIONS

TABLE 17: ESTIMATION OUTPUT FOR CEE/NMS GROUP - REAL NONLIFE PREMIUMS

	Dependent variable: $\Delta \ln(RGDP\_EMP_{it})$							
Explanatory variables:	$PREM_{it} = PREM\_NONLIFE\_EMP_{it}$				$PREM_{it} = PREM\_NONLIFE\_EMP_{it-1}$			
C	**0.0027** (0.346)	**0.0242** (1.453)	**0.0124** (1.222)	**0.0240** (1.534)	**0.0217***** (3.002)	**0.0305*** (1.857)	**0.0297***** (4.184)	**0.0291*** (1.874)
$\Delta \ln(PREM_{it})$	**0.1896***** (3.294)	**0.0597** (1.062)	**0.1198** (1.663)	**0.0465** (0.870)	**-0.1792***** (-3.968)	**-0.0715** (-1.518)	**-0.1556***** (-3.728)	**-0.0596** (1.327)
$\Delta \ln(k_{it})$	**0.6919***** (3.657)	**0.7229***** (5.700)	**0.7401***** (3.914)	**0.7253***** (6.072)	**0.7980***** (4.382)	**0.8232***** (6.278)	**0.8432***** (5.083)	**0.8075***** (6.511)
$\Delta \ln(h_{it})$	**-0.0536** (-1.521)	**0.0049** (0.163)	**-0.0510** (-1.466)	**0.0201** (0.687)	**-0.0411** (-1.179)	**-0.0024** (-0.081)	**-0.0385** (-1.217)	**0.0132** (0.448)
INT_{it}		**-0.0027** (-1.111)		**-0.0010** (-0.406)		**-0.0031** (-1.303)		**-0.0014** (-0.577)
INF_{it}			**-0.0011** (-1.474)	**-0.0023*** (-2.012)			**-0.0015***** (-2.959)	**-0.0022*** (-1.982)
Adj. R2	0.4743	0.7351	0.4905	0.7650	0.5435	0.7529	0.6244	0.7798
F-Statistik	3.5722	7.4758	3.6136	8.1959	4.5717	8.3524	5.7256	9.0698
Probability	0.0003	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Observations	58	43	58	43	55	42	55	42

SOURCE: OWN CALCULATIONS

TABLE 18: ADDITIONAL ESTIMATION OUTPUT FOR CEE/NMS GROUP - REAL NONLIFE PREMIUMS

Durbin-Watson	2.1719	1.8429	2.3370	1.9002	1.6228	1.7841	1.9784	1.8648
Akaike info criteria	-4.7659	-5.8071	-4.7901	-5.9228	-4.8640	-5.8560	-5.0509	-5.9661
Schwarz criteria	-4.0199	-5.0289	-4.0085	-5.1037	-4.1705	-5.1112	-4.3210	-5.1800
Residual test				**0.0360** (0.2141)				**0.0510** (0.2746)
Wald test: -0.5 + C(1)				-0.4639				-0.4489

SOURCE: OWN CALCULATIONS