The role of insurance growth in economic growth

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Abstract

Insurance is one of the key activities in a globalised financial and economic environment. Through its benefits, it offers income, life and property protection to the insured and their keens, as well as income accumulation that can be used at retirement to help preserve the desired lifestyle or living standards. Motivated by this end of insurance, the goal of this paper is to study the contribution of insurance growth to economic growth, by employing the benefit side of the insurance activity, next to the acquisition side that has already been considered. More precisely, the findings provide evidence that gross claims payments and gross operating expenses are significantly and positively related to economic growth. At the same time, the results confirm the findings of the existing literature that gross premia and insurance penetration are also significantly and positively related to economic growth. The outcomes hold true for total, life and non-life insurance, both during the pre- and post- 2008-crisis periods, even though less strong after the crisis. Furthermore, the positive and statistically significant impact of gross capital formation, government expenditure, secondary schooling, FDI inflows, trade openness and financial development is validated, in line with certain theoretical expectations.

Keywords: insurance growth, economic growth, premium, retention, macroeconomic variables.

JEL Classification: E44, F43, G22, O43

1. Intuition

Insurance, and especially life insurance, is perceived as a service that people purchase for the ones they love, because they need them to be taken care of in case something unexpected happens. As such, it has a societal impact. However, insurance entails significant amounts of flows from the insured to the insurer, in terms of premia, and from the insurer to the insured, in terms of benefits. Until the benefits are paid, the insurance premia are directed to the real economy, as well as to the financial markets. Insurers, along with pension funds, are thus among the top investors in the world, as their assets under management amount to trillions of dollars. The pension assets in the OECD area achieved a record high of USD 43.4 trillion in 2017 (OECD, 2018b). According to the United Nations (2016), the insurance assets in the countries monitored by OECD reached 23.7 trillion (OECD 2018a) in 2016, whereas they went up to USD 31 trillion. Accordingly, insurers contribute to the financing of governments, as well as corporations, since they invest in debt and equity, both public and private. In most of the cases, a big portion of these investments is returned to the local economy of the country where they domicile or do business. From that perspective, it is natural to consider that insurance contributes to the growth of an economy, through the use of the premiums it receives.

The primary contribution of insurers to the real economy is based on the claims compensations they make towards individuals and enterprises in case of adverse events. Individuals can protect their income (or their overall wealth), which can be accordingly directed fully or partially to the real economy in the form of consumption or investments. Businesses can continue operating even if their key people or facilities are harmed by an incident. Consequently, their income generating capacity is not affected and they can thus supply the real economy uninterrupted with products or services and pay staff remuneration, dividends, and taxes. Insurance companies also offer income accumulation (pension-type) programs, whose proceeds can be used at retirement. These programs can help the countries to reduce the burden of their social security pensions and direct the corresponding state funds to other needs that their economies may have. The second major contribution of insurers to the economy needs to be sought in the other payments they make. More specifically, insurance companies - similarly to any other enterprise - pay salaries to their personnel and intermediaries, taxes to the government, dividends to the shareholders, and interest to the lenders. Furthermore, they may make donations to the society via their corporate (social) responsibility programs. All these types of money flows (i.e., claims, salaries, taxes, dividends, interest and donations) constitute sources of income for the aforementioned interested parties, who in turn are spent or invested and thereby returned (directly or indirectly) to the economy. Consequently, insurance is expected to contribute to the growth of an economy through the claims payments (compensation) made to the insured and through the operational expenses it incurs. It is, therefore, natural to look for evidence that substantiates this contribution.

Moving from the economy to insurance, we realize that claims and expenses may serve as alternative proxies for the size of the insurance market of a country, instead of the standard insurance depth or penetration indices that are based primarily on premia. This is justified by a number of reasons; first of all, both claims and expenses are metrics of the financial and underwriting performance of an insurer, especially when compared with the premia (earned) for the calculation of the claims and expense ratios. They are both present in the financial statements of an insurance company. Countries consider and highly value these ratios as critical or important for supervisory/regulatory and/or market surveillance; some of them consider them as highly relevant for macro-prudential surveillance (Kwon and Wolfrom, 2016).

In addition, claims and expenses are accounted for in the calculation of the burning cost premium, as insurance products are priced in a way that the premium suffices to cover the (expected) claims and expenses, while at the same time, it leaves some room for profits. The sum of the claims and expense ratios is known as the combined ratio and it is normally anticipated to be less than 100%, so that there is a profit margin. Consequently, they constitute key elements for the profitability and income generation of an insurance company. Moreover, higher claims and expenses imply higher liabilities, which in turn require higher assets to match them; as a result, the promise of the insurer to the insured is met (IAIS, 2019). The size of assets is a typical measure of the size of an insurance market.

Furthermore, claims and expenses are also among the measures used for the ranking of the insurance companies, as the former represent the benefits paid to policyholders, and the latter incorporate the remuneration paid to the staff and some intermediaries, as well as other costs that the insurers occur, such as other administrative and acquisition costs. In life insurance, claims are primarily covering the benefits of endowments and term life insurance (OECD, 2019a). Bigger amounts paid either per policy or in total are representative of bigger insurance markets in a country. Non-life insurance claims are mainly providing coverage for property (and casualty) insurance. Increased amounts occur more frequently in countries that experience natural catastrophes (e.g., earthquakes) (OECD, 2019a). They, therefore, experience increases insurance consciousness, and as a result, makes insurance markets stronger. As an example, in countries with natural catastrophe experience, it could be the banks that provide the mortgage loans that require non-life insurance for the underlying property, as it is used as a collateral to the mortgage loan. Coming to expenses, we realize that higher expenses in a country are indicative of a bigger number of employees, intermediaries and providers, as well as a higher number of overall transactions, which usually stem from bigger insurance markets that need the services of all these individuals/professionals.

There are advantages in the use of claims and expenses to capture the size of the insurance market. One is that they are closer to the real size of the insurance activity compared to the premia, as it is determined by the benefits paid to the stakeholders, such as the insured, the staff and other providers. They determine the burning cost of the insurance products and are free of other loadings that can possibly distort, such as the level of commissions or profit margins or even policy fees (non-commissionable premiums), the cost of potential reinsurance, and taxes. High commissions or high profit margins to attract professionals into the industry could affect the true picture (although still indicative of the market size). The same applies to reinsurance and taxes; higher reinsurance charges or tax rates could disproportionally increase the level of premia and, thus, the insurance penetration. Furthermore, commercial premia are determined by the claims and expenses that the insurance companies experience; in that sense, the premium is a derivative of the claims and the expenses realized. In addition, claims and expenses are factual; they have occurred and as such they cannot be doubted. Premia are determined by actuarial methods and potential mispricing can influence the insurance penetration that uses premia in its estimation.

There are also a couple of disadvantages of the use of claims and expenses compared to the use of premia. Namely, claims and expenses are not always publicly disclosed by insurers, whereas premia are fully disclosed. Therefore, potential differences in the reporting towards the competent authorities or associations could influence the results. Premia are more comprehensive measures of the full insurance activity – despite the aforementioned comparative advantages of claims and expenses mentioned in the previous paragraph – as they incorporate all relevant amounts. Finally, potential one-time events, such as a single natural catastrophe, could have an impact on claims and expenses (for a certain year or years), whereas it will be smoothened out in the premium levels.

The aforementioned arguments indicate that claims and expenses do determine the premium levels, do affect the level of financial and underwriting performance, do influence the size of assets, and do reflect the overall insurance activity of a company and thus of a country. Overall, the use of claims and expenses has more advantages than disadvantages. Consequently, they are good proxies of the size of the insurance market of a country and they can be used instead of the more commonly used measures, such as the insurance depth or penetration.

In this paper, motivated by the previous discussion, the analysis provides evidence that the benefit side of the insurance function, as measured by gross claims payments and gross operating expenses, contributes to economic growth. This is probably anticipated, as these streams of flows reach to the insured, the providers, the distributors and the employees, who in turn redirect them to the real economy. This angle has not been addressed so far in the relevant literature and potentially there lies primarily the novelty and freshness of this work. In addition, the analysis affirms the contribution of the acquisition side of the insurance operation, as measured by gross premium and insurance penetration to economic growth, in line with the available literature. The outcomes are validated for total, life and non-life insurance, during the pre- and post- 2008-crisis periods. Finally, the results support the expected effect of certain macroeconomic (control) variables, such as gross capital formation, government expenditure, secondary schooling, FDI inflows, trade openness, and financial development on economic growth. These findings can be of a significant use to policymakers as they can legislate in such a way that they privilege insurance growth so as to support the growth of the economy.

2 Background discussion

The contribution of insurance to economic growth has been researched by considering a series of methodological approaches and a wide range of data sets from cross-country to country-specific cases. Most of the studies reveal a positive contribution of insurance to economic growth. However, there are some very limited exceptions that indicate the presence of a negative role for it. We present the available literature starting from the broader studies in terms of the countries considered and ending up with the country-specific ones. We list the articles in a chronological order within each strand (i.e. broad versus country specific).

Ward and Zurbruegg (2000) examine the relationship between economic growth and insurance industry growth for nine OECD countries. They conduct a cointegration analysis on a unique set of annual data for real GDP and total real premiums per country over the period 1961-1996. They also conduct causality tests. They find that in certain countries, the insurance industry Granger causes economic growth, whereas in other countries the opposite holds true. Consequently, the promotion of economic growth through insurance, as measured by total premiums, depends on other country specific parameters. These findings triggered the interest of Kugler and Ofoghi (2005) that attributed the results of Ward and Zurbruegg to the fact that they used aggregate data in their estimations. They, therefore, used disaggregated data and looked at the different components of insurance premiums, such as long-term (life and pensions), motor, property, etc. They conducted a cointegration analysis, along with causality tests, to illustrate that in most cases there is a long-run relationship between insurance markets size and economic growth, rather than a cyclical effect.

Arena (2008) tests both for developed and developing countries whether there is a causal relationship between insurance market activity (life and non-life), as measured by density, and economic growth, as measured by GDP per capita. He uses the generalized method of moments (GMM) approach for dynamic models of panel data for 55 countries, spanning the period 1976-2004, to find robust evidence of this relationship. Moreover, he finds that for life insurance, high-income countries drive the results, whereas for non-life insurance, both high-income and developing countries perform the job. At the same time, Haiss and Sumegi (2008) investigate the impact of insurance investments and premiums on GDP growth in Europe by conducting a cross-country panel data analysis for 29 European countries over the period 1992-2005. They find that (i) there is a positive impact of life insurance on GDP growth in the EU-15 countries, Switzerland, Norway and Iceland; (ii) for the new (at that time) EU Member States from Central and Eastern Europe, liability insurance has a larger impact; (iii) both the real interest rate and the level of economic growth have also an impact on the insurance-growth nexus. Curak et al. (2009) empirically examine the relationship between the insurance sector development and economic growth in 10 transition European Union members over the period 1992-2007. They apply fixed-effects panel models to document that the insurance sector development, as measured by penetration, affects economic growth, as measured by GDP per capita growth, in a positive and significant manner. Their results hold true for total, life and non-life insurance.

In a similar direction with Arena (2008), Han et al. (2010) investigate the relationship between insurance development, as measured by insurance density, and economic growth, to draw a conclusion that insurance development is positively correlated with economic growth. They also employ GMM models on a dynamic panel data set of 77 economies over the period 1994-2005. Moreover, for the case of developing economies, the overall insurance, life insurance and non-life insurance development play a much more important role than they do for the case of developed economies. Likewise, Ege and Bahadir (2011) test the role of insurance in economic growth for 29 (OECD) countries over the period 1999-2008 to find that the insurance sector and economic growth are positively related. Hou et al. (2012) investigate the impact of financial institutions on the economic growth of twelve countries in the eurozone. They initially realize that cross-country evidence indicates that life insurance penetration and banking development do not have any impact on real output. They attribute this to the presence of multicollinearity held among the variables they use and their potentially small samples. To tackle this, they use a fixed effects model to conclude that both life insurance and banking activity are important predictors of economic growth in the eurozone. Later on, Chang et al. (2014) apply the bootstrap panel Granger causality test to investigate whether insurance activity promotes economic growth. They use data over the period 1979-2006 for ten OECD countries, while they employ measures of life and non-life real insurance premiums as proxies for insurance market activities, and GDP as a measure of economic growth. They find a significant positive relationship between overall insurance growth and economic growth for five out of ten OECD countries, and more specifically for life and non-life insurance. Their results also confirm the findings of Ward and Zurbruegg that the insurance-growth nexus varies across countries.

However, Zouhaier (2014) finds that there is a positive impact of non-life insurance, as measured by the penetration rate, on economic growth, but a negative effect is exerted by the total insurance and non-life insurance, as measured by the density, on economic growth. Economic growth is measured by the real GDP per capita growth rate, while a dataset of 23 OECD countries over the period 1990-2011 is used. According to Zouhaier (2014), the negative relationship can be justified by the level of development of the insurance business in the countries in the sample (which appear to be only developed countries). He explains that in the OECD countries, the insurance industry has reached the maximum threshold development, and, therefore, the possible positive effects of the insurance business in these countries have been exhausted.

Din et al. (2017a) perform a comparative study between developed and developing countries to realize that there is a positive significant relationship between life insurance, as measured through net written premiums and density, and economic growth for the case of developed countries. The same holds true for a panel of developing countries when insurance is measured through penetration. Non-life insurance is statistically significant across all three measures in developing countries, whereas in developed countries, this holds true only when the density is used. At the same time, Din et al. (2017b) explore the relationship between insurance and economic growth for six (developed, emerging and developing) countries over the period 1980-2015. They apply panel auto-regressive distributed lagged (PMG/ARDL) methods to highlight that there exists (among other results not relevant to our study): (i) a positive and significant relationship between life insurance, non-life insurance, trade openness, stock-market development and economic growth in the long run; (ii) a significant and positive relationship between non-life insurance and economic growth in the short run for the US, the UK, China, India, Malaysia and Pakistan; (iii) a positive and significant relationship between life insurance and economic growth for India, Pakistan and the UK; (iv) a significant, albeit negative, relationship between life insurance and economic growth for the US, China and Malaysia. The paper of Din et al. (2017b) finds a negative relation between life insurance and economic growth for the US, China and Malaysia.

The relationship between insurance and economic growth in Romania is analyzed by Cristea et al. (2014). They realize that insurance growth, measured by insurance penetration and density, is correlated with economic growth, as measured by GDP per capita, with life insurance showing a greater influence than non-life insurance. However, there seems to be no correlation with GDP, contrary to what is exhibited in other countries.

Our research, compared to the aforementioned papers, extends to additional variables with regards to insurance growth, such as gross operating expenses and gross claims payments for the entire range of OECD countries both for life and non-life insurance. As far as the variables employed are concerned, none of the previous papers has explicitly considered them. We offer a fresh approach, as we look not only at the insurance acquisition side, as measured by premium and penetration, but also at the insurance benefit or service side, which is equally important; people trust insurance when they are convinced that the benefits they receive are a significant portion of the premium they pay. This is reflected by claims payments. The same holds true for the other stakeholders, i.e. distributors, staff and providers; they are willing to work in the insurance industry when the remuneration scheme is rewarding. This is included in the operating expenses. Furthermore, we distinguish between the pre- and post- crisis period, which offers an additional new perspective.

We noted some differences with some of the papers we reviewed, which can be summarized as follows. We find the approach of Kugler and Ofoghi (2005), who use disaggregated data and consider separately long-term (life and pensions), motor, property, etc insurance, quite interesting, which we have left for future research. In contract with the paper of Zouhaier (2014), our findings indicate a positive contribution of total, life and non-life insurance, with non-life insurance having the smallest effect; hence, our results are somehow different, as we have not diagnosed any negative effects. The data used by Cristea et al. (2014) are country-specific data, whose findings are similar to ours, with the exception of the lack of correlation between insurance growth and GDP in the case of Romania. The paper of Din et al.

(2017b) finds a negative relation between life insurance and economic growth for the US, China and Malaysia; as the last two countries are not part of our dataset we cannot confirm or discard these findings.

3 Data, variables and methodology

3.1 Data

The analysis uses a heterogeneous sample of 27 OECD countries: Australia, Belgium, Canada, Czech Republic, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Korea, Luxembourg, Mexico, Netherlands, New Zealand, Norway, Poland, Portugal, Slovak Republic, Spain, Sweden, Switzerland, Turkey, the UK and the US. The data obtained span the period, on an annual basis, from 2006to 2016. The primary control variable is that of total gross premium, while we also distinguish them by life and non-life classification.

In addition, data for real GDP per capita (at constant 2005 prices US Dollars per capita), private investments (measured as gross capital formation), government expenses (as a ratio to GDP), trade openness (measured as the ratio of the sum of exports and imports to GDP), secondary schooling, financial development, and FDI inflows were obtained from the World Bank database. All these data were expressed in PPP terms, to adjust for inflation. The analysis uses three indicators of financial development, with financial development data being obtained from Datastream. In particular, financial development is measured as: (i) total liquid liabilities relative to GDP, which measures the relative size of the overall financial depth, consisting of currency plus demand and interest-bearing liabilities of banks and nonbank financial intermediaries –this is the broadest measure of financial intermediation activity, as it covers all banks, central banks, and nonfinancial intermediary activities; (ii) private credit by deposit money banks relative to GDP –this measure isolates the impact of the banking sector; and (iii) stock market capitalisation relative to GDP, which gauges the relative size of the equity market in an economy. These three definitions are consistent with those used in Beck et al. (2010).

3.2 Variables

3.2.1 The definition of insurance variables

The insurance related variables employed in our models are defined in this section.

Insurance penetration

The level of insurance penetration provides an indicator of the relative size and importance of insurance in the domestic economy and is calculated as the ratio of direct gross premiums to GDP (OECD, 2016).

Gross premium

A gross premium is the total premium charged for the period of cover containing the risk premium, commission, an allowance for covering all other types of expenses, an allowance for any premium tax, and a profit loading. It is the premium that the policyholder pays under a (life) insurance contract. It is also the premium before subtracting the cost of reinsurance (Society of Actuaries, 2019).

Gross operating expenses

Gross operating expenses include administrative expenses, acquisition expenses and overhead expenses (OECD, 2019b).

Gross claims payments

Gross claims payments comprise all payments in respect of the financial year including reinsurance. A claim is a demand made by the insured, or the insured's beneficiary, for payment of the benefits provided by the insurance contract or for coverage of an incurred loss (Europa, 2019).

Life Insurance

Includes insurance on a contractual basis of the following items: life assurance (which covers assurance on survival to a stipulated age only, assurance on death only, assurance on survival to a stipulated age or an earlier death, life assurance with return of premiums, marriage assurance and birth assurance), annuities, supplementary insurance (insurance against personal injury and disability resulting from an accident or sickness), and permanent health insurance (OECD, 2019b).

Non-Life Insurance

Includes insurance against the following risks: accident, sickness, land vehicles, railway rolling stock, aircraft, ships, goods in transit, fire and natural forces, other damage to property, motor vehicle liability, aircraft liability, liability for ships, general liability, credit, suretyship, miscellaneous financial loss and legal expenses (OECD, 2019b).

3.2.2The definition of control variables

The definition and the rationale of the use of the selected control variables are elaborated in this section, as supported by the relevant literature.

Foreign direct investments

Foreign direct investments' (FDI) inflows exert a positive impact on economic growth in the presence of highly skilled labour, without inducing efficiency gains (Wijeweera, 2010). An extensive body of the literature has found positive impacts of FDI on GDP (De Gregorio, 1992; Balasubramanyam et al., 1996; Ram and Zhang, 2002; Hsiao and Shen, 2003; Dimelis and Papaioannou, 2010; and Zhao, 2013). By contrast, some studies have also identified a negative impact on growth. Li and Liu (2005) and Axarloglou and Pournarakis (2007) attribute this primarily to the presence of technological gaps. Chowdhury and Mavrotas (2006) find that the direction of causality between FDI and economic growth varies across countries. According to Borensztein et al. (1998) the effect of FDI on economic growth is robustly dependent on the level of human capital stock available in the host economy and not solely on gaining preferential access to that market. Zhang (2001) finds a positive impact when FDI inflows are controlled for geographic proximity to coastline. However, there is a growing body of literature that suggests a reverse causality; namely, the effects of GDP causing FDI inflows rather than having these FDI inflows causing economic growth (Choe, 2003; Mah, 2010).

Gross fixed capital formation as a percentage of GDP

Gross capital formation as a percentage of GDP is the measure of physical capital. Khan and Reinhart (1990) report a positive impact of private investments on growth. De Long and Summers (1991) make a persuasive case for a strong association between equipment investments and growth and find that both machinery and equipment investments have a strong association with growth in the USfrom1960 to 1985. The initial wisdom dates back to Solow (1962), who, despite supporting the principle that investments are a necessary condition for growth, admitted that they were not a sufficient condition. Blomstrom et al. (1996) performed causality tests and found a single direction running from growth to subsequent capital formation to be more important than the reverse, while Podrecca and Carmeci (2001) find a negative relationship between growth and fixed investments.

Financial development

There is also a vast body of literature that investigates the causal linkages between financial development and economic growth. Two relevant strands appear in the literature. The first strand is associated with the supply-leading hypothesis, which posits a causal relationship running from financial development to economic growth, while the second strand is associated with the demand-following hypothesis, which postulates a causal relationship running from economic growth to financial development. Positive empirical stimulations, which can be interpreted as the size of the formal financial intermediary sector relative to central banks or the credit circulated for private firms, have been conducted extensively (King and Levine, 1993; De Gregorio and Guidotti, 1995; Chen, 2006; Campos et al., 2016). Apergis et al. (2007) estimate the relationship between financial deepening and growth for 65 countries, from 1975 to 2000, and provides supportive evidence for the supply-leading hypothesis. However, Calderon and Liu (2003) provide evidence supporting the presence of a bidirectional relationship between financial development and growth. The demand-following strand of the literature supports a unidirectional causality running from economic growth to financial development (Christopoulos and Tsionas, 2004; Liang and Teng 2006).

Trade openness

A number of different studies have sought to investigate the relevance and significance of trade openness for economic growth. Some of these studies on trade and growth find a very strong support for the proposition that trade openness has a positive impact on economic growth (Karras, 2003; Rao and Rao, 2009; Chang and Mendy, 2012). There are other studies, however, that argue that trade openness has little or no impact on growth (Eris and Ulasan, 2013; Babatunde, 2011). Then again, others state that trade openness has a negative impact on economic growth (Zanohogo, 2017; Adhikary, 2011; Krugman, 1994).

Government expenditure

There have been numbers of studies that have attempted to find any relationship between government expenditure and economic growth. These studies have used different theories in specifying the model, as well as different research methods, with the results documenting that the effect of government expenditure on economic growth can run either negative or positive ways, similar to the economic theories which show two different positions of government expenditure on economic growth. Yasin (2000) examines the relationship of government spending and economic growth in 26 sub-Saharan Africa countries. He develops his modelling strategy on the basis of a neoclassical production function. By using panel data his results show that government spending on capital formation has the expected positive and significant effect on economic growth. Furthermore, Alexiou (2009) explores the impact of a string of variables to condition economic growth for seven countries in the South Eastern Europe region, spanning from 1995 to 2005. The evidence yields that government spending has a positive and significant effect on economic growth. Wu et al. (2010) employ the largest sample and the longest period of time and re-examine the causal relationship between government expenditure and economic growth across 182countries, spanning the period 1950 to 2004. They strongly highlight that the hypothesis that government spending is conducive to economic growth holds, regardless of how the government size/spending and economic growth are measured. Alshahrani and Alsadiq (2014) also study the effect of different types of government expenditure on economic growth in Saudi Arabia. They explore both the long and short-run effects of the expenditures on growth through various econometric methods in relevance to Vector Error Correction Modelling (VECM). By employing data over the period 1969–2010, they find that government expenditure stimulate growth in the long-run. By contrast, Butkiewicz and Yanikkaya (2011) study the impact of government expenditure on economic growth that emphasizes how government effectiveness influences the efficiency of government spending. 100 developed and developing countries are included in their data set, while their findings clearly indicate that total expenditure has negative growth effects across the majority of their countries under study.

Secondary schooling

In the literature there are two different thoughts about the effect of human capital on economic growth. The Lucasian models support that the level of output depends on the level of human capital, because human capital is an input, just like any other input. Thus, the growth rate of output depends on the growth rate of human capital, implying that to increase output an economy should have more inputs. The other view is the Nelson-Phelps approach and it supports the idea that human capital is not an input just like any other, but instead human capital is the primary source of innovations. Therefore, economic growth depends on the rate of innovation and, hence, on the level, rather than, the growth rate of human capital (Aghion and Howitt, 1998). There are numerous studies investigating empirically returns from human capital on economic growth. However, the empirical literature remains uncertain about the level of influence and the impact of human capital on economic growth. The uncertainty rises from the methodological difficulties in measuring human capital (Skare, 2012). Mankiw et al. (1992) use the proportion of working age population as a proxy for human capital by extending the Solow growth model framework to evaluate the impact of human capital on economic growth. Their results offer robust support to the findings that human capital exerts a positive impact on economic growth. Agiomirgianakis et al. (2002) examine the contribution of schooling rates to economic growth for a sample of 93 countries by employing a dynamic panel analysis. Their results suggest the presence of a positive and significant correlation between education and economic growth. However, they also conclude that the higher the level of education, the higher the contribution of education to economic growth is. By contrast, Benhabib and Spiegel (1994) find no evidence of a positive and robust influence of human capital on economic growth. However, they introduce an alternative model in which human capital is allowed to influence the growth of total factor productivity, and they obtain more positive results.

3.4Methodology

In this section, we discuss the analytical underpinnings used on our dataset. For the initial estimations the analysis makes use of total gross premiums of insurance as proxies for the demand for insurance services. Next, these premiums are further split into life- and non-life (liability) premiums. Following Eller et al. (2006), Fink et al. (2005) and Webb et al. (2002), the analysis adopts an endogenous growth model with a modified Cobb-Douglas production function assuming constant returns to scale and perfect competition:

$$Y = e^{\beta^1 lnsKaH\beta L_1 - \alpha - \beta + \beta' X'} \tag{1}$$

where Y represents real GDP, $\beta^1 Ins$ denotes technological progress in relevance to a part induced by insurance services, K resembles the physical capital, H stands for human capital and L_1 is the used labour force. Moreover, the vector X includes a set of potential drivers of economic growth, such as gross capital formation, government expenditure, FDI inflows, and trade openness. After transforming Equation (1) into the intensive form, taking logarithms on both sides and differentiating, we yield:

$$\Delta y_{it} = a_i + b_1 \Delta Ins_{it} + b_2 \Delta GKF_{it} + b_3 \Delta G_{it} + b_4 \Delta FDI_{it} + b_5 \Delta TROP_{it} + b_6 \Delta H_{it} + v_{it} \tag{2}$$

where α_i in our case describes country fixed effects, *Ins* is the insurance market metric, *GKF* is gross capital formation, *G* denotes government expenditure, *FDI* shows FDI inflows, *TROP* is trade openness, *H* shows human capital, and v_{it} is the error term. A convenient choice of a functional form to estimate the relationship between insurance and GDP is a dynamic panel model, originated from the benchmark growth model described by equation (1) or (2); the model specification is indicated below:

$$\Delta GDP_{i,t} = \sum_{i=1}^{27}\sum_{t=1}^{11} \gamma_{i,t}\,\Delta \text{GDP}_{it-1} + \sum_{t=1}^{11} \gamma_t\,\Delta \text{Term Premium}_t + \sum_{i=1}^{27}\sum_{t=1}^{11} \gamma_{i,t}\,\text{X}_{i,t} + a_i + \varepsilon_{i,t} \quad (3)$$

The model includes *N=27* countries (indexed by *i*), observed over *T=11* periods (years) (indexed by *t*) and allows for country specific effects (η_i) for the *ith* individual unit. In a panel country framework, the disturbances $\varepsilon_{i,t}$ are uncorrelated. They are assumed to be independently distributed across countries with a zero mean. However, in the presence of cross-section error dependence, conventional panel estimation methods could lead to inconsistent estimates and incorrect inferences. In our framework, this issue is of great importance because cross-section dependencies are likely to be present for a variety of reasons, such as omitted common factors and interactions within the socioeconomic system (Pesaran and Tosetti, 2011). To consider the cross-sectional dependence, we implement a novel econometric methodology suggested by Pesaran (2006).

In addition, the empirical analysis performs Granger causality between insurance variables and economic growth. More specifically, this part of the empirical analysis makes use of the panel causality test introduced by Dumitrescu and Hurlin (2012), while it considers two dimensions of heterogeneity, i.e., both the heterogeneity of the regression model used to test the causality and the heterogeneity of the causality relationships. This test can be used when *T>N* (with *T* being the number of observations and *N* the number of countries considered) which is our case here. The test, which is based on the vector autoregressive scheme (VAR), assumes that there is no cross-sectional dependency. Yet, Monte Carlo simulations show that even under the conditions of cross-sectional dependency, this test can generate strong results. Moreover, the causality methodology makes use of an asymptotic distribution since *T>N.* When there is cross-sectional dependency, simulated and approximated critical values, obtained from 50.000 replications, are used. The corresponding Wald statistic is defined as:

$$Z_{N,T} = \sqrt{\frac{N}{2}}K\left(W_{N,T} - K\right) \quad (4)$$

where *K* is the number of lags in the corresponding VAR model, and

$$W_{N,T} = \frac{1}{N}\sum_{i=1}^{N} W_{i,T} \quad (5)$$

where $W_{i,T}$ stands for the individual Wald statistical values for cross-section units.

4 Empirical analysis

In the first step of the empirical analysis, we examine the unit root properties in the data through advanced panel unit root tests. Panel unit root tests of the first-generation can lead to spurious results if significant degrees of positive residual cross-section dependence exist and are ignored. Consequently, the implementation of second-generation panel unit root tests is desirable only when it has been established that the panel is subject to a significant degree of residual cross-section dependence. Therefore, before selecting the appropriate panel unit root test, it is crucial to provide some evidence on the degree of residual cross-sectional dependence.

The cross-sectional dependence (CD) statistic by Pesaran (2004) is based on a simple average of all pair-wise correlation coefficients of the OLS residuals obtained from standard augmented Dickey-Fuller regressions for each variable in the panel. Under the null hypothesis of cross-sectional independence, the CD test statistic follows asymptotically a two-tailed standard normal distribution. The results, which are reported in Table 1, uniformly reject the null hypothesis of cross-section independence, providing evidence of cross-sectional dependence in the data, given the statistical significance of the CD statistics.

[Insert Table 1 about here]

A second-generation panel unit root test is employed to determine the degree of integration of the respective variables. The Pesaran (2007) panel unit root test does not require the estimation of factor loading to eliminate cross-sectional dependence. Specifically, the usual ADF regression is augmented to include the lagged cross-sectional mean and its first difference to capture the cross-sectional dependence that arises through a single-factor model. The null hypothesis is a unit root for the Pesaran (2007) test. The results of this test are reported in Table 2 and support the presence of a unit root across all panel variables.

[Insert Table 2 about here]

The empirical results are reported in Table 3 with columns indicating certain specifications. In particular, Column (1) displays the estimates with respect to total gross premium and where the definition of financial development is total liquid liabilities relative to GDP, while Column (2) shows the estimates in relevance to total gross premium and where the definition of financial development is private credit by deposit money banks relative to GDP. Column (3) repeats the results of Columns (1) and (2), but this time financial development is defined as stock market capitalisation relative to GDP. The results of the three first columns clearly document the positive and statistically significant impact of total gross premiums on economic growth. The results remain consistently similar across all three definitions of financial development and are in line with those already provided in the relevant literature (Webb et al., 2002; Adams et al., 2005; Arena, 2006). In terms of the remaining determinants of economic growth, the estimates are in accordance with theoretical expectations; more specifically, gross capital formation, government expenditure, secondary schooling, FDI inflows, trade openness and all three definitions of financial development are shown to exert a positive and statistically significant effect on economic growth. These results also remain consistently similar across the three alternative definitions of financial development. Columns (4) and (5) report the results for life and non-life total gross premiums. The results are similar to those reported in columns (1) through (3); however, the impact of total gross premiums in relevance to life insurance seems to be stronger comparatively to non-life insurance premiums, given that in the majority of countries under investigation life insurance amounts to a greater part of total insurance business. The relevant diagnostics are reported at the bottom of Table 3.In particular, the findings report the LM test for the appropriateness of the random effects modelling approach. The null hypothesis of no random effects is rejected, indicating that a random effects model is more suitable.

In terms of the financial development variable that is measured through the definition of total liquid liabilities relative to GDP, the findings uncover a positive and statistically significant association between all insurance variables and GDP growth. In terms of the remaining control variables, the results illustrate that FDI inflows, gross fixed capital formation, and financial development all have a positive and statistically significant at the 1% level impact on economic growth. Similar results hold for the economic freedom index. Finally, Wald tests, based on Wolak's (1989) approach, test the null hypothesis of the restriction that the sum of insurance variables is greater than the sum of the remaining drivers. The results illustrate that the null hypothesis cannot be rejected across all insurance variables, thereby, providing additional evidence that insurance proxies constitute a very substantial factor driving economic growth in these producing countries.

[Insert Table 3 about here]

Table 4reports the causality tests. These causality settings uncover that in the cases of total gross premiums and total gross premiums for life insurance there is a statistically significant bidirectional process between economic growth and insurance premiums, indicating the significance of the insurance role in economic growth. By contrast, in the case of total gross premiums for the non-life insurance, the causality runs only from GDP to the non-life total premiums.

[Insert Table 4 about here]

Next, the empirical analysis performs certain robustness checks in terms of the GMM estimations. In particular, these robustness checks repeat the analysis reported in Table 3 by using three alternative definitions of insurance growth, i.e., penetration, gross claims, and gross operating expenses, where across all three definitions the sample is divided again into life and non-life classes. The new results are reported in Tables 5-7 and across all three insurance proxies they signify the importance of insurance-related variables for economic growth. They also highlight that the strongest impact comes in the case where insurance growth is measured as gross operating expenses, followed by the penetration metric. Finally, in all three versions of estimates, the diagnostics support the validity of the estimates.

[Insert Tables 5-7 about here]

5 The role of the 2007-2008 global financial crisis (GFC)

The literature has agreed that the GFC in 2007-09 has been extremely costly in terms of lost output and jobs. For instance, Claessens et al. (2012) examine how this crisis event affected firms' and economies' performance in 42 countries. They analyze three channels through which the crisis may have affected the process of economic growth: a business-cycle channel, a trade channel and a financial channel, while the crisis had a bigger, negative impact on economies with greater sensitivity to business cycles and trade developments in countries more open to trade. Yamamoto (2014) also finds that US spillover shocks through both US financial and trade linkages exert a significant impact on production in Asian economies, with the impact of financial shocks being greater than that of trade shocks. Feldkircher (2014) also relates the role of pre-crisis credit growth in shaping the real economy's response to the crisis. The author argues that economic growth, accompanied by strong growth of credit, particularly exacerbate the effects of the recent crisis on the real economy.

At the same time, the literature on insurance development that belongs to the vast literature about the role of finance in economic development as pioneered by King and Levine (1993), Levine and Zervos (1998), and Levine (1998, 1999, 2002) has emphasized the role of insurance markets for economic growth (the references mentioned in the literature section), while there is no study, to the best of our knowledge, yet on whether and how the GFC has impacted the performance of those markets. Based on the above discussion, this part of the empirical analysis distinguishes our sample between that in the pro- and the post-crisis periods. Focusing on the estimated results between economic growth and insurance growth (the results for the remaining control variables are available upon request) and across all four alternative definitions of insurance growth, Table 8 reports the new estimates across both regimes. These estimates clearly document that although the relationship between insurance and economic growth remains positive in both regimes, the link gets weaker over the post-crisis regimes, a finding which infers that the weakened financial channel had a particularly negative influence on insurance activity.

[Insert Table 8 about here]

6 Policy implications

Our results provide evidence that insurance growth - as measured by gross premiums, gross operating expenses, gross claims payments and insurance penetration - contributes to the growth of an economy, for composite, life and non-life insurance. This is important as according to the United Nations (2016) in 2014, the overall insurance protection gap, i.e. the financial gap between economic losses and insured losses, amounted to USD 75 billion. Consequently, closing this gap will contribute to insurance growth, which in turn will contribute to economic growth.

This is of key importance to the countries that are looking for growth drivers and, in particular, emerging or developing ones. As according to our findings both life insurance and non-life insurance contribute to economic growth, the different countries can implement policies depending on their needs and level of insurance market maturity. For example, countries that face natural disasters, i.e. earthquakes, can somehow promote the importance of insurance in recuperating the loss that is the results of a natural catastrophe. Countries with weak national health systems can facilitate the growth of health insurance either through individual or through group policies. Moreover, countries that cannot support sufficient pension payments, either because their financials are in distress as a result of a financial crisis or because they face a demographic issue or even because the unemployment rates are high, may enhance the role of private insurance in providing long-term life insurance policies, e.g. annuities. The state may lose the opportunity to collect higher contributions through the state supported pension schemes. However, our findings indicate that the growth of the insurance industry will contribute to economic growth. As a matter of fact, the citizens could have been sceptical in increasing their contributions to the state-run pensions; but they may be willing to sign their own individual or group policy.

Policymakers need to carefully look at this dimension, as by fostering insurance friendly policies and fiscal regimes, they can support the growth of the insurance sector, which as evidenced by our research will stimulate the growth of the economies of their countries. This contribution to economic growth does not come only by the premium and penetration levels – as was the outcome of the available research so far. It is further driven by claim payments and operating expenses that are made to the beneficiaries or other stakeholders of the insurance activity, such as employees, distributors and providers. These money streams are also directed back to the economy. Claims and expenses constitute the proof of the insurance promise to the insured. Its fulfilment has a significant societal impact in parallel with the beneficial effect of the payment of claims and expenses to the economy.

7 Future research venues

This is a first set of evidence that insurance growth and economic growth are indeed related, as shown by a series of variables considered. Our research can be further extended to: (i) investigate the contribution of economic growth to insurance growth, (ii) include additional replicas of insurance growth, and (iii) further distinguish the various insurance lines of business, such as motor, property, etc. We trust that after having completed these steps we will have a comprehensive impression of the link between insurance growth and economic growth.

8 Concluding remarks

In this paper we managed to show that - for the OECD countries of our sample - insurance growth, when measured by gross premiums, insurance penetration, gross claims payments and gross operating expenses, contributes to the growth of an economy, when measured by GDP, for composite, life and non-life insurance. Moreover, the opposite holds true for total insurance and life insurance. The contribution of insurance growth to economic growth is evidenced both for the period before and after the global financial crisis that commenced in 2008. Our paper takes the existing scholarship one step further as it addresses the benefit side of the insurance activity on top of the acquisition side. Our findings can be of added value to policymakers of countries that wish to take advantage of drivers that can trigger their economic growth. Insurance growth is found to be indeed one such driver, even in periods following a severe economic crisis. Creating the conditions that will permit insurance growth will allow these countries to reach higher levels of economic growth, with the contribution coming both from the benefit and the acquisition sides of the insurance activity.

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Table 1
Cross dependence tests

Variables	p-values
FDI inflows	0.00
Gross fixed capital formation	0.01
GDP per capita	0.00
Financial development	0.00
(i) total liquid liabilities relative to GDP	0.00
(ii) private credit by deposit money banks relative to GDP	0.00
(iii) stock market capitalisation relative to GDP	0.00
Government expenditure	0.00
Secondary schooling	0.00
Trade openness	0.00
Total gross premium	0.00
Total gross premium: life	0.00
Total gross premium: non-life	0.00
Penetration	0.00
Penetration: life	0.00
Penetration: non-life	0.00
Gross claims	0.00
Gross claims: life	0.00
Gross claims: non-life	0.00
Gross operating expenses	0.00
Gross operating expenses: life	0.00
Gross operating expenses: non-life	0.00

Notes: The test is based on the sum of correlation coefficient squares among cross sectional residuals. This test, which is asymptotically standard normal distribution, examines the null hypothesis of cross-sectional independence.

Table 2
Panel unit root tests

H_0: Contains a unit root

Variables	CIPS Levels	CIPS 1st Differences
FDI inflows	-1.458	-5.316***
Gross fixed capital formation	-0.729	-5.628***
GDP per capita	-1.245	-6.618***
Financial development		
(i) total liquid liabilities relative to GDP	-1.633	-6.718***
(ii) private credit by deposit money banks relative to GDP	-1.056	-6.062***
(iii) stock market capitalisation relative to GDP	-1.236	-5.894***
Government expenditure	-1.432	-6.327***
Secondary schooling	-1.189	-6.559***
Trade openness	-1.174	-5.980***
Total gross premium	-1.226	-6.452***
Total gross premium: life	-1.098	-6.431***
Total gross premium: non-life	-1.347	-5.996***
Penetration	-1.128	-6.139***
Penetration: life	-1.136	-6.228***
Penetration: non-life	-1.145	-6.227***
Gross claims	-1.219	-5.883***
Gross claims: life	-1.235	-5.904***
Gross claims: non-life	-1.241	-5.875***
Gross operating expenses	-1.174	-6.328***
Gross operating expenses: life	-1.186	-6.439***
Gross operating expenses: non-life	-1.179	-6.347***

Notes: A constant is included in the Pesaran (2007) tests. The results are reported under the null hypothesis of stationarity. Critical values for the Pesaran (2007) test: -2.40 at 1%, -2.22 at 5%, and -2.14 at 10%. The results are reported at lag = 3. ***: $p \leq 0.01$.

Table 3 Dynamic panel estimations (insurance variable = premiums)

Variables	(1)	(2)	(3)	(4)	(5)
ΔGDP(-1)	0.595***	0.566***	0.579**	0.553***	0.516***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
ΔTotal gross premium	0.426***	0.412***	0.438***		
	(0.000)	(0.000)	(0.000)		
ΔTotal gross premium(-1)	0.185***	0.159***	0.172***		
	(0.000)	(0.000)	(0.000)		
ΔTotal gross premium: life				0.167***	
				(0.010)	
ΔTotal gross premium: life(-1)				0.072**	
				(0.030)	
ΔTotal gross premium: non-life					0.059**
					(0.050)
ΔTotal gross premium: non-life(-1)					0.016*
					(0.010)
ΔFDI inflows	0.081***	0.073***	0.086***	0.094***	0.077***
	(0.010)	(0.010)	(0.010)	(0.000)	(0.000)
ΔFDI inflows(-1)	0.039**	0.033**	0.038**	0.046**	0.039**
	(0.030)	(0.040)	(0.030)	(0.030)	(0.030)
ΔGross fixed capital formation	0.538***	0.496***	0.562***	0.544***	0.520***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
ΔGross fixed capital formation(-1)	0.246***	0.224***	0.255***	0.248***	0.237***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
ΔGovernment expenditure	0.429***	0.408***	0.432***	0.449***	0.418***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
ΔGovernment expenditure(-1)	0.182***	0.163***	0.174***	0.188***	0.165***

	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
ΔTrade openness	0.539***	0.510***	0.563***	0.582***	0.553***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
ΔTradeopenness(-1)	0.196***	0.168***	0.179***	0.204***	0.189***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
ΔFinancial development1	0.187***				
	(0.000)				
ΔFinancial development1(-1)	0.074**				
	(0.030)				
ΔFinancial development2		0.236***			
		(0.000)			
ΔFinancial development2(-1)		0.081**			
		(0.020)			
ΔFinancial development3			0.152***	0.168***	0.159***
			(0.010)	(0.000)	(0.000)
ΔFinancial development3(-1)			0.049**	0.059**	0.054**
			(0.040)	(0.030)	(0.040)
ΔSecondary schooling	0.178***	0.162**	0.185***	0.193***	0.173***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
ΔSecondary schooling(-1)	0.063**	0.048**	0.072**	0.078**	0.069**
	(0.020)	(0.030)	(0.020)	(0.020)	(0.020)
Diagnostics					
R^2-adjusted	0.69	0.67	0.71	0.60	0.68
LM test	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
No. of observations	297	297	297	297	297

Notes: Financial development1 is defined as total liquid liabilities relative to GDP, Financial development2 is defined as private credit by deposit money banks relative to GDP, and Financial development3 is defined as stock market capitalization relative to GDP. Figures in brackets denote p-values. LM stands for the Lagrange Multiplier test for random effects (Breusch and Pagan, 1980). The number of lags was determined through the Akaike criterion. All estimations were performed with time dummies. *: p<0.10; **: p<0.05; *** p<0.01.

Table 4
Dumitrescu-Hurlinpanel Granger causality test results

Direction of causality	F-statistic	p-values	Results of causality
GDP →Premiums: total	10.956***	0.00	Bidirectional
Premiumstotal→ GDP	19.863***	0.00	
GDP →Premiums: life	17.102***	0.00	Bidirectional
Premiums life→ GDP	24.351***	0.00	
GDP →Premiums: non-life	10.738***	0.00	Unidirectional
Premiums: non-life→ GDP	1.656	0.24	

Notes: The null hypothesis is that of non-causality. The approximated critical values are obtained from Dumitrescu and Hurlin (2012). The simulated critical values are computed via stochastic simulations with 50,000 replications. ***: p≤0.01.

Table 5 Dynamic panel estimations (insurance variable = penetration)

Variables	(1)	(2)	(3)	(4)	(5)
ΔGDP(-1)	0.562***	0.538***	0.541**	0.534***	0.502***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Δpenetration	0.449***	0.431***	0.459***		
	(0.000)	(0.000)	(0.000)		
Δpenetration(-1)	0.196***	0.174***	0.198***		
	(0.000)	(0.010)	(0.000)		
Δpenetration: life				0.198***	
				(0.000)	
Δpenetration: life(-1)				0.095***	
				(0.010)	
Δpenetration: non-life					0.043*
					(0.060)
Δpenetration: non-life(-1)					0.012
					(0.011)
ΔFDI inflows	0.077***	0.065**	0.079***	0.088***	0.071***
	(0.010)	(0.020)	(0.010)	(0.000)	(0.000)
ΔFDI inflows(-1)	0.034**	0.028**	0.032**	0.041**	0.031**
	(0.040)	(0.050)	(0.040)	(0.030)	(0.040)
ΔGross fixed capital formation	0.513***	0.477***	0.541***	0.536***	0.506***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
ΔGross fixed capital formation(-1)	0.225***	0.211***	0.238***	0.226***	0.219***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
ΔGovernm entexpenditure	0.413***	0.401***	0.419***	0.432***	0.403***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
ΔGovernment expenditure(-1)	0.164***	0.148***	0.152***	0.165***	0.144***

	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
ΔTrade openness	0.514***	0.496***	0.542***	0.549***	0.530***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
ΔTrade openness(-1)	0.172***	0.145***	0.153***	0.179***	0.163***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
ΔFinancial development1	0.164***				
	(0.000)				
ΔFinancial development1(-1)	0.059**				
	(0.040)				
ΔFinancial development2		0.217***			
		(0.000)			
ΔFinancial development2(-1)		0.066**			
		(0.030)			
ΔFinancial development3			0.138***	0.150***	0.143***
			(0.010)	(0.000)	(0.000)
ΔFinancial development3(-1)			0.042**	0.051**	0.046**
			(0.050)	(0.030)	(0.050)
ΔSecondary schooling	0.166***	0.153**	0.168***	0.172***	0.159***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
ΔSecondary schooling(-1)	0.051**	0.040**	0.059**	0.066**	0.060**
	(0.030)	(0.040)	(0.030)	(0.030)	(0.030)
Diagnostics					
R^2-adjusted	0.67	0.66	0.69	0.63	0.69
LM test	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
No. of observations	297	297	297	297	297

Notes: Financial development1 is defined as total liquid liabilities relative to GDP, Financial development2 is defined as private credit by deposit money banks relative to GDP, and Financial development3 is defined as stock market capitalization relative to GDP. Figures in brackets denote p-values. LM stands for the Lagrange Multiplier test for random effects (Breusch and Pagan, 1980). The number of lags was determined through the Akaike criterion. All estimations were performed with time dummies. *: p<0.10; **: p<0.05; *** p<0.01.

Table 6 Dynamic panel estimations (insurance variable = gross claims)

Variables	(1)	(2)	(3)	(4)	(5)
ΔGDP(-1)	0.578***	0.543***	0.550**	0.548***	0.526***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Δgross claims	0.418***	0.404***	0.432***		
	(0.000)	(0.000)	(0.000)		
Δgross claims(-1)	0.164***	0.145***	0.169***		
	(0.000)	(0.010)	(0.000)		
Δgross claims: life				0.166***	
				(0.000)	
Δgross claims: life(-1)				0.063**	
				(0.020)	
Δgross claims: non-life					0.030*
					(0.080)
Δgross claims: non-life(-1)					0.004
					(0.02)
ΔFDI inflows	0.085***	0.074***	0.088***	0.095***	0.079***
	(0.000)	(0.010)	(0.000)	(0.000)	(0.000)
ΔFDI inflows(-1)	0.039**	0.034**	0.040**	0.048**	0.034**
	(0.030)	(0.040)	(0.030)	(0.020)	(0.040)
ΔGross fixed capital formation	0.536***	0.493***	0.558***	0.550***	0.524***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
ΔGross fixed capital formation(-1)	0.236***	0.223***	0.249***	0.238***	0.231***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
ΔGovernment expenditure	0.422***	0.412***	0.428***	0.440***	0.419***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
ΔGovernment expenditure(-1)	0.172***	0.156***	0.161***	0.174***	0.153***

	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
ΔTrade openness	0.528***	0.509***	0.565***	0.570***	0.549***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
ΔTrade openness(-1)	0.179***	0.156***	0.166***	0.188***	0.180***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
ΔFinancial development1	0.168***				
	(0.000)				
ΔFinancial development1(-1)	0.063**				
	(0.030)				
ΔFinancial development2		0.233***			
		(0.000)			
ΔFinancial development2(-1)		0.075**			
		(0.020)			
ΔFinancial development3			0.144***	0.159***	0.152***
			(0.000)	(0.000)	(0.000)
ΔFinancial development3(-1)			0.046**	0.058**	0.053**
			(0.040)	(0.020)	(0.030)
ΔSecondary schooling	0.173***	0.159**	0.175***	0.180***	0.166***
	(0.000)	(0.010)	(0.000)	(0.000)	(0.000)
ΔSecondary schooling(-1)	0.059**	0.048**	0.065**	0.074**	0.066**
	(0.020)	(0.030)	(0.020)	(0.020)	(0.020)
Diagnostics					
R^2-adjusted	0.63	0.61	0.64	0.58	0.66
LM test	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
No. of observations	297	297	297	297	297

Notes: Financial development1 is defined as total liquid liabilities relative to GDP, Financial development2 is defined as private credit by deposit money banks relative to GDP, and Financial development3 is defined as stock market capitalization relative to GDP. Figures in brackets denote p-values. LM stands for the Lagrange Multiplier test for random effects (Breusch and Pagan, 1980). The number of lags was determined through the Akaike criterion. All estimations were performed with time dummies. *: p<0.10; **: p<0.05; *** p<0.01

Table 7 Dynamic panel estimations (insurance variable = gross operating expenses)

Variables	(1)	(2)	(3)	(4)	(5)
ΔGDP(-1)	0.559***	0.532***	0.536**	0.530***	0.496***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Δgross operating expenses	0.478***	0.446***	0.474***		
	(0.000)	(0.000)	(0.000)		
Δgross operating expenses(-1)	0.203***	0.184***	0.211***		
	(0.000)	(0.010)	(0.000)		
Δgross operating expenses: life				0.210***	
				(0.000)	
Δgross operating expenses: life(-1)				0.116***	
				(0.000)	
Δgross operating expenses: non-life					0.058**
					(0.050)
Δgross operating expenses: non-life(-1)					0.029*
					(0.090)
ΔFDI inflows	0.072***	0.060**	0.073***	0.082***	0.064**
	(0.010)	(0.030)	(0.010)	(0.000)	(0.020)
ΔFDI inflows(-1)	0.030**	0.023*	0.027**	0.035**	0.025**
	(0.050)	(0.060)	(0.050)	(0.040)	(0.050)
ΔGross fixed capital formation	0.506***	0.469***	0.534***	0.528***	0.493***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
ΔGross fixed capital formation(-1)	0.214***	0.203***	0.230***	0.2186***	0.209***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
ΔGovernment expenditure	0.405***	0.396***	0.412***	0.424***	0.390***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
ΔGovernment expenditure(-1)	0.157***	0.142***	0.144***	0.157***	0.136***

	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
ΔTrade openness	0.504***	0.490***	0.535***	0.541***	0.523***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
ΔTrade openness(-1)	0.161***	0.133***	0.139***	0.162***	0.141**
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
ΔFinancial development1	0.161***				
	(0.000)				
ΔFinancial development1(-1)	0.052**				
	(0.040)				
ΔFinancial development2		0.208***			
		(0.000)			
ΔFinancial development2(-1)		0.057**			
		(0.040)			
ΔFinancial development3			0.132***	0.143***	0.135***
			(0.010)	(0.000)	(0.000)
ΔFinancial development3(-1)			0.038*	0.045**	0.041*
			(0.060)	(0.040)	(0.040)
ΔSecondary schooling	0.158***	0.145**	0.161***	0.162***	0.150***
	(0.000)	(0.010)	(0.000)	(0.000)	(0.000)
ΔSecondary schooling(-1)	0.044**	0.036**	0.052**	0.061**	0.052**
	(0.040)	(0.050)	(0.030)	(0.030)	(0.030)
Diagnostics					
R^2-adjusted	0.69	0.68	0.72	0.67	0.74
LM test	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
No. of observations	297	297	297	297	297

Notes: Financial development1 is defined as total liquid liabilities relative to GDP, Financial development2 is defined as private credit by deposit money banks relative to GDP, and Financial development3 is defined as stock market capitalization relative to GDP. Figures in brackets denote p-values. LM stands for the Lagrange Multiplier test for random effects (Breusch and Pagan, 1980). The number of lags was determined through the Akaike criterion. All estimations were performed with time dummies. *: p<0.10; **: p<0.05; *** p<0.01

Table 8
Insurance growth and economic growth: prior to and after the Global Financial Crisis

Definition of insurance	Insurance growth	Insurance growth (-1)
Prior to 2008		
Premiums	0.494***	0.197***
	(0.000)	(0.010)
Penetration	0.528***	0.217***
	(0.000)	(0.000)
Gross claims	0.462***	0.185***
	(0.000)	(0.010)
Gross operating expenses	0.553***	0.239***
	(0.000)	(0.000)
Diagnostics		
R^2-adjusted	0.41	0.39
No. of observations	81	81
After 2008		
Premiums	0.398***	0.144**
	(0.000)	(0.030)
Penetration	0.421***	0.173***
	(0.000)	(0.010)
Gross claims	0.380***	0.142**
	(0.000)	(0.030)
Gross operating expenses	0.451***	0.179***
	(0.000)	(0.010)
Diagnostics		
R^2-adjusted	0.40	0.42
No. of observations	216	216

Notes: Figures in brackets denote p-values. The results are based on the definition of financial development = total liquid liabilities relative to GDP. **: p<0.05; *** p<0.01.