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# Regulations, institutions and income smoothing by managing technical reserves: international evidence from the insurance industry


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# Regulations, institutions and income smoothing by managing technical reserves: international evidence from the insurance industry

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**Abstract**

This paper investigates the role of technical reserves in the income smoothing behavior of insurance companies. This is one of the first attempts in the literature to trace such relationship in the insurance industry, especially at a multi-country setting. The experience of 770 insurance firms operating in 87 countries over the period 2000-2009 reveals that there is a significant evidence of income smoothing. The paper also finds that institutional characteristics, e.g., the rule of law, common law legal origin, economic freedom, and regulations relating to technical provisions and supervisory power constrain income smoothing but other factors such as capital requirements, tax deductibility of provisions, auditing, and corporate governance do not have a significant effect.

Keywords: Earnings management, income smoothing, insurance, technical reserves

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## 1. Introduction

Practitioners and academics have recognized for years that managers have the incentives and the ability to use latitude in accounting rules in order to determine the figure printed in the earnings report for a particular period. This allows them to avoid reporting losses or profit decreases, a practice known as income smoothing or earnings management. Healy and Wahlen (1999) in a review of the literature state that "*In general, the evidence is consistent with firms managing earnings to window-dress financial statements prior to public securities' offerings, to increase corporate managers' compensation and job security, to avoid violating lending contracts, or to reduce regulatory costs or to increase regulatory benefits*" (p. 367).

The importance of earnings management lies on the fact that various stakeholders (e.g. investors, creditors, regulators, etc.) use financial statements to make more informed decisions. However, in cases of excessive manipulation, the decision makers can no longer rely on the financial statements and evaluate the financial position and the operating performance of the firm. Additionally, financial misrepresentation can be extremely costly for shareholders and individual offenders. For example, Karpoff et al. (2008a) document that while the penalties imposed on firms through the legal system average only $23.5 million, firms also lose 38% (on average) of their market values when news of their misconduct are reported.[1] Ge and Kim (2014) focus on the cost of new bond issues in the U.S. to conclude that bondholders perceive real earnings management as a credit risk-increasing factor and thus require high risk premiums. In another study, Karpoff et al. (2008b) show that while fewer than one out of three managers face criminal charges and penalties, a substantial proportion (93%) lose their jobs by the end of the regulatory enforcement period, and they also bear substantial financial losses through restrictions on their future employment, their shareholdings in the firm, and SEC fines. Therefore, it is not surprising that this topic has attracted the attention of numerous researchers who have related earning managements to market power (Datta et al., 2013), marketing actions (Chapman and Steenburgh, 2011), management buyouts (Fischer and Louis, 2008), and analysts' forecast accuracy (Louis et al., 2013), to name a few. Recent efforts have also been directed towards the development of quantitative models for the detection of earnings management (Tsai and Chiou, 2009; Dikmen and Kucukkocaoglu, 2010).

[1] A recent report by Cornerstone Research (2014) also indicates that accounting cases corresponded to the vast majority of the total value of class action cases settled over the period 2004-2012, ranging between 73% (2011) and 97% (2006).

The present study aims to extend the existing literature while focusing on the insurance industry.[2] As discussed in Eckles and Halek (2010) insurance firms have not been exempt from scandals related to accounting manipulations in order to meet earnings goals, with AIG being a notable example. An interesting aspect of the insurance industry is that company executives have at least one accounting accrual at their discretion, namely technical provisions. These provisions represent amounts set aside by the firms to meet potential liabilities arising out of insurance contracts. Therefore, fair provisioning is of great importance for managers, regulators and other stakeholders.[3] However, an insurer's reserves are at best only a forecast of future payments for outstanding claims, and there are various methods available to estimate technical provisions (e.g. case-by-case, statistical and actuarial methods). Yet, while the uncertainty in the estimation of technical reserves affects the various stakeholders of an insurance firm, and it has the potential to greatly influence the solvency position of the firm, the nature and extent of this uncertainty is generally not well understood (KPMG, 2007).

Our first objective is to use a cross-country sample of insurers and analyze whether the managers of insurance firms engage in income smoothing by managing technical reserves, at an international level. Existing empirical evidence from the insurance industry is limited (compared to other industries), and comes from country-specific studies, mainly U.S. ones. Nonetheless, institutional and regulatory differences across countries, do not allow us to generalize the results of such country-specific studies, and we aim to close this gap in the literature by using an international sample.

Our second objective is to examine the effect of the business conditions, and in particular the regulatory and institutional environment, on technical reserves and income smoothing. Apparently, earnings management depends upon both the means and the incentives that managers have at their disposal. In the case of the insurance industry, these attributes depend not only on the overall institutional framework of a country but also on specific regulations that govern the insurance industry. One would expect that opportunities for earnings management decrease in a stricter regulatory environment. As we discuss in more

[2] The insurance industry has traditionally attracted academic attention with studies focusing on various topics like intellectual capital and performance (Lu et al., 2014), organization and efficiency (Biener and Eling, 2012), insurance claims decisions (Braun et al., 2006), optimal premium pricing strategies (Pantelous and Passalidou, 2015).

[3] For example, technical reserves form an important part of Pillar I in Solvency II, the new regulatory framework that will be implemented in the Europe Union. In the United States, the Securities Exchange Commission (SEC) increasingly requests additional disclosures regarding reserve uncertainty, while the International Association of Insurance Supervisors -IAIS (2005) highlights that "*technical provisions have to be prudent, reliable, and objective and allow comparison across insurers worldwide*" (p. 10).

detail in Section 2, some recent studies that examine non-financial sectors and the banking industry document that regulations and institutions influence the managerial decisions with respect to provisioning and earnings management (e.g. Leuz et al., 2003; Shen and Chih, 2005; Fonseca and Gonzalez, 2008). However, no such evidence exists for the insurance industry.

Our results show that insurance firms use technical reserves to smooth their income. We find that control of corruption, and the regulatory quality do not influence income smoothing; however, the rule of law, and common law regimes have mitigating effects. Two overall institutional development indicators, namely economic freedom and economic development also appear to constrain income smoothing. Higher stringency in regulations relating to technical provisions, along with supervisory power seem to constrain income smoothing, whereas capital requirements, the taxation framework for provisions, auditing, and corporate governance and internal control mechanisms do not have a significant impact on income smoothing. Surprisingly, disclosure requirements related to technical provisions have a positive effect on income smoothing.

Our findings could be of interest to various stakeholders. For example, our multi-level model reveals that 50.6% of variation in technical reserves can be explained by differences across firms, whereas differences across countries account for 41.7%. The first should be of interest to internal auditors who may want to understand what drives technical reserves or to use audit analytics to detect earnings management in their firm. The variation across countries could be of interest to policy makers in the insurance industry, as regulations appear to have an important impact on technical reserves and earnings management. Within this context, our findings could also form the basis for the development of models for the detection of earnings management, an area of research that relates to audit analytics and the detection of falsified financial statements (see e.g. Pasiouras et al., 2007; Gaganis, 2009). While the development of such a model does not fall into the scope of the present study, other researchers could incorporate some of the variables that we find to be related to earnings management (e.g. regulations relating to technical provisions) in their models, and test whether they improve their prediction ability.[4] Subsequently, such models could be used by either external or internal auditors.

[4] For example, Tsai and Chiou (2009) provide such an exercise using a sample of listed Taiwanese firms from the electronics industry.

The rest of the paper is structured as follows. Section 2 provides a review of the related literature. Section 3 presents the variables and the methodology. Section 4 discusses the empirical results. Section 5 concludes.

## 2. Brief Literature review

Our work is broadly related to three strands of the literature. The first consists of studies that provide evidence from the U.S. insurance industry. For example, Petroni (1992) finds that managers of financially weak U.S. insurance firms bias downwards estimates of claim loss reserves relative to financially strong insurers. This finding is stronger for firms "close" to attracting regulatory attention. Beaver et al. (2003) also find that property-casualty insurance firms with small positive earnings understate loss reserves relative to firms with small negative earnings. Gaver and Paterson (2000) provide country-specific evidence on the association between the loss reserves practices and state regulatory quality in the US. They find that under-reserving by financially weak insurers declined after the National Association of Insurance Commissioners instituted a program for accrediting states that met certain standards in terms of insurance regulation. In another U.S. study, Gaver and Paterson (2004) report that insurance firms manage loss reserves to avoid violating certain test ratio bounds that are used by regulators for solvency assessment.

The second strand of the literature consists of cross-country studies that highlight the role of institutional and regulatory factors while focusing on banking as well as non-financial firms. For instance, using a sample of non-financial firms across 31 countries, Leuz et al. (2003) find that a country's legal and institutional environment influences the properties of reported earnings. In another study that considers non-financial firms from Australia, France, and the UK, Jeanjean and Stolowy (2008) conclude that management incentives and national institutional factors play an important role in framing financial reporting characteristics, and this role is probably more important than accounting standards alone. Shen and Chih (2005) provide evidence from the banking sector. Using data from 48 countries they find that stronger protection of investors and greater transparency in accounting disclosures can reduce banks' incentives to manage earnings. They also report that stronger law enforcement results in more earnings management; however this effect is observed in low-income countries only. Fonseca and Gonzalez (2008) also consider the impact of institutions, but most importantly they investigate the effect of bank regulations on income smoothing. They find that there is less bank income smoothing not only with the strength of investor protection, but also with

the extent of accounting disclosures, restrictions on bank activities, and official and private supervision, while there is more income smoothing with market orientation and development of a country's financial system. Biurrun and Rudolf (2010) also examine the impact of regulations, but they estimate different measures of earnings management focusing on loss avoidance, income smoothing and earnings aggressiveness. Using a large sample of banks operating in 47 countries between 1990 and 2006, they conclude that overall earnings management is decreasing with the restrictiveness of bank regulations and the extent of official supervision and private monitoring, with the latest being the most important regulatory mechanism.

Our research also relates, to a small extent, to recent work on the detection of earnings management.[5] Building on work that investigates the driving factors of earnings management- i.e. like the present one - and traditional studies on accounting fraud, this strand of the literature attempts to detect cases of earnings management. However, in this case the spotlight is on the prediction rates and the benchmarking of alternative quantitative techniques. For example, these studies usually rely on data from individual countries to assess the forecasting ability of neural networks, decision trees, fuzzy linear regression techniques, etc. (e.g. Tsai and Chiou, 2009; Dikmen and Kucukkocaoglu, 2010; Höglund, 2012, 2013).

## 3. Data and Methodology

### *3.1. Dataset*

Firm-specific data are obtained from the OSIRIS database of Bureau Van Dijk, which has information on publicly listed, and major unlisted companies that are significant within their sector. Cross-country information on the regulatory conditions in the insurance industry is obtained from the Insurance Laws database of the International Association of Insurance Supervisors.[6] Indicators of the institutional environment are collected from various sources such as the database of the Heritage Foundation, the Kaufmann et al. (2010) World Bank

[5] As we mention in Section 1, the development of such a model is outside the scope of the present study; however, our findings could be of interest to researchers working on this particular field.

[6] The IAIS started creating the database in 2002. While initially the database was designed for use and benefit by IAIS Members only, the database was opened in October 2005 to Observers, non-Member supervisors – and- on a case by case basis-to non-profit or academic institutions. Thus, while regulatory data were allowed to vary over the period 2005-2009, we had to work under the assumption that there were no changes during the period 2000-2005. Furthermore, these variables enter the regressions lagged once as it may take some time for regulatory conditions to impact technical reserves. The database contains the responses of regulators to a number of individual questions classified in various chapters (e.g. Licensing, Corporate Governance, Solvency/Capital, etc.). However, not all of them are available to non-supervisors (e.g. Control Procedures and Examinations) and the country coverage varies greatly among questions.

"Worldwide Governance Indicators", and the Global Market Information Database (GMID). Additional data to control for other country-specific characteristics are obtained from the 2010 update of the Beck et al. (2000) World Bank Database on Financial Development and Structure, La Porta et al. (1999), and the GMID.

Our full dataset includes 155 life insurance, 480 non-life insurance, and 135 combined insurance firms operating in 87 countries over the period 2000-2009. This sample is unbalanced and consists of 4,479 yearly observations. In the case of the regressions with the regulatory variables our sample ranges between 2,592 and 3,041 observations due to missing data for countries which do not provide information to the IAIS database.

### 3.2. Variables

*3.2.1. Firm-level variables*

Our dependent variable is the ratio of net technical reserves scaled by total assets (NTRTA). U.S. studies tend to use the difference between the initially reported loss reserves with most recent revised estimates for a given year (e.g. Beaver et al., 2003); however, such data are not available in OSIRIS for the countries that we examine. Thus, our framework resembles more closely the international studies in banking that use loan loss provisions as their dependent variable (e.g. Fonseca and Gonzalez, 2008; Leventis et al., 2011).[7] Our approach to use accumulated reserves rather than yearly provisions is also driven by data availability in OSIRIS. However, this approach is consistent with Hasan and Wall (2004) and it considers the overall behavior of managers in building the reserves of their firms over the years.[8] Furthermore, regulators and market participants will most likely be interested in the accumulated reserves rather than the yearly provisions.

A central question in our study is whether insurance firms use technical provisions to smooth their income. In any given year, higher technical provisions will result in a higher value for net technical reserves, and lower values for earnings all else equal. To avoid this spurious correlation, the proxies for earnings must not include the contemporaneous impact of the provisions. Thus, one must use an indicator of income prior to provisioning. In the present study we use the net premium written scaled by total assets (NPWTA). A positive and significant impact of NPWTA on NTRTA is consistent with income smoothing behavior.

[7] Some other studies use the shape of the distribution of income metrics as indicators of earnings management (e.g. Shen and Chih, 2005). However, Durtschi and Easton (2005, 2009) heavily criticize this approach and they show that using the shapes as evidence of earnings management can lead to erroneous conclusions.

[8] Hasan and Wall (2004) examine the determinants of banks' loan loss allowance (i.e. reserves), and especially their relationship with preprovision income for various samples of U.S. and non-U.S. banks.

This could mean that firms with lower income reduce their reserves to help them increase their income targets (Hasan and Wall, 2004). Alternatively, it could mean that firms with higher than expected income (or actual losses lower than expected losses) contribute additional provisions to their reserves during good times, so that they can decrease provisioning during bad times (Laeven and Majnoni, 2003)

As mentioned earlier, Gaver and Paterson (2004) find that U.S. insurers manage loss reserves to avoid violations of ratios used by regulators for solvency assessment. We therefore use the solvency ratio, calculated as shareholders' funds to total assets. To control for the activities of the firms in the sample, we use two dummy variables to distinguish between life insurance (LIFE), non-life insurance (NLIFE), and composite insurance firms with the latter being the reference category. We also control for size using the natural logarithm of total assets (see e.g. Kanagaretnam et al., 2010; Leventis et al., 2011).

*3.2.2. Regulatory variables*

In the present study, the first set of the country-level variables of interest are those that capture the regulatory conditions in each country. Broadly speaking, these could be classified in two groups. The first group includes regulations that are directly related to technical provisions such as their disclosure, the coverage of assets, the setting up of provisions, and their taxation. The second group includes regulations that may be seen as complements or substitutes namely capital requirements, supervisory power, and corporate governance. In the discussion that follows, we present briefly the regulatory indexes and the rationale for their inclusion in the present study.[9] The construction of the regulatory variables follows an approach that is similar to that used in recent insurance (e.g. Pasiouras and Gaganis, 2013) and banking studies (e.g. Barth et al., 2001; Ioannidis et al., 2010, Engineer et al., 2013). [10]

The index of technical provisions (TPROV) reveals whether there are requirements to hold assets of a certain quality, the amount of which at least equals the technical provisions. It also shows whether insurers make technical provisions for unexpired risk, life insurance/other mathematical provisions, unearned premiums, unit-linked life insurance policies, etc. Theoretically, TPROV ranges from 0 to 10, with higher values indicating higher stringency.

[9] To conserve space we do not present here all the questions used in the calculation of each index. Readers interesting in further details may have a look at the working version of the manuscript (Gaganis et al., 2011).

[10] In some cases, the regulatory requirements vary between different types of firms. IAIS provides separate questions/answers for life and non-life insurers, so we use the appropriate figures for each type of firm in our sample. For combined insurers, we weight the regulatory index using the percentage of net premium originating from life and non-life business lines for each combined insurer. In a few cases where disaggregated data for net premium by business line are not available we use an equal weighting (i.e. 50%).

We expect that higher stringency, allowing less latitude to managers, will decrease income smoothing.

More demanding requirements for accounting and auditing that increase both the volume and quality of firm-related information may help market participants and supervisors to reduce earnings management. Therefore, we construct a disclosures and auditing index (DISCAUD) by considering whether various amounts relating to life insurance provision/other mathematical provision, technical provision for unit-lined life insurance policies, provision for unearned premiums, claims outstanding, *etc*. are disclosed in the balance sheet. This index also captures the extent of auditing and the responsibilities of auditors (e.g. certify compliance with the provisions on solvency/capital adequacy, examine the filing and data supply system, report to supervisory authority, comment on internal controls, etc.) as well as the requirements to become an external auditor of an insurance company (e.g. experience in auditing insurance firms, university degree, professional membership). Theoretically, it takes values between 0 and 20, with higher values indicating more information disclosure and external auditing requirements.

The above two regulatory indices capture various elements of provisioning (e.g. requirements, disclosures). However, none of these variables considers if there are differences in the taxation framework with regard to provisions. However, stricter rules concerning the amount of provisions that are tax deductible are likely to affect both the absolute level of the technical reserves and its changes over the cycle.[11] Therefore, we construct an index that reveals whether the increase in provisions is tax deductible, along with the extent of such deductibility. In the case of life insurance firms, IAIS includes information about the following: (i) life insurance provision/other mathematical provision, (ii) provision for bonuses and rebates/funds for future application, (iii) technical provisions for unit-linked life insurance policies, (iv) Other. In the case of non-life insurance firms, we consider: (i) provisions for unearned premiums, (ii) provisions for unexpired risks, (iii) claims outstanding, including IBNR, (iv) equalization / catastrophe provision, (v) Other. In each case, we assign the value of 1 when an item is fully deductible, 0.5 when it is partially deductible, and 0 if it is not tax deductible.[12] Then we take the summation of the values assigned to each item, and we construct an overall index (TAXPROV), with higher figures indicating higher tax deductibility.

[11] We would like to thank an anonymous reviewer for a comment that motivated us to consider this variable in the analysis.

[12] We also re-estimate the index, while assigning the value of 1 in cases where an item is either fully or partially deductible (i.e. we do not distinguish between full and partial deductibility). The results do not change.

Capital requirements have received a lot of attention by academics and regulators (e.g. Cummins et al., 1995; Solvency II, etc.), and there are a number of reasons for which they could be related to technical provisions. The International Association of Insurance Supervisors (2007) mentions that the calibration of capital requirements should take into account the relationship between assets and technical provisions, whereas in its 2008 guidance paper on the regulatory capital requirements it states that "*These aspects of solvency assessment (namely technical provisions and capital) are intrinsically inter-related and cannot be considered in isolation in a solvency regime*". Our indicator of capital requirements (CAPRQ) considers whether the level of business/premium income, the type of the business and risk exposures, the company's assets and liabilities, reinsurance and claims incurred, are taken into account when calculating the solvency/capital requirements. It also considers the frequency of reporting of firms' solvency situation. Theoretically, CAPRQ takes values from 0 to 10 with higher values indicating higher stringency.

The supervisory review process and the power of official supervisors is another regulatory mechanism that has received attention in recent recommendations of the IAIS, as well as in Pillar II of Solvency II. The official supervision theory argues that the governmental supervisory authorities have the capability and the reasons to overcome information and transaction costs and regulate the industry. Within our context, this could translate to actions that reduce managerial incentives to use technical provisions for income smoothing. In a sense, supervisory power may be seen as a prerequisite to enforce regulations related to technical provisions or complement a poor regulatory framework relating to technical provisions. In contrast, under the regulatory capture theory, regulators may behave in a way that benefit the industry rather than the public due to lobbying, political support during election campaigns, bribes, etc. (Becker, 1983; Shleifer and Vishny, 1998; Schiro, 2006; Grace and Phillips, 2008). Existing evidence from the banking industry provides mixed results. Fonseca and Gonzalez (2008) find that supervisory power reduces the extent of earnings management through loan loss provisions. However, Kanagaretnam et al. (2010) find a positive relationship between supervisory power and their indicators of loss-avoidance or just-meet-or-beat prior year's earnings. The authors suggest that higher bank regulation and bank supervision may increase the incentives for loss-avoidance due to closer scrutiny by regulators. For the purposes of the present study, we use an indicator of supervisory power (SPOWER) that reveals the extent of the actions that are available to supervisors (e.g. request to set up a recovery plan, ask for an increase in capital, ask for changes in technical provisions, restrict the payment of dividends, remove managers or directors, prohibit the

underwriting of new business), along with actions to enforce orders and sanctions.[13] The index also takes into account whether the supervisors have the latitude to take these actions at an early point or at a late point (i.e. on the basis of whether the insurance firm still meets the financial requirements to conduct business or not). The index may take values from 0 to 54 with higher figures revealing more power in the hands of the supervisory body.

Firm-level evidence from insurance studies indicates that corporate governance mechanisms have an impact on performance (Diacon and O'Sullivan, 1995), and earnings management (e.g. Eckles and Halek, 2010). Therefore, it is not surprising that corporate governance and internal control are part of Pillar II in Solvency II. The IAIS (2007) also describes sound governance as a prerequisite for an efficient solvency regime suggesting that *"The supervisory regime should require insurers to have and maintain corporate governance policies, practices and structures and undertake sound risk management in relation to all aspects of their business"*. To take these aspects into account we use an index of corporate governance and internal control (GOVINT). It reveals the role of the supervisory agency (e.g. are there fit and proper requirements applied by the supervisor to the firm managers and directors, the actuary, the external auditor, etc.?), whether the supervisor has the latitude to intervene when he is not satisfied with a firm's corporate governance, whether corporate governance rules in a country refer to detailed corporate structure, board characteristics (composition and organizational structure), and the responsibilities of key persons and groups in the firm (board, senior managers, auditors, actuary, risk manager, and compliance officer). This index also indicates whether internal control procedures in insurance companies address among others compliance with legislation and procedures of the company, independence of key functions, etc., as well as whether the insurance legislation imposes the compulsory set up of various committees (e.g. audit, risk management, etc.). We also consider whether internal control procedures are required or recommend by law or professional standards, as well as who supervises the internal control procedures. Theoretically, GOVINT can take values from 0 to 40, with higher values indicating more demanding governance and internal control rules.[14]

[13] With regard to available actions related to orders and sanctions the index takes into account the following: fining the insurer, fining members of the board of directors, and imprisonment.

[14] Given that the GOVINT indicator considers the application of fit and proper requirements and the ability of the supervisor to intervene one could wonder whether it is replicating information in SPOWER. In general, we do not consider the same set of questions/answers when calculating different indices and we follow the classification of IAIS. The correlation between GOVINT and SPOWER is rather small and negative, as can been in Table 2.

*3.2.3. Institutional Variables*

The second set of the country-specific variables includes those that capture the institutional environment in each country. The main hypothesis to be tested is whether the development of institutions helps to suppress conflicts of interest that arise in a typical principal–agent relationship. For example, one would expect that in countries with low legal protection, corruption, and overall poor quality of legal institutions, there may be higher opportunities for risk-taking while managers will also be more inclined towards income smoothing. Therefore, we use the following World Bank indicators compiled by Kaufmann et al. (2010): regulatory quality (RQUAL), rule of law (RLAW), and control of corruption (COR). These indicators range between -2.5 and 2.5 with higher values indicating more desirable outcomes. We also use a more general indicator of the legal environment by including in the analysis a dummy variable (COMLAW) that takes the value of one in the case of common law (i.e. British legal origin) and zero in the case of a civil law origin (i.e. French, German, Scandinavian).[15]

Following Dermiguc-Kunt et al. (2004) we also use the Economic Freedom Index (EFI), which is estimated on the basis of the following ten indicators: business freedom, trade freedom, fiscal freedom, government spending, monetary freedom, investment freedom, financial freedom, property rights, freedom from corruption, labor freedom. EFI takes values between 0 and 100, with higher values indicating higher freedom.

Finally, considering the difficulties in defining and measuring adequately all the features of well-functioning institutions, we also use the natural logarithm of GDP per capita expressed in U.S. dollars using the purchasing power parity (GDPCAP) as a general indicator of institutional environment (Demirguc-Kunt et al., 2004).

*3.2.4.* Other Country-control variables

The annual real GDP growth (GDPGR) is included to control for the procyclical effect of provisioning (e.g. Fonseca and Gonzalez, 2008). In robustness tests presented in Section 4.2, we control for additional country specific factors such as the religious inclination and the development of the stock market and the insurance industry.

[15] La Porta et al. (1998) show that countries with the common law legal origin have better protection of minority shareholders than countries with civil law legal origin. Additionally, Gassen et al. (2006) conclude that firms in common-law regimes tend to disclose more conservative earnings, whereas the ones in civil-law regimes appear to engage more strongly in income smoothing.

*3.2.5. Descriptive statistics*

Table 1 presents descriptive statistics (average, median, standard deviation) of our variables while distinguishing between geographical regions.[16] Table 2 presents the correlation matrix. To deal with outliers, all firm-level variables are capped at the 1st and 99th percentile.

The average (median) NTRTA in our sample is 53.07 (56.11). Asia Pacific, Eastern Europe, and North America have average figures slightly below or above the sample average. However, the average for Middle East & Africa is considerably lower at 34.94 (median equal to 25.19), while Western Europe and Australasia have average figures above 60. The sample average (median) for NPWTA is 33.70 (25.05). Asia Pacific, Latin America and North America, have figures close to the sample average. Eastern Europe has a much higher average that is equal to 51.40. In contrast, the average figures are lower in Middle East & Africa (25.19), Western Europe (23.94) and Australasia (19.05).

Turning to the institutional indicators, we observe that in all the cases, the scores for the regions that include mostly developing or transition economies (Asia Pacific, Eastern Europe, Middle East & Africa, Latin America) are lower than the sample average, while the average figures of the geographical regions that include the advanced and major advanced economies (North America, Western Europe, Australasia) are higher than the sample average. Take the rule of law (RLAW) for example. The sample average is 0.86. The average for the developing economies ranges between -0.13 (Eastern Europe) and 30 (Asia Pacific). In contrast, the figures for the developed economies range between 1.43 (Western Europe) and 1.73 (Australasia). In the case of economic freedom (EFI), the averages for the developed economies are between 70.64 (Western Europe) and 80.58 (Australasia), while the ones of the developing economies range between 56.30 (Eastern Europe) and 65.43 (Latin America). In the case of the regulatory conditions, things are more complicated. For example, both Western Europe (4.35) and Australasia (3.33) have averages lower than the sample average (5.10) in the case of CAPRQ, whereas Eastern Europe (6.32) and Latin America (5.25) have stricter rules. However, both regions are above average in the case of disclosure and auditing requirements, with the Asia Pacific (6.91) and North America (7.00) being the only ones with averages below the sample mean (8.96). Nonetheless, North America has stricter rules than the sample average in all other cases.

[16] The statistics have been calculated using the number of firm yearly observations for each variable. We do not present information at a country level due to: (i) the large number of countries and (ii) confidentiality issues since access to IAIS is restricted to insurance regulators and it is being made available to non-profit or academic institutions on a case by case basis, only.

[Insert Tables 1 and 2 Around Here]

### *3.3. Methodology*

Our dataset has a hierarchical setting, with three levels. That is, individual firms are nested in countries over a number of years. Consequently, we employ a Hierarchical Linear Modelling (HLM) or else known as Multi-Level Modelling.[17] HLM is superior to OLS because it accounts for the fact that our data have different levels of aggregation and it provides error terms that control for the potential dependency due to nesting effects, which is not the case with OLS (see e.g. Newman et al., 2010). In other words, by modelling each level of the hierarchy, multilevel models consider that firms within a country are more similar to one another than firms from different countries. Furthermore, as mentioned in Li et al. (2011) the HLM framework allows the separation of the variance in firm-level reserves decisions explained by the firm-versus country-level independent variables.

For example, let us assume that we have data from firms (*i*) nested in countries (*j*), an outcome $Y_{ij}$ of firm *i* in country *j*, and explanatory variables at the firm-level (X), and the group-level (Z). To model these data we could use a two-level random intercept model, which can be written as follows:[18]

$$\text{Level 1: } Y_{ij} = \beta_{0j} + \beta X_{ij} + r_{ij} \quad (1)$$

$$\text{Level 2: } \beta_{0j} = a + \gamma Z_j + u_j \quad (2)$$

In the present study we first estimate a mixed model with random intercepts at both the country and the firm-within-country levels. The model is fitted using an interactive maximum likelihood algorithm in which the fixed and random effects are estimated simultaneously until the model converges. In its combined form the base model, without the cross-level interactions, can be written as follows:

[17] The terms hierarchical linear models, multilevel models, mixed-effects models denote essentially the same modelling approach. We use these terms interchangeably in our discussion. This approach has been used widely in studies that examine firm and business segment performance (Goldszmidt et al., 2011), and more recently corruption and the decision of firms to bribe (Martin et al., 2007; Spencer and Gomez, 2011, Kaufman, 2014), capital structure decisions (Li et al., 2011) and corporate risk-taking (Li et al., 2013). However, to the best of our knowledge, there are no applications of multi-level modelling in the cross-country income smoothing literature.

[18] Those interested in a more detailed presentation of the equations estimated for each one of the different levels, in models with more levels, random coefficients, and centered variables can have a look at standard textbooks (Gelman and Hill, 2007) or methodological papers on the field (Hofmann and Gavin, 1998). We do not present them here to conserve space.

$$NTRTA_{ijt} = \underbrace{a + \beta X_{ijt} + \gamma Z_{jt}}_{fixed\_components} + \underbrace{r_{ij} + u_j + e_{ijt}}_{random\_components} \quad (3)$$

Where $NTRTA_{ijt}$ is the ratio of net technical reserves to total assets of firm *i* in country *j* in year *t*; X is a vector of firm-level explanatory variables, and Z is a vector of country-level variables. The model contains explanatory variables at the firm and the country levels. The random variables $r_{ij}$ and $u_j$ allow the intercept to be random and unique to every firm and country. The term $e_{ijt}$ is the residual.

As it is common in the multi-level literature (see e.g. Martin et al., 2007; Spencer and Gomez, 2011), we center the firm-level right hand side variables at the group mean (i.e. country). We name these firm-level differences from their corresponding country-level means as "_firmdif". However, the use of group-centered firm-level variables means that our model no longer includes the between-group variance in the predictors that could explain variance in firms' technical reserves. Therefore, we add the country means of the firm-level variables back into the country-level intercept model, so that the correct between-group variance will be estimated (Kidwell et al., 1997; Hofmann and Gavin, 1998; Raudenbuch and Bryk, 2002). We name these variables as "_ctrymean".

In the above model, the intercept is random and all slope coefficients are fixed, implying that all slope parameters are identical across firms and countries. Depending on theoretical considerations and the research questions, the above model can be extended so that some coefficients can be specified to differ across firms and/or countries in a stochastic manner. Within our context, it could be argued that the process of provisioning, given the net premium written, is not identical across firms (i.e. there is heterogeneity). Therefore, we estimate a second model which incorporates, in addition to the random intercepts, a random coefficient for the effect of NPWTA_firmdif on NTRTA, while all other coefficients remain fixed. In this case, equation (3) becomes:

$$NTRTA_{ijt} = a + \beta X_{ijt} + \gamma Z_{jt} + r_{0ij} + r_{1ij} NPWTA\_fimrdif_{ijt} + u_j + e_{ijt} \quad (4)$$

This approach yields both fixed and random effects estimates for the firm-level net premium total assets ratio. The fixed effects refer to the overall expected effect of a firm's NPWTA on reserves; the random effect provides information on whether or not this differs. We opt for an

unstructured variance-covariance structure between the random intercept and the random slope of NPWTA_firmdif.

Finally, to test the influence of the institutional development and the regulatory conditions on income smoothing, we include interaction terms of the grand-mean centered country-level variables discussed in Sections 3.2.2 and 3.2.3 with the NPWTA_firmdif.[19] Thus, the coefficient of each interaction term reveals the impact of the particular country variable on firm-level behavior, in our case income smoothing.

## 4. Empirical Results

### *4.1. Main results*

Table 3 presents the results when we discard all the independent variables. The only remaining regressors are the sample-wide constant, the two random variables that account for firm and country variation around the constant, and an idiosyncratic error. Thus, the results show the relative importance of factors at the firm and country level with respect to net technical reserves (scaled by assets). The results show that 41.7% of variation in technical reserves can be explained with difference across countries. Differences across firms account for 50.6%, and 7.7% remain unexplained.

[Insert Table 3 Around Here]

Table 4 presents our base model which includes the firm-specific variables and real GDP growth. The first column presents the results of the model that includes only the random intercepts and the fixed slope coefficients (i.e. Equation 3). The second column presents the results of the model that accounts for the hypothesis that the process of transforming premium written into reserves may not be identical across firms, by adding a random coefficient for NPWTA_firmdif (i.e. Equation 4). In both cases, NPWTA_firmdif enters with a positive and statistically significant coefficient, indicating that the insurance firms in our sample use technical reserves to smooth their income. The results of a Likelihood-ratio test favor the model that allows for a random firm-specific regression line (i.e. Equation 4) over the model

[19] The transformation of the country-level variables is less of an issue (Raudenbush and Bryk, 2002). However, since we incorporate cross-level interaction effects we follow the recommendation of Raudenbush and Bryk (2002) and we center the country-level data (including the "_ctrymean" variables) at the grand mean, consistent with Martin et al. (2007), Li et al. (2011, 2013), Spencer and Gomez (2001) among others.

that allows only for a firm-specific shift (Equation 3). Therefore all our remaining specifications are estimated using a random coefficient for NPWTA_firmdif.[20]

[Insert Table 4 Around Here]

The next two tables present the results when we include the institutional (Table 5) and the regulatory (Table 6) variables in the analysis.[21] As in Fonseca and Gonzalez (2008) we start by incorporating the institutional and regulatory variables separately rather than simultaneously due to the large number of country variables and interaction terms. In further regressions we include simultaneously in the regressions the variables with a statistically significant coefficient.

NPWTA_firmdif retains its positive and statistically significant coefficient in all the specifications in Table 5. The interactions of the three WB indicators with NPWTA_firmdif (i.e. NPWTA_firmdif*RQUAL, NPWTA_firmdif *RLAW, and NPWTA_firmdif *COR) carry the expected negative sign. However, only NPWTA_firmdif *RLAW is statistically significant. Thus, higher quality of contract enforcement, property rights, the police and the courts, as well as the likelihood of crime and violence, which are captured in the rule of law indicator, can be useful in reducing income smoothing. The interaction NPWTA_firmdif *COMLAW is also negative and statistically significant, indicating that a common law regime mitigates income smoothing. Other country characteristics such as the ability of the government to formulate and implement sound policies and regulations that permit and promote private sector development (i.e. RQUAL) and the control of corruption (i.e. COR) do not influence the income smoothing behavior of insurance firms. The interactions of NPWTA_firmdif with the two indicators that capture the degree of economic freedom (NPWTA_firmdif *EFI) and the overall economic development (NPWTA_firmdif *GDPCAP) also enter with a significantly negative sign, indicating that they can influence managerial incentives to smooth income through technical reserves.

[Insert Table 5 Around Here]

[20] The Likelihood-ratio test presented at the end of Tables 5 and 6 confirms that equation (4) should be preferred to equation (3) in all our specifications.

[21] To conserve space Tables 5 and 6 do not report the random-effects parameters. The full results are available from the authors upon request.

The inclusion of the regulatory variables in the analysis presented in Table 6 does not alter our main finding. NPWTA_firmdif is positive and statistically significant in all the specifications. NPWTA_firmdif *TPROV is negative and statistically significant, indicating that higher stringency in regulations relating to technical provisions reduces income smoothing. Higher supervisory power in terms of intervention, sanctions and enforcement, also exercises a negative and significant influence on income smoothing which is consistent with recent banking studies (Fonseca and Gonzalez, 2008; Biurrum and Rudolf, 2010).

The insignificance of both CAPRQ and NPWTA_firmdif *CAPRQ indicates that the extent of items that are considered during the calculation of the capital requirements and the frequency in the reporting of the solvency position do not influence neither technical reserves nor income smoothing. Turning to the governance and internal control indicator, the negative and statistically significant impact of GOVINT on NTRTA (at the 10% level) provides some evidence that more governance and internal control mechanisms decrease net technical reserves. However, while NPWTA_firmdif *GOVINT enters with the expected negative sign, it is insignificant, implying that these mechanisms do not appear to work in mitigating income smoothing. The interaction of TAXPROV and NPWTA_firmdif is also insignificant, suggesting that tax deductibility is not a driving factor of income smoothing.[22]

The significant negative coefficient of DISCAUD suggests that disclosures and auditing decrease net technical reserves; however, the positive coefficient of the interaction term NPWTA_firmdif *DISCAUD shows that this effect diminish when the bank has high NPWTA_firmdif with the incentives to engage in income smoothing. While this is consistent with the findings of Kanagaretnam et al. (2010) who report a positive and significant relationship between a private monitoring index (i.e. disclosure requirements, credit ratings, etc.) and bank earnings management, it contradicts our expectations and the findings of other studies (e.g. Fonseca and Gonzalez, 2008). To explore this issue a little further we proceed as follows.

First, we include simultaneously in the analysis all the three significant regulatory variables (DISCAUD, SPOWER, TPROV) along with their interaction term with NPWTA_firmdif. This allows us to investigate the impact of DISCAUD in the presence of

[22]The interaction TAXPROV*NPWTA_firmdif has a significant (negative) impact when considering the model with the random intercept only. However, the LR test that compares the two models strongly supports the use of the model with the random intercept and random coefficient (p-value = 0.000). So, this is the model that we report in column 3 of Table 6.

other regulatory devices. We continue to find evidence of income smoothing, while all three interactions maintain their sign and significance.[23]

Second, we decompose this index into disclosure requirements (DISC) and auditing requirements (AUD), and we estimate two additional regressions, including each pair (i.e. the sub-index and its interaction with NPWTA_firmdif) in our base model one at a time. The interaction NPTWA_firmdif *AUD is negative but insignificant (coefficient = -0.013, p-value = 0.339). However, NPTWA_firmdif *DISC continues to enter the regression with a positive and statistically significant sign (coefficient = 0.036, p-value=0.000). Including the two sub-indices and their interaction with NPWTA_firmdif simultaneously in our base model, does not alter our findings for NPTWA_firmdif *DISC (coefficient = 0.037, p-value=0.000), although NPTWA_firmdif *AUD becomes significant at the 10% level (coefficient = -0.023, p-value =0.093). In all the cases, we continue to find that NPWTA_firmdif is positive and statistically significant.

[Insert Table 6 Around Here]

### *4.2. Robustness tests*

In this section we discuss a number of robustness tests.[24,25] As mentioned earlier, we have already estimated a model that includes simultaneously the three regulatory variables with a significant interaction. To lessen further potential concerns about omitted variable bias we also include in this specification the GDPCAP and its interaction. Thus, this specification controls simultaneously for the regulatory and the institutional environment. The only difference with the previously reported results is that the interaction of SPOWER becomes insignificant. All the other interactions retain their sign and significance, and we continue to find evidence of income smoothing.[26]

The models that we present in Tables 4-6 were obtained using maximum likelihood estimation. The alternative would be to use the restricted maximum likelihood estimation-

[23] See Appendix I, column 1.

[24] To conserve space we do not present Tables with all these robustness tests. However, selected specifications are shown in Appendix I. All the results are available from the authors upon request.

[25] All the country-level variables enter the regressions centered at the grand mean.

[26] GDPCAP was selected for two reasons. First, it can be seen as an overall indicator of institutional development. Second, both its level and interaction were significant in column 5 of Table 5. We do not include other institutional variables in the regression due to the relatively high correlation with GDPCAP (e.g. 0.879 with RQAL, 0.866 with RLAW, etc.). The insignificance of NPWTA_firmdif *SPOWER could be due to the positive and significant correlation of SPOWER with GDPAP (0.617), and the even higher correlation between NPWTA_firmdif*GDPCAP and NPWTA_firmdif *SPOWER (0.922).

REML (Corbeil and Searle, 1976). This can be seen as a special case of the MLE that partitions the likelihood under normality into two parts, one being free of the fixed effects. Maximizing this part yields the REML estimators. Thus, this approach incorporates the degrees of freedom used to estimate fixed effects into the estimation of the variance components. Estimating the models presented in Tables 4-6 with the REML does not alter our findings.

Some studies in banking suggest that the reserves (or provisions) should be dichotomized into their discretionary and non-discretionary components by including in the regressions the non-performing loans or the change in outstanding loans (e.g. Hasan and Wall, 2004; Fonseca and Gonzalez, 2008).[27] Following up from this argument, we re-estimate our base model while introducing an additional firm-specific variable of interest that is the ratio of net claims to total assets (NCTA). Since technical reserves are the amounts that insurers set aside from profits to cover claims, NCTA could serve as a proxy for the non-discretionary component of reserves. Consistent with our expectations the NCTA_firmdif is positively associated with the net technical reserves to total assets ratio. However, the introduction of NCTA in the analysis does not influence our main finding. NPWTA_firmdif continues to have a positive and significant impact on NTRTA.[28]

We use MACGDP to control for the potential impact of the development of a country's stock market on technical reserves and income smoothing. For example, market oriented systems may enhance the incentives of managers to influence external perception of the firm's solvency position or to smooth earnings and present more stable profits due to a higher number of users of financial statements (Fonseca and Gonalez, 2008). On the other hand, firms in more developed financial markets may be subject to monitoring by more sophisticated investors, higher-quality institutional environments, and stronger investor protection, leading to a negative relationship with earnings management (see e.g. Leuz et al., 2003). MACGDP enters the regressions in Tables 5 and 6 with a positive (in most of the cases) but insignificant coefficient, and it does not alter the so far reported results. We also interacted MACGDP with NPWTA_firmdif and re-estimated our base model to test whether the development of the stock market mitigates income smoothing (see .e.g. Leuz et al., 2003;

[27]However, not all studies follow this approach. For example, our framework is consistent with that of Leventis et al. (2011) who control for the non-discretionary components only as a robustness test.

[28] We do not include NCTA in further specifications such as the ones presented in Tables 5 and 6 due to its extremely high and statistically significant correlation with our main variable of interest (i.e. net premium written to total assets) that could distort our results once we will introduce more variables and especially interaction terms in our specifications. More detailed, the correlation between NPWTA_firmdif and NCTA_firmdif is 0.931 (p-value = 0.000), while that between NPWTA_ctrymean and NCTA_ctrymean is 0.849 (p-value = 0.000).

Fonseca and Gonzalez, 2008). The interaction term enters which a negative sign which is consistent with our expectations; however, its impact is not statistically significant.

PREMGDP serves as an indicator of development, specifically designed for the insurance industry. When we re-estimate the specifications in Tables 5 and 6, we find that (i) PREMGDP is insignificant, and (ii) its inclusion in the analysis does not influence the so far reported results. As above, we also tested the interaction term of PREMGDP with NPWTA_firmdif by re-estimating our base model. Consistent with the rationale for the stock market development, a positive sign could imply that firms in more developed insurance markets are subject to higher monitoring and they may engage in earnings management to report more stable profits. On the other hand, higher development of the insurance industry could result in more informed investors and customers that are aware of insurance business decreasing managerial incentives to smooth income. Our results support the latter, since the interaction term enters with a negative and statistically significant coefficient.

Recent evidence suggests that religion may influence corporate reporting. For example, Dyreng et al. (2012) report that higher levels of religious adherence are associated with both a lower likelihood of financial restatement and less risk that financial statements are misrepresented because of overstated (understated) revenue/assets (expenses/liabilities). McGuire et al. (2012) also find evidence that firms from areas with strong religious social norms experience lower incidences of financial reporting irregularities. We therefore control for religious inclination using the percentage of the population in each country that is Roman Catholic (CATH), Protestant (PROT), Muslim (MUSL) or that belongs to "other denominations" (with "others" being the reference category).[29] This does not alter the findings presented in Tables 5 and 6. In most of the regressions CATH, PROT, and MUSL enter with a negative sign. While they appear to be significant in some cases (especially CATH), this finding is not robust across all our specifications. We also re-estimate our base model (i.e. Table 4) while including the religious inclination variables and their interaction with NPWTA. We find that NPWTA_firmdif*PROT enters with a negative and statistically

[29] Using the percentages instead of binary dummy variables allows us to take into account that in some cases the differences between two religions are rather small (e.g. Roman Catholic = 42.6% vs Protestant = 42.4%). Thus, we avoid the arbitrary classification in one group over the other. Our approach is consistent with Barth et al. (2004) among others. However, to give the readers an idea about the distribution of the firms in our sample by religious group, we provide here a hypothetical classification in four distinct groups, that are formed on the basis of the highest percentage in each country. There are 140 firms operating in 27 countries with Roman Catholic religious inclination (861 firm-year observations), 224 firms operating in 10 countries with Protestant religious inclination (1,563 firm-year observations), 152 firms operating in 15 countries with Muslim religious inclination (648 firm-year observations), and 251 firms operating in 34 countries with another religious inclination (1,398 firm-year observations).

significant coefficient, indicating that firms from countries with a high percentage of Protestants are less inclined towards income smoothing.

We also re-estimate the models in Tables 4-6 using a dummy variable that takes the value of one for non-life insurance firms (i.e. zero for life and combined firms) along with its interaction with NPWTA_firmdif.[30] Diers et al. (2009) highlight at least five distinguishing aspects of non-life insurance firms that could lead to more volatile profits, and therefore provide higher incentives for income smoothing.[31] Consistent with our expectations the interaction term NPWTA_firmdif*NLIFE enters the regressions with a positive and statistically significant sign indicating that non-life firms engage more heavily than other insurance firms in income smoothing.[32] In all the cases, we continue to find a positive and statistically significant relationship between NPWTA_firmdif and NTRTA.

As mentioned earlier, in the so far presented regressions we used the accumulated reserves rather than the yearly provisions. As a further test, we take the first difference of NTRTA (i.e. difference from one year to another) and the corresponding figure for NPWTA (i.e. NPWTACH), and we re-estimate the specifications in Table 4. We find that NPWTACH_firmdif has a positive and significant impact on NTRTACH.[33]

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[30] In this case, we slightly depart from our earlier approach in Tables 4-6 to use two dummy variables and distinguish between all three types of firms. The reason for doing so is that the type of insurance firm becomes at this point of the analysis a main variable of interest. Therefore, considering the differences in the sub-sample sizes (i.e. 980 observations for life firms, 2809 for non-life firms, and 690 for combined firms) along with the introduction of the interaction terms we decided to group together the life firms and the combined ones.

[31] First, there are no periodic yearly premium payments in non-life, whereas this is usually the case in life insurance. Second, the claim distributions in non-life insurance especially with business lines that are exposed to catastrophes are considerably more volatile than the benefit payments to life insurance policyholders. Third, the short-term orientation of non-life insurance products results in very high fluctuations in the structure of their liabilities. Fourth, cash outflows in non-life insurance sector are linked to particular claim events and consequently depend on the distribution of the number and severity of claims, whereas in the life sector they mainly depend on biometric risks, investment returns, and cancellation of the policy. Fifth, annual cash flows in the life insurance sector are less extreme than in the case of the non-life sector due to the rather precise estimates of mortality rates.

[32] The interaction of NPWTA_firmdif*NLIFE is positive and statistically significant in all but one case. However, inspection of the data reveals that this insignificance could be attributed to the very high correlations in this particular specification. More detailed, NPWTA_firmdif*NLIFE becomes insignificant only when we simultaneously include in our base model: the non-life dummy (NLIFE), the technical provisions index (TPROV), the interaction NPWTA_lifedif*NLIFE, and the interaction NPWTA_firmdif*TPROV. The correlation between the dummy variable and TPROV is -0.759 (p-value 0.000) while that between the two interaction terms is as high as -0.959 (p-value = 0.000). When we drop the interaction NPWTA_firmdif*TPROV (while keeping TPROV in our analysis) the results are consistent with all the other regressions showing a positive and significant NPWTA_firmdif*NLIFE.

[33] We would like to thank an anonymous reviewer for suggesting this test. One could argue that provisions are a much better indicator than accumulated reserves, in the context of the present study. By taking the first difference, the positive relationship between NTRTACH and NPWTACH provides further evidence that the reserve ratio increases (decreases) when the premiums written ratio also increases (decreases). We also re-estimated the specifications shown in Tables 5 and 6, using NTRTACH, NPWTACH and the interaction of NPWTACH with the institutional and regulatory variables. In the case of the institutional variables, the interactions of GDPCAP*NPWTACH and RLAW* NPWTACH become insignificant; however, the interaction

## 5. Conclusions

Our study adds to a growing body of the literature that uses cross-country samples to understand the impact of institutions and regulations on income smoothing. Our main contribution to the literature is that we examine for the first time a sample of insurance firms. This is important for at least three reasons. First, country-specific studies do not tell us much about the impact of institutions and regulations. Second, knowledge from existing studies that examine other sectors is not necessarily applicable to the insurance industry, due to cross-industry differences in firms' characteristics and the regulatory environment. Third, while technical reserves have traditionally received the attention of insurance regulators, the interest has now been renewed due to changes in the calculation of technical reserves under Solvency II, the new European regulatory framework that it is expected to have a worldwide impact.

Our sample consists of 770 insurance firms operating in 87 countries during 2000-2009. Following recent studies from other disciplines, we use for the first time in the cross-country income smoothing literature a multi-level mixed model that has several advantages over OLS. Our results indicate a positive and statistically significant relationship between net premium written and net technical reserves (both scaled by total assets), which could be interpreted as evidence of income smoothing. This finding is robust across all our specifications.

We use a number of variables to examine the impact of institutional development and the regulatory environment. Four out of the six institutional indicators appear to mitigate income smoothing. These are the rule of law, common law legal origin, economic freedom, and the GDP per capita. As it concerns the regulatory mechanisms we find that higher stringency in technical provisions, and higher supervisory power constrain income smoothing. Other regulatory tools such as tax deductibility of provisions, capital requirements, auditing, and corporate governance and internal control do not influence income smoothing. Surprisingly, disclosure requirements related to technical provisions have a positive effect on income smoothing. This relationship holds across a number of specifications, and it could be an avenue for future research. In robustness test, we re-estimate our models using the restricted maximum likelihood estimator instead of the maximum likelihood estimator. Furthermore, we include additional controls for the development of the stock market and the

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RQUAL*NPWTACH becomes negative and significant. As it concerns the interaction of the remaining institutional variables (COR, COMLAW, EFI) with NPWTACH, our findings remain the same with the ones presented in Table 5. Thus, various characteristics of the institutional environment continue to play an important role in mitigating income smoothing. Turning to the regulatory variables, the results remain the same, and we only observe some changes at the significance level.

insurance sector, as well as the religion inclination in each country. Our findings remain the same.

Future research could include in the analysis firm-level corporate governance characteristics (e.g. board structure, committees, etc.). While we find the country-level corporate governance and internal control rules to be insignificant, firm-level information may shed additional light. Furthermore, coverage in OSIRIS database used in this study is restricted to publicly listed and major unlisted companies. Including smaller firms in the sample would be another avenue for future research. Additionally, one could take into account the cross-listing of insurance firms. Finally, future efforts could be directed towards the development of models for the detection of earnings management in the insurance industry.

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Table 1: Descriptive statistics (Raw Data)

| | Asia Pacific | | | Eastern Europe | | | Latin America | | | Middle East & Africa | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Average | Median | St. Dev | Average | Median | St. dev. | Average | Median | St. dev | Average | Median | St. Dev |
| NTRTA | 51.23 | 52.39 | 27.65 | 52.34 | 56.11 | 18.79 | 46.77 | 46.55 | 21.22 | 34.94 | 27.03 | 25.32 |
| NPWTA | 34.02 | 28.98 | 19.11 | 51.40 | 44.75 | 26.02 | 35.51 | 28.46 | 23.98 | 25.19 | 19.92 | 18.14 |
| SOLV | 33.86 | 30.39 | 23.56 | 28.62 | 25.47 | 12.45 | 33.29 | 29.84 | 18.03 | 43.95 | 47.47 | 24.73 |
| LNTA | 12.90 | 12.52 | 2.97 | 12.53 | 12.48 | 1.71 | 12.98 | 13.02 | 2.25 | 12.24 | 11.86 | 1.82 |
| LIFE | 0.16 | 0.00 | 0.37 | 0.01 | 0.00 | 0.11 | 0.23 | 0.00 | 0.42 | 0.10 | 0.00 | 0.30 |
| NLIFE | 0.74 | 1.00 | 0.44 | 0.75 | 1.00 | 0.44 | 0.75 | 1.00 | 0.43 | 0.49 | 0.00 | 0.50 |
| NCLTA | 17.92 | 14.24 | 12.41 | 27.91 | 24.70 | 16.38 | 19.18 | 15.99 | 13.94 | 14.21 | 10.92 | 12.21 |
| GDPGR | 4.30 | 4.90 | 2.84 | 4.53 | 5.50 | 4.29 | 3.86 | 4.20 | 2.66 | 6.00 | 5.60 | 4.74 |
| RQUAL | 0.35 | 0.42 | 0.65 | 0.22 | 0.42 | 0.58 | 0.71 | 0.53 | 0.71 | 0.28 | 0.50 | 0.63 |
| RLAW | 0.30 | 0.41 | 0.75 | -0.13 | -0.09 | 0.65 | 0.21 | -0.18 | 0.86 | 0.20 | 0.45 | 0.69 |
| COR | 0.08 | -0.01 | 0.78 | -0.15 | -0.12 | 0.59 | 0.49 | 0.11 | 0.83 | 0.33 | 0.45 | 0.76 |
| COMLAW | 0.51 | 1.00 | 0.50 | 0.00 | 0.00 | 0.00 | 0.43 | 0.00 | 0.50 | 0.66 | 1.00 | 0.47 |
| EFI | 63.71 | 64.30 | 7.85 | 56.30 | 54.10 | 5.91 | 65.43 | 64.70 | 6.49 | 62.28 | 63.70 | 6.53 |
| GDPCAP | 9.11 | 9.11 | 1.05 | 9.48 | 9.50 | 0.37 | 8.96 | 8.93 | 0.41 | 9.38 | 9.85 | 1.26 |
| TPROV | 4.35 | 5.00 | 1.89 | 4.94 | 6.00 | 1.34 | 3.37 | 3.00 | 1.70 | 3.87 | 4.50 | 1.86 |
| DISCACC | 6.91 | 7.00 | 1.21 | 12.29 | 10.00 | 2.87 | 11.05 | 10.00 | 2.86 | 11.58 | 14.00 | 3.74 |
| CAPRQ | 1.99 | 2.00 | 1.28 | 6.32 | 6.00 | 1.41 | 5.25 | 5.00 | 2.70 | 6.27 | 7.00 | 1.55 |
| TAXPROV | 0.41 | 0.00 | 1.19 | 0.29 | 0.00 | 0.70 | 0.88 | 0.00 | 1.63 | 0.67 | 0.00 | 1.48 |
| SPOWER | 25.11 | 31.00 | 8.18 | 12.51 | 13.00 | 12.87 | 23.62 | 21.00 | 6.27 | 26.40 | 24.00 | 6.80 |
| GOVINT | 15.25 | 12.00 | 4.80 | 8.44 | 10.00 | 6.80 | 12.51 | 21.00 | 11.95 | 19.75 | 16.00 | 7.55 |
| MACGDP | 79.43 | 68.91 | 65.89 | 53.15 | 42.03 | 40.33 | 51.78 | 35.29 | 42.37 | 106.10 | 77.98 | 87.22 |
| PREMGDP | 6.29 | 3.61 | 4.83 | 3.08 | 3.02 | 0.98 | 2.23 | 1.95 | 1.26 | 5.57 | 2.74 | 5.70 |
| CATH | 2.31 | 0.60 | 6.87 | 38.82 | 15.00 | 36.92 | 60.47 | 87.80 | 37.22 | 5.83 | 1.00 | 8.69 |
| MUSL | 21.80 | 3.90 | 32.71 | 7.11 | 1.20 | 10.20 | 0.09 | 0.00 | 0.67 | 65.93 | 93.00 | 39.17 |
| PROT | 2.72 | 0.90 | 4.20 | 1.61 | 0.10 | 3.45 | 13.96 | 4.00 | 15.35 | 7.39 | 0.30 | 12.72 |

Table 1: Descriptive statistics (Raw Data) - Continue

| | North America | | | Western Europe | | | Australasia | | | Total Sample | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Average | Median | St. dev | Average | Median | St. Dev | Average | Median | St. Dev. | Average | Median | St. dev |
| NTRTA | 57.31 | 59.63 | 21.22 | 65.24 | 67.10 | 18.90 | 62.42 | 63.57 | 16.50 | 53.07 | 56.11 | 24.38 |
| NPWTA | 39.72 | 23.20 | 50.40 | 23.94 | 21.64 | 16.58 | 19.05 | 22.61 | 13.42 | 33.70 | 25.05 | 33.44 |
| SOLV | 25.45 | 23.50 | 14.94 | 16.19 | 11.35 | 14.88 | 20.96 | 20.01 | 16.37 | 29.02 | 25.03 | 20.43 |
| LNTA | 15.02 | 14.93 | 2.20 | 15.73 | 15.69 | 2.49 | 15.77 | 16.51 | 1.98 | 14.00 | 13.92 | 2.71 |
| LIFE | 0.34 | 0.00 | 0.47 | 0.18 | 0.00 | 0.39 | 0.37 | 0.00 | 0.49 | 0.22 | 0.00 | 0.41 |
| NLIFE | 0.64 | 1.00 | 0.48 | 0.44 | 0.00 | 0.50 | 0.51 | 1.00 | 0.51 | 0.63 | 1.00 | 0.48 |
| NCLTA | 28.42 | 14.94 | 41.08 | 16.27 | 14.20 | 10.87 | 11.21 | 10.53 | 8.98 | 20.97 | 14.44 | 25.94 |
| GDPGR | 1.94 | 2.50 | 1.79 | 1.49 | 2.00 | 2.68 | 2.70 | 2.60 | 1.39 | 3.21 | 3.10 | 3.26 |
| RQUAL | 1.54 | 1.55 | 0.07 | 1.39 | 1.52 | 0.38 | 1.68 | 1.69 | 0.06 | 0.95 | 1.34 | 0.74 |
| RLAW | 1.55 | 1.53 | 0.08 | 1.43 | 1.61 | 0.50 | 1.73 | 1.73 | 0.05 | 0.86 | 1.23 | 0.87 |
| COR | 1.61 | 1.66 | 0.26 | 1.53 | 1.77 | 0.65 | 2.02 | 2.01 | 0.12 | 0.91 | 1.26 | 0.94 |
| COMLAW | 1.00 | 1.00 | 0.00 | 0.21 | 0.00 | 0.41 | 1.00 | 1.00 | 0.00 | 0.61 | 1.00 | 0.49 |
| EFI | 79.01 | 79.10 | 2.09 | 70.64 | 70.50 | 7.02 | 80.58 | 81.10 | 1.70 | 69.97 | 70.40 | 9.36 |
| GDPCAP | 10.60 | 10.61 | 0.12 | 10.33 | 10.38 | 0.33 | 10.46 | 10.48 | 0.13 | 9.88 | 10.32 | 0.97 |
| TPROV | 4.26 | 3.00 | 1.84 | 4.35 | 4.51 | 2.05 | 2.58 | 1.00 | 1.92 | 4.19 | 3.00 | 1.89 |
| DISCACC | 7.00 | 7.00 | 0.00 | 11.96 | 11.00 | 2.32 | 13.33 | 14.00 | 1.51 | 8.96 | 7.00 | 3.05 |
| TAXPROV | 0.79 | 0.00 | 1.15 | 2.68 | 2.72 | 2.42 | n.a. | n.a. | n.a. | 0.92 | 0.00 | 1.59 |
| CAPRQ | 6.00 | 6.00 | 0.00 | 4.35 | 4.00 | 2.13 | 3.33 | 3.00 | 0.76 | 5.10 | 6.00 | 2.09 |
| SPOWER | 44.00 | 44.00 | 0.00 | 25.55 | 23.00 | 7.33 | 24.00 | 23.00 | 2.27 | 33.86 | 37.00 | 11.55 |
| GOVINT | 17.00 | 17.00 | 0.00 | 21.49 | 18.00 | 8.36 | 21.67 | 20.00 | 3.78 | 16.57 | 17.00 | 7.29 |
| MACGDP | 137.56 | 139.74 | 17.71 | 99.88 | 71.24 | 80.55 | 128.83 | 132.62 | 42.06 | 103.27 | 117.00 | 64.55 |
| PREMGDP | 8.94 | 8.97 | 0.72 | 8.98 | 7.09 | 5.20 | 7.25 | 7.41 | 0.94 | 7.37 | 8.76 | 4.23 |
| CATH | 31.74 | 30.00 | 5.09 | 39.64 | 35.00 | 30.63 | 28.27 | 29.60 | 3.61 | 28.22 | 30.00 | 28.45 |
| MUSL | 0.78 | 0.80 | 0.06 | 5.27 | 0.10 | 20.38 | 0.18 | 0.20 | 0.07 | 13.90 | 0.80 | 30.34 |
| PROT | 42.13 | 43.60 | 4.29 | 28.48 | 16.10 | 26.70 | 25.26 | 23.50 | 4.77 | 21.92 | 16.10 | 21.13 |

Notes: Statistics calculated on the basis of firm-level yearly observations that are available per variable and geographical region.

Table 2 – Correlation matrix (Raw Data)

| | NPWTA | SOLV | LNTA | LIFE | NLIFE | NCTA | GDPGR | RQUAL | RLAW | COR | EFI | COMLAW |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| NPWTA | 1.000*** | | | | | | | | | | | |
| SOLV | 0.164*** | 1.000*** | | | | | | | | | | |
| LNTA | -0.218*** | -0.547*** | 1.000*** | | | | | | | | | |
| LIFE | -0.107*** | -0.349*** | 0.231*** | 1.000*** | | | | | | | | |
| NLIFE | 0.208*** | 0.447*** | -0.323*** | -0.686*** | 1.000 | | | | | | | |
| NCTA | 0.920*** | 0.078*** | -0.080*** | -0.057*** | 0.152*** | 1.000 | | | | | | |
| GDPGR | 0.007 | 0.280*** | -0.331*** | -0.121*** | 0.084*** | -0.064*** | 1.000 | | | | | |
| RQUAL | -0.073*** | -0.351*** | 0.582*** | 0.139*** | -0.067*** | 0.070*** | -0.386*** | 1.000 | | | | |
| RLAW | -0.092*** | -0.363*** | 0.591*** | 0.121*** | -0.080*** | 0.056*** | -0.394*** | 0.948*** | 1.000 | | | |
| COR | -0.099*** | -0.325*** | 0.573*** | 0.127*** | -0.071*** | 0.048*** | -0.348*** | 0.943*** | 0.952*** | 1.000 | | |
| EFI | -0.004 | -0.267*** | 0.450*** | 0.185*** | -0.035*** | 0.111*** | -0.404*** | 0.889*** | 0.840*** | 0.817*** | 1.000 | |
| COMLAW | 0.009 | 0.154*** | 0.014 | 0.055*** | 0.090*** | 0.042*** | -0.065*** | 0.253*** | 0.233*** | 0.237*** | 0.395*** | 1.000 |
| GDPCAP | -0.053*** | -0.297*** | 0.593*** | 0.087*** | -0.047*** | 0.085*** | -0.337*** | 0.879*** | 0.866*** | 0.861*** | 0.774*** | 0.145 |
| TPROV | -0.088*** | -0.290*** | 0.145*** | 0.733*** | -0.706*** | -0.047** | -0.031 | -0.016 | -0.024 | -0.047** | -0.029 | 0.084 |
| DISCAUD | -0.093*** | 0.192*** | -0.212*** | -0.182*** | -0.034*** | -0.118*** | 0.135*** | -0.330*** | -0.331*** | -0.252*** | -0.457*** | -0.428*** |
| TAXPROV | -0.099*** | -0.340*** | 0.237*** | 0.499*** | -0.573*** | -0.046** | -0.190*** | 0.049*** | 0.017 | 0.014 | 0.004 | -0.325*** |
| SPOWER | 0.066*** | -0.077*** | 0.258*** | 0.171*** | 0.110*** | 0.136*** | -0.288*** | 0.735*** | 0.697*** | 0.656*** | 0.817*** | 0.595*** |
| CAPRQ | 0.121*** | 0.050*** | -0.108*** | 0.063*** | 0.015 | 0.121*** | -0.052*** | 0.051*** | -0.036** | 0.055*** | 0.138*** | -0.059*** |
| GOVINT | 0.021 | -0.157*** | 0.043** | 0.074*** | -0.231*** | 0.037** | -0.160*** | -0.067*** | -0.009 | -0.051*** | 0.022 | -0.423*** |
| MACGDP | -0.047*** | -0.127*** | 0.346*** | 0.089*** | -0.047*** | 0.044*** | -0.231*** | 0.530*** | 0.517*** | 0.512*** | 0.569*** | 0.312*** |
| PREMGDP | -0.057*** | -0.293*** | 0.509*** | 0.106*** | -0.045*** | 0.024 | -0.300*** | 0.676*** | 0.668*** | 0.639*** | 0.623*** | 0.213*** |
| CATH | 0.050*** | -0.193*** | 0.090*** | 0.120*** | -0.130*** | 0.046*** | -0.198*** | 0.116*** | -0.011 | 0.070*** | 0.110*** | -0.332*** |
| MUSL | -0.066*** | 0.439*** | -0.414*** | -0.184*** | 0.052*** | -0.089*** | 0.360*** | -0.499*** | -0.417*** | -0.395*** | -0.469*** | 0.027* |
| PROT | 0.024 | -0.228*** | 0.379*** | 0.136*** | -0.007 | 0.114*** | -0.327*** | 0.650*** | 0.657*** | 0.678*** | 0.651*** | 0.334*** |

Table 2: Correlation Coefficients (Raw Data) – continue

| | GDPCAP | TPROV | DISCAUD | TAXPROV | SPOWER | CAPRQ | GOVINT | MACGDP | PREMGDP | CATH | MUSL | PROT |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| GDPCAP | 1.000 | | | | | | | | | | | |
| TPROV | -0.026 | 1.000 | | | | | | | | | | |
| DISCAUD | -0.154*** | -0.061*** | 1.000 | | | | | | | | | |
| TAXPROV | 0.092*** | 0.553*** | 0.250*** | 1.000 | | | | | | | | |
| SPOWER | 0.617*** | -0.012 | -0.533*** | -0.099*** | 1.000 | | | | | | | |
| CAPRQ | 0.239*** | -0.177*** | 0.256*** | 0.124*** | 0.170*** | 1.000 | | | | | | |
| GOVINT | 0.030 | -0.140*** | 0.202*** | 0.413*** | -0.049** | 0.279*** | 1.000 | | | | | |
| MACGDP | 0.529*** | 0.071*** | -0.256*** | -0.038** | 0.391*** | 0.007 | -0.059*** | 1.000 | | | | |
| PREMGDP | 0.677*** | -0.007 | -0.291*** | 0.063** | 0.498*** | 0.001 | -0.006 | 0.607*** | 1.000 | | | |
| CATH | 0.054*** | -0.018 | 0.312*** | 0.412*** | -0.164*** | 0.353*** | 0.419*** | -0.097*** | -0.118*** | 1.000 | | |
| MUSL | -0.343*** | -0.088*** | 0.302*** | -0.113*** | -0.281*** | 0.130*** | 0.081*** | -0.184*** | -0.444*** | -0.411*** | 1.000 | |
| PROT | 0.543*** | -0.006 | -0.439*** | -0.120*** | 0.704*** | 0.244*** | -0.132*** | 0.395*** | 0.376*** | 0.007 | -0.427*** | 1.000 |

Notes: Correlation Coefficients calculated on the basis of firm-level yearly observations; *** Statistically significant at the 1% level. ** Statistically significant at the 5% level. * Statistically significant at the 10% level.

Table 3: Results from Variance Decomposition (Multi-level Null Model)

| | Estimate | Std. Error |
|---|---|---|
| Fixed effects | | |
| Constant | 49.547 | 2.086 |
| Random Components | | |
| Variance (residual) | 50.547 | 1.174 |
| Variance (Country-level) | 275.043 | 53.739 |
| Variance (Firm-level) | 333.203 | 18.53738 |
| Variance Decomposition | | |
| Residual | 7.7% | |
| Country-level | 41.7% | |
| Firm-level | 50.6 % | |
| LR test Estimated model vs linear regression | 8195.55 | |
| AIC | 33131.77 | |
| No. of yearly observations | 4479 | |
| No. of firms | 770 | |
| No. of countries | 87 | |

Notes: Maximum likelihood estimates from a multi-level model with fixed and random components. The dependent variable is NTRTA

Table 4: Insurance Firms income smoothing: Base Model

| | (1) | (2) |
|---|---|---|
| Fixed effects | | |
| NPWTA_firmdif | 0.053*** | 0.117*** |
| | (0.000) | (0.000) |
| SOLV_firmdif | -0.685*** | -0.653*** |
| | (0.000) | (0.000) |
| LNTA_firmdif | 0.404** | 0.289 |
| | (0.023) | (0.108) |
| LIFE_firmdif | 6.296*** | 6.012*** |
| | (0.001) | (0.001) |
| NLFIFE_firmdif | -5.688*** | -6.755*** |
| | (0.001) | (0.000) |
| NPWTA_ctrymean | 0.101* | 0.128** |
| | (0.090) | (0.035) |
| SOLV_ctrymean | -0.952*** | -0.922*** |
| | (0.000) | (0.000) |
| LNTA_ctrymean | 1.077** | 1.338** |
| | (0.036) | (0.010) |
| LIFE_ctrymean | 0.283 | -1.720 |
| | (0.942) | (0.660) |
| NLFIFE_ctrymean | -1.991 | -2.863 |
| | (0.512) | (0.341) |
| GDPGR | 0.051 | 0.026 |
| | (0.138) | (0.420) |
| Constant | 52.600*** | 52.637*** |
| | (0.000) | (0.000) |
| Random Effects parameters | | |
| Var (residual) | 29.628 | 23.925 |
| | [0.694] | [0.602] |
| Var (Country-level) | 12.490 | 15.760 |
| | [5.773] | [6.838] |
| Var (Firm-level) | 145.912 | 119.032 |
| | [8.566] | [7.938] |
| Var (NPWTA_firmdif) | | 0.093 |
| | | [0.012] |
| Covariance (NPWTA_firmdif, intercept) | | -0.227 |
| | | [0.222] |
| LR test Estimated Models vs linear regression | 4920.19*** | 5348.22*** |
| | (0.000) | (0.000) |
| LR test Random slope & intercept vs Random intercept only | | 428.03*** |
| | | (0.000) |
| AIC | 30444.94 | 30020.91 |
| No. of yearly observations | 4479 | 4479 |
| No. of firms | 770 | 770 |
| No. of countries | 87 | 87 |

Notes: Maximum likelihood estimates from a multi-level model with fixed and random components. The dependent variable is NTRTA. The suffix "_firmdif" indicates firm-level group mean centered variables. The suffix "_ctrymean" indicates grand mean centered averages of corresponding firm-level variables. P-value in parenthesis. *** Statistically significant at the 1% level. ** Statistically significant at the 5% level. * Statistically significant at the 10% level.

Table 5: Insurance firms' income smoothing and institutional environment variables

| | (1) | (2) | (3) | | (4) | (5) |
|---|---|---|---|---|---|---|
| NPWTA_firmdif | 0.112*** | 0.102*** | 0.115*** | 0.123*** | 0.108*** | 0.106*** |
| | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) |
| SOLV_firmdif | -0.653*** | -0.650*** | -0.653*** | -0.652*** | -0.634*** | -0.639*** |
| | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) |
| LNTA_firmdif | 0.291 | 0.288 | 0.314* | 0.308* | 0.359* | 0.142 |
| | (0.105) | (0.110) | (0.085) | (0.085) | (0.052) | (0.481) |
| LIFE_firmdif | 5.888*** | 5.726*** | 6.211*** | 5.851*** | 6.314*** | 6.548*** |
| | (0.001) | (0.002) | (0.001) | (0.001) | (0.000) | (0.000) |
| NLFIFE_firmdif | -6.694*** | -6.497*** | -6.559*** | -6.943*** | -6.983*** | -7.147*** |
| | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) |
| NPWTA_ctrymean | 0.139** | 0.123** | 0.134** | 0.126** | 0.124* | 0.138** |
| | (0.021) | (0.047) | (0.027) | (0.041) | (0.054) | (0.025) |
| SOLV_ctrymean | -0.914*** | -0.920*** | -0.922*** | -0.922*** | -0.913*** | -0.927*** |
| | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) |
| LNTA_ctrymean | 1.138** | 1.371** | 1.208** | 1.326** | 1.456*** | 0.770 |
| | (0.031) | (0.010) | (0.023) | (0.011) | (0.008) | (0.178) |
| LIFE_ ctrymean | -2.142 | -1.851 | -1.845 | -1.754 | -1.492 | -1.095 |
| | (0.579) | (0.635) | (0.636) | (0.660) | (0.713) | (0.781) |
| NLFIFE_ctrymean | -3.039 | -2.800 | -2.993 | -2.926 | -2.806 | -3.375 |
| | (0.306) | (0.352) | (0.319) | (0.331) | (0.385) | (0.274) |
| GDPGR | 0.018 | 0.027 | 0.022 | 0.024 | 0.023 | 0.032 |
| | (0.579) | (0.407) | (0.507) | (0.464) | (0.483) | (0.319) |
| RQUAL | 1.141* | | | | | |
| | (0.074) | | | | | |
| NPWTA_firmdif*RQUAL | -0.027 | | | | | |
| | (0.128) | | | | | |
| RLAW | | -0.121 | | | | |
| | | (0.851) | | | | |
| NPWTA_firmdif*RLAW | | -0.066*** | | | | |
| | | (0.000) | | | | |
| COR | | | 0.471 | | | |
| | | | (0.308) | | | |
| NPWTA_firmdif*COR | | | -0.054 | | | |
| | | | (0.517) | | | |
| COMLAW | | | | -0.067 | | |
| | | | | (0.966) | | |
| NPWTA_firmdif*COMLAW | | | | -0.164*** | | |
| | | | | (0.000) | | |
| EFI | | | | | -0.023 | |
| | | | | | (0.567) | |
| NPWTA_firmdif*EFI | | | | | -0.009*** | |
| | | | | | (0.000) | |
| GDPCAP | | | | | | 1.778*** |
| | | | | | | (0.002) |
| NPWTA_firmdif*GDPCAP | | | | | | -0.069*** |
| | | | | | | (0.000) |
| Constant | 52.880*** | 52.602*** | 52.699*** | 52.609*** | 52.500*** | 52.850*** |
| | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) |
| LR test Estimated Model vs Linear Regression | 5276.07*** (0.000) | 5292.11*** (0.000) | 5349.64*** (0.000) | 5333.85*** (0.000) | 5033.1*** (0.000) | 5068.74*** (0.000) |
| LR test Random slope & intercept vs Random intercept only | 401.89*** (0.000) | 402.44*** (0.000) | 423.46*** (0.000) | 403.85*** (0.000) | 405.57*** (0.000) | 436.42*** (0.000) |
| AIC | 30019.21 | 30009.12 | 30023.46 | 30005.75 | 28074.07 | 28004.32 |
| No. of yearly observations | 4479 | 4479 | 4479 | 4479 | 4212 | 4201 |

| | | | | | | |
|---|---|---|---|---|---|---|
| No. of firms | 770 | 770 | 770 | 770 | 728 | 728 |
| No. of countries | 87 | 87 | 87 | 87 | 83 | 84 |

Notes: Maximum likelihood estimates from a multi-level model with fixed effects, random intercepts for countries and firms & a random slope for NPWTA_lifedif. The dependent variable is NTRTA. The suffix "_firmdif" indicates firm-level group mean centered variables. The suffix "_ctrymean" indicates grand mean centered averages of corresponding firm-level variables. The random effects parameters are not shown to conserve space. They are available from the authors upon request. P-value in parenthesis. *** Statistically significant at the 1%, ** Statistically significant at the 5%, * Statistically significant at the 10%.

Table 6: Insurance firms' income smoothing and regulatory variables

| | (1) | (2) | (3) | (4) | (5) | (6) |
|---|---|---|---|---|---|---|
| NPWTA_firmdif | 0.065*** | 0.052** | 0.064*** | 0.062*** | 0.050** | 0.062*** |
| | (0.003) | (0.011) | (0.002) | (0.002) | (0.015) | (0.002) |
| SOLV_firmdif | -0.722*** | -0.730*** | -0.704*** | -0.708*** | -0.733*** | -0.707*** |
| | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) |
| LNTA_firmdif | 0.278 | 0.017 | 0.104 | 0.113 | 0.023 | 0.137 |
| | (0.249) | (0.945) | (0.644) | (0.610) | (0.924) | (0.536) |
| LIFE_firmdif | 1.526 | 1.927 | 4.014 | 1.941 | 2.129 | 1.897 |
| | (0.570) | (0.415) | (0.115) | (0.414) | (0.365) | (0.424) |
| NLFIFE_firmdif | -9.798*** | -8.802*** | -9.107*** | -8.693*** | -8.463*** | -8.748*** |
| | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) |
| NPWTA_ctrymean | 0.004 | -0.033 | 0.012 | 0.002 | -0.007 | 0.000 |
| | (0.963) | (0.640) | (0.865) | (0.980) | (0.923) | (0.998) |
| SOLV_ctrymean | -0.882*** | -0.962*** | -0.921*** | -0.931*** | -0.922*** | -0.928*** |
| | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) |
| LNTA_ctrymean | 0.755 | 0.462 | 0.792 | 0.519 | 0.649 | 0.479 |
| | (0.322) | (0.458) | (0.229) | (0.447) | (0.360) | (0.474) |
| LIFE_ctrymean | -1.913 | -3.010 | 0.421 | 0.026 | -1.297 | 0.984 |
| | (0.711) | (0.522) | (0.936) | (0.996) | (0.806) | (0.843) |
| NLFIFE_ctrymean | -2.631 | -0.447 | -3.087 | -1.811 | -1.187 | -2.944 |
| | (0.499) | (0.896) | (0.382) | (0.613) | (0.753) | (0.412) |
| GDPGR | 0.008 | 0.050 | 0.049 | 0.043 | 0.051 | 0.037 |
| | (0.859) | (0.264) | (0.251) | (0.313) | (0.253) | (0.389) |
| TPROV | -0.158 | | | | | |
| | (0.695) | | | | | |
| NPWTA_firmdif*TPROV | -0.034*** | | | | | |
| | (0.003) | | | | | |
| DISCAUD | | -0.373* | | | | |
| | | (0.060) | | | | |
| NPWTA_firmdif*DISCAUD | | 0.021*** | | | | |
| | | (0.002) | | | | |
| PROVTAX | | | -0.606 | | | |
| | | | (0.127) | | | |
| NPWTA_firmdif*PROVTAX | | | 0.007 | | | |
| | | | (0.588) | | | |
| CAPRQ | | | | 0.044 | | |
| | | | | (0.874) | | |
| NPWTA_firmdif*CAPRQ | | | | -0.003 | | |
| | | | | (0.778) | | |
| SPOWER | | | | | 0.006 | |
| | | | | | (0.935) | |
| NPWTA_firmdif*SPOWER | | | | | -0.005*** | |
| | | | | | (0.001) | |
| GOVINT | | | | | | -0.133* |
| | | | | | | (0.064) |
| NPWTA_firmdif*GOVINT | | | | | | 0.001 |
| | | | | | | (0.697) |
| Constant | 53.051*** | 53.774*** | 52.975*** | 52.998*** | 53.008*** | 53.202*** |
| | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) |
| LR test Estimate Model | 2892.7*** | 2780.73*** | 3382.72*** | 3263.21*** | 2768.29*** | 3330.2*** |
| vs Linear Regression | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) |
| LR test Random intercept only | 225.36*** | 200.9*** | 207.75*** | 221.62*** | 206.92*** | 220.36*** |
| vs Random slope & intercept | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) |
| AIC | 17505.23 | 17383.2 | 20487.6 | 20420.16 | 17401.56 | 20416.63 |
| Number of yearly observations | 2615 | 2592 | 3041 | 3041 | 2594 | 3041 |
| Number of firms | 454 | 455 | 520 | 517 | 456 | 517 |
| Number of countries | 42 | 42 | 46 | 45 | 43 | 45 |

Notes: Maximum likelihood estimates from a multi-level model with fixed effects, random intercepts for countries and firms & a random slope for NPWTA_lifedif. The dependent variable is NTRTA. The suffix "_firmdif" indicates firm-level group mean centered variables. The suffix "_ctrymean" indicates grand mean centered averages of corresponding firm-level variables. The random effects parameters are not shown to conserve space. They are available from the authors upon request. P-value in parenthesis. *** Statistically significant at the 1%, ** Statistically significant at the 5%, * Statistically significant at the 10%.

Appendix I – Selected additional regressions

| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
|---|---|---|---|---|---|---|---|---|
| NPWTA_firmdif | 0.064*** | 0.068*** | 0.062*** | 0.121*** | 0.094*** | 0.112*** | 0.105*** | |
| | (0.002) | (0.002) | (0.003) | (0.000) | (0.000) | (0.000) | (0.000) | |
| SOLV_firmdif | -0.747*** | -0.745*** | -0.628*** | -0.671*** | -0.680*** | -0.647*** | -0.654*** | -0.042*** |
| | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) |
| LNTA_firmdif | 0.164 | 0.047 | 0.430** | 0.327 | 0.460** | 0.287 | 0.234 | -0.180*** |
| | (0.513) | (0.861) | (0.017) | (0.109) | (0.024) | (0.109) | (0.191) | (0.002) |
| LIFE_firmdif | 0.273 | -0.015 | 6.277*** | 6.596*** | 6.004*** | 5.801*** | | 0.014 |
| | (0.919) | (0.995) | (0.001) | (0.000) | (0.002) | (0.002) | | (0.972) |
| NLFIFE_firmdif | -9.867*** | -9.623*** | -6.803*** | -7.024*** | -6.351*** | -6.664*** | -9.869*** | 0.757** |
| | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.045) |
| NPWTA_ctrymean | -0.052 | -0.018 | -0.109 | 0.128** | 0.084 | 0.119* | 0.112* | |
| | (0.446) | (0.809) | (0.363) | (0.036) | (0.213) | (0.056) | (0.065) | |
| SOLV_ctrymean | -0.964*** | -0.895*** | -0.933*** | -0.907*** | -0.955*** | -0.918*** | -0.920*** | -0.023 |
| | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.229) |
| LNTA_ctrymean | 0.430 | 0.385 | 0.827 | 1.380** | 1.057* | 1.382*** | 1.213** | -0.140 |
| | (0.537) | (0.619) | (0.140) | (0.011) | (0.084) | (0.007) | (0.020) | (0.208) |
| LIFE_ctrymean | -2.943 | -3.060 | -0.330 | -2.086 | -4.019 | -1.266 | | 0.031 |
| | (0.523) | (0.550) | (0.933) | (0.598) | (0.340) | (0.752) | | (0.974) |
| NLFIFE_ctrymean | 0.601 | -1.503 | -3.363 | -2.663 | -0.565 | -2.934 | -2.638 | 1.051 |
| | (0.861) | (0.691) | (0.260) | (0.393) | (0.870) | (0.332) | (0.376) | (0.105) |
| GDPGR | 0.001 | 0.014 | 0.040 | 0.027 | -0.011 | 0.024 | 0.024 | -0.002 |
| | (0.981) | (0.775) | (0.214) | (0.463) | (0.769) | (0.451) | (0.463) | (0.939) |
| TPROV | -0.167 | -0.036 | | | | | | |
| | (0.666) | (0.929) | | | | | | |
| NPWTA_firmdif*TPROV | -0.030*** | -0.029** | | | | | | |
| | (0.007) | (0.011) | | | | | | |
| DISCAUD | -0.440** | -0.468** | | | | | | |
| | (0.029) | (0.034) | | | | | | |
| NPWTA_firmdif*DISCAUD | 0.021** | 0.020** | | | | | | |
| | (0.012) | (0.016) | | | | | | |
| SPOWER | -0.064 | -0.089 | | | | | | |
| | (0.377) | (0.281) | | | | | | |
| NPWTA_firmdif*SPOWER | -0.005** | -0.001 | | | | | | |
| | (0.12) | (0.544) | | | | | | |
| GDPCAP | | 1.457* | | | | | | |
| | | (0.079) | | | | | | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| NPWTA_firmdif*GDPCAP | | -0.065*** | | | | | | |
| | | (0.004) | | | | | | |
| NCTA_firmdif | | | 0.115*** | | | | | |
| | | | (0.000) | | | | | |
| NCTA_ctrmean | | | 0.450** | | | | | |
| | | | (0.019) | | | | | |
| MACGDP | | | | 0.005 | | | | |
| | | | | (0.110) | | | | |
| NPWTA_firmdif*MACGDP | | | | 0.000 | | | | |
| | | | | (0.187) | | | | |
| PREMGDP | | | | | 0.088 | | | |
| | | | | | (0.412) | | | |
| NPWTA_firmdif*PREMGDP | | | | | -0.007** | | | |
| | | | | | (0.047) | | | |
| CATH | | | | | | -0.051** | | |
| | | | | | | (0.030) | | |
| MUSL | | | | | | -0.027 | | |
| | | | | | | (0.371) | | |
| PROT | | | | | | -0.042 | | |
| | | | | | | (0.262) | | |
| NPWTA_firmdif*CATH | | | | | | -0.001 | | |
| | | | | | | (0.325) | | |
| NPWTA_firmdif*MUSL | | | | | | 0.000 | | |
| | | | | | | (0.769) | | |
| NPWTA_firmdif*PROT | | | | | | -0.002** | | |
| | | | | | | (0.022) | | |
| NPWTA_firmdif* NLFIFE_firmdif | | | | | | | 0.162*** | |
| | | | | | | | (0.000) | |
| NPWTACH_firmdif | | | | | | | | 0.333*** |
| | | | | | | | | (0.000) |
| NPWTACH_ctrymean | | | | | | | | -0.017 |
| | | | | | | | | (0.857) |
| Constant | 53.307*** | 53.200*** | 53.374*** | 52.928*** | 53.364*** | 52.585*** | 52.439*** | 0.300 |
| | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.115) |
| LR test Estimates Model | 2571.17*** | 2574.31*** | 5297*** | 4711.34*** | 4221*** | 5162*** | 5353.34*** | 628.07*** |
| vs linear regression | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) |
| LR test Random intercept only | 188.65*** | 197.68*** | 474.1*** | 419.4*** | 335.6*** | 382.5*** | 391.99*** | 619.82*** |
| vs Random slope | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) |
| AIC | 16211 | 16202.92 | 29571 | 26886.25 | 24377 | 29960 | 30015.99 | 23178.61 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Number of yearly observations | 2412 | 2412 | 4422 | 4013 | 3646 | 4470 | 4479 | 3685 |
| Number of firms | 430 | 430 | 761 | 716 | 655 | 767 | 770 | 734 |
| Number of countries | 41 | 41 | 86 | 82 | 71 | 86 | 87 | 87 |

Notes: Notes: Maximum likelihood estimates from a multi-level model with fixed effects, random intercepts for countries and firms & a random slope for NPWTA_lifedif. In columns (1) to (7) the dependent variable is NTRTA. In column (8) the dependent variable is NTRTACH that is the first difference of NTRTA (i.e. from one year to another), the main independent variable of interest is NPWTACH that is the first difference of NPWTA (i.e. from one year to another), and the specification includes a random slope for NPWTACH_lifedif. The suffix "_firmdif" indicates firm-level group mean centered variables. The suffix "_ctrymean" indicates grand mean centered averages of corresponding firm-level variables. The random effects parameters are not shown to conserve space. They are available from the authors upon request. P-value in parenthesis. *** Statistically significant at the 1%, ** Statistically significant at the 5%, * Statistically significant at the 10%.

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