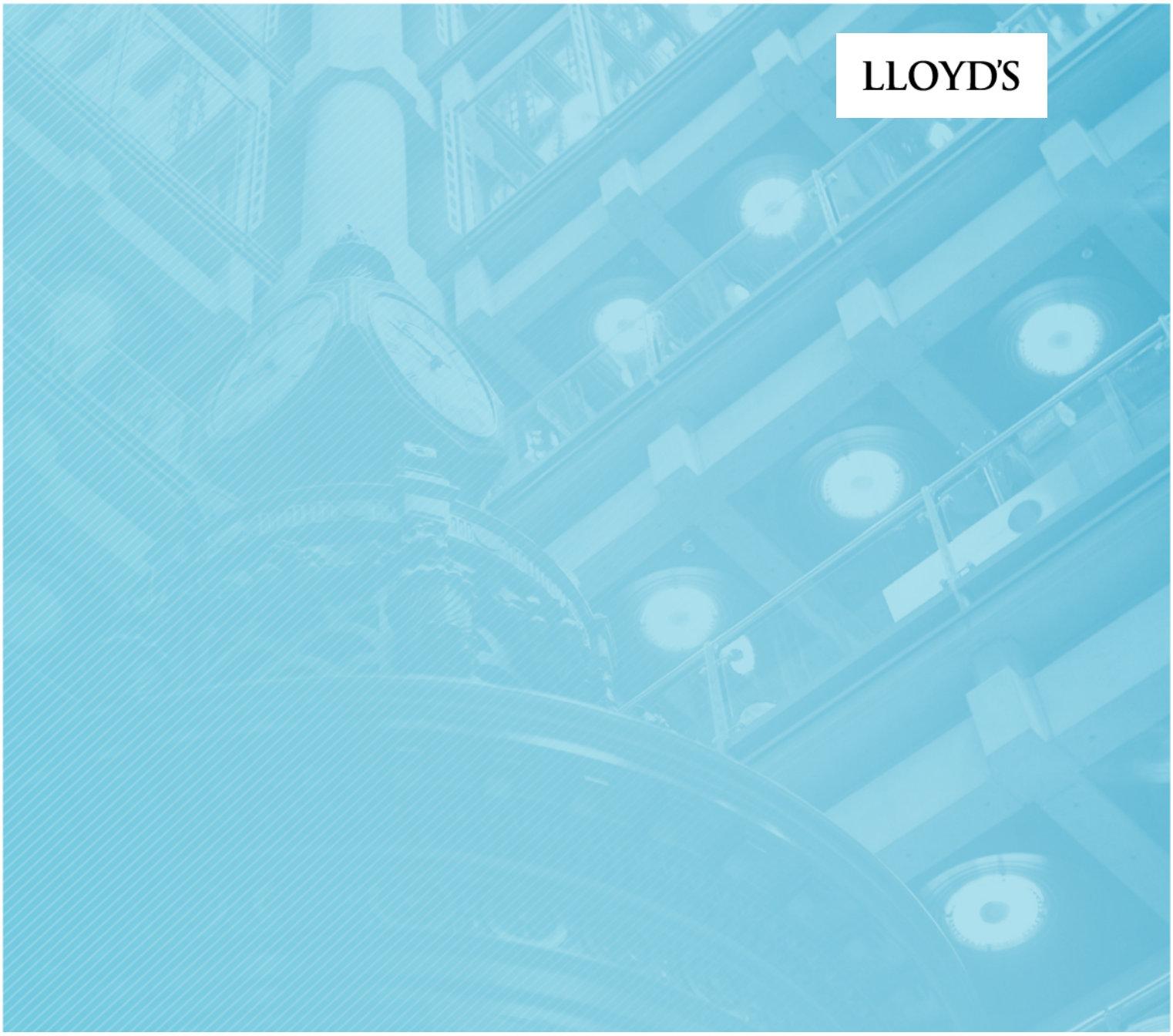

LLOYD'S

# LLOYD'S GLOBAL UNDERINSURANCE REPORT

October 2012

Cebr

Making Business Sense

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**Authorship and acknowledgements**

This report has been produced by Cebr, an independent economics and business research consultancy established in 1992. The study was led by Colin Edwards, Cebr economist, with guidance from Charles Davis, Cebr Head of Macroeconomics. The views expressed herein are those of the authors only and are based upon independent research by them.

This study has been commissioned by The Society of Lloyd's – the insurance market – and has used a combination of data provided by The Society of Lloyd's and those available in the public domain through ONS, Sigma, World Bank etc.

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London, August 2012

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# CONTENTS

# SECTION I – THE INSURANCE OF COUNTRIES

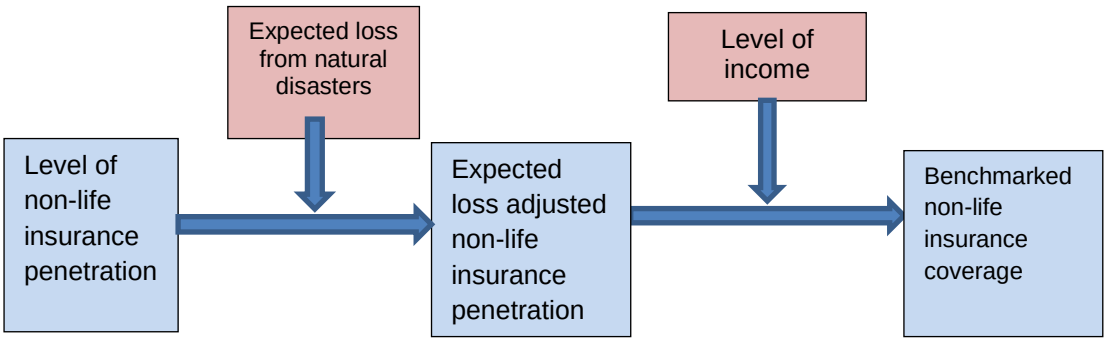
## 1.1 Introduction

This section develops a methodology for measuring country specific levels of non-life insurance[1] coverage, once controlling for the risk from natural catastrophes. In this way it is possible to establish where countries appear underinsured and therefore exposed to large uninsured losses following natural catastrophes. Furthermore, the research presents evidence of the historic uninsured loss which has emerged since 2004. We conclude by undertaking comparative analysis which relates our estimates of underinsurance to the size of uninsured losses.

## 1.2 Measuring the level of insurance

### 1.2.1 Methodology

In order to evaluate the level of non-life insurance coverage across countries, the analysis uses a process of adjustment. The initial measures of non-life insurance penetration of each country are adjusted by the expected losses resulting from natural catastrophe and the income level of the country. This process can be represented as follows:




### 1.2.2 Insurance penetration (Premiums as a % of GDP)

The insurance penetration in a country shows the level of written non-life insurance premiums in a given year compared to the GDP of the country in the same year. In order to examine the development of an insurance market within a given country, it is customary to look at the level of insurance penetration. A higher insurance penetration level would indicate a more developed insurance market within the economy. These non-life insurance penetration figures form the starting point of the analysis and provide an initial indication of the insurance of countries. Table 1 shows the rank and insurance penetration of each of the 42 countries in 2011.

The 42 countries included within this analysis provide a global picture of non-life insurance coverage. As well as accounting for over 90% of the non-life insurance premiums written in 2011[2], the countries include some of those which are most exposed to the devastating effects of natural disasters, while also representing economies at varying stages of development.

[1] Non-life insurance is defined in accordance with EU and OECD conventions, health and accident insurance are considered to belong to the non-life insurance segment, although some countries or insurance companies may employ a divergent classification (Swiss Re-Insurance Company, 2004: 28)

[2] 'World insurance in 2011' Swiss Re, *sigma* No 3/2012

**Table 1 - Rank and insurance penetration (Premiums as a % of GDP) 2011**

| Rank | Country | Insurance penetration | Rank | Country | Insurance penetration |
|---|---|---|---|---|---|
| **1** | Netherlands | 9.5 | **20** | Poland | 1.9 |
| **2** | New Zealand | 5.2 | **23** | Chile | 1.8 |
| **3** | South Korea | 4.6 | **23** | Malaysia | 1.8 |
| **4** | United States | 4.1 | **25** | Norway | 1.7 |
| **5** | Canada | 4.0 | **25** | Thailand | 1.7 |
| **6** | Germany | 3.6 | **27** | Colombia | 1.6 |
| **7** | Austria | 3.2 | **28** | United Arab Emirates | 1.5 |
| **8** | Taiwan | 3.1 | **28** | Singapore | 1.5 |
| **8** | United Kingdom | 3.1 | **28** | Brazil | 1.5 |
| **10** | Australia | 3.0 | **31** | Hong Kong | 1.4 |
| **11** | Denmark | 2.9 | **32** | China | 1.2 |
| **12** | Spain | 2.7 | **33** | Turkey | 1.1 |
| **12** | South Africa | 2.7 | **33** | Mexico | 1.1 |
| **14** | Israel | 2.4 | **35** | Saudi Arabia | 1.0 |
| **15** | Italy | 2.3 | **36** | Vietnam | 0.9 |
| **15** | Russia | 2.3 | **37** | India | 0.7 |
| **15** | Argentina | 2.3 | **38** | Indonesia | 0.6 |
| **18** | Ireland | 2.2 | **39** | Nigeria | 0.5 |
| **18** | Japan | 2.2 | **40** | Philippines | 0.4 |
| **20** | France | 1.9 | **40** | Egypt | 0.4 |
| **20** | Sweden | 1.9 | **42** | Bangladesh | 0.2 |

*Source: SIGMA World insurance in 2011, CEBR analysis*

These levels give an initial indication as to how well-insured each of the countries is. However, these figures do not account for the relative risks faced by each of the countries, or for the fact that the countries are at different stages of development. The treatment of these factors is considered through measures of the expected loss and income per capita which follow.

## 1.3 Adjusting insurance penetration levels for risk

### 1.3.1 Expected loss

In order to assess how well insured a country is, a measure of the risks which the country faces is needed. This stage of the analysis makes use of publically available data from the EM-DAT database.[3] From this database, Cebr obtained data relating to the 10 most costly – natural catastrophes occurring in each country by economic loss[4] between 1900 and 2012.

Based on this information, the cost of each catastrophe was calculated as a proportion of the nominal GDP of each country in the year in which the catastrophe took place. The average loss as a proportion of GDP was calculated based on the figures for these ten events in each country.

In order to assess how often significant natural catastrophes occur – those which are costly enough to be contained within the ten most damaging – the difference between the earliest and most recently occurring catastrophes, divided by the number of catastrophes (i.e. ten), was taken to be a measure of the frequency of catastrophes. This estimates the time period, in years, over which a significant natural catastrophe would be expected to occur. Based upon these figures, the expected loss per year, as a proportion of GDP, was calculated for each country.

This calculation is an approximation of the expected loss occurring in a given country in a given year. This can be viewed as:

$$Probability\ of\ natural\ disaster\ \mathbf{X}\ Cost\ associated\ with\ natural\ disaster\ =\ Expected\ loss\ of\ disaster$$

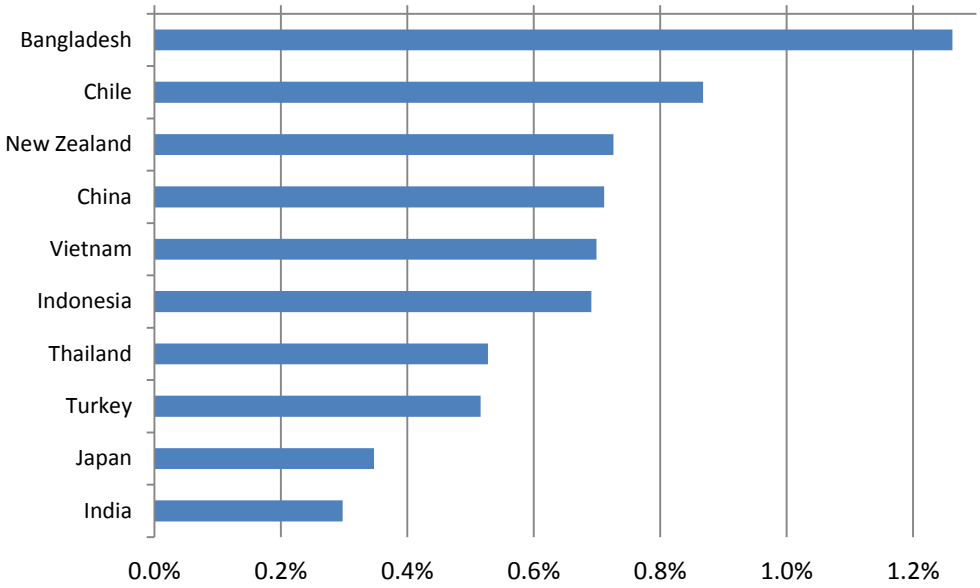
What this means, for example, is that if the probability of a natural catastrophe occurring in a given year is 1/100 and the cost associated with the catastrophe is $100m, then the expected cost of natural catastrophe in that year would be $1m.

The ten countries with the highest annual expected losses, as a proportion of GDP for the sampled countries are shown in Figure 1. The expected losses of Bangladesh are by far the highest in terms of its GDP.

[3] *"EM-DAT: The OFDA/CRED International Disaster Database www.em-dat.net - Université Catholique de Louvain - Brussels – Belgium," accessed May 2012*

[4] This is defined within the EM-DAT database simply as the value of all damages and economic losses directly or indirectly related to the disaster.

**Figure 1 - Countries with highest expected losses per annum (% of GDP)**




*Source: EM-DAT, CEBR analysis*

Adjusting the insurance penetration levels by the expected losses resulting from natural catastrophes allows the insurance penetration levels across countries to be standardised and compared more easily, and, critically allows us to consider penetration in relation to a country's vulnerability to natural catastrophe. So, for example, it follows from Figure 1 that in order for Bangladesh to be considered as well insured as India, Bangladesh must have a higher level of insurance penetration.

### 1.3.2 Expected loss adjusted insurance penetration

This stage of the analysis makes use of data obtained from the Swiss Re Sigma World Insurance annual reports. Insurance penetration figures are taken directly from these reports. These figures were then adjusted based on the expected loss figures calculated previously. Underlying this methodology is the assumption that in an efficient insurance market the cost of insurance – the insurance premium – should be equal to the expected loss incurred by the party insured if the event which they are insuring against were to occur. This means that:

***Expected loss = Insurance Premium***

This relationship makes the assumption that consumers of insurance are both rational and risk neutral – this implies that the consumer would only insure to the point that the benefit of insurance – the mitigation of risk – is equal to its cost. In an efficient insurance market, competition between insurers would be expected to produce this outcome.[5]

The extent to which the insured party is under or over insured can therefore be calculated by looking at whether this equality holds. If the expected loss is greater than the insurance premiums, the insured party is underinsured. If the expected loss is less than the insurance premiums – particularly over a long period of time - then the party is inefficiently insured.

[5] Consumers may gain a greater benefit from insurance than this equation allows. The extra peace of mind, for example, may induce the consumer of insurance to be prepared to pay a price greater than the expected cost of the insurable event. However, the expected cost is the lowest point at which the insurer could profitably supply insurance in the long term, which allows for this equation to hold in the long term. Empirical evidence further suggests that insurance premiums approximate to the expected losses, whereby insurance premiums approximate to insurance claims – see 'Section III – The contribution of non-life insurance to the economy' of this research for evidence from the UK.

The optimal expenditure on insurance against the risk of natural catastrophe in a given year is the expected loss resulting from natural catastrophes in that year. Subtracting the expected loss as a proportion of GDP for each country from the insurance penetration figures for each country provides an estimate of the insurance penetration of each country, after accounting for the optimal insurance against the risks associated with natural catastrophes. This can be represented as:

$$\boldsymbol{Insurance\ penetration}\ (\boldsymbol{proportion\ of\ GDP}) - \boldsymbol{expected\ loss}\ (\boldsymbol{proportion\ of\ GDP}) = \boldsymbol{expected\ loss\ adjusted\ insurance\ penetration}$$

Since non-life insurance does not only cover losses incurred as a result of natural catastrophes, this figure would be expected to be positive except in extreme cases. The equation immediately allows us to see countries whose penetration is not adequate for the expected levels of loss, and which are therefore likely to face higher uninsured losses as a result of natural catastrophes occurring in that country.

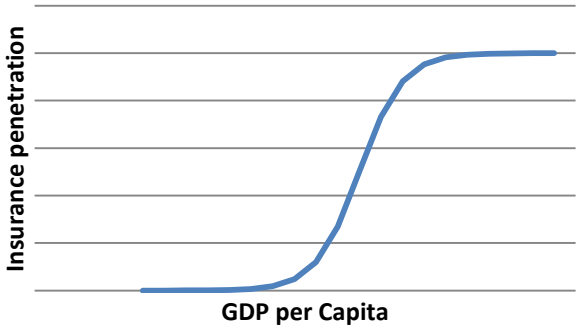
## 1.4 Assessing levels of underinsurance

### 1.4.1 Adjusting for income levels

As countries become wealthier the demand for non-life insurance increases. This means that a country with a higher level of income would be expected to have a higher level of non-life insurance coverage. It is well documented amongst insurance related literature that insurance penetration follows an S-curve relationship against GDP per capita,[6] such as that shown in Figure 2.

This relationship needs to be accounted for when comparing the insurance levels of countries. Therefore in order to calculate the underinsurance of each country, a suitable benchmark is required as a means of comparison.

**Figure 2 - S curve relationship**




*Source: CEBR analysis*

As a country's GDP per capita increases, it would be expected to demonstrate an increase in insurance penetration. Initially this increase would be somewhat subdued, before increasing more rapidly and then slowing again. For this reason it would be expected that two countries facing identical risks and with the same level of GDP, but with *different GDP per capita* would have different levels of insurance penetration. In order to account for this S-curve relationship the sampled countries have been grouped according to their GDP per capita in 2010[7].

### 1.4.2 Benchmarked insurance coverage

To account for the relationship between non-life insurance penetration and GDP per capita, we identified the three countries facing the lowest expected loss resulting from natural catastrophe within three groups (low, medium and high income). The average insurance penetration of these countries over the period 2004-2011[8] provides an estimate of the minimum requirement for a country in this income group to be considered adequately insured.

These countries provide a suitable benchmark since they are the least likely to be underinsured against natural disasters and therefore represent insurance penetration levels which countries at similar income levels should be expected to meet at a minimum. An average of three low risk countries over the period is taken in order to minimise the risk of distortion in the analysis resulting from exceptional insurance levels in any one country.

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[6] See for example 'The S-curve relationship between per capita income and insurance penetration', Rudolf Enz, *The Geneva papers on risk and insurance, vol 35, no.3, July 2000.*

[7] The grouping of the countries is shown within *Appendix A – Income classifications.*

[8] The time period 2004-2011 is used due to restrictions in the availability of data relating to historic insured and uninsured losses.

Table 2 shows the countries identified as being the ***benchmark requirements*** in each income classification.

**Table 2 - Benchmark requirements for insurance coverage**[9]

| Benchmarks | Countries | GDP per capita 2010 ($US) | Average non-life insurance penetration 2004-2011 | Expected loss | Expected loss adjusted non-life insurance penetration | Benchmark requirement |
|---|---|---|---|---|---|---|
| High income | Hong Kong | $31,575 | 1.3% | 0.01% | 1.3% | 1.5% |
| | Singapore | $43,865 | 1.5% | 0.00% | 1.5% | |
| | United Arab Emirates | $57,043 | 1.6% | 0.00% | 1.6% | |
| Middle income | Israel | $29,264 | 2.8% | 0.06% | 2.9% | 1.9% |
| | Russia | $10,408 | 2.3% | 0.06% | 2.2% | |
| | Saudi Arabia | $16,377 | 0.7% | 0.03% | 0.6% | |
| Low income | Egypt | $2,808 | 0.5% | 0.18% | 0.3% | 1.6% |
| | Malaysia | $8,418 | 1.7% | 0.07% | 1.7% | |
| | South Africa | $7,271 | 2.9% | 0.10% | 2.8% | |

*Source: "EM-DAT", World Bank, Sigma, CEBR analysis*

The difference between each country's insurance penetration and the benchmark shows whether countries are underinsured or insured beyond the minimum requirement. These calculations represent each country's ***benchmarked insurance coverage*** - these results are shown for 2011 within Table 3 following the worked example of Brazil.

| **Worked example** - ***Estimating underinsurance for Brazil in 2011*** | | |
|---|---|---|
| **Non-life insurance penetration in 2011:** | | **1.5%** |
| ***LESS* Expected annual loss (% of GDP):** | **(0.11%)** | |
| **Expected loss adjusted insurance penetration:** | | **1.3%** |
| ***LESS* Benchmark requirement** (for middle income)**:** | **(1.9%)** | |
| **Benchmarked insurance coverage:** | | **-0.51%** |
| **Underinsurance** (0.51% of nominal GDP in 2011 in $US) | | **$12.68bn** |

[9] Numbers may not sum due to rounding

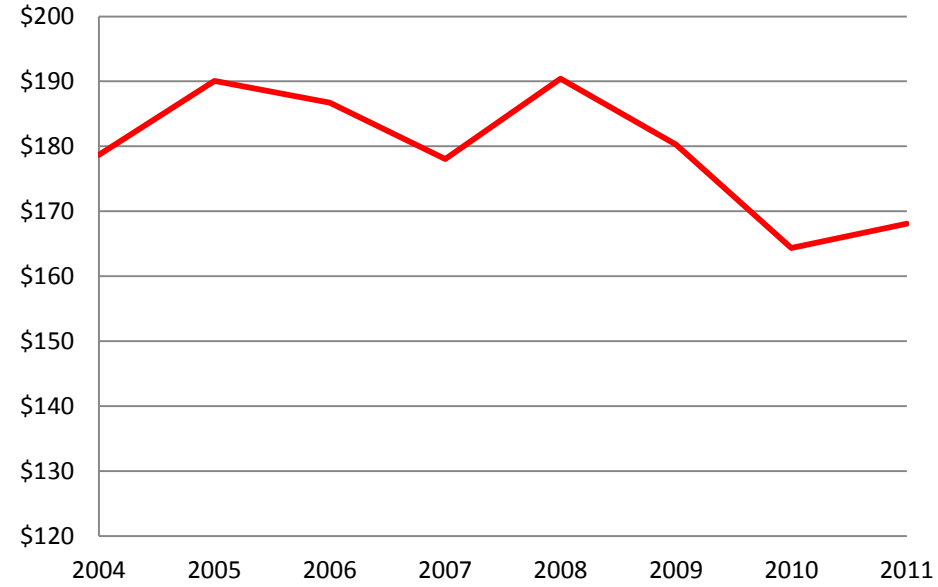
**Table 3 – Benchmarked insurance coverage (2011)**

| Rank | Country | Benchmarked insurance coverage | Underinsurance (US$ bn) | Rank | Country | Benchmarked insurance coverage | Underinsurance (US$ bn) |
|---|---|---|---|---|---|---|---|
| **1** | Netherlands | 8.01 | - | **22** | Norway | 0.25 | - |
| **2** | New Zealand | 3.05 | - | **23** | Malaysia | 0.15 | - |
| **3** | South Korea | 2.55 | - | **24** | United Arab Emirates | 0.08 | - |
| **4** | United States | 2.53 | - | **25** | Singapore | 0.08 | - |
| **5** | Canada | 2.47 | - | **26** | Hong Kong | -0.03 | $0.08 |
| **6** | Germany | 2.11 | - | **27** | Poland | -0.15 | $0.78 |
| **7** | Austria | 1.67 | - | **28** | Colombia | -0.17 | $0.57 |
| **8** | United Kingdom | 1.60 | - | **29** | Thailand | -0.41 | $1.41 |
| **9** | Australia | 1.39 | - | **30** | Brazil | -0.51 | $12.68 |
| **10** | Denmark | 1.36 | - | **31** | Mexico | -0.67 | $7.78 |
| **11** | Spain | 1.05 | - | **32** | Saudi Arabia | -0.93 | $5.35 |
| **12** | South Africa | 1.02 | - | **33** | Chile | -0.97 | $2.40 |
| **13** | Taiwan | 0.97 | - | **34** | China | -1.09 | $79.57 |
| **14** | Ireland | 0.75 | - | **35** | Nigeria | -1.11 | $2.64 |
| **15** | Italy | 0.62 | - | **36** | India | -1.18 | $19.72 |
| **16** | Argentina | 0.44 | - | **37** | Turkey | -1.31 | $10.23 |
| **17** | Israel | 0.44 | - | **38** | Egypt | -1.36 | $3.20 |
| **18** | Sweden | 0.44 | - | **39** | Philippines | -1.36 | $2.90 |
| **19** | Japan | 0.43 | - | **40** | Vietnam | -1.38 | $1.69 |
| **20** | France | 0.39 | - | **41** | Indonesia | -1.67 | $14.12 |
| **21** | Russia | 0.34 | - | **42** | Bangladesh | -2.64 | $2.99 |
| | ***Total underinsurance*** | | - | | ***Total underinsurance*** | | ***$168.11*** |

*Source: "EM-DAT", World Bank, Sigma, CEBR analysis*

Table 3 shows that **17 countries are identified as being underinsured**. The total estimated level of underinsurance - the shortfall in non-life insurance premiums - is **$168bn**. Figure 3 shows the change in the estimated underinsurance level among the 42 countries analysed since 2004.

**Figure 3 - Underinsurance ($bns, 2011 prices)**




*Source: "EM-DAT", World Bank, Sigma, CEBR analysis*

The Figure clearly shows that the estimated level of underinsurance has in fact decreased in recent years – since 2004 the level is estimated to have fallen by around $10bn. However, the level of underinsurance in 2011 remains at 94% of where it stood in 2004, while between 2010 and 2011 underinsurance increased by an estimated $2bn.

### 1.4.3 Classification of insurance coverage by country

Countries have been classified according to how well insured they are in order to aid comparison between countries. Tier 1 indicates a country is better insured, Tier 2 indicates that a country is only marginally above the minimum requirement and Tier 3 indicates that a country is underinsured, using the previous analysis from Table 3. Table 4 displays the 42 countries by their insurance classification in 2011.

**Table 4 - Insurance classification of countries (2011)**

| Tier 1 *(Better insured)* | | Tier 2 *(Moderately insured)* | | Tier 3 *(Underinsured)* | |
|---|---|---|---|---|---|
| Country | Benchmarked insurance level | Country | Benchmarked insurance level | Country | Benchmarked insurance level |
| Netherlands | 8.01 | Denmark | 1.36 | Hong Kong | -0.03 |
| New Zealand | 3.05 | Spain | 1.05 | Poland | -0.15 |
| South Korea | 2.55 | South Africa | 1.02 | Colombia | -0.17 |
| United States | 2.53 | Taiwan | 0.97 | Thailand | -0.41 |
| Canada | 2.47 | Ireland | 0.75 | Brazil | -0.51 |
| Germany | 2.11 | Italy | 0.62 | Mexico | -0.67 |
| Austria | 1.67 | Argentina | 0.44 | Saudi Arabia | -0.93 |
| United Kingdom | 1.60 | Israel | 0.44 | Chile | -0.97 |
| Australia | 1.39 | Sweden | 0.44 | China | -1.09 |
| | | Japan | 0.43 | Nigeria | -1.11 |
| | | France | 0.39 | India | -1.18 |
| | | Russia | 0.34 | Turkey | -1.31 |
| | | Norway | 0.25 | Egypt | -1.36 |
| | | Malaysia | 0.15 | Philippines | -1.36 |
| | | United Arab Emirates | 0.08 | Vietnam | -1.38 |
| | | Singapore | 0.08 | Indonesia | -1.67 |
| | | | | Bangladesh | -2.64 |

*Source: "EM-DAT", World Bank, Sigma, CEBR analysis*

The Tier 1 (better insured) classification is based upon how each country compares with others. In order to produce this classification, the group of countries which are not underinsured is identified. Of these countries, those above the average within the subset are placed in the Tier 1 (better insured) category. Those below the average are placed in the Tier 2 (moderately insured) category. This method of classification takes into account not only how well insured a country is above the minimum, but also how it compares to countries.

For countries such as Norway which face relatively low levels of expected loss, while having high levels of GDP per capita, a Tier 2 classification may not be cause for concern. For countries like Japan with

relatively high levels of expected loss and historically large differences between insured and total losses (see next section) this classification is more of an issue. Given its higher risk status, one would expect Japan to aim to become better insured compared to other high income countries. New Zealand, for example, has a high level of insurance penetration and proportionally lower uninsured losses, despite facing a comparable level of risk from natural catastrophes.

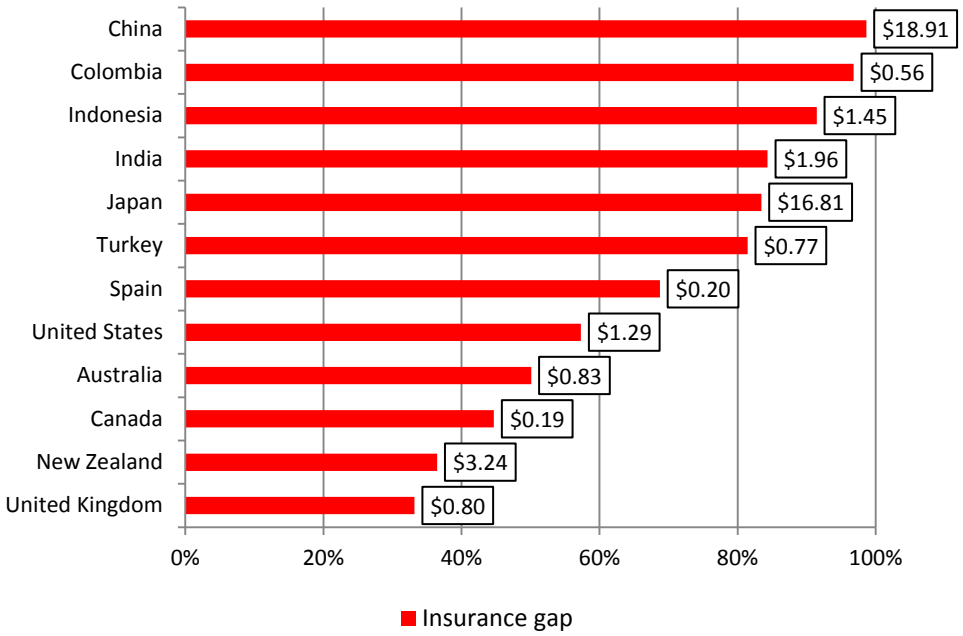
## 1.5 The Historic gap between insured and uninsured losses

In order to explore this issue of what constitutes good insurance levels, we have examined historic data relating to actual losses following major catastrophe events, looking at the difference between the overall loss to the economy and the sum, within that loss, which was recovered through insurance. This historic difference represents *the insurance gap*. It shows how even countries insured above the minimum levels have experienced major economic losses as a result of natural catastrophes which are not recovered through insurance, and re-emphasises the vulnerability of those failing to make the minimum level at all.

How well-insured a country is – as measured in the previous section – gives an indication of how well prepared the country is for the financial impact of natural catastrophes. Higher insurance penetration would be expected to manifest itself in a lower level of uninsured losses resulting from natural catastrophes.

In order to analyse whether this is the case, Cebr analysed data relating to the insured and uninsured losses following natural catastrophes from 2004 to 2011.[10] This is represented in Figure 4.

**Figure 4 – Uninsured loss (% of total loss and average uninsured loss per natural catastrophe 2004-2011, $bn)**




*Source: SIGMA Natural catastrophes and man-made disasters 2005-2012, CEBR analysis*

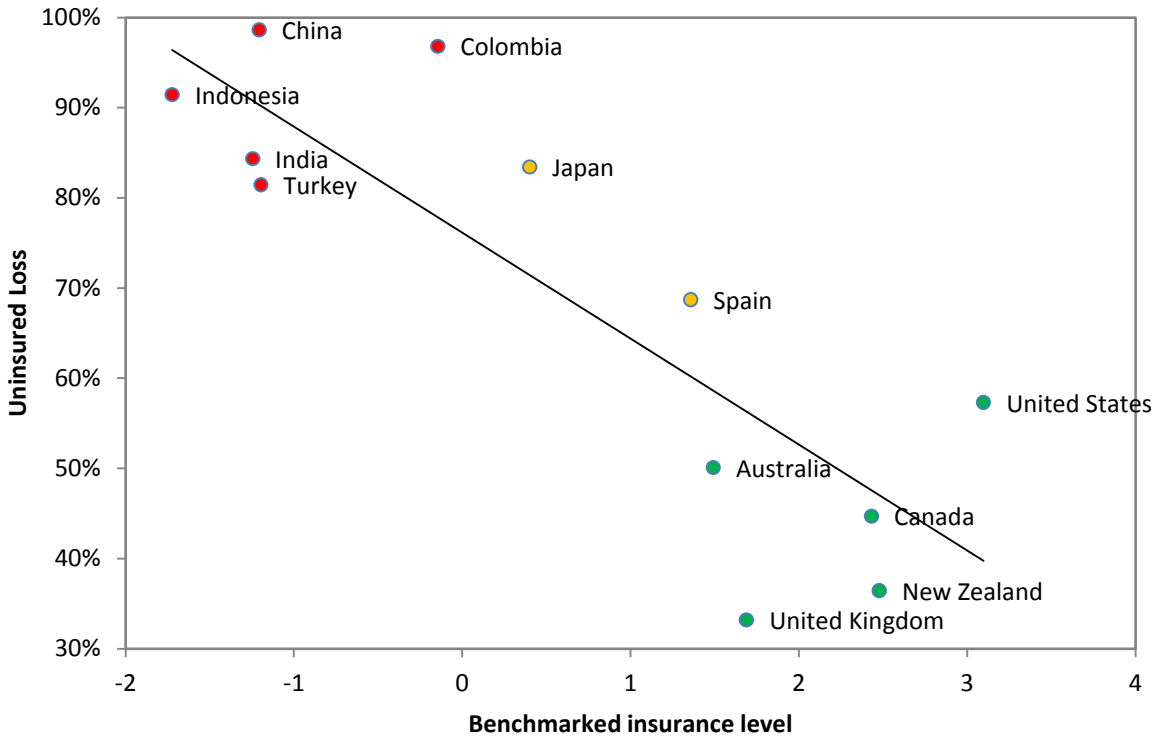
The data shows that countries such as China and Colombia, which were identified using our methodology (see table 4) as being underinsured, had proportionately higher uninsured losses between 2004 and 2011. Countries identified as being better insured, such as Canada and New Zealand had

[10] These data were taken from the Sigma 'Natural catastrophes and man-made disasters' series of reports from 2005-2012. Available at http://www.swissre.com/

much lower uninsured losses. The relationship between the benchmarked insurance coverage and the size of the insurance gap is shown in Figure 5.

This Figure also shows that a sizeable insurance gap existed between 2004 and 2011 for even the countries with some of the highest levels of penetration. For example, in the US, the gap cost the economy $1.29bn on average following each catastrophe – 57% of the overall loss.

**Figure 5 – Uninsured loss 2004-2011 (% of total loss) and benchmarked insurance coverage (average for 2004-2011) with colour coded tier classifications**




*Source: "EM-DAT", World Bank, Sigma, CEBR analysis*

The graph clearly shows that as countries become better insured, based on their benchmarked insurance coverage, the proportion of losses resulting from natural catastrophes which is uninsured decreases. Specifically, the correlation between the two demonstrates that a 1 percentage point increase in benchmarked insurance coverage is equivalent to an 11 percentage point reduction in the estimated average uninsured loss. To put this in context, this represents a fall from an uninsured loss of roughly that of Japan, at 83%, to Spain, at 69%.

The effect of the different classifications is also apparent within the historic data. Table 5 shows the average proportion of losses resulting from natural disasters for each Tier classification:

**Table 5 - Insured losses by insurance Tier classification**

| Insurance classification | Historic insured proportion of losses (2004-2011) |
|---|---|
| Tier 1 | 46.97% |
| Tier 2 | 16.55% |
| Tier 3 | 6.86% |

*Source: "EM-DAT", World Bank, Sigma, CEBR analysis*

The differences between the proportion of historic losses which have been recoverable through insurance between the three insurance coverage Tiers are huge. Between 2004 and 2011, Tier 1 (better insured) countries, on average, recovered 47% of economic losses resulting from natural disasters through insurance. Tier 2 (moderately insured) countries on the other hand, recovered only 17% of losses through insurance – a difference of 30 percentage points. For those countries sampled the difference between Tier 1 and Tier 2 classification led almost an extra third of the damage resulting from natural catastrophes being recovered through insurance.

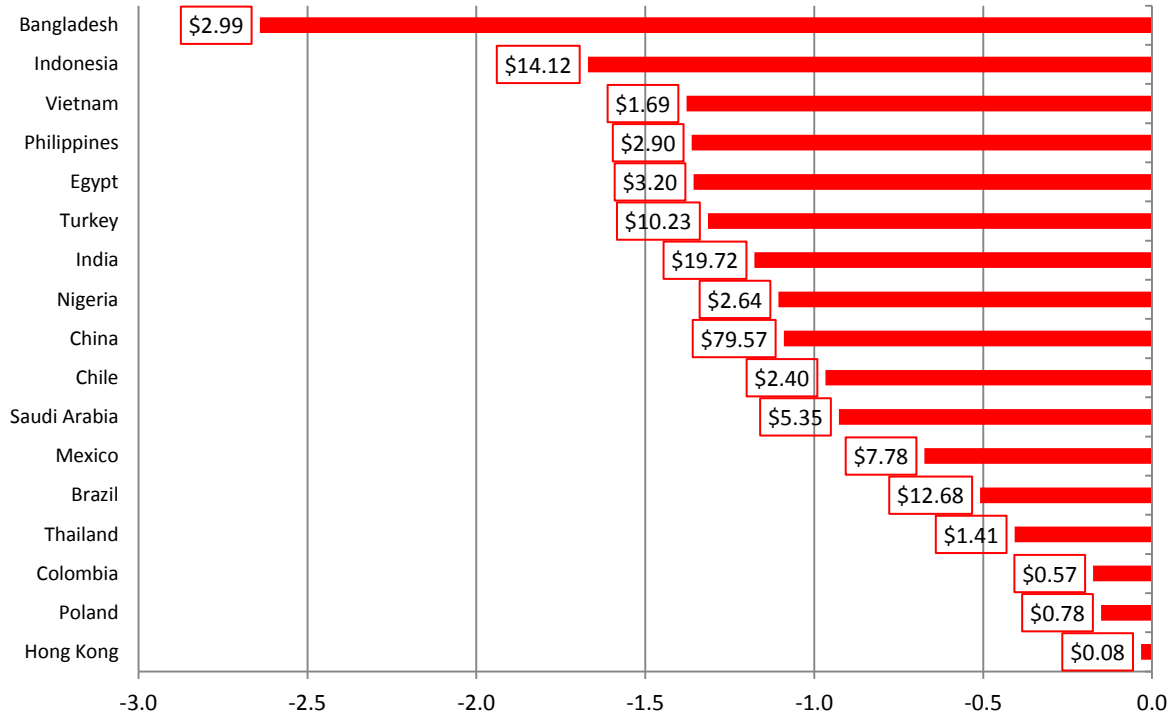
The difference between Tier 2 (moderately insured) countries and Tier 3 (underinsured countries) is less in magnitude, but remains significant. Tier 3 countries recovered only 7% of natural catastrophe related losses through insurance – 10 percentage points less than the average for those countries in Tier 2.

## 1.6 Summary and conclusions

### *Bangladesh is identified as having the most underinsured economy*

Figure 6 shows the countries we have identified as being significantly underinsured. This demonstrates the estimated non-life insurance premium shortfall in 2011 as a percentage of GDP and by the absolute sum in $bns. As a proportion of GDP, Bangladesh is by far the most underinsured economy, while Hong Kong is the only high income economy, as measured by GDP per capita, which is identified as being underinsured.

**Figure 6 - Underinsurance % of GDP and $bns**




*Source: "EM-DAT", World Bank, Sigma, CEBR analysis*

Of the 17 countries identified as being underinsured, eight are found in Asia. The levels of underinsurance identified in Asia are confirmed by the size of the insurance gap measured for countries in the region and suggest a high vulnerability to excessive uninsured losses. The development of non-life insurance markets within countries identified as being underinsured will help to significantly reduce the potential to incur such high uninsured losses.

There is a sharp contrast among the three African nations. South Africa is identified as being reasonably well insured, while Egypt and Nigeria are both identified here as being significantly underinsured.

### *China represents 47% of the underinsurance identified*

The analysis of underinsurance reveals an estimated shortfall in non-life insurance coverage of $168.11bn in 2011. This is based on an assessment of each of 42 country's non-life insurance premiums compared to minimum requirements calculated based on natural disaster exposure and a comparison with low risk countries at similar income levels.

China alone comprised $79.57bn of the estimated underinsurance. This represents 47% of the total underinsurance, making China the most underinsured country analysed in monetary terms.

***A number of countries facing the highest risk as a proportion of GDP display the lowest rates of insurance penetration***

A number of the countries analysed demonstrate a high degree of exposure to natural catastrophes in terms of the expected annual losses to GDP. The countries which would be expected to incur economic losses each year amounting to more than 0.5% of GDP are shown within Table 6. The huge cost which this represents to national output means that only eight countries of the 42 included within the research make it over this 0.5% of GDP level.

What is concerning here is that of these eight countries – those at the greatest risk of economic losses – only one, New Zealand, is identified as being well insured through our analysis. This suggests that some of the countries at greatest risk from natural catastrophes are the least insured against the potential damages resulting from them.

**Table 6 - Countries with highest expected annual losses (% of GDP)**

| Country | Expected Loss |
|---|---|
| Bangladesh | 1.26% |
| Chile | 0.87% |
| New Zealand | 0.73% |
| China | 0.71% |
| Vietnam | 0.70% |
| Indonesia | 0.69% |
| Thailand | 0.53% |
| Turkey | 0.52% |

*Source: "EM-DAT", World Bank, CEBR analysis*

Indeed, of the eight countries with an expected annual loss resulting from natural catastrophes of 0.5% of GDP or more, five appear within the bottom ten countries as measured by insurance penetration.

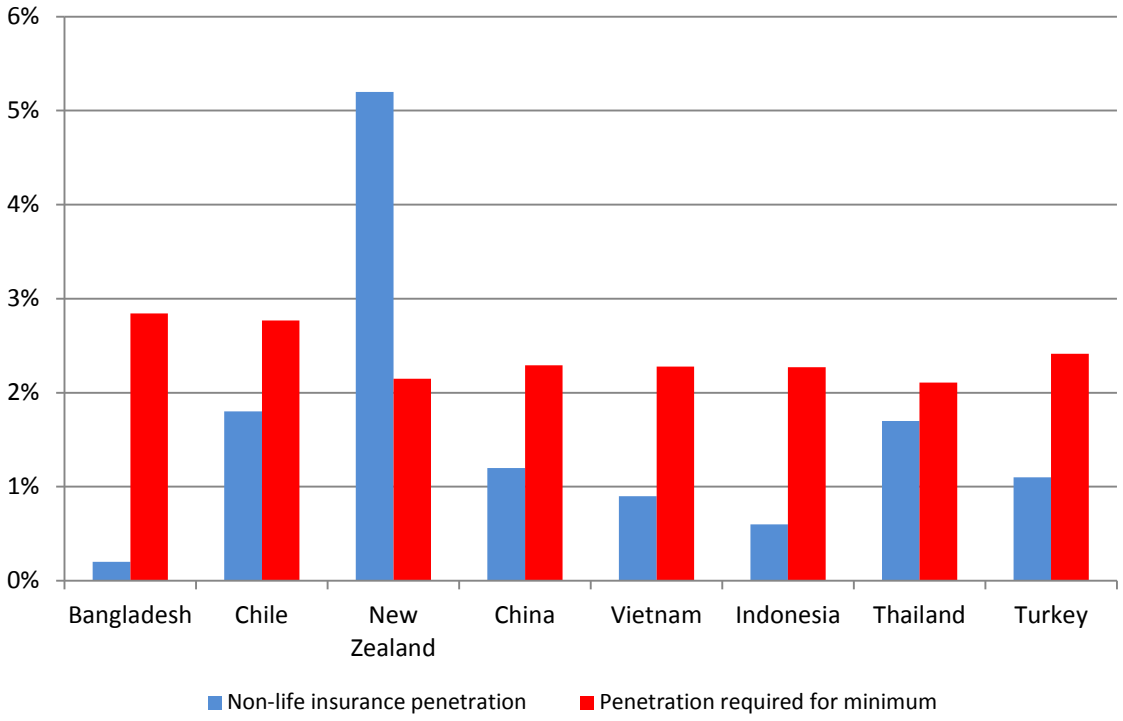
**Table 7 - Bottom 10 countries by insurance penetration**

| Country | Insurance Penetration |
|---|---|
| China | 1.30% |
| Turkey | 1.10% |
| Mexico | 1.00% |
| Saudi Arabia | 1.00% |
| Vietnam | 0.80% |
| India | 0.70% |
| Indonesia | 0.50% |
| Philippines | 0.40% |
| Egypt | 0.40% |
| Bangladesh | 0.20% |

*Source: "EM-DAT", World Bank, Sigma, CEBR analysis*

This suggests that Bangladesh, China, Vietnam, Indonesia and Turkey would be exposed to large uninsured losses following the occurrence of a natural catastrophe – which is borne out by the historical insurance gap data in Figure 4 shown previously. Figure 7 shows the insurance penetration and the penetration required in order to meet the benchmark requirements in 2011 of the countries with high expected losses.

**Figure 7 - Insurance penetration (2011) and levels required to meet minimum benchmark requirements**




*Source: "EM-DAT", World Bank, Sigma, CEBR analysis*

Initial observations would indicate quite clearly that New Zealand would appear to be well insured, while other countries may be left exposed to high uninsured losses. Indeed, China is shown to have experienced an exceptionally large insurance gap from 2004-2011 in comparison with other high risk countries such as New Zealand.

***Bangladesh and Indonesia both have insurance penetration levels which are below their expected annual loss as a proportion of GDP***

As outlined further within the methodology, the optimal insurance level would be expected to be where insurance premiums are equal to expected losses. This suggests that both countries are highly uninsured. Even if damage resulting from natural catastrophes was the ***only*** risk posed to them, both countries would be considered underinsured.

| Country | Insurance Penetration | Expected Loss | Expected loss adjusted ins penetration |
|---|---|---|---|
| Indonesia | 0.50% | 0.69% | -0.19% |
| Bangladesh | 0.20% | 1.26% | -1.06% |

*Source: "EM-DAT", World Bank, Sigma, CEBR analysis*

***Uninsured losses point to huge shortfalls in China and Japan***

**Table 8 - Insurance gap**

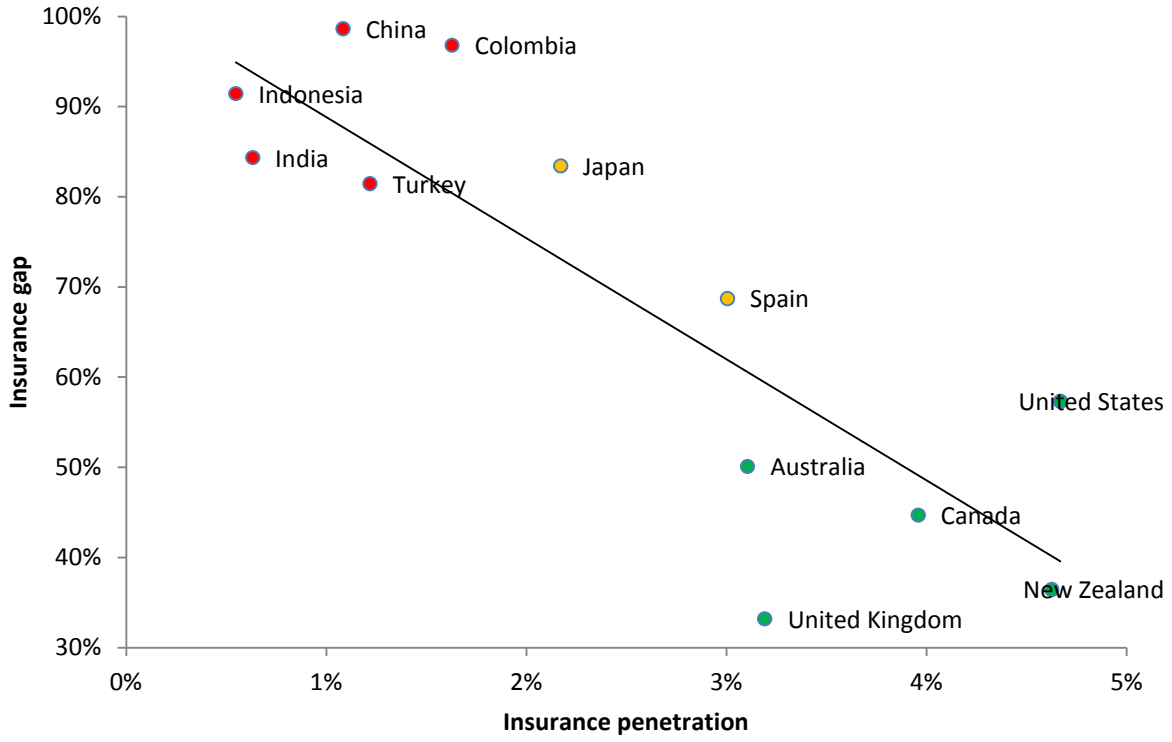
| *Country* | *Insured proportion of loss (2004-2011)* | *Uninsured losses ($USm)(2004-2011)** | *Data Points* |
|---|---|---|---|
| United Kingdom | 66.8% | $2,391 | 3 |
| New Zealand | 63.5% | $19,432 | 6 |
| Canada | 55.3% | $1,323 | 7 |
| Australia | 49.9% | $9,982 | 12 |
| United States | 42.7% | $148,580 | 115 |
| Spain | 31.4% | $603 | 4 |
| Turkey | 18.6% | $2,300 | 3 |
| Japan | 16.6% | $201,676 | 12 |
| India | 15.7% | $7,856 | 4 |
| Indonesia | 8.6% | $5,785 | 4 |
| Colombia | 3.2% | $1,667 | 3 |
| China | 1.4% | $208,003 | 11 |

*Source: "EM-DAT", World Bank, Sigma, CEBR analysis*
** Only catastrophes for which data relating to insured and uninsured losses are included*

The data show that countries with a greater level of insurance penetration can be expected to incur lower uninsured losses as a proportion of the total loss. Despite major earthquakes occurring over the time period, New Zealand sees 60% of the losses incurred insured. Japan over the same period had insured losses of only 16.6% of the total. Without the inclusion of the earthquake and tsunami of 2011, the insured proportion of the losses actually falls marginally to 16.0%, although the absolute magnitude of the gap falls dramatically to $26bn.

The relationship between the insurance gap and insurance penetration is highlighted in Figure 8. A 1 percentage point increase in insurance penetration is shown to decrease the insurance gap by approximately 12.9% of the total damage associated with catastrophes between 2004 and 2011.

**Figure 8 - Insurance gap and insurance penetration**




*Source: "EM-DAT", World Bank, Sigma, CEBR analysis*

# SECTION II - NATURAL CATASTROPHE CASE STUDIES

## 2.1 Introduction to the case study approach

This section analyses five natural catastrophes in order to examine the role of non-life insurance in reducing costs to the taxpayer and increasing the speed of recovery, both in terms of economic activity and full reconstruction following natural disasters. Using this methodology, it is possible to gain an insight into the role which insurance plays in bearing a proportion of the costs of reconstruction following damaging events resulting from the forces of nature.

What follows is a summary of case studies into five natural disasters; Hurricanes Katrina, Rita and Wilma in the United States in 2005; the widespread flooding in the UK in 2007; the earthquake in Sichuan Province China in 2008; flooding across Thailand in 2011; the Great Eastern earthquake and Tsunami in Japan in 2011. These include some of the most devastating natural catastrophe events of recent years.

The case studies in this section aim to demonstrate the role which non-life insurance plays following natural disasters, both in recovering a proportion of the economic losses, but also in minimising the costs which are borne by taxpayers following such an event. For each case an estimate of when the affected country or region can be said to have recovered is used in order to aid comparison between cases.

Recovery can take on many definitions; while structural and material damage may be repaired, the acts of nature examined within these case studies can undoubtedly lead to untold emotional devastation and loss of life. As such, the discussion within this document does not presume to encompass all aspects of recovery.

In this study we have defined recovery as the normalisation of economic activity, which is examined using numerous data series. Due to the differing availability of data in each case, the analysis makes use of employment, industrial output, GDP and export data, as well as anecdotal evidence and government statements, in order to gauge the progression of the recovery process. An assessment of the time taken for the completion of reconstruction efforts is also included based on national government and World Bank estimates.

## 2.2 Case studies

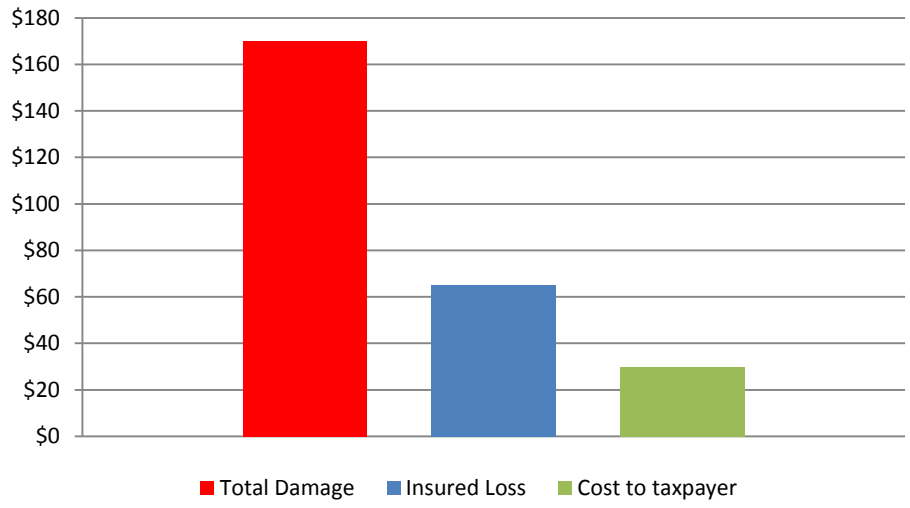
### 2.2.1 US hurricanes 2005

| Key facts | $bns | % of GDP | Months |
|---|---|---|---|
| **Total damage** | $170 | 1.35% | |
| **Insured loss** | $65 | 0.51% | |
| **Insurance gap** | $105 | 0.83% | |
| **Speed of economic activity recovery** | | | 36 |
| **Total reconstruction time** | | | 48 |

*Source: Swiss Re, Sigma, World Bank, Macrobond and FEMA*

In August 2005, the United States was hit by hurricane Katrina, the most devastating hurricane in its history, resulting in record damages[11] of $135bn, of which approximately $45bn were recoverable through insurance. The following month the US suffered the impact of hurricane Rita, resulting in estimated further damages totalling $15bn, of which $10bn was insured. Then in October, hurricane Wilma, the most powerful hurricane ever recorded, caused total damage estimated at $20bn, with insured losses estimated at $10bn. Figure 9 illustrates the resulting losses.

**Figure 9 - *Losses from US hurricanes ($bns)***




*Swiss Re, Sigma and FEMA*

[11] The definition of total damage used by Sigma is also used throughout this analysis, that is: Total losses/damage is defined as: the financial losses directly attributable to an event – damage to buildings, infrastructure, vehicles etc. The term also includes losses due to business interruption as a direct consequence of property damage.

It is important to note that the figures for insured loss and cost to the taxpayer would be unlikely to sum to total damage. This is because some losses may not be covered through insurance, or redeemed at the expense of the taxpayer. Some losses may simply never be recovered. Equally should the government fund reconstruction efforts which rebuild to a greater standard, for example by improving the resilience of infrastructure to similar events, this may represent a higher cost than that included within the estimated total damage.

See: *Natural catastrophes and man-made disasters in 2011*, Sigma.

### *Cost to taxpayer*

Based on the initial government's release of funds to support the recovery effort, the cost to the taxpayer is estimated at $29.76bn, this is outlined in Table 9.

**Table 9 - Federal assistance following 2005 hurricanes ($USbns)**

| | Katrina | | Rita | | Wilma | |
|---|---|---|---|---|---|---|
| | Louisiana[12] | Mississippi[13] | Alabama[14] | Louisiana & Texas[15] | Florida[16] | Total |
| **Disaster relief ($bns)** | $17.50 | $9.00 | $0.95 | $1.30 | $1.01 | $29.76 |

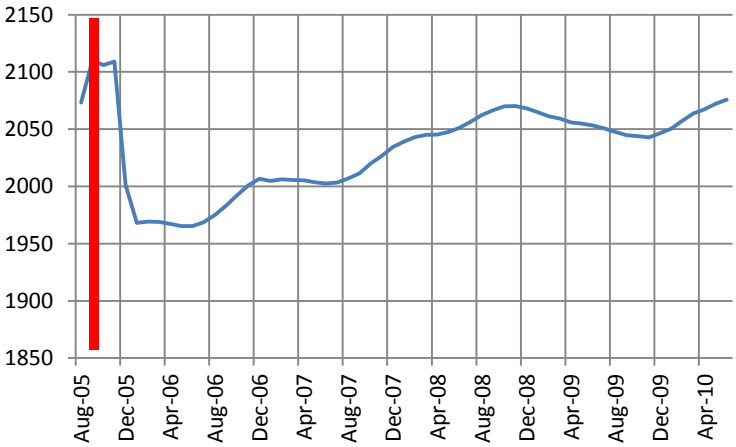
### Impact of insurance

The majority of insurance claims following hurricanes Katrina, Rita and Wilma were settled under the National Flood Insurance Program (NFIP), a federal government backed insurance scheme. The official estimate of claims at the time suggested insurance claims through the program would reach $23bn – at the time this was greater than the sum of claims paid out in the NFIPs entire history.[17] The sustainability of the scheme was called into question following the 2005 hurricane season as the government ultimately guarantees the claims put to the NFIP.

### Recovery

By far the greatest effects resulting from the hurricanes were felt in the state of Louisiana. Indeed, recovery work is still continuing there. In order to assess when economic activity began to normalise in the state of Louisiana, Bureau of Labour Statistics' local employment statistics were examined (see **Figure 10**). Using the size of the labour force as a guide, it is estimated that Louisiana could be judged to have recovered by around November 2008, giving an estimated recovery period of approximately 3 years.

**Figure 10 - *Louisiana labour force, thousands***




*Source: US Bureau of labour statistics*

[12] http://www.fema.gov/news/newsrelease.fema?id=57329 (accessed May 2012)

[13] http://www.fema.gov/news/newsrelease.fema?id=57789 (accessed May 2012)

[14] http://www.fema.gov/news/newsrelease.fema?id=39233 (accessed May 2012)

[15] http://www.fema.gov/news/newsrelease.fema?id=41009 (accessed May 2012)

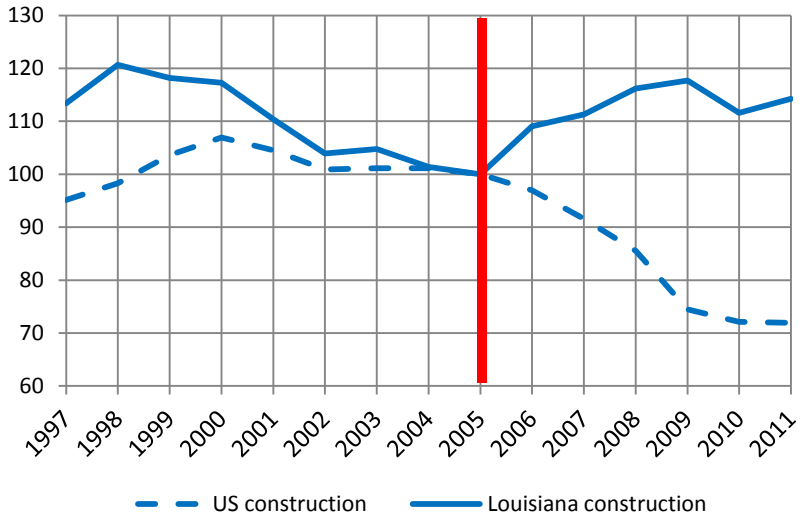
[16] http://www.fema.gov/news/newsrelease.fema?id=28220 (accessed May 2012)

[17] HURRICANE KATRINA GAO's Preliminary Observations Regarding Preparedness, Response, and Recovery, March 2006.

Following the hurricanes in August and September 2005 (marked by red line in Figure 10), the Louisiana labour force declined sharply by almost 150,000, as people were forced out of their homes and as a result displaced from the labour force. The slow but steady increase in the labour force up to November 2008 is consistent with people re-entering the labour market as the state of Louisiana began to recover from the disasters of 2005. Towards the end of 2007, the effects of the financial crisis may have begun to have an impact on the recovery of the labour market. Therefore it is likely that in the absence of these effects, the labour market in Louisiana may have made a full recovery by mid-2008. While some reconstructive work still remains in progress, the recovery of the labour market is indicative of the normalisation of economic activity.

Figure 11 illustrates the time taken for a more complete recovery using construction output data for the state of Louisiana.

**Figure 11 - *US and Louisiana real state output index (2005=100); output***




*Source: US Bureau of Economic analysis and Bureau of labour statistics*

The output of the state of Louisiana is somewhat slower to recover. Figure 11 shows US and Louisiana state real construction output indexed to 2005 for all industry and construction. The graph clearly shows that construction output increases sharply following the hurricanes in 2005. Output does not begin to follow the national trend until around 2009, suggesting that the construction sector in Louisiana State was still receiving a boost from reconstruction.

However, given the superior quality of US data compared to that available for the other case studies analysed, it seems prudent to take the conservative estimate of 36 months as the economic recovery time taken, while total reconstruction can be estimated at around 48 months using construction output data.

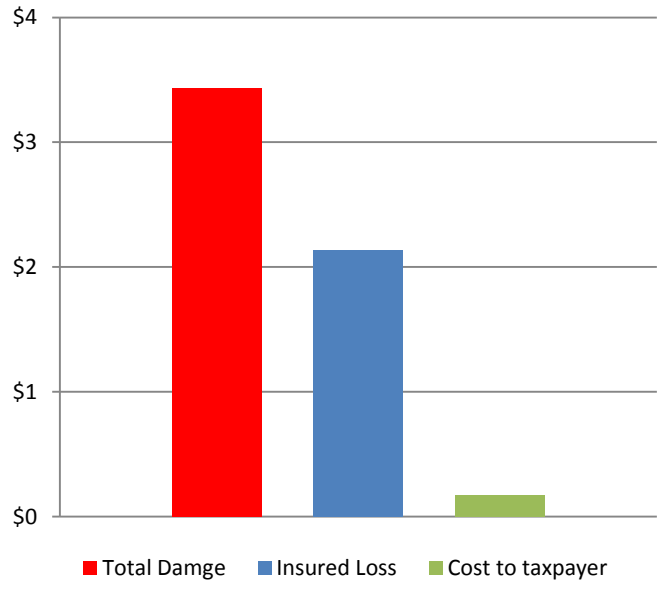
### 2.2.2 UK flooding in 2007[18]

| Key facts | $bns | % of GDP | Months |
|---|---|---|---|
| **Total damage** | $3.4 | 0.12% | |
| **Insured loss** | $2.1 | 0.08% | |
| **Insurance gap** | $1.3 | 0.05% | |
| **Speed of economic activity recovery** | | | 3 |
| **Total reconstruction time** | | | 12 |

*Source: Swiss Re, Sigma, World Bank, Macrobond, and Pitt review, Cebr analysis*

In the summer of 2007, a number of areas within the UK were subjected to widespread flooding. Sustained rains in early summer increased groundwater levels. This meant that in June and July when rainfall exceeded previous records – going back to 1879 - by 20%, rivers burst their banks and other areas experienced flash flooding. The resulting damage is estimated at $3.44bn, with insurers bearing $2.14bn of losses - a significant proportion at 62.21%. A breakdown of the losses is shown in Figure 12.

**Figure 12 - *Losses resulting from UK floods 2007 ($bns)***




*Source: Swiss Re, Sigma and Pitt review*

### Cost to taxpayer

The total cost to the UK taxpayer, through immediate relief and subsequent investment in the recovery process, is estimated at around $174m (£87m)[19]. Following the floods, central and local government offered financial assistance through a number of funding mechanisms for businesses.

[18] Figures relate to flooding which occurred between 15-22 June and 20-31 July 2007.

**Impact of insurance**

Insurance provided a crucial service in the aftermath of the floods. A review into the events and subsequent government response by Sir Michael Pitt highlights the supporting role provided by the insurance industry, both in providing financial assistance to businesses and in reducing the emotional distress felt by householders, comparatively improving the health of flood victims. The Pitt review estimates that local government was able to compensate the uninsured in some cases, but that this usually equated to just a few hundred pounds in each case, compared to an average claim value on insurance of between £15,000 and £45,000.

Had none of the UK households which were affected by flooding been insured, in order to compensate each household by just £200, the government would have incurred extra costs totalling £26m[20] – a 25% increase in the burden on the taxpayer compared to the original £87m costs.

**Recovery**

Based on the findings of the Pitt Review it can be concluded that the reconstruction phase of the recovery was largely completed by June 2008, at which point 78% of insurance claims had been settled and 96% of homeowners were back in their homes. This represents a time period of around 12 months between the final flooding event, in July 2007 and the subsequent reconstruction. The flooding itself did not have a significant impact on UK macroeconomic indicators and as such economic recovery is estimated at three months.

[19] The Pitt Review, June 2008, pp. 9.

[20] Based on compensation of 130,000 homeowner claimants. See The Pitt review, June 2008, pp. 9

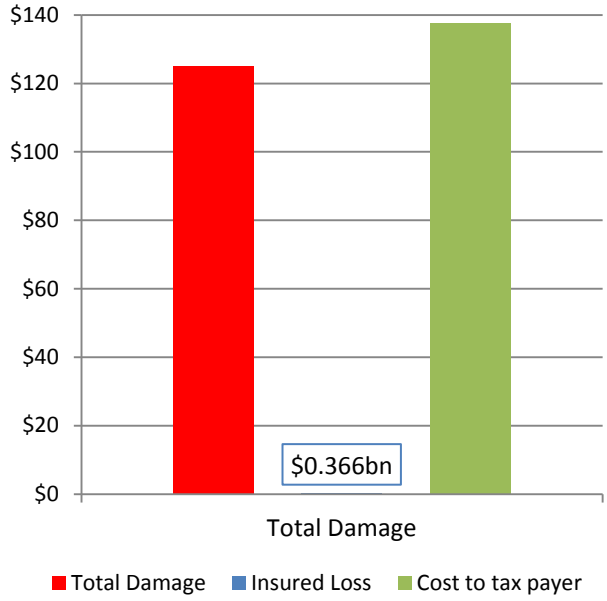
### 2.2.3 Chinese earthquake 2008

| Key facts | $bns | % of GDP | Months |
|---|---|---|---|
| **Total damage** | $125.0 | 2.77% | |
| **Insured loss** | $0.4 | 0.01% | |
| **Insurance gap** | $124.6 | 2.76% | |
| **Speed of economic activity recovery** | | | 12 |
| **Total reconstruction time** | | | 36 |

*Source: Swiss Re, Sigma, Central People's Government of China, World Bank,Cebr analysis*

In May 2008, an earthquake measuring 7.9 on the Richter scale struck the Sichuan Province of China. The damage caused to schools and other structures led to the loss of over 70,000 lives. The resulting damages from the earthquake are estimated at $125bn with only 0.3% ($0.366bn) estimated to have been covered by insurance. The estimated losses are shown in Figure 13.

**Figure 13 - Losses resulting from China**




*Source: Swiss Re, Sigma, Central People's Government of China*

#### Cost to taxpayer

Government reports suggest that $137.5bn has been spent on the rebuilding and improvement of Sichuan province following the earthquake.[21]

[21] The Central People's Government of the People's Republic of China: http://english.gov.cn/2012-02/24/content_2076240.htm, accessed June 2012

### Impact of insurance

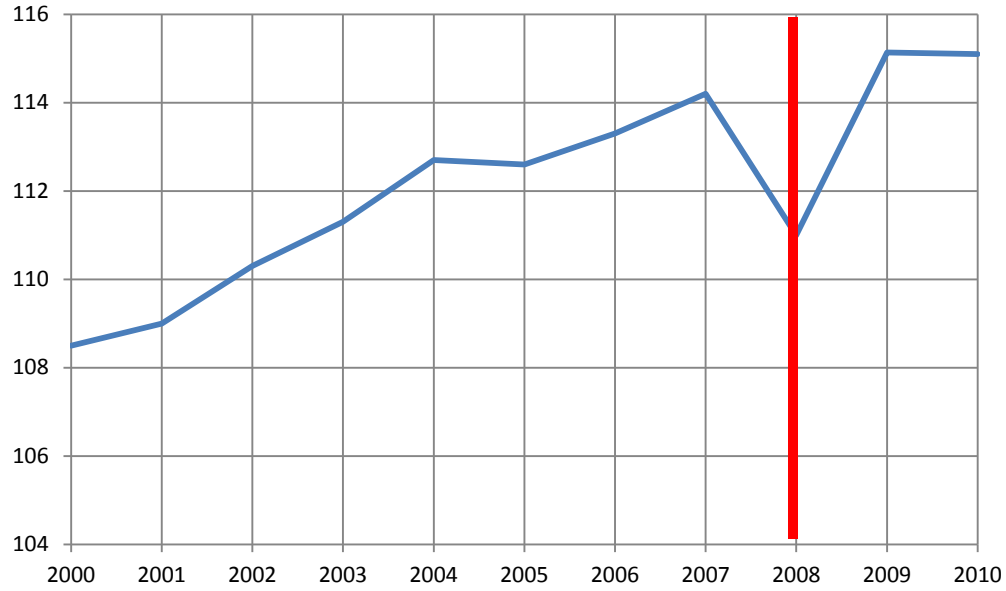
The estimated insured loss resulting from the earthquake suggests that of the $125bn damage caused, less than 1.0% was recoverable through insurance, with claims estimated at $366m. The impact of insurance is therefore negligible.

### Recovery

The overwhelming fiscal response by the Chinese government to the disaster led to an immediate bounce-back in regional GDP. Government statements[22] suggest that the reconstruction process was completed in 2011, estimating the recovery time at around three years.

Figure 14 shows that following the earthquake in 2008, GDP in Sichuan rebounded in 2009. This is due to the extensive spending program enacted by the Chinese government within the region.

**Figure 14 - Real GDP index (PY=100), Sichuan province**




*Source: Macrobond*

The diagram shows that following the earthquake in 2008, GDP in Sichuan rebounded in 2009. This is due to the extensive spending program enacted by the Chinese government within the region.

[22]The Central People's Government of the People's Republic of China: http://english.gov.cn/official/2012-03/15/content_2092737_2.htm, accessed June 2012.

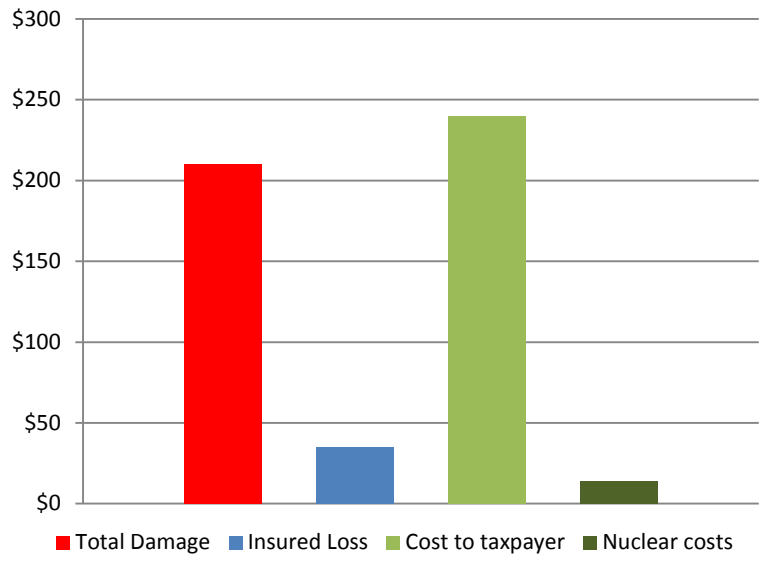
### 2.2.4 Japanese earthquake and tsunami 2011

| Key facts | $bns | % of GDP | Months |
|---|---|---|---|
| **Total damage** | $210 | 3.58% | |
| **Insured loss** | $35 | 0.60% | |
| **Insurance gap** | $175 | 2.98% | |
| **Speed of economic activity recovery** | | | 12 |
| **Total reconstruction time** | | | 60 |

*Source: Swiss Re, Sigma and Japanese ministry of finance, World Bank, Macrobond, Cebr analysis*

In March 2011, an earthquake measuring 9.0 on the Richter scale – the fourth most powerful earthquake ever recorded struck off the North East coast of Japan. The damage caused by the earthquake was almost inconsequential compared to the damage caused by the resulting tsunami, which sent a destructive wall of water up to six miles inland, devastating large areas of the North East coast of Japan. The resulting damage was estimated at $210bn with approximately 16.7% of the losses, $35bn recoverable through insurance. The estimated losses are shown in Figure 15.

**Figure 15 - Losses resulting from Japan earthquake and tsunami**




*Source: Swiss Re, Sigma and Japanese ministry of finance*

#### Cost to taxpayer

The Japanese Ministry of Finance estimates that 3,775bn Yen ($40.9bn) will be spent over 2012 on reconstruction following the earthquake and tsunami in 2011. This comes in addition to reconstruction and relief expenditures of approximately 17,888.2 bn Yen ($224.45bn) in 2011. The cost associated with

repair and containment of damage to nuclear facilities comprises around 1,112.3bn Yen ($13.9bn) and is included separately in Figure 15.

Tables 10 -14 below breakdown the costs to the taxpayer sourced from the Ministry of Finance of Japan and the specific budgets from which the costs are taken. The overall costs to the taxpayer are estimated as the sum of these individual budgets, which serve to illustrate the recovery expenditures required following natural catastrophes.

**Table 10 - Supplementary Budget 1 2011**

| **Expenditure category** | | |
|---|---|---|
| **Total (billion Yen)** | | **4015** |
| **Of which nuclear** | | - |
| **Recoverable loans** | | **701.4** |
| ***Disaster assistance loan*** | 35 | |
| ***Livelihood welfare loan fund*** | 25.7 | |
| ***Disaster related public finance programmes*** | 640.7 | |
| **Net cost** | | **3314** |

**Table 11 - Supplementary Budget 2 2011**

| **Expenditure category** | | |
|---|---|---|
| **Total (billion Yen)** | | **1999** |
| **Of which nuclear** | | **275.4** |
| ***Expenses related the act on compensation for nuclear damages*** | 275.4 | |
| **Net cost** | | **1723** |

**Table 12 - Supplementary Budget 3 2011**

| **Expenditure category** | | |
|---|---|---|
| **Total (billion Yen)** | | **11734** |
| **Of which nuclear** | | **355.8** |
| ***Decontamination and reconstruction*** | 355.8 | |
| | | |
| **Recoverable loans** | | **671.6** |
| ***Loans for rebuilding business*** | 653 | |
| ***Loans for rebuilding agriculture*** | 18.6 | |
| **Net cost** | | **10706** |

**Table 13 - Supplementary Budget 4 2011**

| Expenditure category | |
|---|---|
| **Total (billion Yen)** | **140.6** |
| **Of which nuclear** | - |
| **Recoverable loans** | - |
| **Net cost** | **140.6** |

**Table 14 - Special account for reconstruction 2012**

| Special account for reconstruction | 2012 |
|---|---|
| **Expenditure category** | |
| **Total (billion Yen)** | **3775.4** |
| **Of which nuclear** | **481.1** |
| **Recoverable loans** | **-** |
| **Net cost** | **3294.3** |

**Impact of insurance**

Of the estimated $210bn in total damage caused by the earthquake and tsunami, only $35bn is estimated to have been covered through insurance. Aon Benfield estimates personal insured losses to be around $20bn, while commercial and industrial insured losses are estimated at $8bn[23]. This suggests that personal insurance pay-outs have played a more significant role than commercial loss recoveries.

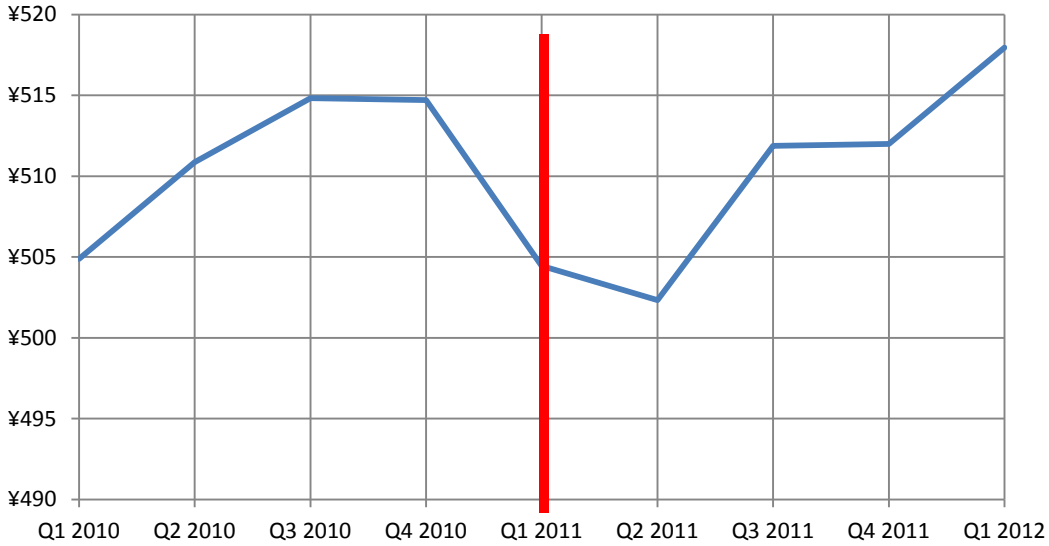
**Recovery**

An examination of the GDP of Japan suggests that the aggregate economy has already recovered from the disaster (see Figure 16). This places the estimated economic recovery time period at 12 months. It is estimated that reconstruction will take much longer, at around five years.[24]

[23] Tohoku Earthquake and Tsunami Event Recap Report, AON Benfield, August 2011.

[24] World Bank:http://siteresources.worldbank.org/INTEAPHALFYEARLYUPDATE/Resources/550192-1300567391916/EAP_Mon

**Figure 16 - Japan real GDP (Trillion Yen, 2005 prices)**

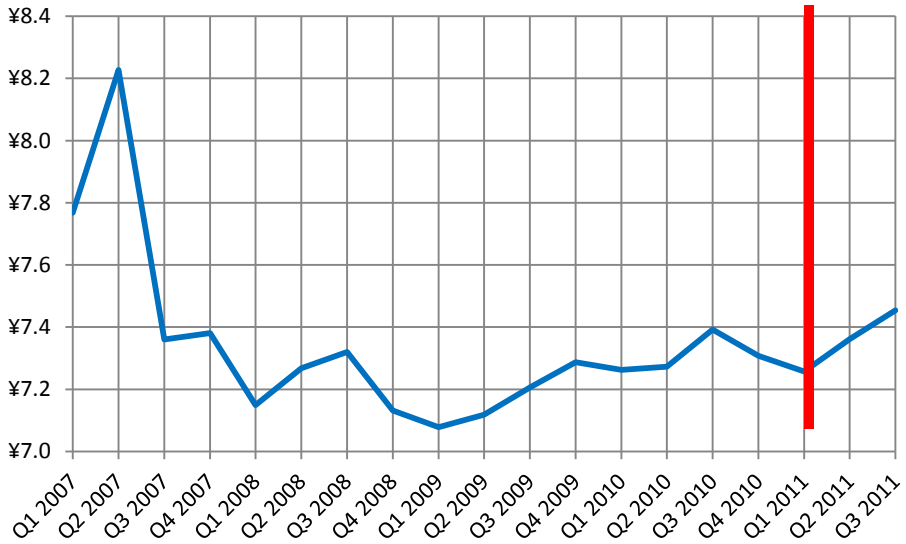



*Source: Macrobond*

In looking at the real GDP of Japan, it appears the economy has recovered from the earthquake and tsunami of March 2011 – in the first quarter of 2012 real GDP surpassed the level realised before the disaster. A look at construction output data indicates (see Figure 17) that this recovery is being driven by extremely high output in the construction sector – output currently stands at its highest level since early 2007. This is not surprising given the Japanese government's intensive expenditure on reconstruction within affected areas; reconstruction efforts following an event are often a significant source of economic stimulus.

The estimated time taken for economic recovery is 12 months.

**Figure 17 - Japan real Construction output (Trillion Yen, 2005 prices)**




*Source: Macrobond*

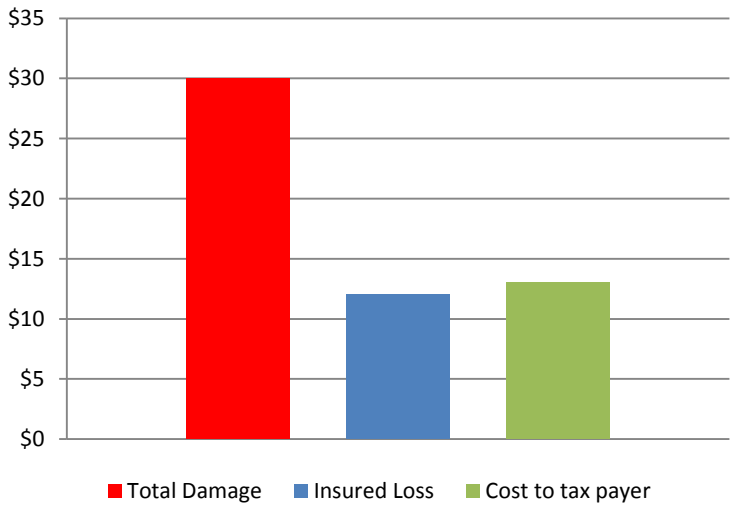
### 2.2.5 Thailand flooding 2011

| Key facts | $bns | % of GDP | Months |
|---|---|---|---|
| **Total damage** | $30 | 8.68% | |
| **Insured loss** | $12 | 3.47% | |
| **Insurance gap** | $18 | 5.21% | |
| **Speed of economic activity recovery** | | | 12 |
| **Total reconstruction time** | | | 36 |

*Source: Swiss Re, Sigma and World Bank, Macrobond, Cebr analysis*

The southwest monsoon season between August and September and the northeast monsoon season of October, combined with earlier heavy rainfall resulting from tropical storms earlier in May to produce widespread flooding across Thailand. By November 2011, 5.5% of the total landmass of Thailand had been affected.[1] The flooding led to dams and reservoirs exceeding capacity while seven major industrial parks were subject to excessive damage. The estimated losses are shown in Figure 18.

**Figure 18 - Costs resulting from Thailand floods 2011 ($bn)**




*Source: Swiss Re, Sigma and World Bank*

#### Cost to taxpayer

The World Bank estimates that the recovery process will come at the expense of $13 bn, although this figure includes the expected cost of rebuilding to a higher standard than previously.[25]

[25] See 'Thai Flood 2011. Overview. Rapid assessment for resilient recovery and reconstruction planning.' World Bank 2012.

### Impact of insurance

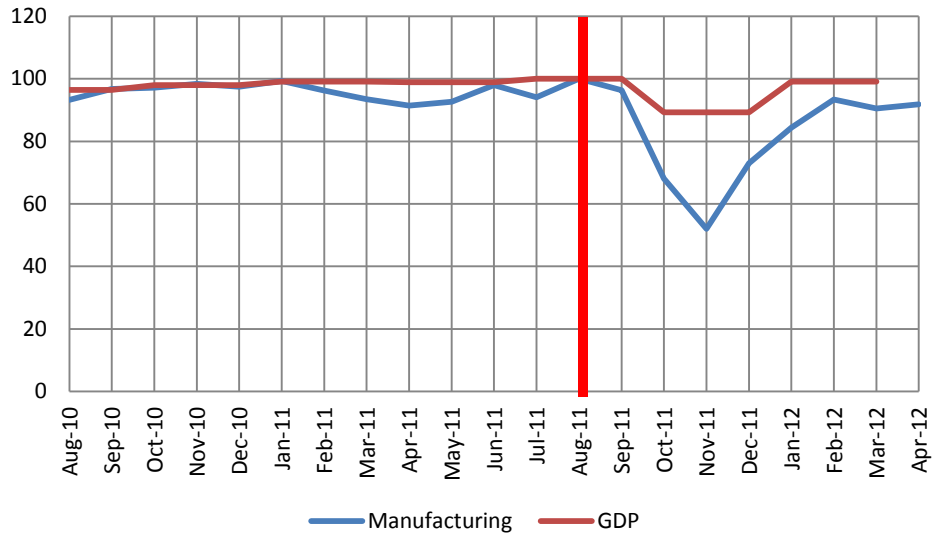
The World Bank estimates the total damage, plus economic losses resulting from the floods, at around $45bn. This higher figure includes the impact on international supply chains. The majority of this figure - 70% - is estimated to have been shouldered by the manufacturing industry. This is due to the flooding of several industrial estates. The manufacturing industry is therefore the beneficiary of the majority of insurance payments – Aon Benfield estimate the combined total sum insured for seven industrial estates affected at around $11.1bn.[26]

The picture for private households, however, is somewhat different. Damage to households and personal property is estimated at around THB84bn ($2.8bn).[27]

### Recovery

The recovery in Thailand is best judged by the performance of its manufacturing sector, given that this is where the vast majority of the total damage is estimated to have taken place. Based upon the recovery of manufacturing output (see Figure 19) the economic recovery period in Thailand is estimated at 12 months. The time period estimated for complete reconstruction is estimated at three years based on World Bank statements.[28]

**Figure 19 - Manufacturing output and GDP index (August 2011=100)**




*Source: Macrobond*

The damage to Thailand resulting from the flooding is predominantly focused upon the manufacturing sector as a result of the flooding of industrial parks. The diagram shows how both GDP and manufacturing levels compare to immediately before the onset of flooding. Remarkably, manufacturing output has already almost recovered to the level seen before August 2011 and would be expected to return to this level over the course of 2012.

Based upon this evidence, the economic recovery from the Thai floods is estimated at 12 months.

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[26] 2011 Thailand Floods Event Recap Report, AON Benfield, March 2012

[27] Ibid

[28] See www.worldbank.org/en/news/2011/12/13/world-bank-supports-thailands-post-floods-recovery-effort accessed June 2012.

## 2.3 Summary of findings and comparisons

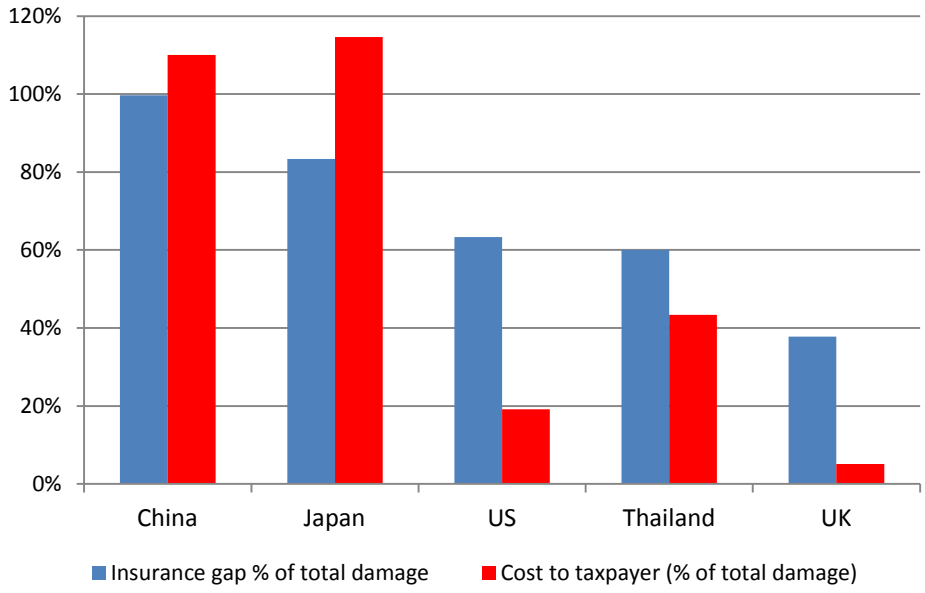
### *A higher insurance gap is associated with an increased cost to the taxpayer*

The difference between total damage and the total insured damage, or the 'insurance gap', has a strong effect on the cost which ultimately falls upon the taxpayer when comparing the five case studies.

Figure 20 shows the insurance gap and the cost to the taxpayer as a proportion of the total damage associated with each natural disaster. It is clear that reducing the insurance gap reduces the proportion of the total damage which falls on the taxpayer.

The cost to the taxpayer can exceed the estimated total damage due to the costs of reconstruction and regeneration which follow the disaster. In this sense governments may use the aftermath of catastrophes to improve infrastructure in an affected area, reconstructing structures to a higher standard than those which they replace, as well as the improving defences against future natural catastrophes. This is the case for both the 2008 earthquake in China, which was met by a huge government response and also in Japan, where the government response has included fiscal stimulus measures and is likely to be spread over the next five years.

**Figure 20 - *The insurance gap and the cost to the taxpayer***




*Source: SIGMA, The Central People's Government of the People's Republic of China, The Ministry of Finance Japan, The World Bank, The Pitt Review, Federal Emergency Management Agency, CEBR analysis*

### *Flooding in Thailand had the greatest impact as a proportion of GDP*

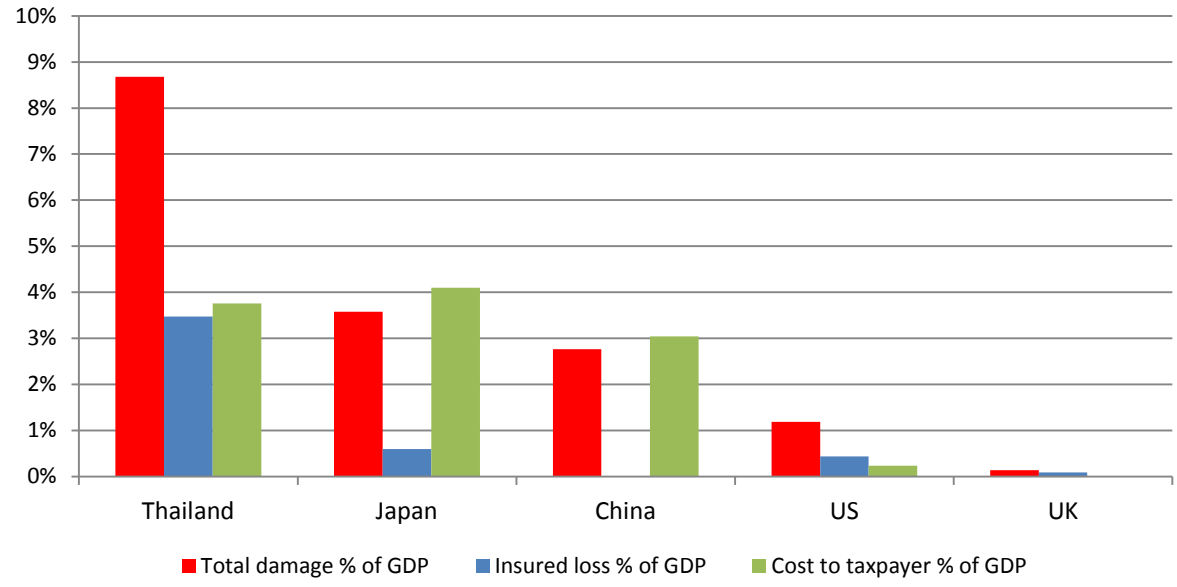
Figure 21 shows that, of all the natural disasters analysed within this section, the damage caused was proportionately highest in Thailand. The insured loss was also reasonably high – this is largely due to the insurance of the manufacturing industry which bore the brunt of the effects of the flooding.

The costs to the taxpayer in China and Japan both exceed the estimated cost of initial damage. This is due to expenditure in both cases which is intended for rebuilding to a better standard.

Although hurricanes Katrina Rita and Wilma produced some of the highest levels of damage ever seen, the proportion of the GDP of the United States which this represents is small in comparison with other disasters.

In the UK the damage as a proportion of GDP is also extremely low, especially considering that the 2007 event caused the highest damage from flooding recorded in 2007 across the globe.

**Figure 21 - Comparison of costs**



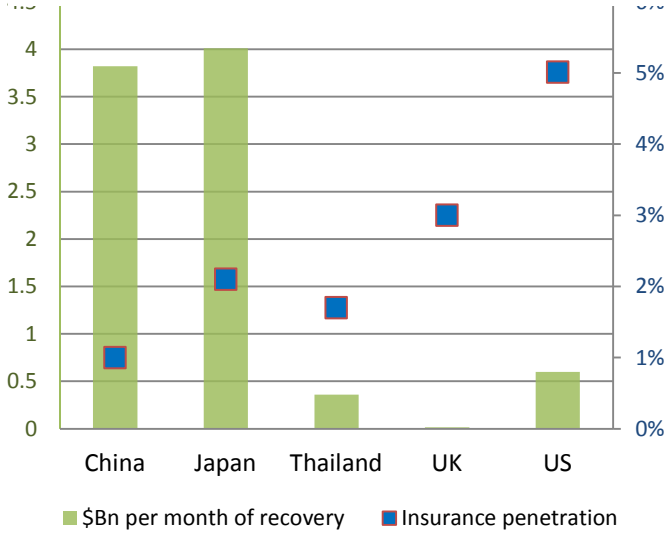

*Source: SIGMA, The Central People's Government of the People's Republic of China, The Ministry of Finance Japan, The World Bank, The Pitt Review, Federal Emergency Management Agency, CEBR analysis*

### *The cost to the taxpayer is substantially reduced through increased insurance penetration*

Figure 22 shows the estimated cost of recovery to the taxpayer per month following each event. The insurance penetration levels at the time of the events are also plotted. In general, the monthly cost of recovery to the taxpayer is lower the higher the level of insurance penetration at the time.

Clearly an increase in insurance premiums alone would not help to reduce the taxpayer's burden of recovery. It is important for all concerned – not least the insurance industry – that governments maintain high levels of emergency assistance in the first stages of a disaster. Insurance penetration is used here as an indicator of insurance market activity within the country as a whole. The message from this data is that increased insurance market activity within a country is likely to lead to better insurance coverage, and subsequently a reduction in the level of damages and recovery cost, which fall upon the government and therefore upon the taxpayer.

**Figure 22- $bn cost to taxpayer per month of recovery (LHS) and insurance penetration (RHS)**




*Source: SIGMA, The Central People's Government of the People's Republic of China, The Ministry of Finance Japan, The World Bank, The Pitt Review, Federal Emergency Management Agency, CEBR analysis*

***A 1 percentage point increase in insurance penetration is associated with a reduced burden on the taxpayer of one fifth of estimated total damage***

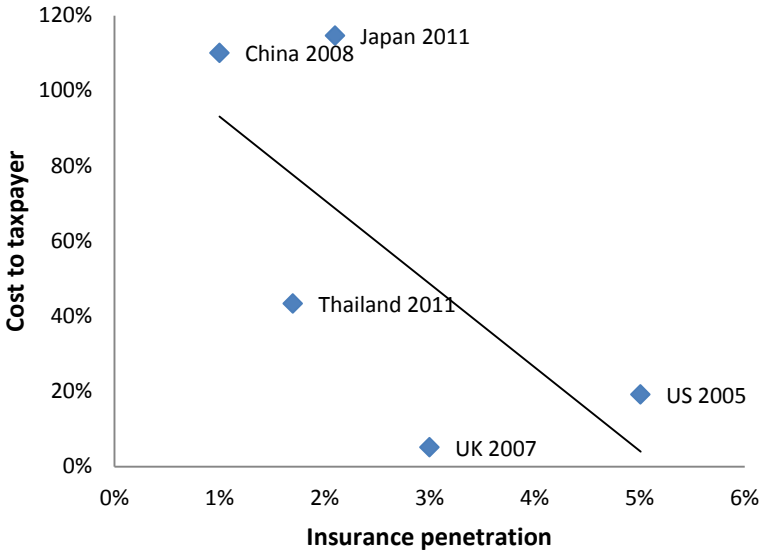
In general, the ability of an economy to recover following a natural catastrophe must depend upon the scale of the damage caused, which is best measured as a proportion of GDP. Insurance can play a key role in reconstruction efforts through the release of funds. In the absence of this funding, recovery must be funded through the government and relief agencies.

Of the five case studies included within the analysis, each shows a similar time period for the completion of reconstruction efforts. There must necessarily be a limit to how fast an area can regenerate following a natural disaster, and for these events, insurance penetration did not have a marked effect on the speed of a recovery. It is worth bearing in mind, however, that all of the countries sampled were relatively large economies – all five were within the top 25 countries as measured by their GDP in 2011 according to Cebr's World Economic League Table (WELT). In essence, even in the absence of insurance claims, the governments involved were in a position to fund reconstruction. We cannot assume the same for smaller economies.

What is notable when comparing the costs to the taxpayer is that even though the recovery times following events may be similar, the costs which fall on the taxpayer are lower where there is a higher level of insurance penetration present within the economy at the time of the event.

Figure 23 suggests that, among this small sample of case studies, an increase in insurance penetration of 1 percentage point would reduce proportion of the total damage resulting from a natural disaster borne by the taxpayer by approximately 22% of the total estimated damage.

**Figure 23 - % of total damage borne by the taxpayer and insurance penetration**

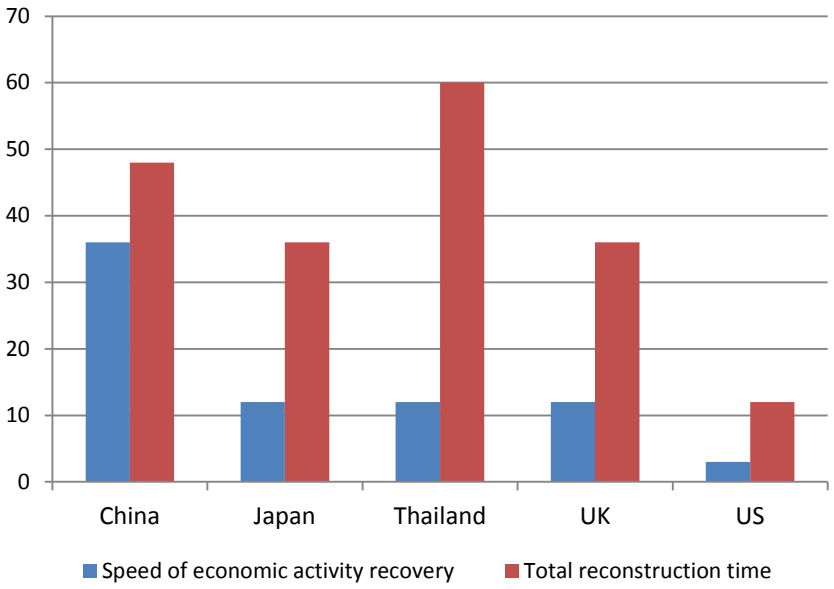



*Source: SIGMA, The Central People's Government of the People's Republic of China, The Ministry of Finance Japan, The World Bank, The Pitt Review, Federal Emergency Management Agency, CEBR analysis*

***The recovery of economic activity is usually faster than the completion of reconstruction***

In all cases, economic activity within the country or region is seen to reach pre-catastrophe levels long before reconstruction is completed. Government and private reconstruction efforts provide a boost to output which allows areas affected by natural disasters to recover, in terms of the employment and the output they are able to produce, before the area has been completely rebuilt. This is shown in Figure 24.

**Figure 24 – Estimated economic recovery and reconstruction (months)**




*Source: SIGMA, The Central People's Government of the People's Republic of China, The Ministry of Finance Japan, The World Bank, The Pitt Review, Federal Emergency Management Agency, Macrobond; CEBR analysis*

# SECTION III – THE CONTRIBUTION OF NON-LIFE INSURANCE TO THE ECONOMY

This section examines the relationship between non-life insurance penetration and the economy. The relationship between non-life insurance and income growth is explored and an assessment is made of the investment generated by non-life insurers. Furthermore, an analysis into the non-life insurance industry in the UK is conducted which illustrates the contributions made by the sector.

## 3.1 Non-life insurance and economic growth

There are numerous reasons to suppose that non-life insurance may facilitate economic growth[29]:

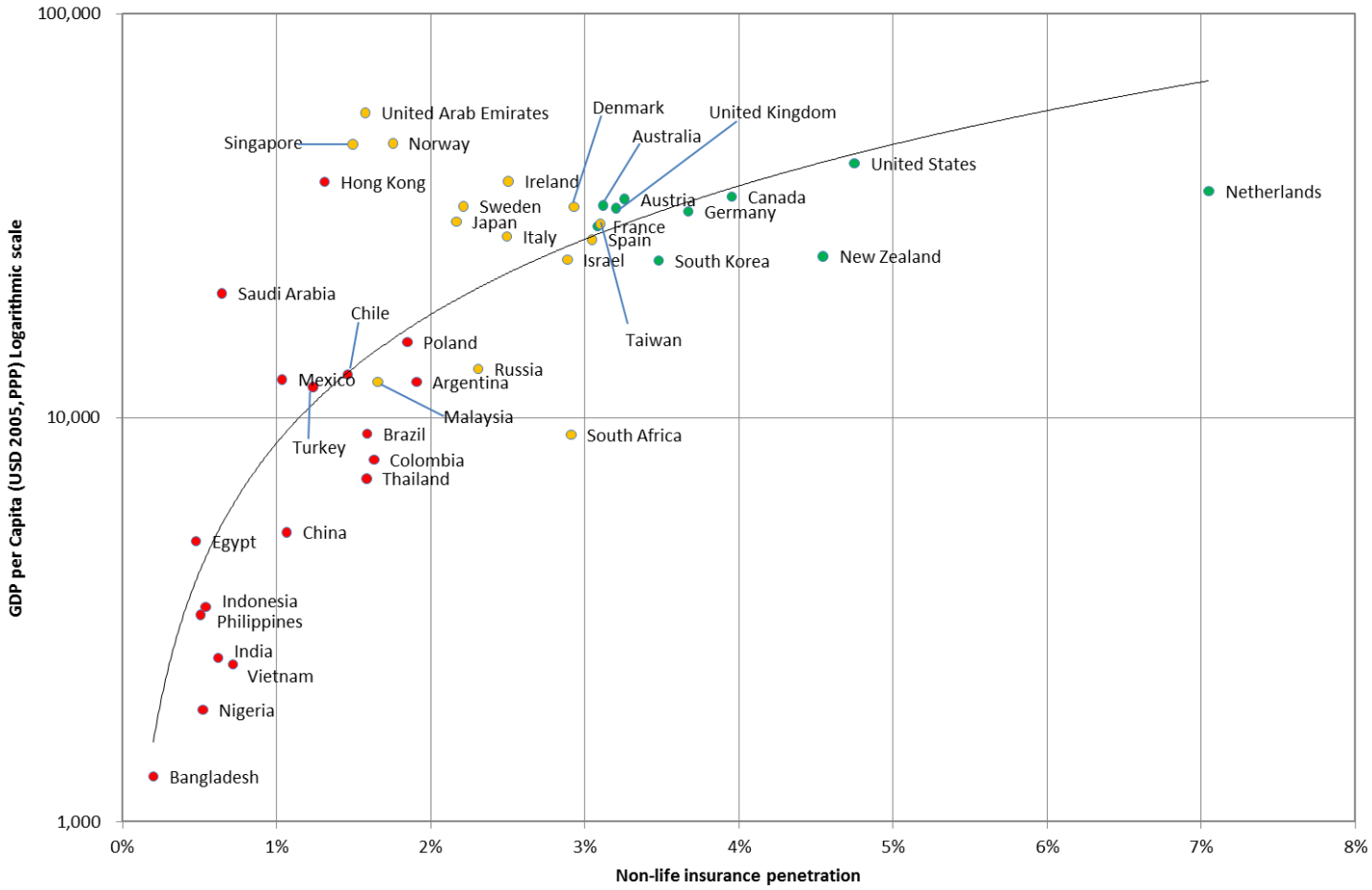
- Insurers reduce the uncertainty faced by businesses, encouraging increased investment and reducing the capital which firms need to operate.
- Insurers invest significant amounts of money into the economy and as such promote the development of financial markets while increasing businesses' access to capital.
- Insurance provides security other than that offered by the state, thereby reducing the potential burden on government finances.
- The risk transference facilitated by insurance smooths incomes and therefore consumption over time, promoting economic growth.

Therefore, it may be expected that the development of the non-life insurance market leads to increases in output, as measured by gross domestic product (GDP). In order to examine the development of an insurance market within a given country, it is usual to look at the level of insurance penetration. This gives the total insurance premiums written in a given country in a given year as a percentage of the total output produced in the same year. A higher insurance penetration level would indicate a more developed insurance market and more 'insured' economy.

There is an extremely strong correlation between income levels and non-life insurance penetration. This suggests that as countries become wealthier, non-life insurance activity increases and proportionately more of the income generated within the economy is spent on non-life insurance. This is illustrated in Figure 25 which shows non-life insurance penetration compared to GDP per capita.

[29] For further development of these and other arguments see for example: 'The Contribution of the Insurance Sector to Economic Growth and Employment in the EU', June 2006, COMITÉ EUROPÉEN DES ASSURANCES.

**Figure 25 - Insurance penetration and GDP per capita (based on averages over 2004-2010)**




*Source: World Bank: World development indicators and financial structure databases, Sigma, Cebr*

The relationship (as illustrated by the trend-line) demonstrates that a 1 percentage point increase in non-life insurance penetration is linked to an average increase in per capita GDP of around $6,000 across the 42 sampled countries. Data points have been colour coded according to their benchmarked insurance level in 2011, as outlined within Section 1 (the insurance of countries) of the research. Red indicates that a country is underinsured, amber moderately insured and green better insured. The diagram clearly shows where there is scope for underinsured countries to increase their insurance level.[30]

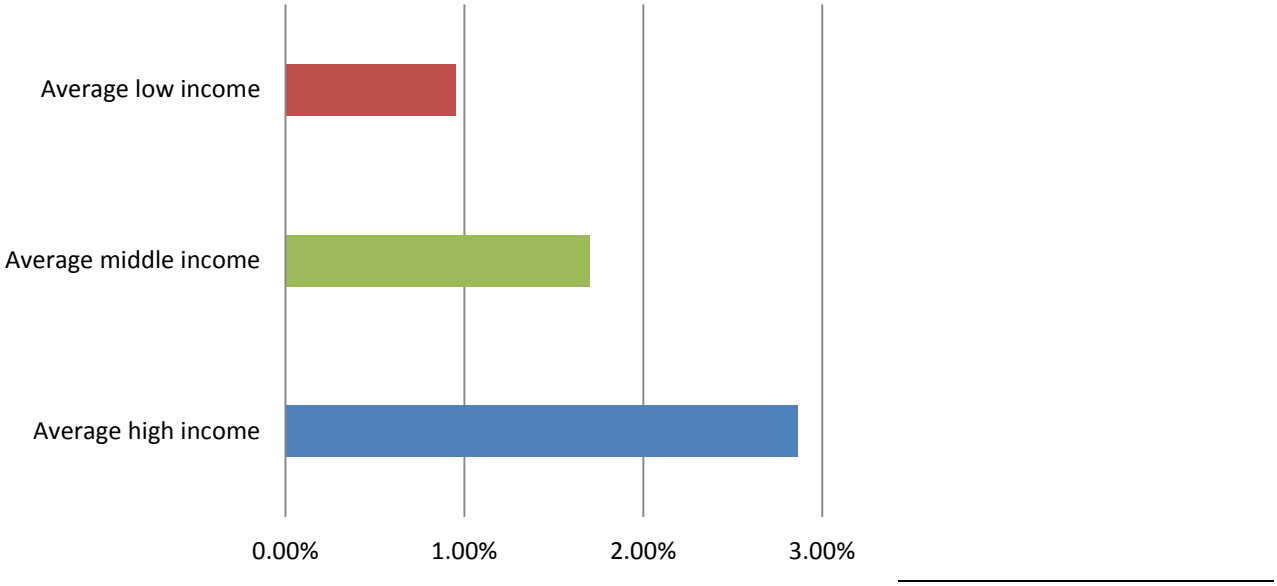
[30] For data used here see

Clustered around the bottom left of the diagram are developing nations in which non-life insurance is an undeveloped sector of the economy. The process of the development of the non-life insurance sector would be expected to occur alongside increasing income levels. With increased non-life insurance coverage these countries would stand to gain from increased security of flows on income, promoting further increases in GDP per capita.

As countries become richer, non-life insurance activity increases in tandem. However, the increase in GDP per capita cannot be wholly attributed to growth in insurance penetration. As people become wealthier their demand for insurance is likely to increase. This means that while non-life insurance is likely to be a driver of economic growth, for the reasons given above, growth in the non-life insurance industry is also driven by economic growth itself; it is a complex relationship.

Figure 26 shows the average insurance penetration levels across income groups of countries, using the World Bank defined income categories[31]. The graph shows clearly that as countries' incomes increase, their insurance penetration levels also increase. High income countries have insurance penetration levels over 1.0 percentage points higher than middle income countries and over 2.0 percentage points higher than low income countries. In future, as countries develop and their incomes increase, it would be expected that insurance penetration levels would see corresponding increases.

**Figure 26 - Insurance penetration by income**




*Source: World Bank: World development indicators and financial structure databases, Cebr analysis*

Appendix B – Insurance and GDP per capita relationship.

[31] 'Low income' countries here include also 'lower-middle income' countries, as defined by the World Bank, while 'middle income countries' include only upper-middle income countries as defined by the World Bank. Under these definitions countries are classified based on their Gross National Income per capita.

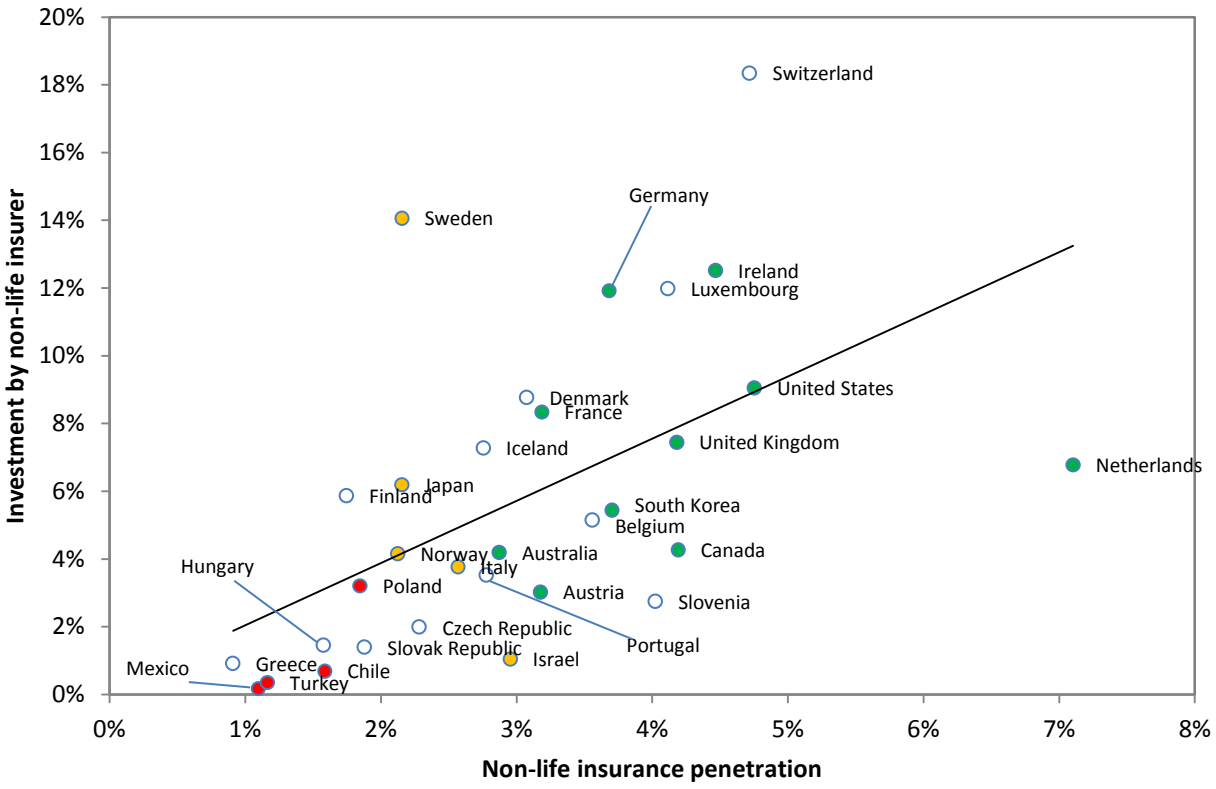
The fact that countries with higher GDP per capita levels have a higher level of insurance penetration indicates that the growth of the non-life insurance market is a natural part of development. The differences between the income categories demonstrate the scope which exists for growth in non-life insurance sectors within low and middle income countries. For higher income countries, it would be expected that insurance penetration would demonstrate much slower growth, or even begin to level off, as non-life insurance coverage reaches a stable level.

As countries with lower income levels increase their wealth, insurance penetration levels are shown to increase. However, this does not necessarily mean that insurance market development in itself facilitates growth. In order to argue the case for insurance as a driver of growth, the next section examines the relationship between national savings and non-life insurance and the role of non-life insurers as investors.

## 3.2 Investment

Insurers play an important role in mobilising the savings of individuals and businesses, transmitting these funds into productive long-term investments. Through this practice insurers can provide a catalyst to economic growth. The relationship between insurance penetration and investment is shown in Figure 27*:*

**Figure 27 - Investment by insurers and insurance penetration (2004-2010 averages)**




Source: World Bank: Financial structure databases, Sigma, OECD, Cebr analysis

Data relating to non-life insurance penetration levels across countries between 2004 and 2010 is used to estimate the average level of insurance penetration over the time period. This reduces the effects of temporary movements in the rates of insurance penetration and captures the long term level of non-life insurance activity. This is then compared to the average stock of non-life insurers' investments within the country over the same time period.

On average, the graph illustrates that as the insurance market develops, domestic investment by insurers is expected to increase. More formally, the data for 2004-2010 estimate that a 1 percentage point increase in insurance penetration is associated with an increase in the stock of domestic investment held domestically by insurers equivalent to 2% of nominal GDP. This relationship illustrates the potential benefits which low and middle income countries stand to gain through the development of their non-life insurance markets.

Insurance against potential risks facilitates the transfer of savings into investments, supporting productivity gains, which in turn provide a stimulus to increased economic capacity and allow for long term increases in output. This demonstrates a direct causal channel between insurance market development and economic growth. This long term relationship suggests that the development of the non-life insurance industry within an economy facilitates a structural increase in the level of investment driven by the nature of non-life insurers as institutional investors. The relationship is evidenced here across 33 countries with varying insurance levels and levels of income over a nine year period. This therefore represents a robust channel through which development in non-life insurance coverage can influence the wider economy.

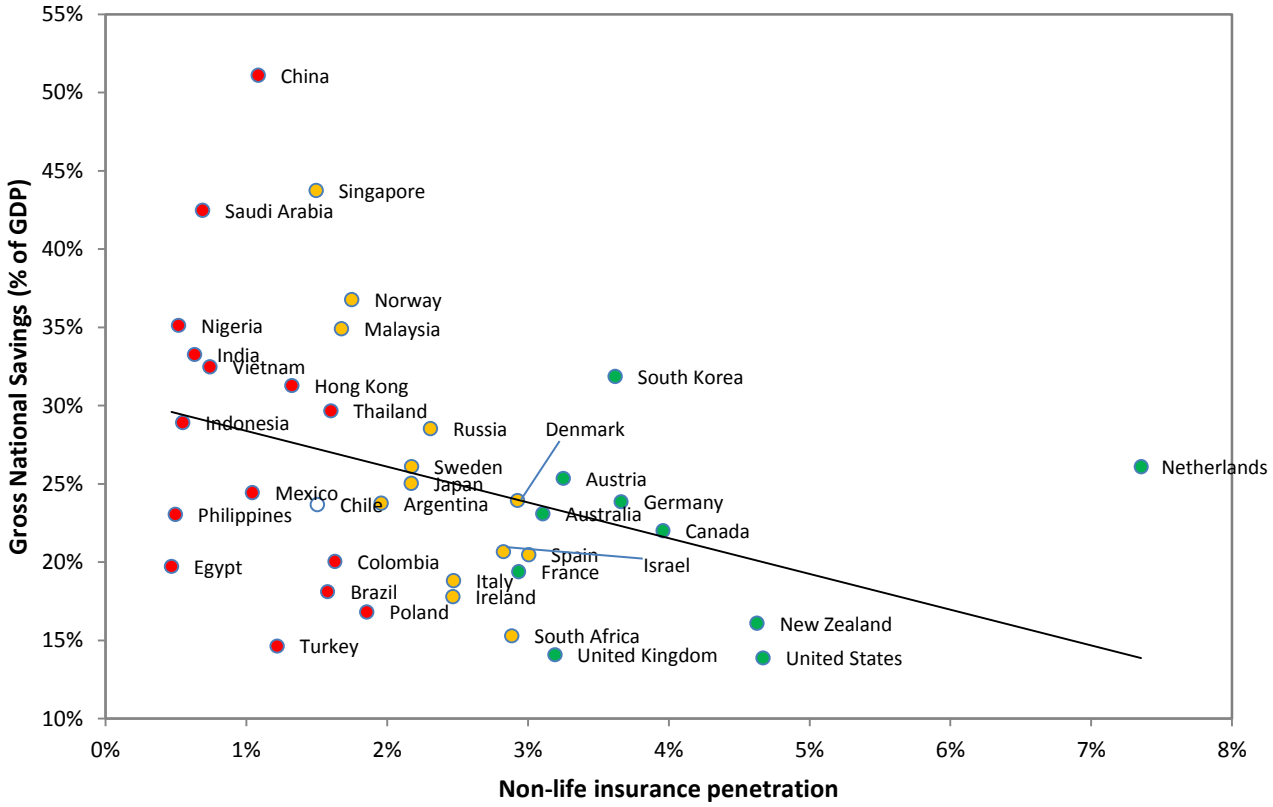
### 3.2.1 Insurance and savings

The role which non-life insurance can play in economic development can be illustrated through an examination of the savings rates of countries compared to their non-life insurance penetration levels. There are many factors which may influence the savings rate for businesses, individuals and the government within a country. The level of uncertainty, the availability of credit, the interest rate and a savings inclined culture are all factors which may play a role.

It would be expected that as insurance coverage increases this would reduce the uncertainty faced by decision makers within the economy. Therefore as non-life insurance coverage increases, holding other factors constant, the proportion of income which is saved would be expected to decrease – as individuals and businesses transfer their risk, the need to hold assets as a contingency reduces. This means that when comparing two almost identical countries, differing only in their levels of non-life insurance penetration, the country with higher non-life insurance penetration would be expected to save proportionately less of its income.

Figure **29** shows the relationship between non-life insurance penetration and gross national savings. Gross national savings are calculated as GDP minus total consumption and therefore illustrate the proportion of national income which not is consumed.

**Figure 29 - Non-life insurance penetration and gross national savings (2004-2011 averages)**




Source: World Bank: Financial structure databases, Sigma, IMF WEO database, Cebr analysis

The diagram shows the stark difference between the savings rates across countries. For example, the high rates of China and Saudi Arabia compared to those of the UK and the US. This difference is due in part to the lower levels of insurance within China and Saudi Arabia. Of course political and cultural differences must play some part, as does each country's exposure to natural catastrophes. However, even between Asian economies, which traditionally have higher savings rates, those with higher levels of non-life insurance penetration are seen to have lower savings rates. Take the examples of Singapore and South Korea. Both are at a similar level of development and have similarly structured high-tech economies. Yet while Singapore saves around 43% of its national income every year, South Korea saves only 32%. The difference in their non-life insurance penetration may provide some insight into why this is the case. South Korea makes great use of non-life insurance – it is the most highly insured economy analysed within South East Asia and third overall. On the other hand, Singapore, while it is a low risk county in terms of its associated risk of natural disaster, has insurance penetration levels which are well below other economies at similar levels of development.

Among the sampled countries, a 1 percentage point increase in the level of non-life insurance penetration is associated with a 2.3 percentage point reduction in the savings rate. As the non-life insurance market develops, households, businesses and governments are able to save less, because their risks are transferred. The ability of the economy to consume more of the income which it produces can prove to be a key driver of improvements in living standards, as relatively higher consumption is facilitated, for a given level of income, due to the mitigation of risk. The analysis shows that not only do non-life insurers facilitate long term investments by reinvesting the premiums which are paid to them, but also that higher non-life insurance coverage tends to allow higher consumption within an economy for a given level of income.

It is interesting to note that some of the countries identified within Section 1 of this research as being underinsured have high savings rates in comparison to other countries. This suggests that these countries are indeed using savings to mitigate against potential losses – following an economic loss;

savings may provide a means through which to recover in the absence of insurance. China's high savings rate, for example, may allow it to absorb significant economic losses following natural catastrophes – this was evident in the huge government response following the Sichuan earthquake in 2008 (see Section 2).

Countries without the savings rates of China, but which have also been identified as being underinsured, such as Egypt and Turkey, are likely to incur high uninsured losses following natural catastrophes which will struggle to be matched by national savings in the same way. In terms of natural catastrophe exposure, countries with high savings rates may be able to cover themselves against economic losses, though this is likely to be a much less efficient method of risk mitigation as it necessarily reduces the funds available for consumption. At the other end of the spectrum, countries which are both underinsured and have low savings rates may find it difficult to stimulate recovery following unforeseen events.

## 3.3 The UK non-life insurance industry

This section details the contributions which the non-life insurance industry makes to the UK economy. Direct impacts are examined first, which have an immediate impact upon the GDP of the UK. The investment by non-life insurers is explored, followed by an examination of the indirect effects emanating from the non-life insurance industry.

### 3.3.1 Direct impacts

**Employment**

The UK non-life insurance industry employs approximately 80,000 staff with an estimated total compensation of employees of £2.812bn. [32] This amounts to average remuneration of each employee in 2010 of £35,150.

This means that the non-life insurance industry is responsible for approximately 0.03% of all employment within the UK[33], while employees within non-life insurance are among the highest paid in the UK – average earnings in the UK in 2010 were £21,212.[34]

### Gross Value Added

Gross value added (GVA) measures the output of the economy, before considerations for taxation are made. It is the sum of wages and profits and as such can provide an indication of an individual industry's contribution to the output of the economy. It is similar to Gross Domestic Product as a measure of output and the two follow the relationship:

GVA + taxes on production – subsidies on production = GDP

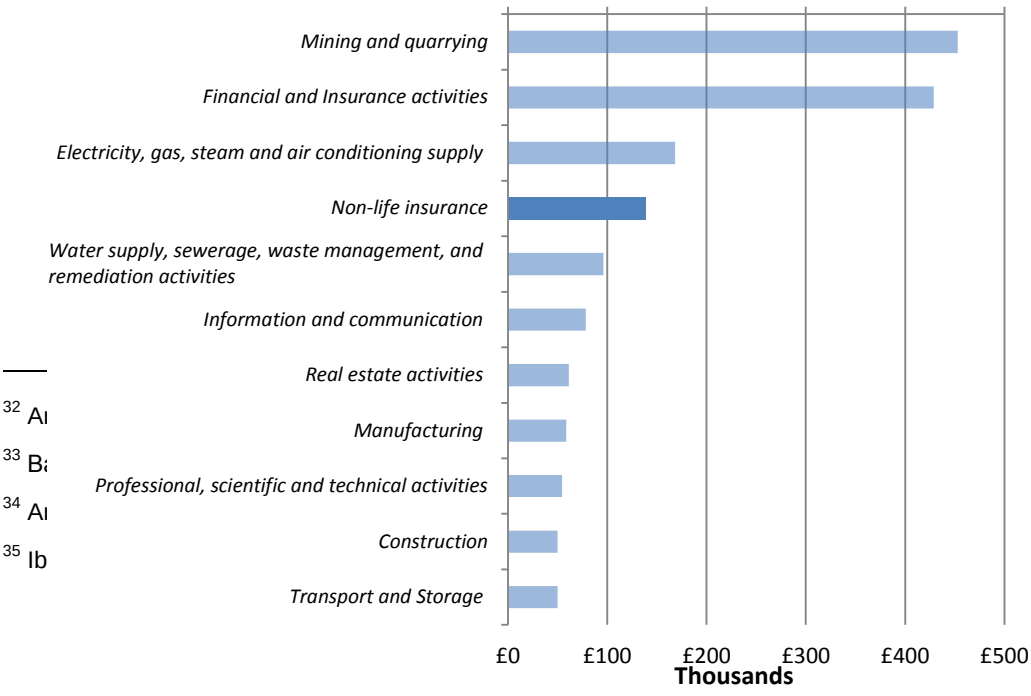
Since figures for taxes and subsidies on production are made at the aggregate level, GVA provides a measure of output at the level of individual sectors of the economy.

The total GVA contribution of the non-life insurance industry in the UK in 2010 is estimated at £10.77bn.[35] This means that the non-life insurance industry is responsible for approximately 1.15% of the GVA of the UK.

The non-life insurance industry is among the most productive industries in the entire UK economy, with GVA per head in 2010 estimated around £138,051, representing an increase of over £30,000 from £106,052 in 2008. This compares to the average in the UK as a whole of approximately £35,507. How the non-life insurance industry compares to the 10 most productive broad sector groups in the UK is shown in **Error! Reference source not found.**.

The non-life insurance industry ranks highly compared to other wider sectors of the UK economy. While there will be industries within each broad sector which may be more productive than the non-life insurance industry, the data nevertheless suggest that the non-life insurance industry is a highly productive contributor to the UK economy.

**Figure 30 – Gross Value Added per head of the ten most productive sectors in the UK in 2010 and the non-life insurance industry (£ 000's)**




[32] Al
[33] Ba
[34] Al
[35] Ib

**Tax contributions**

UK businesses contribute to the government tax revenues through the taxation on their employee's earnings and the businesses profits. Estimates of these contributions are outlined within

Table **15**.

**Table 15 - UK tax contributions (£m)**

| | Tax contribution 2010 (£m) |
|---|---|
| **Income tax**[36] | £458.8 |
| **National insurance contribution** | £259.0 |
| **Corporation tax**[37] | £2,227.7 |
| **Premiums tax**[38] | £2,589.0 |
| **Total** | **£5204.5** |

Source: ONS, Annual Business Survey 2010, HMRC, Cebr analysis

The summary of the non-life insurance industry's total estimated contribution to UK GDP in 2010 is shown within

Table **16**.

**Table 16 - Direct contributions 2010 £bn**

| Description | Estimated contribution (2010, £bn) |
|---|---|
| Gross Value Added | £10.77 |
| Of which wages of employees | £2.81 |

[36] Income tax and NI contributions based on those required of a £35,150 salary in the 2009/10 tax year.

[37] Calculated based on corporation tax levied at 28% on operating profits as outlined within the 2010 ABS survey.

[38] Tax levied on general insurance premiums. Figure taken from HMRC for the 2009-10 tax year.

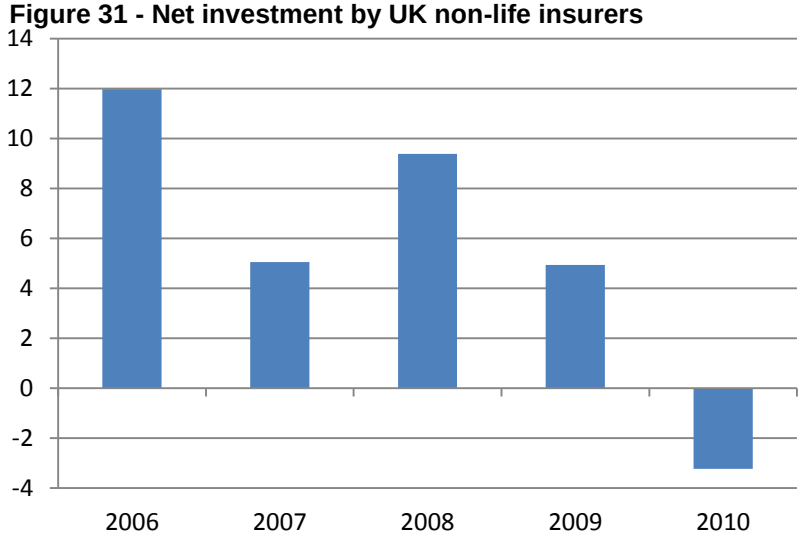
| | |
|---|---|
| Tax contributions | £5.20 |
| **Estimated direct contribution** | **£15.97** |

Source: ONS, Annual Business Survey 2010, Cebr analysis

### 3.3.2 Investment by UK non-life insurers

Aside from their direct impact on UK output, non-life insurers also invest their accumulated premium income across an array of assets. In 2010, non-life insurers reduced their investment holdings by around £3.23bn. This follows previous consecutive increases in investment (see Figure 30).

**Figure 31 - Net investment by UK non-life insurers**

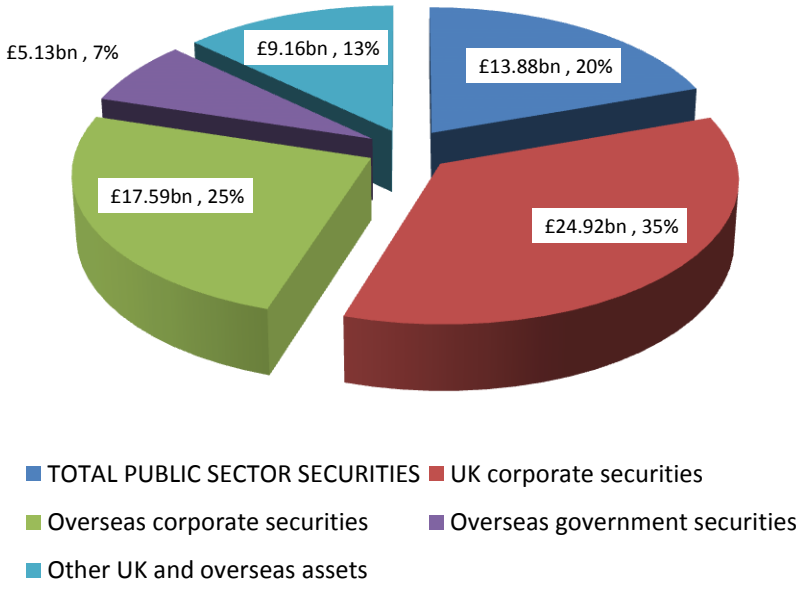



Source: ONS, Cebr analysis

Despite this net reduction in investment, the total investment portfolio of non-life insurers in the UK was valued at £70.67bn. The breakdown of this investment is shown in Figure 31.

Over 55% of investment is estimated to be contained within the UK, with around 35% of investment, £22.92bn, invested in UK businesses through corporate securities.

**Figure 32 - Investment by UK non-life insurers £bn**




Source: ONS, Cebr analysis

### 3.3.3 Indirect impacts

#### Industry benefits from claims

The impact of the non-life insurance industry within the UK on other UK industries can be measured through the destinations of the sums paid out in the settling of insurance claims. When an insurer pays a claim for motor vehicle or property damage for example, these funds will go directly into the motor vehicle or construction trade. When a car is damaged in an accident, the insurer will pay for either replacement or repair of the vehicle depending upon the nature of the damage and coverage. This means that claims data relating to both motor vehicle and property policies provide an estimate of the amount of revenue provided to the UK construction and retail and repair of motor vehicles industries respectively.

Table **17** shows the 2011 claims and turnover data relating to the two sectors.

**Table 17 - Non-life insurance claims and turnover in 2010 (£m)**

| | Insurance claims (£m) | Turnover (£m) | Claims % of turnover |
|---|---|---|---|
| **Retail and repair of motor vehicles** | £12,963 | £132,783 | 9.76% |
| **Construction** | £7,483 | £184,130 | 4.06% |

*ONS, Annual Business Survey 2010, Insurance Europe, Cebr analysis*

Non-life insurance provided approximately £7.48bn of revenue to the construction industry in 2010 and £12.96bn to the retail and repair of motor vehicles industry. As shown in table 4, this represents a significant proportion of the revenues of both industries – almost 10% of the turnover of the retail and repair of motor vehicles industry over 4% of the revenues of the construction industry, as shown in

Table **17**. While at the aggregate level this does not represent an increase in GDP, the coverage against losses through insurance nevertheless provides an important source of income for UK businesses.

**Funds released through non – life insurance**

Non-life insurance plays a key role in allowing businesses to mitigate the risks they face. In performing this task, non-life insurance comprises approximately 1.73% of inputs into the production of UK industries.[39] This amounts to approximately £23.12bn in 2009. Through this interaction businesses are able to outsource the risks they face, in some cases making the operation of the business possible.

Insurance allows the spreading of incurred losses out over time, smoothing incomes and consumption. The price of insurance – the premiums paid – is likely to be lower than the reserves required to hold against potential risks. Without insurance, households and businesses may have to accumulate savings in order to cover the costs incurred resulting from the risks they face. For example, without the ability to insure, in order to cover the cost of fire damage, businesses must hold savings for repairs or replacement of stock, otherwise they risk becoming insolvent should the business be affected by fire.

If the cost associated with fire damage, the *potential loss* is estimated at £100,000, the business should accumulate reserves approaching £100,000 in order to safeguard against fire damage in a given year. The *expected loss* associated with fire damage may actually be much lower. This is given by the probability of fire damage multiplied by the *potential loss* incurred as a result of fire. For example, if the probability of fire damage in one year is estimated at 1% and the cost of fire damage is £100,000, the *expected loss* associated with fire damage in one year is £1,000.

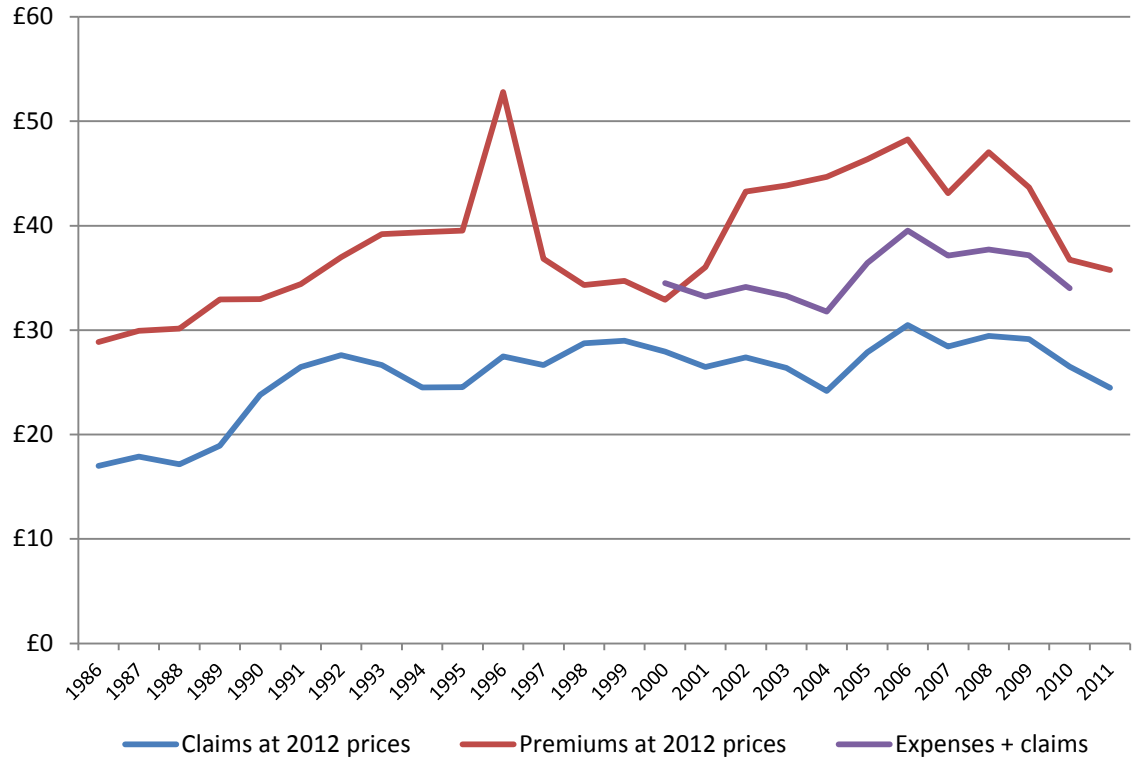
By using insurance, the business can pay a premium close to the *expected loss* associated with fire damage each year. In effect, the business can pay around £1,000 each year, instead of accumulating reserves of £100,000. The overall result of this is a release of funds for the business of £99,000, in this simple example.

It is possible to examine how the process of insuring impacts the UK economy as a whole in the context of non-life insurance using both claims data and premium data. For the UK as a whole, the non-life claims in any given year are likely to approximate, on average, to the expected insurable non-life losses. This means that, in a given year, non-life insurance claims should approximate to non-life premiums,

[39] Based on an analysis of the ONS 2009 intermediate use table

while any difference over time is attributable to the profits and operating expenses of non-life insurers. This is shown graphically in Figure 33:

**Figure 33 - UK historical non-life insurance claims and premiums (£bn)**




Source: ONS, Cebr analysis

The Figure shows that following the inclusion of expenses from 2000 onwards, a significant proportion of the difference between claims and premium income is accounted for.

The total non-life insurance claims in any given year, as outlined, provide an approximation of the expected losses insurable through non-life insurance. However, from the perspective of those individual economic agents which purchase insurance, the *potential loss* which would be incurred should an event take place is greater than the *expected loss*. Therefore, if those agents were not able to mitigate their risks using insurance, the reserves required to protect against the *potential loss* would exceed the *expected loss*. The reserves required can be approximated by estimating what the total effect of all agents' *potential losses* occurring in one year would be.

Over a longer time period the probability of *potential losses* occurring is higher. Claims data over a number of years can provide an approximation of the sum of all *potential losses* in a given year. If we assume that households and businesses *potential losses* would be revealed within five years, then claims data over five years would give an indication as to the reserves required in order for individuals and businesses to prepare for the their *potential losses*. Table 18 below details claims data in 2012 prices:

**Table 18 - Sum of non-life insurance claims (2012 prices, £m)**

| 2007 | 2008 | 2009 | 2010 | 2011 | Total |
|---|---|---|---|---|---|

| | | | | | |
|---|---|---|---|---|---|
| **£28,424** | £29,461 | £29,137 | £26,511 | £24,489 | **£138,021** |

Source: ONS, Cebr analysis

The total non-life claims made of UK non-life insurers from 2007-2012 was £138.02bn. This suggests that without the option of buying insurance, in order to accumulate savings to cover their potential losses, households and businesses would have to hold reserves approaching this level in order to safeguard themselves against potential risks. This assumes that the sum of all non-life insurable risks occurring in one year is approximated by claims data over 5 years. The size of this figure illustrates how dependent the UK has become on non-life insurance.

A key role which insurance plays is in freeing up these would-be reserves. Pooling the risks faced by individuals and businesses within the economy allows insurers to charge individuals and businesses a premium close to the *expected loss* of the risks they face, rather than having to prepare against the entirety of the *potential loss*, were the insurable event to occur.

It is possible to estimate the funds which are released through insurance by examining the difference between the sum of the *potential losses* and the premiums paid in a given year.

Figure **34** shows the estimated funds released for the UK economy in a given year based on the estimates of the sum of *potential losses* faced by individual and businesses.

**Figure 34 - Estimated funds released (£bn)**


Source: ONS, Cebr analysis

Based on the preceding arguments a conservative estimate of the funds released as a result of the availability of non-life insurance would place them at £102.27bn. The necessity of replenishing reserves following losses means that non-life insurance companies are responsible for releasing these funds on an annual basis.

This calculation is based upon the assumption that without the ability to purchase non-life insurance, individuals and businesses would accumulate reserves in order to protect themselves against potential losses. Of course there are alternatives to saving, for example, it may be possible to gain financing to recover following losses, or the individual or business may 'take the risk' and operate without preparing for potential losses. What this analysis shows, however, is the size of the resources which would be required in order to operate at a comparable level of certainty, in absence of the ability to purchase non-life insurance.

There is, of course, less tangible advantage of a well insured business sector. Primarily, that insurance encourages risk reducing behaviours by the insured. Businesses that make the decision to buy insurance and – critically – agree the terms of a policy are de facto making a commitment to risk mitigation by

accepting demands from the insurer, or listening to their advice, in order to reduce their premium. So as well as providing financial protection, the contract can also act as a spur to reduce the aggregate risk faced by the insured.

# SECTION IV – THE INSURANCE OF INDUSTRIES

This section details research into the insurance of 16 industries across the economies of 18 countries. While research into how different industries of the economy make use of insurance is limited, this research aims to shed light on this area through the use of data from national accounts.

## 4.1 Methodology

The measure of insurance coverage and activity typically used in insurance analysis is the insurance penetration level. This shows the insurance premiums written in a given year - the amount spent on insurance - divided by the GDP of the economy in the same year - the income generated by the economy. A higher insurance penetration level is associated with a more developed insurance market and higher insurance coverage.

A measure similar to this is constructed within this section on the insurance spend of different industry sectors. Insurance premium data is not available in great detail at the level of industries within the economy and this report aims to shed some light on the issue of how well protected different sectors are against risk. This analysis relies on the creation of a similar method of comparison used in establishing insurance penetration for individual countries. The ratio of insurance expenditure in each industry to the total output of the industry is calculated as a measure of the ***industrial insurance penetration (IIP)*** of the industry.

This research does not attempt to measure underinsurance, which would require considerable analysis of the particular risks faced by each industry, in each country. However, it forms the foundation for a detailed discussion of this issue, on the basis of the relative penetration levels of each industrial sector.

In order to examine the level of industrial insurance penetration in each sector within each country, the analysis makes extensive use of the national input-output tables of each country. These tables detail the inputs each industry requires to produce their final output. The expenditure of each industry on insurance is assumed to indicate the level of insurance of that industry in the absence of specific data relating to insurance premiums. The complex nature of the production of the input-output tables for each country means that there is a time lag – usually at least two years – between the year which the tables relate to and their release. The 2007 input-output tables are the most widely available for the sampled countries. As such, for ease of comparison, it is the 2007 tables which have been used to compile the estimated insurance levels.[40] Appendix D demonstrates that the relative insurance expenditure by industries remain largely stable over time.

[40] This is with the exception of Canada, where 2008 data is used and Turkey, where only data relating to 2002 is available.

*Appendix D – Stability of* industrial insurance measures shows that the difference between the insurance levels of Sectors is a stable indicator and does not change dramatically over time.

The input-output tables estimate only the expenditure of businesses on insurance, therefore all expenditure is assumed to encompass only non-life insurance expenditure. Furthermore, industries' use of captives or self-insurance will not be captured by the input-output framework. This is due to the nature of self-insurance being a transfer of funds as opposed to direct insurance premium expenditure.

From each national table smaller industries have been aggregated into larger sectors to resemble as closely as possible the sectors representing the Standard Industrial Classifications 2007 (SIC 2007). However, due to differences in national accounting techniques, the utilities industries and professional and administrative services have been further aggregated in order to allow for a meaningful comparison across countries. The differences between the classifications used are outlined in

Table **19**.

**Table 19 - Sector classifications**

| Industry by SIC (2007) code | Classification used |
|---|---|
| | |
| **Agriculture, forestry and fishing** | Agriculture, forestry and fishing |
| **Mining and quarrying** | Mining and quarrying |
| **Manufacturing** | Manufacturing |
| **Electricity, gas, steam and air-conditioning supply** | Utilities |
| **Water supply; sewerage, waste management** | Utilities |
| **Construction** | Construction |
| **Wholesale and retail trade, repair of motor vehicles** | Wholesale and retail trade |
| **Transportation and storage** | Transportation and storage |
| **Accommodation and food service activities** | Accommodation and food service activities |
| **Information and communication** | Information and communication |
| **Financial and insurance activities** | Financial and insurance activities |
| **Real estate activities** | Real estate activities |
| **Professional, scientific and technical activities** | Professional and administrative services |
| **Administrative and support service activities** | Professional and administrative services |
| **Public administration and defence; compulsory social security** | Public administration and defence; compulsory social security |
| **Education** | Education |
| **Human health and social work activities** | Human health and social work activities |
| **Arts, entertainment and recreation** | Arts, entertainment and recreation |

In the case of the United States, anomalies within the input output tables regarding insurance expenditure mean that US figures are Cebr estimates based on total insurance expenditure distributed between industries according to the insurance differentials across countries. This differential is outlined within section 3.1 and

Figure **36**.

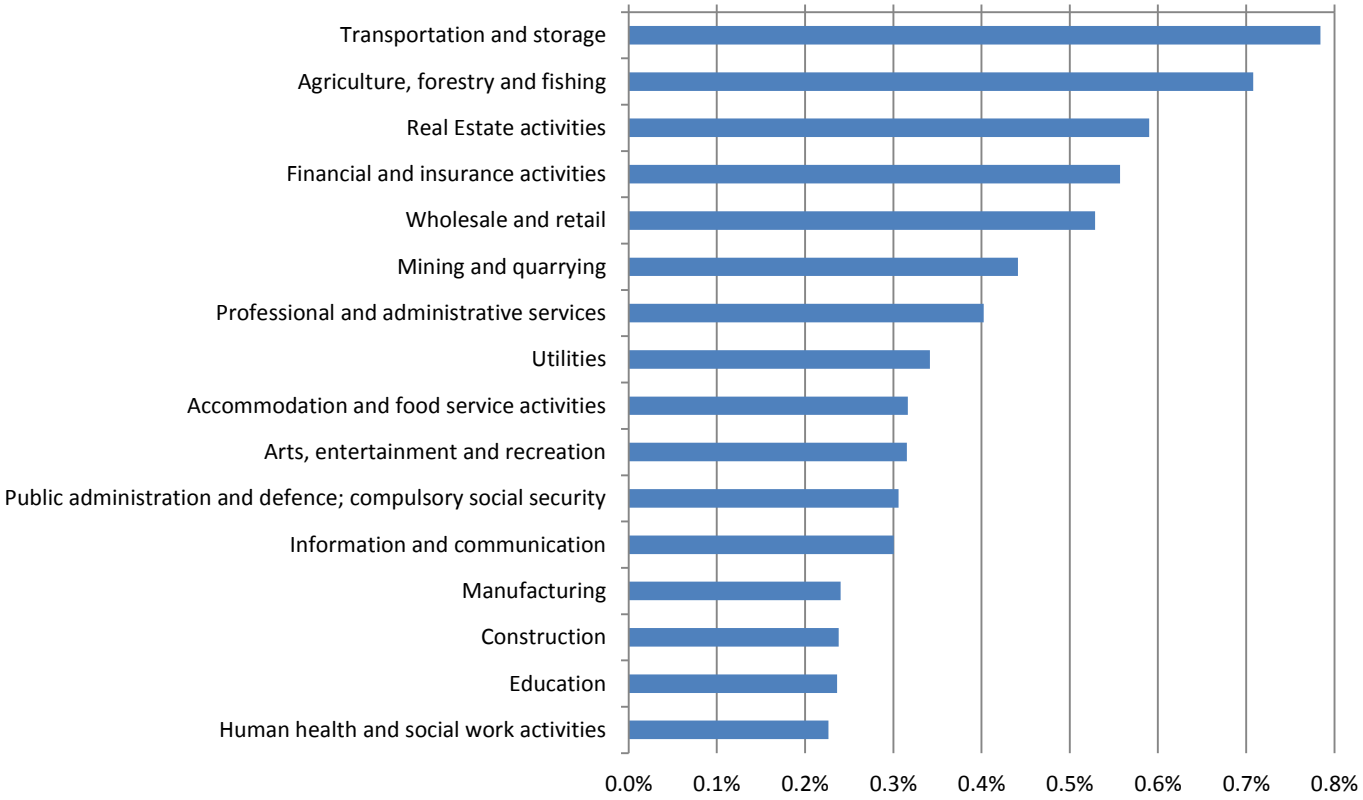
Following the aggregation of the industries into these classifications, the insurance expenditure of each of the 16 sectors was calculated.[41] Using this information and the total output for the sector, a measure of insurance expenditure as a percentage of the total output of the industry was calculated. This gives a measure of insurance expenditure as a percentage of the total economic activity of the sector or the ***industrial insurance penetration*** (IIP) of each industry.

## 4.2 Results

### 4.2.1 Insurance of sectors

The industrial insurance penetration figures are shown in Figure 35 based on the average across countries.

**Figure 35 - Average industrial insurance penetration**




Source: National input output table, Cebr

The graph shows that transportation and storage is typically more highly insured than other sectors, while human health and social work, education and construction are typically less insured.

[41] Note that the expenditure of the 'Financial and insurance activities sector' excludes the expenditure of the insurance sector on insurance. This is to avoid the distortions caused by larger domestic insurance markets and expenditure on reinsurance which may inflate the calculations of the expenditure on insurance within the sector. This is also the case for calculations of the average industrial insurance penetration across countries.

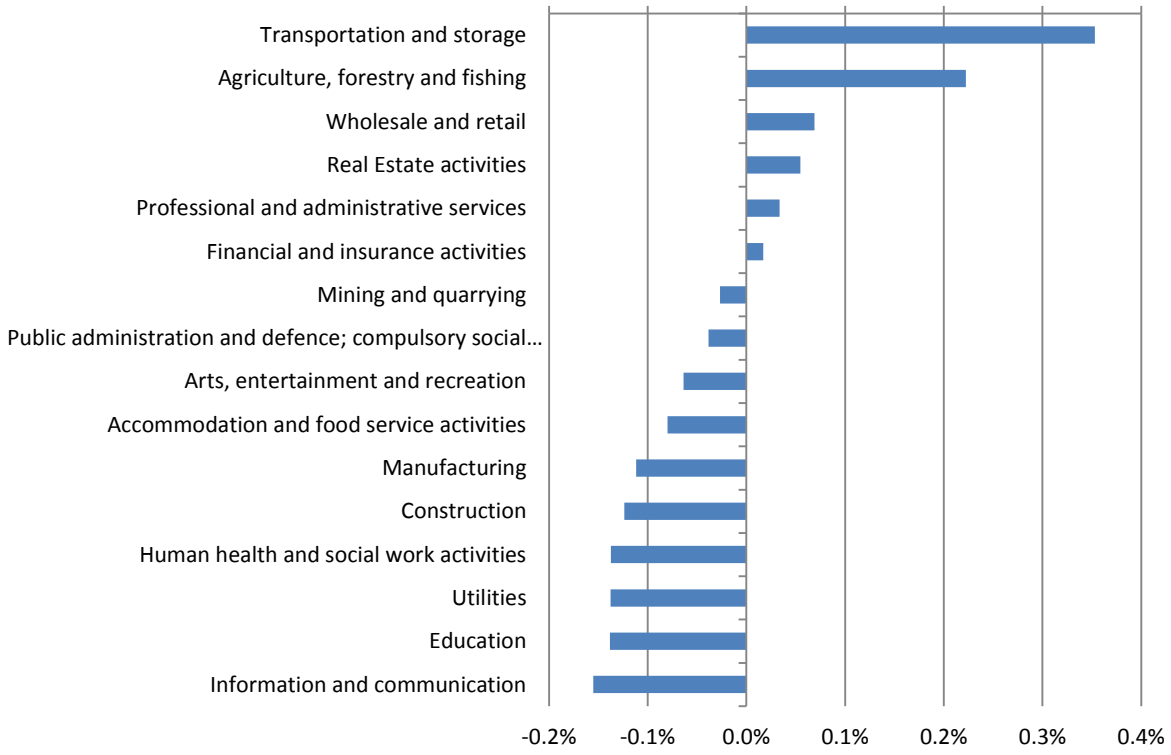
The external risks facing transportation and storage and agriculture explain their position at the top of the table. The high position of real estate activities – which would include companies working in property management – is also unsurprising.

The diagram largely reflects where risks are likely to be less manageable as well as where they may be highest. These are usually the conditions when businesses will seek to transfer their risk to a third party. The position of construction and manufacturing so low down the ranking is surprising and could point to these industries underusing insurance in general. More analysis is needed into the reasons why these sectors are so low on this table.

Taking an average across countries can distort the results since countries with highly insured industries in general may bias the figures. In order to account for this, a measure of the industrial insurance differential was calculated. This is done by subtracting the IIP of the country from the IIP of the individual industry. A positive figure illustrates that the industry is more insured than the average industry within the economy, while a negative figure illustrates that the industry is less insured than the average industry within the economy. Taking the average of these figures across all the sampled countries shows, on average, which industries have the highest levels of IIP compared to the rest of the economy. The results of this analysis are shown within

Figure **36**.

**Figure 36 - Industrial insurance differential**




Source: National input output table, Cebr

The graph shows that, as before, Transportation and storage remains the most highly insured, while Human health and social work, Education and Construction remain lower down the rankings. The change in the measure of relative IIP does mean that the Information and communication industry moves to the bottom of the rankings, reflecting that in the majority of countries analysed this sector is typically the least insured compared to the rest of the economy. Under the analysis in Figure 35 its higher position is a reflection of the sector having a high industrial insurance penetration level overall, but not when controlling for higher levels the IIP of other sectors within a given country.

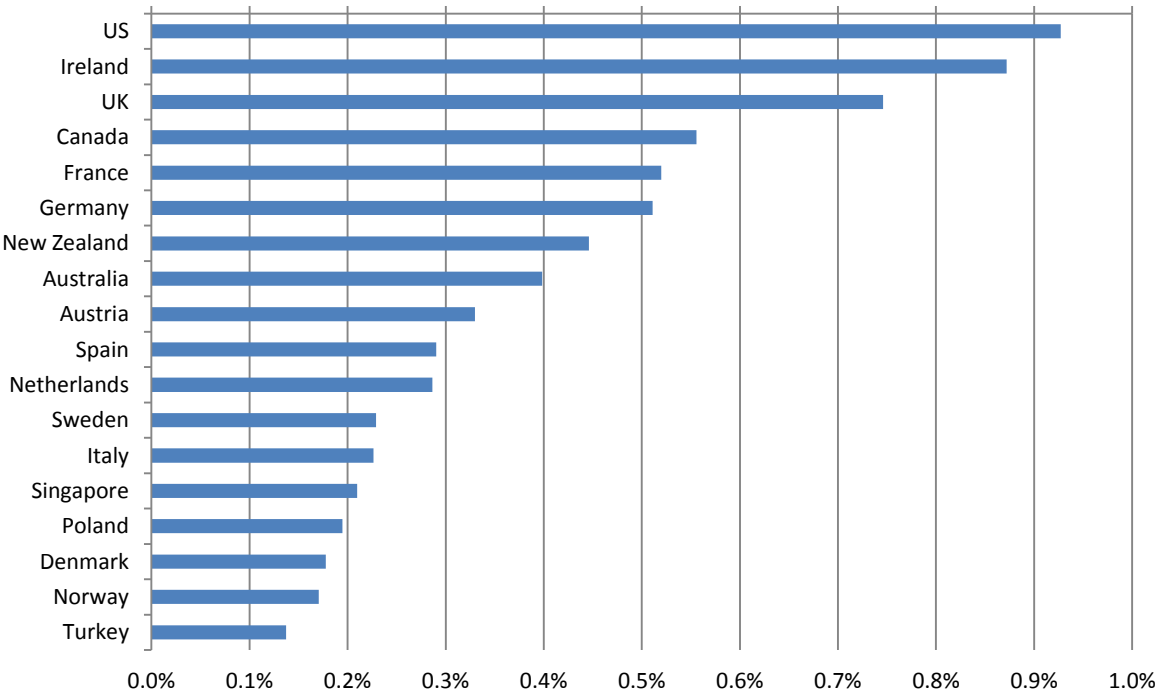
In general, the ranking illustrated within Figure 35 and

Figure **36** is extremely similar and display consistent patterns within the IIP levels across different sectors. [42]

### 4.2.2 Industrial insurance of countries

A measure of industrial insurance penetration across industries as a whole indicates the relative insurance levels of industries between countries. This differs to the usual measures of insurance penetration at the level of the economy as whole[43] in that it does not include expenditure on insurance by households and individuals. Figure 36 shows the levels of industrial insurance penetration across all industries, in 18 national economies.[44]

**Figure 37 - Average industrial insurance penetration**




Source: National input output table, Cebr

The US has the most insured industries by this measure, while Turkey ranks the lowest of the countries examined. The rankings of industrial insurance penetration levels by country largely reflect those found in Section 1 at the level of the economy as a whole. The comparison of the rankings is shown within Table **20 – Average industrial insurance penetration**

[42] The comparison between countries and sectors is contained within Appendix E and F.

[44] Excluding the insurance industry

| Average industrial insurance penetration | | | Section 1 Rankings* | |
|---|---|---|---|---|
| 1 | United States | 0.93% | 1 | Netherlands |
| 2 | Ireland | 0.87% | 2 | United States |
| 3 | United Kingdom | 0.75% | 3 | New Zealand |
| 4 | Canada | 0.56% | 4 | Canada |
| 5 | France | 0.52% | 5 | Germany |
| 6 | Germany | 0.51% | 6 | Austria |
| 7 | New Zealand | 0.45% | 7 | France |
| 8 | Australia | 0.40% | 8 | Denmark |
| 9 | Austria | 0.33% | 9 | United Kingdom |
| 10 | Spain | 0.29% | 10 | Spain |
| 11 | Netherlands | 0.29% | 11 | Australia |
| 12 | Sweden | 0.23% | 12 | Poland |
| 13 | Italy | 0.23% | 13 | Ireland |
| 14 | Singapore | 0.21% | 14 | Italy |
| 15 | Poland | 0.19% | 15 | Sweden |
| 16 | Denmark | 0.18% | 16 | Norway |
| 17 | Norway | 0.17% | 17 | Singapore |
| 18 | Turkey | 0.14% | 18 | Turkey |

.

The greatest changes here are seen in the Netherlands which moves down 10 places and Ireland, which moves up 11 places. The result for the Netherlands is not particularly surprising since an abnormally large proportion of its insurance penetration is estimated to come from health insurance premiums. Ireland however, improves its ranking significantly, reporting some of the highest industrial insurance penetration figures in a number of sectors. Similarly the United Kingdom rises six places in the rankings to third place. In general, countries with higher non-life insurance penetration levels as a whole demonstrate higher insurance levels within their industries.

**Table 20 – Average industrial insurance penetration**

| Average industrial insurance penetration | | | Section 1 Rankings* | |
|---|---|---|---|---|

| | | | | |
|---|---|---|---|---|
| **1** | United States | 0.93% | **1** | Netherlands |
| **2** | Ireland | 0.87% | **2** | United States |
| **3** | United Kingdom | 0.75% | **3** | New Zealand |
| **4** | Canada | 0.56% | **4** | Canada |
| **5** | France | 0.52% | **5** | Germany |
| **6** | Germany | 0.51% | **6** | Austria |
| **7** | New Zealand | 0.45% | **7** | France |
| **8** | Australia | 0.40% | **8** | Denmark |
| **9** | Austria | 0.33% | **9** | United Kingdom |
| **10** | Spain | 0.29% | **10** | Spain |
| **11** | Netherlands | 0.29% | **11** | Australia |
| **12** | Sweden | 0.23% | **12** | Poland |
| **13** | Italy | 0.23% | **13** | Ireland |
| **14** | Singapore | 0.21% | **14** | Italy |
| **15** | Poland | 0.19% | **15** | Sweden |
| **16** | Denmark | 0.18% | **16** | Norway |
| **17** | Norway | 0.17% | **17** | Singapore |
| **18** | Turkey | 0.14% | **18** | Turkey |

***The rankings from Section 1 have been adapted to reflect the reduced sample of 18 countries**

The industrial insurance penetration figures are lower than those found in Section 1 for the economy as a whole. There are two major reasons for the smaller scale of the figures reported within this section.

First, the figures represent only insurance expenditure by industries, whereas in Section 1 premium volumes include both household expenditure and industry expenditure. Since both are effectively divided by GDP, it would be expected that industrial insurance penetration would be lower.

Second, industry insurance expenditure is divided by the total output of the industry in order to calculate a measure of the industry insurance penetration. This measure accounts for the total activity of the industry through its production. The actual contribution of an industry to GDP is more accurately reflected through what the industry generates through wages and profits, or its value added. Measuring insurance expenditure as a proportion of value added would distort the figures depending upon the profitability of industries. Since total output is necessarily larger than value added, this reduces the estimates of industrial insurance penetration.[45]

# APPENDICES

### Appendix A – Income classifications

[45] Gross value added (GVA) measures the output of the economy, before considerations for taxation are made. It is the sum of wages and profits and as such can provide an indication of an individual industry's contribution to the output of the economy. It is similar to Gross Domestic Product as a measure of output and the two follow the relationship:
GVA + taxes on production – subsidies on production = GDP
Since figures for the taxes and subsidies on production are made at the aggregate level, GVA provides a measure of output at the level of individual sectors of the economy.

| Income classification | Country | GDP per capita ($US) 2010 |
|---|---|---|
| High | Norway | $85,055 |
| | United Arab Emirates | $57,043 |
| | Denmark | $56,369 |
| | Australia | $55,474 |
| | Sweden | $49,078 |
| | Netherlands | $46,989 |
| | United States | $46,900 |
| | Ireland | $46,298 |
| | Canada | $46,283 |
| | Austria | $45,271 |
| | Singapore | $43,865 |
| | Japan | $43,015 |
| | France | $40,809 |
| | Germany | $40,198 |
| | United Kingdom | $36,371 |
| | Italy | $34,154 |
| | New Zealand | $32,226 |
| | Hong Kong | $31,575 |
| | Spain | $30,334 |
| Middle | Israel | $29,264 |
| | South Korea | $20,765 |
| | Taiwan | $18,573 |
| | Saudi Arabia | $16,377 |
| | Chile | $12,571 |
| | Poland | $12,286 |
| | Brazil | $11,089 |
| | Russia | $10,408 |
| | Turkey | $10,062 |
| Low | Mexico | $9,219 |
| | Argentina | $9,131 |
| | Malaysia | $8,418 |
| | South Africa | $7,271 |
| | Colombia | $6,312 |
| | Thailand | $4,992 |

| | | |
|---|---|---|
| | China | $4,421 |
| | Indonesia | $2,981 |
| | Egypt | $2,808 |
| | Philippines | $2,123 |
| | India | $1,342 |
| | Nigeria | $1,261 |
| | Vietnam | $1,174 |
| | Bangladesh | $642 |

*Source: IMF world economic outlook database*

## Appendix B – Insurance and GDP per capita relationship

**Table 20 - Non-life insurance penetration and GDP per capita (2004-2010 averages)**

| Country | Non-life insurance penetration (excl cross border business) | GDP per Capita (USD 2005, PPP) |
|---|---|---|

| | | |
|---|---|---|
| **Netherlands** | 7.0% | 36,439 |
| **United States** | 4.8% | 42,607 |
| **New Zealand** | 4.5% | 25,105 |
| **Canada** | 4.0% | 35,276 |
| **Germany** | 3.7% | 32,446 |
| **South Korea** | 3.5% | 24,531 |
| **Austria** | 3.3% | 34,779 |
| **United Kingdom** | 3.2% | 32,989 |
| **Australia** | 3.1% | 33,566 |
| **Taiwan** | 3.1% | 30,215 |
| **France** | 3.1% | 29,818 |
| **Spain** | 3.0% | 27,589 |
| **Denmark** | 2.9% | 33,258 |
| **South Africa** | 2.9% | 9,090 |
| **Israel** | 2.9% | 24,650 |
| **Ireland** | 2.5% | 38,475 |
| **Italy** | 2.5% | 28,100 |
| **Russia** | 2.3% | 13,201 |
| **Sweden** | 2.2% | 33,365 |
| **Japan** | 2.2% | 30,556 |
| **Argentina** | 1.9% | 12,278 |
| **Poland** | 1.8% | 15,415 |
| **Norway** | 1.8% | |

| | | |
|---|---|---|
| | | 47,802 |
| **Malaysia** | 1.7% | 12,279 |
| **Colombia** | 1.6% | 7,878 |
| **Brazil** | 1.6% | 9,126 |
| **Thailand** | 1.6% | 7,076 |
| **United Arab Emirates** | 1.6% | 56,845 |
| **Singapore** | 1.5% | 47,498 |
| **Chile** | 1.5% | 12,785 |
| **Hong Kong** | 1.3% | 38,384 |
| **Turkey** | 1.2% | 11,910 |
| **China** | 1.1% | 5,203 |
| **Mexico** | 1.0% | 12,426 |
| **Vietnam** | 0.7% | 2,454 |
| **Saudi Arabia** | 0.6% | 20,303 |
| **India** | 0.6% | 2,544 |
| **Indonesia** | 0.5% | 3,408 |
| **Nigeria** | 0.5% | 1,896 |
| **Philippines** | 0.5% | 3,255 |
| **Egypt** | 0.5% | 4,951 |
| **Bangladesh** | 0.2% | 1,294 |

*Source: IMF world economic outlook database, Sigma Swiss Re World Insurance annual reports*

**Appendix C - Sources of national input output tables**

Australia
Australian bureau of statistics
http://www.abs.gov.au/

Canada

Statistics Canada
http://www.statcan.gc.ca

European nations and Turkey
Eurostat
http://epp.eurostat.ec.europa.eu/portal/page/portal/eurostat/home/

New Zealand
Statistics New Zealand
http://www.stats.govt.nz/

Singapore
Department of statistics Singapore
http://www.singstat.gov.sg/stats/themes/economy/natac.html

United States
Bureau of economic analysis
http://www.bea.gov/industry/io_benchmark.htm

**Appendix D – Stability of industrial insurance measures**

This section shows the change in the levels of industrial insurance penetration over time in Australia, Germany, Poland and the UK. This is done to examine the stability of the relationship in the absence of the existence of data up to 2011for all countries examined. The countries have been chosen subject to

data availability and in order to provide a sample representative of the other countries included within this section of the research.

The graphs show that while there are small fluctuations in the rates of industrial insurance penetration within sectors, the relative relationships hold in general over the time periods examined. This suggests that the estimates of industrial insurance penetration contained within the preceding analysis are likely to be consistent with the current structure of insurance expenditure by sectors.

Data following the financial crisis in 2008 is available only for the UK. This shows a fall in the industrial insurance penetration across all sectors of the economy in 2008 which subsequently recovers again in 2009. The relative insurance penetration differences, however, are maintained. This again suggests that the relative relationships are largely stable over time.

**Figure 38 - Industrial insurance penetration Australia**

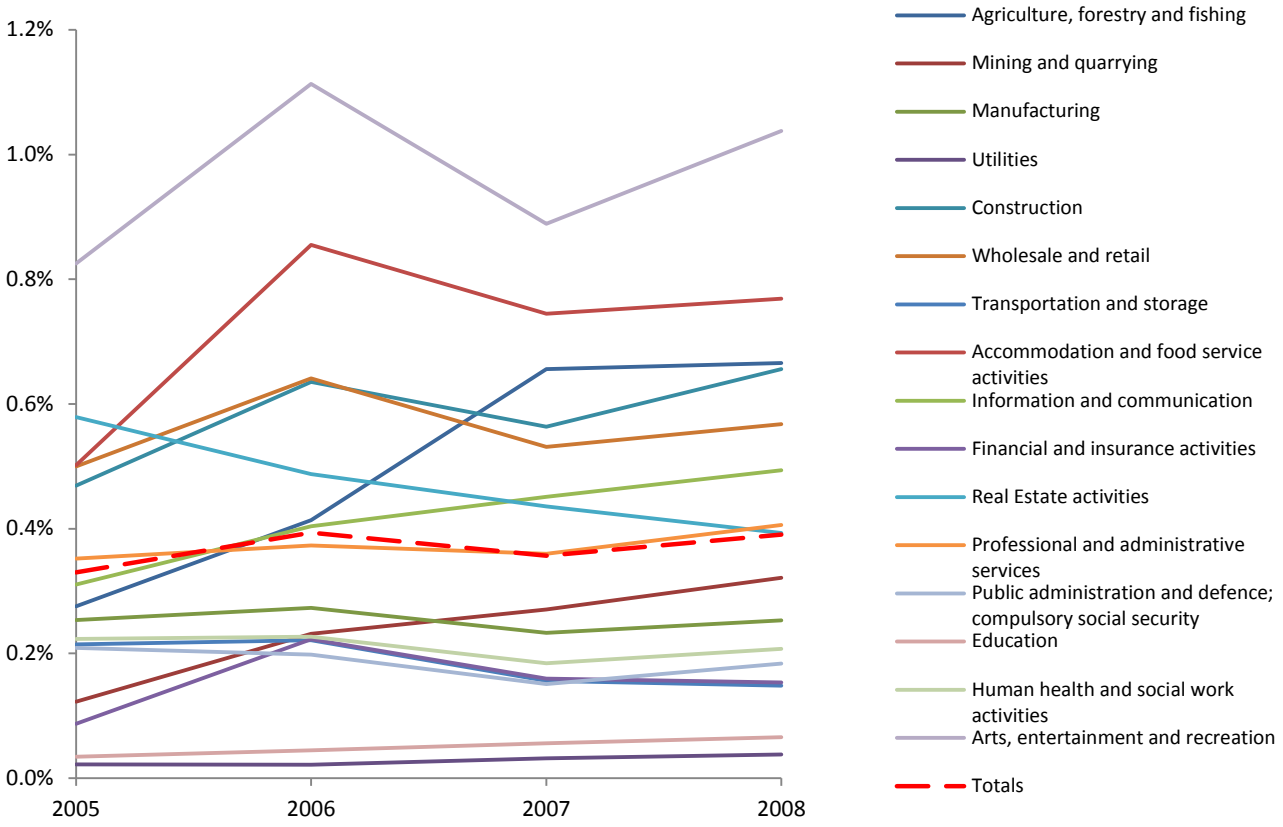


**Figure 39 - Industrial insurance penetration Germany**

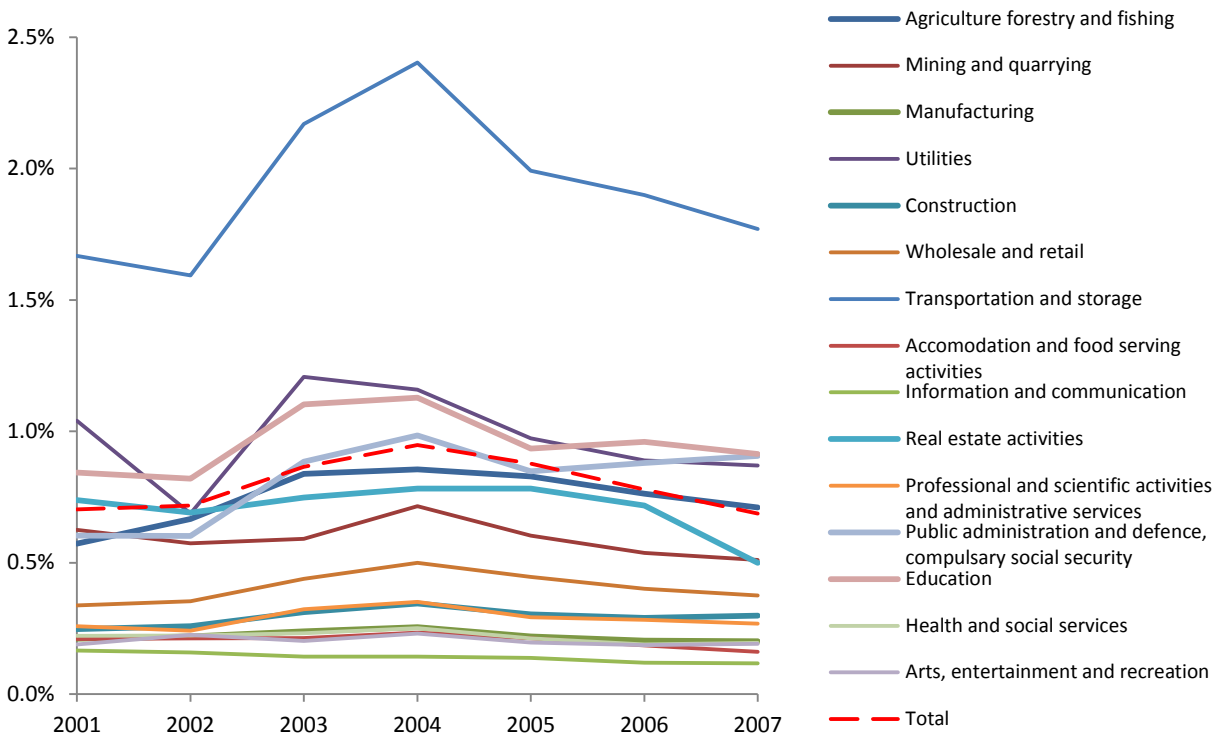



**Figure 40 - Industrial insurance penetration Poland**

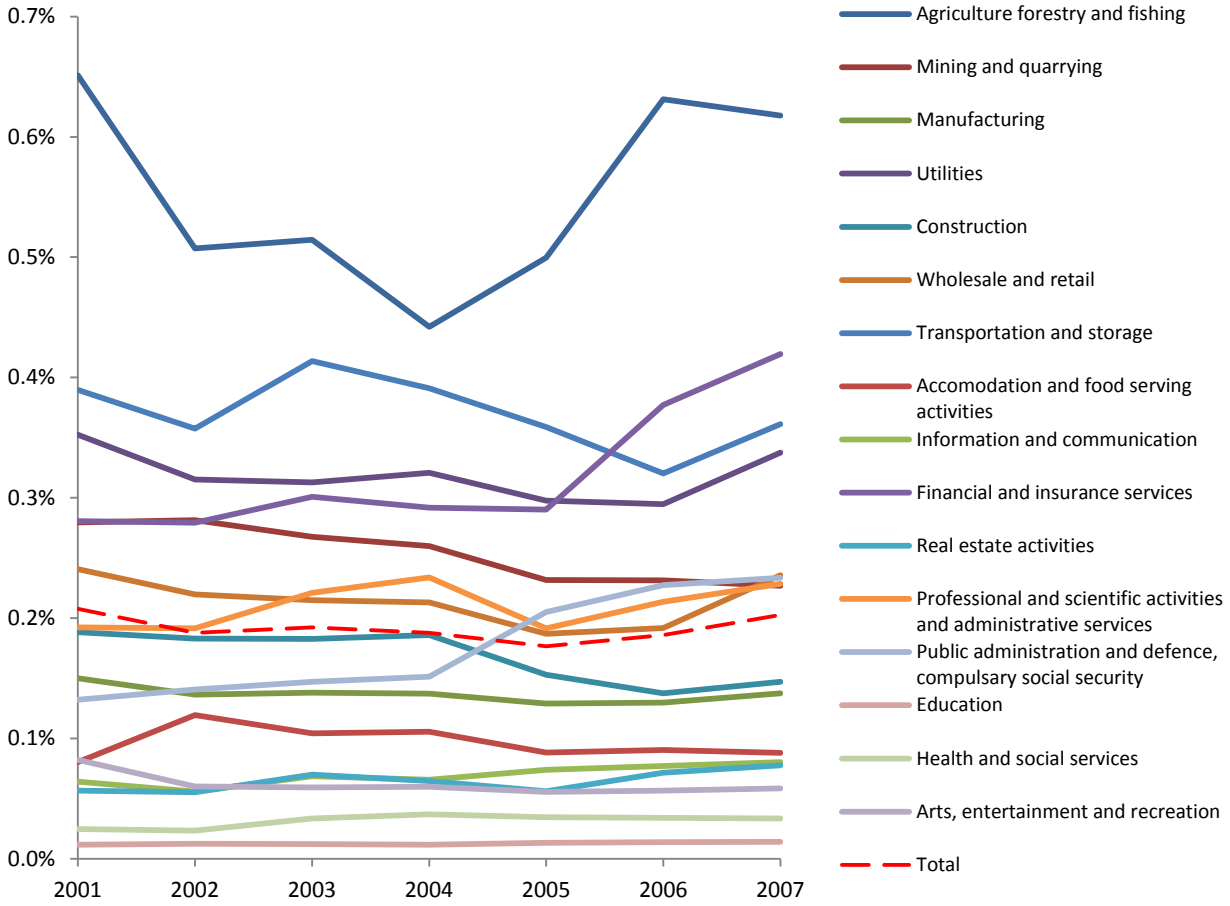
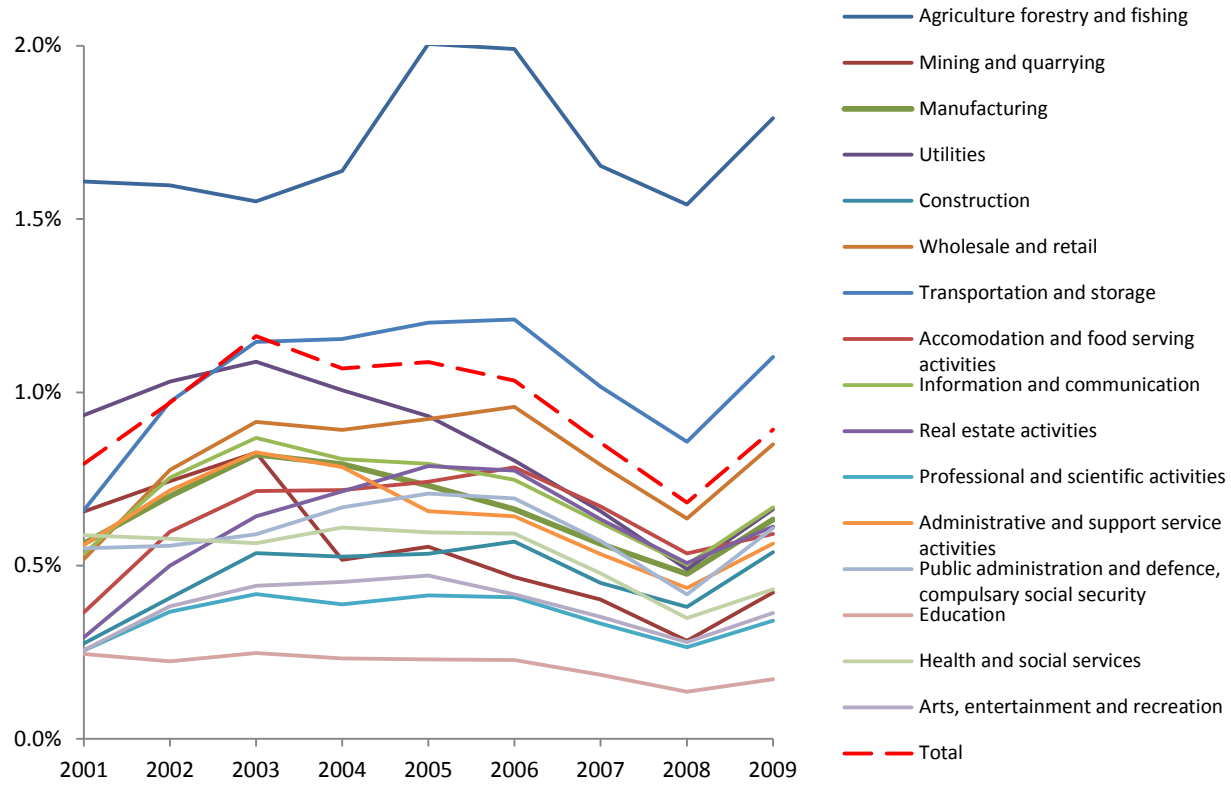


**Figure 41 - Industrial insurance penetration UK**



**Appendix E - Industrial insurance penetration by industry**

This appendix shows the industrial insurance penetration levels calculated for each industry, broken down by county. The contribution of the industry to the output of the economy, measured as its gross value added[46] (GVA), is also included.

It is difficult to find any correlation between the GVA contribution and the IIP for each sector. Indeed some of the most valuable parts of the economy (e.g. Canada's mining sector) score relatively low levels of IIP whilst relatively minor sectors (e.g. Agriculture) are well protected. On the face of it, it seems likely that insurance cover rises steeply in sectors where insurance is deemed compulsory for the protection of wider society (for example in the transportation and real estate sectors).

One question thrown up by this research is whether the most important sectors in national economies are sufficiently protected by insurance. In some instances it appears that the chief reason businesses choose to insure may simply be because they are required to by law.

In many ways, this research throws up more questions than answers. In particular, it does not analyse the role of captives in picking up some of these risks. There is certainly scope to build upon this research through detailed risk assessments of some of the sectors which score comparatively low IIPs.

The following tables display figures calculated based on data from 2007. The exceptions to this are in Canada where data relates to 2008 and Turkey where the only data available is taken from 2002.

**Agriculture, forestry and fishing**

| Rank | Country | IIP | GVA contribution |
|---|---|---|---|
| **1** | UK | 2.15% | 0.69% |
| **2** | France | 1.53% | 2.21% |
| **3** | Ireland | 1.32% | 1.45% |
| **4** | US | 1.26% | 1.03% |
| **5** | Canada | 1.19% | 1.66% |
| **6** | Germany | 0.71% | 0.95% |
| **7** | Australia | 0.67% | 2.44% |
| **8** | New Zealand | 0.66% | 5.77% |
| **9** | Poland | 0.62% | 4.33% |
| **10** | Norway | 0.54% | 1.36% |
| **11** | Netherlands | 0.51% | 2.08% |
| **12** | Spain | 0.48% | 2.88% |
| **13** | Sweden | 0.45% | 1.71% |
| **14** | Denmark | 0.36% | 1.18% |

[46] Gross value added (GVA) measures the output of the economy, before considerations for taxation are made. It is the sum of wages and profits and as such can provide an indication of an individual industry's contribution to the output of the economy. It is similar to Gross Domestic Product as a measure of output and the two follow the relationship:
GVA + taxes on production – subsidies on production = GDP
Since figures for the taxes and subsidies on production are made at the aggregate level, GVA provides a measure of output at the level of individual sectors of the economy.

| | | | |
|---|---|---|---|
| **15** | Austria | 0.34% | 1.76% |
| **16** | Italy | 0.28% | 2.02% |
| **17** | Singapore | 0.16% | 0.04% |
| **18** | Turkey | 0.08% | 16.53% |

**Mining and quarrying**

| **Rank** | Country | IIP | GVA contribution |
|---|---|---|---|
| **1** | Ireland | 2.29% | 0.64% |
| **2** | US | 0.99% | 1.81% |
| **3** | New Zealand | 0.95% | 1.31% |
| **4** | France | 0.63% | 0.17% |
| **5** | Germany | 0.51% | 0.22% |
| **6** | Austria | 0.50% | 0.40% |
| **7** | UK | 0.43% | 2.46% |
| **8** | Australia | 0.32% | 7.64% |
| **9** | Italy | 0.31% | 0.36% |
| **10** | Turkey | 0.25% | 1.50% |
| **11** | Spain | 0.24% | 0.27% |
| **12** | Poland | 0.23% | 2.25% |
| **13** | Canada | 0.23% | 10.36% |
| **14** | Sweden | 0.08% | 0.62% |
| **15** | Denmark | 0.05% | 3.96% |
| **16** | Netherlands | 0.04% | 3.08% |
| **17** | Norway | 0.03% | 25.03% |
| **18** | Singapore | 0.00% | 0.00% |

**Utilities**

| Rank | Country | IIP | GVA contribution |
|---|---|---|---|
| 1 | Sweden | 1.25% | 2.64% |
| 2 | US | 0.90% | 1.77% |
| 3 | Germany | 0.87% | 2.42% |
| 4 | Ireland | 0.55% | 1.48% |
| 5 | Canada | 0.53% | 2.24% |
| 6 | Turkey | 0.39% | 3.76% |
| 7 | Singapore | 0.39% | 1.21% |
| 8 | Poland | 0.34% | 3.33% |
| 9 | UK | 0.31% | 1.75% |
| 10 | New Zealand | 0.27% | 3.19% |
| 11 | France | 0.17% | 1.61% |
| 12 | Denmark | 0.17% | 1.93% |
| 13 | Austria | 0.15% | 2.32% |
| 14 | Netherlands | 0.12% | 1.95% |
| 15 | Spain | 0.12% | 2.09% |
| 16 | Italy | 0.09% | 2.26% |
| 17 | Norway | 0.05% | 2.16% |
| 18 | Australia | 0.04% | 2.25% |

**Construction**

| Rank | Country | IIP | GVA contribution |
|---|---|---|---|
| 1 | US | 0.79% | 4.66% |
| 2 | Australia | 0.66% | 7.73% |
| 3 | France | 0.32% | 6.27% |
| 4 | Singapore | 0.32% | 3.16% |
| 5 | Canada | 0.30% | 7.20% |
| 6 | Germany | 0.30% | 4.06% |
| 7 | Denmark | 0.29% | 5.66% |
| 8 | New Zealand | 0.28% | 5.82% |
| 9 | Spain | 0.27% | 11.86% |
| 10 | UK | 0.26% | 6.45% |
| 11 | Italy | 0.21% | 6.13% |
| 12 | Austria | 0.21% | 6.95% |

| | | | |
|---|---|---|---|
| **13** | Ireland | 0.16% | 9.75% |
| **14** | Poland | 0.15% | 7.14% |
| **15** | Netherlands | 0.12% | 5.55% |
| **16** | Turkey | 0.10% | 6.70% |
| **17** | Norway | 0.06% | 4.98% |
| **18** | Sweden | 0.06% | 5.33% |

**Wholesale and retail**

| Rank | Country | IIP | GVA contribution |
|---|---|---|---|
| **1** | Canada | 1.60% | 10.80% |
| **2** | Ireland | 1.28% | 10.52% |
| **3** | US | 1.09% | 12.15% |
| **4** | UK | 0.99% | 11.32% |
| **5** | France | 0.75% | 9.98% |
| **6** | Netherlands | 0.65% | 13.19% |
| **7** | Austria | 0.64% | 12.74% |
| **8** | Australia | 0.57% | 9.47% |
| **9** | Spain | 0.53% | 10.52% |
| **10** | Germany | 0.37% | 10.07% |
| **11** | Denmark | 0.25% | 12.84% |
| **12** | New Zealand | 0.24% | 12.96% |
| **13** | Poland | 0.24% | 18.39% |
| **14** | Singapore | 0.23% | 19.53% |
| **15** | Italy | 0.22% | 11.11% |
| **16** | Sweden | 0.20% | 11.26% |
| **17** | Turkey | 0.16% | 19.95% |
| **18** | Norway | 0.06% | 8.88% |

**Transportation and storage**

| Rank | Country | IIP | GVA contribution |
|---|---|---|---|
| **1** | Ireland | 2.32% | 3.14% |
| **2** | Germany | 1.77% | 3.87% |
| **3** | US | 1.34% | 2.89% |
| **4** | UK | 1.24% | 4.46% |

| | | | |
|---|---|---|---|
| **5** | France | 1.10% | 4.38% |
| **6** | Canada | 1.08% | 3.91% |
| **7** | New Zealand | 0.84% | 4.16% |
| **8** | Netherlands | 0.64% | 4.48% |
| **9** | Italy | 0.62% | 5.29% |
| **10** | Austria | 0.58% | 4.44% |
| **11** | Spain | 0.55% | 4.58% |
| **12** | Norway | 0.54% | 5.34% |
| **13** | Sweden | 0.50% | 5.49% |
| **14** | Denmark | 0.48% | 5.70% |
| **15** | Singapore | 0.38% | 9.69% |
| **16** | Poland | 0.36% | 4.65% |
| **17** | Turkey | 0.18% | 17.62% |
| **18** | Australia | 0.15% | 5.39% |

**Accommodation and food service activities**

| **Rank** | Country | IIP | GVA contribution |
|---|---|---|---|
| **1** | Ireland | 1.07% | 2.43% |
| **2** | US | 0.87% | 2.94% |
| **3** | UK | 0.79% | 2.87% |
| **4** | Australia | 0.77% | 2.39% |
| **5** | Canada | 0.48% | 2.19% |
| **6** | France | 0.44% | 2.38% |
| **7** | New Zealand | 0.37% | 2.00% |
| **8** | Austria | 0.30% | 4.55% |
| **9** | Netherlands | 0.26% | 1.84% |
| **10** | Germany | 0.16% | 1.70% |
| **11** | Spain | 0.16% | 7.21% |
| **12** | Denmark | 0.14% | 1.57% |
| **13** | Turkey | 0.13% | 3.56% |
| **14** | Italy | 0.13% | 3.77% |
| **15** | Poland | 0.09% | 1.16% |
| **16** | Sweden | 0.07% | 1.42% |
| **17** | Singapore | 0.02% | 2.04% |
| **18** | Norway | 0.01% | 1.53% |

| Information and communication | | | |
|---|---|---|---|
| **Rank** | Country | IIP | GVA contribution |
| **1** | France | 1.86% | 1.99% |
| **2** | US | 0.86% | 4.53% |
| **3** | UK | 0.50% | 2.59% |
| **4** | Australia | 0.49% | 3.30% |
| **5** | Ireland | 0.40% | 1.89% |
| **6** | Sweden | 0.37% | 1.78% |
| **7** | Canada | 0.28% | 3.51% |
| **8** | Italy | 0.24% | 2.05% |
| **9** | New Zealand | 0.19% | 3.85% |
| **10** | Austria | 0.14% | 1.82% |
| **11** | Germany | 0.12% | 1.79% |
| **12** | Turkey | 0.09% | 2.83% |
| **13** | Denmark | 0.09% | 2.11% |
| **14** | Netherlands | 0.09% | 2.46% |
| **15** | Poland | 0.08% | 2.46% |
| **16** | Spain | 0.08% | 2.20% |
| **17** | Singapore | 0.05% | 2.25% |
| **18** | Norway | 0.02% | 1.59% |

| Real Estate activities | | | |
|---|---|---|---|
| **Rank** | Country | IIP | GVA contribution |
| **1** | UK | 1.62% | 9.45% |
| **2** | Canada | 1.57% | 10.15% |
| **3** | Spain | 1.33% | 9.15% |
| **4** | US | 1.11% | 11.33% |
| **5** | Ireland | 0.94% | 8.34% |
| **6** | Sweden | 0.85% | 9.13% |
| **7** | New Zealand | 0.60% | 5.69% |
| **8** | Germany | 0.50% | 12.09% |
| **9** | Austria | 0.40% | 9.25% |
| **10** | Australia | 0.39% | 9.60% |
| **11** | Netherlands | 0.34% | 8.27% |

| | | | |
|---|---|---|---|
| **12** | Norway | 0.31% | 6.54% |
| **13** | France | 0.27% | 14.29% |
| **14** | Turkey | 0.10% | 13.59% |
| **15** | Singapore | 0.09% | 5.34% |
| **16** | Poland | 0.08% | 6.38% |
| **17** | Italy | 0.04% | 13.35% |
| **18** | Denmark | 0.00% | 9.96% |

**Professional and administrative services**

| Rank | Country | IIP | GVA contribution |
|---|---|---|---|
| **1** | Ireland | 1.55% | 9.52% |
| **2** | US | 0.96% | 11.82% |
| **3** | France | 0.60% | 14.30% |
| **4** | New Zealand | 0.60% | 9.59% |
| **5** | Austria | 0.57% | 9.42% |
| **6** | UK | 0.56% | 14.27% |
| **7** | Australia | 0.41% | 8.98% |
| **8** | Italy | 0.37% | 9.10% |
| **9** | Spain | 0.37% | 8.11% |
| **10** | Netherlands | 0.32% | 13.70% |
| **11** | Canada | 0.28% | 6.78% |
| **12** | Germany | 0.27% | 13.17% |
| **13** | Norway | 0.25% | 8.16% |
| **14** | Poland | 0.23% | 7.38% |
| **15** | Turkey | 0.14% | 5.23% |
| **16** | Singapore | 0.13% | 8.35% |
| **17** | Denmark | 0.13% | 9.03% |
| **18** | Sweden | 0.07% | 12.28% |

**Public administration and defence; compulsory social security**

| Rank | Country | IIP | GVA contribution |
|---|---|---|---|
| **1** | Germany | 0.91% | 5.68% |
| **2** | US | 0.86% | 12.55% |
| **3** | UK | 0.80% | 5.06% |

| | | | |
|---|---|---|---|
| **4** | New Zealand | 0.69% | 5.20% |
| **5** | Norway | 0.49% | 4.52% |
| **6** | Italy | 0.44% | 6.52% |
| **7** | Sweden | 0.26% | 4.82% |
| **8** | Ireland | 0.25% | 4.52% |
| **9** | Poland | 0.23% | 5.79% |
| **10** | France | 0.22% | 7.42% |
| **11** | Australia | 0.18% | 5.23% |
| **12** | Singapore | 0.17% | 4.39% |
| **13** | Turkey | 0.16% | 7.16% |
| **14** | Denmark | 0.12% | 6.20% |
| **15** | Canada | 0.11% | 11.15% |
| **16** | Netherlands | 0.08% | 6.81% |
| **17** | Austria | 0.05% | 5.59% |
| **18** | Spain | 0.04% | 6.05% |

**Education**

| **Rank** | Country | IIP | GVA contribution |
|---|---|---|---|
| **1** | Ireland | 1.09% | 4.43% |
| **2** | Germany | 0.91% | 4.40% |
| **3** | US | 0.79% | 0.98% |
| **4** | UK | 0.42% | 5.81% |
| **5** | New Zealand | 0.31% | 4.53% |
| **6** | Norway | 0.29% | 4.21% |
| **7** | Canada | 0.21% | 1.53% |
| **8** | Netherlands | 0.16% | 4.24% |
| **9** | Italy | 0.10% | 4.66% |
| **10** | Austria | 0.09% | 5.16% |
| **11** | Singapore | 0.08% | 1.21% |
| **12** | Turkey | 0.07% | 4.42% |
| **13** | Australia | 0.07% | 4.30% |
| **14** | Spain | 0.06% | 4.73% |
| **15** | Denmark | 0.06% | 5.35% |
| **16** | France | 0.05% | 5.24% |
| **17** | Sweden | 0.04% | 5.35% |
| **18** | Poland | 0.01% | 4.80% |

| Human health and social work activities | | | |
|---|---|---|---|
| **Rank** | Country | IIP | GVA contribution |
| **1** | US | 0.78% | 6.69% |
| **2** | UK | 0.65% | 7.14% |
| **3** | New Zealand | 0.52% | 6.12% |
| **4** | Canada | 0.34% | 4.83% |
| **5** | Ireland | 0.33% | 7.02% |
| **6** | Singapore | 0.31% | 1.56% |
| **7** | France | 0.26% | 8.51% |
| **8** | Austria | 0.23% | 5.71% |
| **9** | Australia | 0.21% | 6.09% |
| **10** | Germany | 0.19% | 7.02% |
| **11** | Norway | 0.18% | 8.81% |
| **12** | Spain | 0.15% | 5.62% |
| **13** | Netherlands | 0.14% | 8.64% |
| **14** | Turkey | 0.12% | 2.37% |
| **15** | Italy | 0.10% | 5.85% |
| **16** | Denmark | 0.05% | 10.70% |
| **17** | Sweden | 0.03% | 10.61% |
| **18** | Poland | 0.03% | 3.67% |

| Arts, entertainment and recreation | | | |
|---|---|---|---|
| **Rank** | Country | IIP | GVA contribution |
| **1** | Australia | 1.04% | 0.86% |
| **2** | US | 0.87% | 0.98% |
| **3** | Canada | 0.58% | 0.69% |
| **4** | Ireland | 0.57% | 1.14% |
| **5** | France | 0.54% | 2.08% |
| **6** | UK | 0.42% | 2.71% |
| **7** | New Zealand | 0.42% | 1.56% |
| **8** | Netherlands | 0.30% | 1.35% |
| **9** | Turkey | 0.27% | 1.17% |
| **10** | Austria | 0.27% | 1.59% |
| **11** | Norway | 0.21% | 1.32% |
| **12** | Germany | 0.19% | 1.79% |

| | | | |
|---|---|---|---|
| **13** | Italy | 0.18% | 1.40% |
| **14** | Singapore | 0.14% | 0.60% |
| **15** | Denmark | 0.07% | 1.78% |
| **16** | Sweden | 0.06% | 1.63% |
| **17** | Poland | 0.06% | 1.07% |
| **18** | Spain | 0.06% | 2.43% |

**Appendix F – Industrial insurance penetration by country**

The following tables display figures calculated based on data from 2007. The exceptions to this are in Canada where data relates to 2008 and Turkey where the only data available is taken from 2002.

**Australia**

| Rank | Sector | IIP | GVA contribution |
|---|---|---|---|
| 1 | Arts, entertainment and recreation | 1.04% | 0.86% |
| 2 | Accommodation and food service activities | 0.77% | 2.39% |
| 3 | Agriculture, forestry and fishing | 0.67% | 2.44% |
| 4 | Construction | 0.66% | 7.73% |
| 5 | Wholesale and retail | 0.57% | 9.47% |
| 6 | Information and communication | 0.49% | 3.30% |
| 7 | Professional and administrative services | 0.41% | 8.98% |
| 8 | Real Estate activities | 0.39% | 9.60% |
| 9 | Mining and quarrying | 0.32% | 7.64% |
| 10 | Manufacturing | 0.25% | 10.08% |
| 11 | Human health and social work activities | 0.21% | 6.09% |
| 13 | Public administration and defence; compulsory social security | 0.18% | 5.23% |
| 12 | Financial and insurance activities | 0.20% | 9.01% |
| 14 | Transportation and storage | 0.15% | 5.39% |
| 15 | Education | 0.07% | 4.30% |
| 16 | Utilities | 0.04% | 2.25% |

**Austria**

| Rank | Sector | IIP | GVA contribution |
|---|---|---|---|
| 1 | Wholesale and retail | 0.64% | 12.74% |
| 2 | Transportation and storage | 0.58% | 4.44% |
| 3 | Professional and administrative services | 0.57% | 9.42% |
| 4 | Mining and quarrying | 0.50% | 0.40% |
| 5 | Real Estate activities | 0.40% | 9.25% |
| 6 | Financial and insurance activities | 0.35% | 4.18% |
| 7 | Agriculture, forestry and fishing | 0.34% | 1.76% |
| 8 | Accommodation and food service activities | 0.30% | 4.55% |

| | | | |
|---|---|---|---|
| **9** | Arts, entertainment and recreation | 0.27% | 1.59% |
| **10** | Human health and social work activities | 0.23% | 5.71% |
| **11** | Manufacturing | 0.23% | 20.43% |
| **12** | Construction | 0.21% | 6.95% |
| **13** | Utilities | 0.15% | 2.32% |
| **14** | Information and communication | 0.14% | 1.82% |
| **15** | Education | 0.09% | 5.16% |
| **16** | Public administration and defence; compulsory social security | 0.05% | 5.59% |

**Canada**

| **Rank** | Sector | IIP | GVA contribution |
|---|---|---|---|
| **1** | Wholesale and retail | 1.60% | 10.80% |
| **2** | Real Estate activities | 1.57% | 10.15% |
| **3** | Agriculture, forestry and fishing | 1.19% | 1.66% |
| **4** | Transportation and storage | 1.08% | 3.91% |
| **5** | Financial and insurance activities | 0.72% | 6.24% |
| **6** | Arts, entertainment and recreation | 0.58% | 0.69% |
| **7** | Utilities | 0.53% | 2.24% |
| **8** | Accommodation and food service activities | 0.48% | 2.19% |
| **9** | Human health and social work activities | 0.34% | 4.83% |
| **10** | Construction | 0.30% | 7.20% |
| **11** | Information and communication | 0.28% | 3.51% |
| **12** | Professional and administrative services | 0.28% | 6.78% |
| **13** | Mining and quarrying | 0.23% | 10.36% |
| **14** | Education | 0.21% | 1.53% |
| **15** | Manufacturing | 0.18% | 11.57% |
| **16** | Public administration and defence; compulsory social security | 0.11% | 11.15% |

**Denmark**

| **Rank** | Sector | IIP | GVA contribution |
|---|---|---|---|

| | | | |
|---|---|---|---|
| **1** | Transportation and storage | 0.48% | 5.70% |
| **2** | Agriculture, forestry and fishing | 0.36% | 1.18% |
| **3** | Construction | 0.29% | 5.66% |
| **4** | Wholesale and retail | 0.25% | 12.84% |
| **5** | Utilities | 0.17% | 1.93% |
| **6** | Manufacturing | 0.14% | 14.09% |
| **7** | Accommodation and food service activities | 0.14% | 1.57% |
| **8** | Professional and administrative services | 0.13% | 9.03% |
| **9** | Public administration and defence; compulsory social security | 0.12% | 6.20% |
| **10** | Financial and insurance activities | 0.09% | 4.36% |
| **11** | Information and communication | 0.09% | 2.11% |
| **12** | Arts, entertainment and recreation | 0.07% | 1.78% |
| **13** | Education | 0.06% | 5.35% |
| **14** | Human health and social work activities | 0.05% | 10.70% |
| **15** | Mining and quarrying | 0.05% | 3.96% |
| **16** | Real Estate activities | 0.00% | 9.96% |

**France**

| **Rank** | Sector | IIP | GVA contribution |
|---|---|---|---|
| **1** | Information and communication | 1.86% | 1.99% |
| **2** | Agriculture, forestry and fishing | 1.53% | 2.21% |
| **3** | Transportation and storage | 1.10% | 4.38% |
| **4** | Financial and insurance activities | 0.89% | 3.59% |
| **5** | Wholesale and retail | 0.75% | 9.98% |
| **6** | Mining and quarrying | 0.63% | 0.17% |
| **7** | Professional and administrative services | 0.60% | 14.30% |
| **8** | Arts, entertainment and recreation | 0.54% | 2.08% |
| **9** | Accommodation and food service activities | 0.44% | 2.38% |
| **10** | Manufacturing | 0.39% | 12.46% |
| **11** | Construction | 0.32% | 6.27% |

| | | | |
|---|---|---|---|
| **12** | Real Estate activities | 0.27% | 14.29% |
| **13** | Human health and social work activities | 0.26% | 8.51% |
| **14** | Public administration and defence; compulsory social security | 0.22% | 7.42% |
| **15** | Utilities | 0.17% | 1.61% |
| **16** | Education | 0.05% | 5.24% |

**Germany**

| **Rank** | Sector | IIP | GVA contribution |
|---|---|---|---|
| **1** | Financial and insurance activities | 3.24 % | 3.24% |
| **2** | Transportation and storage | 1.77 % | 3.87% |
| **3** | Education | 0.91 % | 4.40% |
| **4** | Public administration and defence; compulsory social security | 0.91 % | 5.68% |
| **5** | Utilities | 0.87 % | 2.42% |
| **6** | Agriculture, forestry and fishing | 0.71 % | 0.95% |
| **7** | Mining and quarrying | 0.51 % | 0.22% |
| **8** | Real Estate activities | 0.50 % | 12.09% |
| **9** | Wholesale and retail | 0.37 % | 10.07% |
| **10** | Construction | 0.30 % | 4.06% |
| **11** | Professional and administrative services | 0.27 % | 13.17% |
| **12** | Manufacturing | 0.20 % | 23.64% |
| **13** | Human health and social work activities | 0.19 % | 7.02% |
| **14** | Arts, entertainment and recreation | 0.19 % | 1.79% |
| **15** | Accommodation and food service activities | 0.16 % | 1.70% |
| **16** | Information and communication | 0.12 % | 1.79% |

| Ireland | | | |
|---|---|---|---|
| **Rank** | Sector | IIP | GVA contribution |
| **1** | Transportation and storage | 2.32% | 3.14% |
| **2** | Mining and quarrying | 2.29% | 0.64% |
| **3** | Professional and administrative services | 1.55% | 9.52% |
| **4** | Agriculture, forestry and fishing | 1.32% | 1.45% |
| **5** | Wholesale and retail | 1.28% | 10.52% |
| **6** | Education | 1.09% | 4.43% |
| **7** | Accommodation and food service activities | 1.07% | 2.43% |
| **8** | Real Estate activities | 0.94% | 8.34% |
| **9** | Manufacturing | 0.80% | 21.93% |
| **10** | Arts, entertainment and recreation | 0.57% | 1.14% |
| **11** | Utilities | 0.55% | 1.48% |
| **12** | Financial and insurance activities | 0.49% | 8.22% |
| **13** | Information and communication | 0.40% | 1.89% |
| **14** | Human health and social work activities | 0.33% | 7.02% |
| **15** | Public administration and defence; compulsory social security | 0.25% | 4.52% |
| **16** | Construction | 0.16% | 9.75% |

| Italy | | | |
|---|---|---|---|
| **Rank** | Sector | IIP | GVA contribution |
| **1** | Financial and insurance activities | 0.64% | 4.72% |
| **2** | Transportation and storage | 0.62% | 5.29% |
| **3** | Public administration and defence; compulsory social security | 0.44% | 6.52% |
| **4** | Professional and administrative services | 0.37% | 9.10% |
| **5** | Mining and quarrying | 0.31% | 0.36% |
| **6** | Agriculture, forestry and fishing | 0.28% | 2.02% |
| **7** | Information and communication | 0.24% | 2.05% |
| **8** | Wholesale and retail | 0.22% | 11.11% |
| **9** | Construction | 0.21% | 6.13% |
| **10** | Arts, entertainment and recreation | 0.18% | 1.40% |
| **11** | Manufacturing | 0.13% | 18.24% |
| **12** | Accommodation and food service activities | 0.13% | 3.77% |

| | | | |
|---|---|---|---|
| **13** | Human health and social work activities | 0.10% | 5.85% |
| **14** | Education | 0.10% | 4.66% |
| **15** | Utilities | 0.09% | 2.26% |
| **16** | Real Estate activities | 0.04% | 13.35% |

**Netherlands**

| **Rank** | Sector | IIP | GVA contribution |
|---|---|---|---|
| **1** | Wholesale and retail | 0.65% | 13.19% |
| **2** | Transportation and storage | 0.64% | 4.48% |
| **3** | Agriculture, forestry and fishing | 0.51% | 2.08% |
| **4** | Real Estate activities | 0.34% | 8.27% |
| **5** | Professional and administrative services | 0.32% | 13.70% |
| **6** | Arts, entertainment and recreation | 0.30% | 1.35% |
| **7** | Accommodation and food service activities | 0.26% | 1.84% |
| **8** | Financial and insurance activities | 0.24% | 3.78% |
| **9** | Manufacturing | 0.20% | 14.10% |
| **10** | Education | 0.16% | 4.24% |
| **11** | Human health and social work activities | 0.14% | 8.64% |
| **12** | Construction | 0.12% | 5.55% |
| **13** | Utilities | 0.12% | 1.95% |
| **14** | Information and communication | 0.09% | 2.46% |
| **15** | Public administration and defence; compulsory social security | 0.08% | 6.81% |
| **16** | Mining and quarrying | 0.04% | 3.08% |

| New Zealand | | | | |
|---|---|---|---|---|
| **Rank** | | Sector | IIP | GVA contribution |
| | **1** | Mining and quarrying | 0.95% | 1.31% |
| | **2** | Transportation and storage | 0.84% | 4.16% |
| | **3** | Public administration and defence; compulsory social security | 0.69% | 5.20% |
| | **4** | Agriculture, forestry and fishing | 0.66% | 5.77% |
| | **5** | Real Estate activities | 0.60% | 5.69% |
| | **6** | Professional and administrative services | 0.60% | 9.59% |
| | **7** | Human health and social work activities | 0.52% | 6.12% |
| | **8** | Arts, entertainment and recreation | 0.42% | 1.56% |
| | **9** | Accommodation and food service activities | 0.37% | 2.00% |
| | **10** | Manufacturing | 0.32% | 14.80% |
| | **11** | Education | 0.31% | 4.53% |
| | **12** | Construction | 0.28% | 5.82% |
| | **13** | Utilities | 0.27% | 3.19% |
| | **15** | Wholesale and retail | 0.24% | 12.96% |
| | **14** | Financial and insurance activities | 0.27% | 6.38% |
| | **16** | Information and communication | 0.19% | 3.85% |

| Norway | | | | |
|---|---|---|---|---|
| **Rank** | | Sector | IIP | GVA contribution |
| | **1** | Transportation and storage | 0.54% | 5.34% |
| | **2** | Agriculture, forestry and fishing | 0.54% | 1.36% |
| | **3** | Public administration and defence; compulsory social security | 0.49% | 4.52% |
| | **4** | Real Estate activities | 0.31% | 6.54% |
| | **5** | Education | 0.29% | 4.21% |
| | **6** | Professional and administrative services | 0.25% | 8.16% |
| | **7** | Arts, entertainment and recreation | 0.21% | 1.32% |
| | **8** | Human health and social work activities | 0.18% | 8.81% |

| | | | |
|---|---|---|---|
| **9** | Financial and insurance activities | 0.14% | 2.81% |
| **10** | Construction | 0.06% | 4.98% |
| **11** | Manufacturing | 0.06% | 10.19% |
| **12** | Wholesale and retail | 0.06% | 8.88% |
| **13** | Utilities | 0.05% | 2.16% |
| **14** | Mining and quarrying | 0.03% | 25.03% |
| **15** | Information and communication | 0.02% | 1.59% |
| **16** | Accommodation and food service activities | 0.01% | 1.53% |

**Poland**

| **Rank** | Sector | IIP | GVA contribution |
|---|---|---|---|
| **1** | Agriculture, forestry and fishing | 0.62% | 4.33% |
| **2** | Transportation and storage | 0.36% | 4.65% |
| **3** | Utilities | 0.34% | 3.33% |
| **4** | Wholesale and retail | 0.24% | 18.39% |
| **5** | Public administration and defence; compulsory social security | 0.23% | 5.79% |
| **6** | Professional and administrative services | 0.23% | 7.38% |
| **7** | Mining and quarrying | 0.23% | 2.25% |
| **8** | Financial and insurance activities | 0.22% | 3.83% |
| **9** | Construction | 0.15% | 7.14% |
| **10** | Manufacturing | 0.14% | 18.99% |
| **11** | Accommodation and food service activities | 0.09% | 1.16% |
| **12** | Information and communication | 0.08% | 2.46% |
| **13** | Real Estate activities | 0.08% | 6.38% |
| **14** | Arts, entertainment and recreation | 0.06% | 1.07% |
| **15** | Human health and social work activities | 0.03% | 3.67% |
| **16** | Education | 0.01% | 4.80% |

| Singapore | | | |
|---|---|---|---|
| **Rank** | Sector | IIP | GVA contribution |
| **1** | Financial and insurance activities | 0.52% | 10.65% |
| **2** | Utilities | 0.39% | 1.21% |
| **3** | Transportation and storage | 0.38% | 9.69% |
| **4** | Construction | 0.32% | 3.16% |
| **5** | Human health and social work activities | 0.31% | 1.56% |
| **6** | Wholesale and retail | 0.23% | 19.53% |
| **7** | Public administration and defence; compulsory social security | 0.17% | 4.39% |
| **8** | Agriculture, forestry and fishing | 0.16% | 0.04% |
| **9** | Arts, entertainment and recreation | 0.14% | 0.60% |
| **10** | Professional and administrative services | 0.13% | 8.35% |
| **11** | Manufacturing | 0.12% | 24.24% |
| **12** | Real Estate activities | 0.09% | 5.34% |
| **13** | Education | 0.08% | 1.21% |
| **14** | Information and communication | 0.05% | 2.25% |
| **15** | Accommodation and food service activities | 0.02% | 2.04% |
| **16** | Mining and quarrying | 0.00% | 0.00% |

| Spain | | | |
|---|---|---|---|
| **Rank** | Sector | IIP | GVA contribution |
| **1** | Real Estate activities | 1.33% | 9.15% |
| **2** | Transportation and storage | 0.55% | 4.58% |
| **3** | Wholesale and retail | 0.53% | 10.52% |
| **4** | Agriculture, forestry and fishing | 0.48% | 2.88% |
| **5** | Professional and administrative services | 0.37% | 8.11% |
| **6** | Construction | 0.27% | 11.86% |
| **7** | Mining and quarrying | 0.24% | 0.27% |
| **8** | Accommodation and food service activities | 0.16% | 7.21% |
| **9** | Human health and social work activities | 0.15% | 5.62% |
| **10** | Utilities | 0.12% | 2.09% |

| | | | |
|---|---|---|---|
| **11** | Manufacturing | 0.11% | 14.95% |
| **12** | Information and communication | 0.08% | 2.20% |
| **13** | Education | 0.06% | 4.73% |
| **14** | Arts, entertainment and recreation | 0.06% | 2.43% |
| **15** | Financial and insurance activities | 0.05% | 4.52% |
| **16** | Public administration and defence; compulsory social security | 0.04% | 6.05% |

**Sweden**

| **Rank** | Sector | IIP | GVA contribution |
|---|---|---|---|
| **1** | Utilities | 1.25% | 2.64% |
| **2** | Real Estate activities | 0.85% | 9.13% |
| **3** | Transportation and storage | 0.50% | 5.49% |
| **4** | Agriculture, forestry and fishing | 0.45% | 1.71% |
| **5** | Information and communication | 0.37% | 1.78% |
| **6** | Public administration and defence; compulsory social security | 0.26% | 4.82% |
| **7** | Wholesale and retail | 0.20% | 11.26% |
| **8** | Manufacturing | 0.10% | 19.63% |
| **9** | Mining and quarrying | 0.08% | 0.62% |
| **10** | Accommodation and food service activities | 0.07% | 1.42% |
| **11** | Professional and administrative services | 0.07% | 12.28% |
| **12** | Arts, entertainment and recreation | 0.06% | 1.63% |
| **13** | Construction | 0.06% | 5.33% |
| **14** | Financial and insurance activities | 0.05% | 2.70% |
| **15** | Education | 0.04% | 5.35% |
| **16** | Human health and social work activities | 0.03% | 10.61% |

| Turkey | | | |
|---|---|---|---|
| **Rank** | Sector | IIP | GVA contribution |
| **1** | Utilities | 0.39% | 3.76% |
| **2** | Arts, entertainment and recreation | 0.27% | 1.17% |
| **3** | Financial and insurance activities | 0.25% | 6.60% |
| **4** | Mining and quarrying | 0.25% | 1.50% |
| **5** | Transportation and storage | 0.18% | 17.62% |
| **6** | Wholesale and retail | 0.16% | 19.95% |
| **7** | Public administration and defence; compulsory social security | 0.16% | 7.16% |
| **8** | Professional and administrative services | 0.14% | 5.23% |
| **9** | Accommodation and food service activities | 0.13% | 3.56% |
| **10** | Human health and social work activities | 0.12% | 2.37% |
| **11** | Manufacturing | 0.11% | 28.36% |
| **12** | Real Estate activities | 0.10% | 13.59% |
| **13** | Construction | 0.10% | 6.70% |
| **14** | Information and communication | 0.09% | 2.83% |
| **15** | Agriculture, forestry and fishing | 0.08% | 16.53% |
| **16** | Education | 0.07% | 4.42% |

| UK | | | |
|---|---|---|---|
| **Rank** | Sector | IIP | GVA contribution |
| **1** | Agriculture, forestry and fishing | 2.15% | 0.69% |
| **2** | Real Estate activities | 1.62% | 9.45% |
| **3** | Transportation and storage | 1.24% | 4.46% |
| **4** | Financial and insurance activities | 1.13% | 6.66% |
| **5** | Wholesale and retail | 0.99% | 11.32% |
| **6** | Public administration and defence; compulsory social security | 0.80% | 5.06% |
| **7** | Accommodation and food service activities | 0.79% | 2.87% |
| **8** | Human health and social work activities | 0.65% | 7.14% |
| **9** | Manufacturing | 0.61% | 12.36% |
| **10** | Professional and administrative services | 0.56% | 14.27% |
| **11** | Information and communication | 0.50% | 2.59% |

| | | | |
|---|---|---|---|
| **12** | Mining and quarrying | 0.43% | 2.46% |
| **13** | Arts, entertainment and recreation | 0.42% | 2.71% |
| **14** | Education | 0.42% | 5.81% |
| **15** | Utilities | 0.31% | 1.75% |
| **16** | Construction | 0.26% | 6.45% |

**US**

| **Rank** | Sector | IIP | GVA contribution |
|---|---|---|---|
| **1** | Transportation and storage | 1.34% | 2.89% |
| **2** | Agriculture, forestry and fishing | 1.26% | 1.03% |
| **3** | Financial and insurance activities | 1.11% | 4.93% |
| **4** | Real Estate activities | 1.11% | 11.33% |
| **5** | Wholesale and retail | 1.09% | 12.15% |
| **6** | Mining and quarrying | 0.99% | 1.81% |
| **7** | Professional and administrative services | 0.96% | 11.82% |
| **8** | Utilities | 0.90% | 1.77% |
| **9** | Accommodation and food service activities | 0.87% | 2.94% |
| **10** | Arts, entertainment and recreation | 0.87% | 0.98% |
| **11** | Public administration and defence; compulsory social security | 0.86% | 12.55% |
| **12** | Information and communication | 0.86% | 4.53% |
| **13** | Manufacturing | 0.80% | 12.10% |
| **14** | Construction | 0.79% | 4.66% |
| **15** | Education | 0.79% | 0.98% |
| **16** | Human health and social work activities | 0.78% | 6.69% |