

HOW INSURANCE DRIVES ECONOMIC GROWTH

June 2018



**INSURANCE
INFORMATION**
INSTITUTE

Dr. Steven Weisbart, CLU
Chief Economist
Insurance Information Institute
stevenw@iii.org



TABLE OF CONTENTS

	<i>Page</i>
Executive summary.....	3
I. Safety/Security.....	6
II. Economic/Financial stability.....	8
III. Development.....	12
Reinsurance and economic growth.....	14
Conclusion.....	16
Sources and endnotes.....	17



EXECUTIVE SUMMARY

When asked what insurance does, most people are likely to say that it provides protection against financial aspects of a premature death, injury, loss of property, loss of earning power, legal liability or other unexpected expenses. All that is true.

However, the industry's contribution to the economy goes much further. One could point to the millions of people employed in insurance and related activities, to the billions of income taxes and premium taxes paid and to extensive charitable works. But, significant as they are, these are byproducts of the contributions of an industry that is at the heart of the growth and progress of every modern economy. Those contributions can be grouped under three broad categories: safety/security; economic/financial stability; and development. Under these headings, this paper describes 10 ways in which insurers and reinsurers drive economic growth. Briefly:

Safety/Security



1. Financial first responders.

Oftentimes on-site at the same time as emergency officials, insurers make every effort to restore claimants and beneficiaries quickly and reliably. This lessens the costs of unexpected losses and benefits even among those not directly affected by a loss.



2. Risk mitigators.

Insurers sponsor and promote knowledge and activities that save lives and protect and preserve property.

Economic/Financial Stability



3. Capital Protectors.

Insurers are not as susceptible to short-term liquidity crunches as are other financial services firms. Reinsurers further stabilize insurer exposure to loss by spreading or diversifying transferred risk.



4. Partners in Social Policy.

Insurance is an instrument of social policy. By providing significant social benefits, such as compensation for injuries at work and rebuilding property after catastrophes, insurance contributes to the rebuilding of people's livelihoods, as well as to the economy as a whole.



5. Sustainers of the Supply Chain.

Insurance protects economic interdependence among businesses by insuring supply chains, which become increasingly vulnerable with more complex technological components.



6. Capital Infusers.

Insurance reduces the need for "rainy day funds." Rather than having to set aside a relatively large amount of money to pay for unexpected losses, consumers and businesses can buy insurance for a relatively small premium, thereby putting more working capital into the economy, producing and consuming more goods and services to create a higher standard of living.

Development



7. Community Builders.

Insurers are among the largest investors in the world, with more than \$8 trillion in assets under management. Since these investments need to be available to pay long-term claims, investments often include private and municipal bonds that help communities grow and thrive.



8. Infrastructure Enablers.

Insurance enables economy-boosting construction projects and events to take place.



9. Innovation Catalysts.

Insurance allows innovators to take the risk that's needed to spur modernization. For more than 300 years—including every industrial revolution—insurance has been a critical driving force, and thus is central to a developing economy.



10. Credit Facilitators.

Insurance is critical to the borrowing process. With insurance, lenders are more likely to provide funding for large purchases, consumer durables and to businesses, and charge lower interest rates for these loans.



I. SAFETY/SECURITY



1. Insurers are financial first responders.

Insurance drives economic growth by expediting the recovery of claimants and beneficiaries. Insurers pay claims whenever there is a covered loss described in the insurance contract. In 2017 the insurance industry paid roughly \$1.5 trillion (an average of \$125 billion per month) to help claimants and beneficiaries rebuild their lives, property, and businesses, and get medical care. Health insurers paid \$589.9 billion, life/annuity insurers provided \$590.3 billion and property/casualty (P/C) insurers paid \$414.6 billion.¹

Insurance claims payments benefit not only those directly affected by loss, but others as well. For example, many claim payments ultimately go to auto repair shops, home improvement stores and healthcare facilities to fix cars, rebuild homes and provide medical treatment. By supporting these businesses that continue to pay taxes and keep people employed, economic growth is further stimulated.

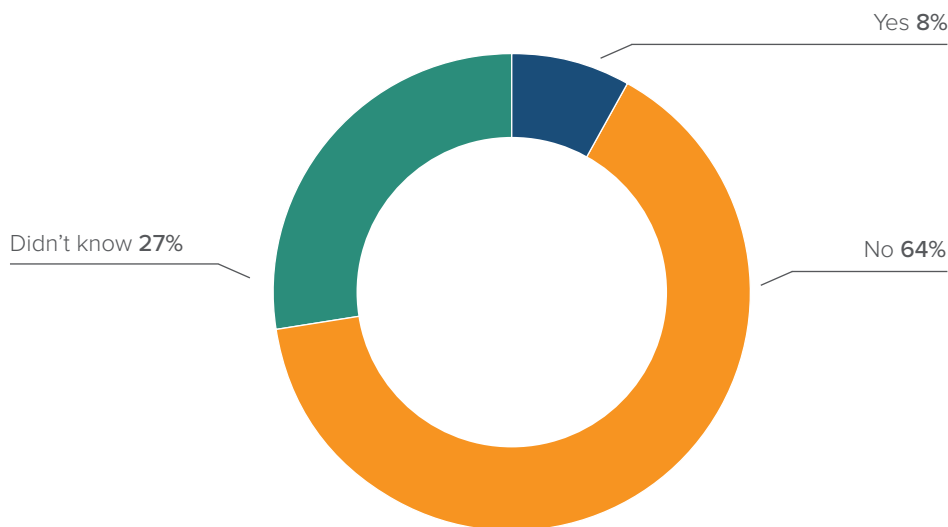
Too many people believe they do not need insurance because they believe that they will get help from one or more government agencies. For example, the Insurance Information Institute has regularly conducted polls asking, with reference to a major natural disaster, “Will the government pay for damage to your home that is not covered in your homeowners policy?” **Figure 1** shows that in 2012, 8 percent answered yes, and another 27 percent did not know, meaning that more than one person in three could incorrectly expect government support where none would be forthcoming.²

Indeed, such help is uncertain—after a disaster, government assistance often requires a special legislative act that might not ensue. For non-governmental victims it is usually in the form of loans. The Small Business Administration can provide homeowners with a maximum disaster assistance loan of \$200,000.³ These loans are themselves uncertain because they are based on the lender’s belief that the borrower can repay the loan—an ability that those who have been devastated by a catastrophe might not be able to demonstrate. With insurance, if the loss is covered, insurers aim to adjust the claim and pay as soon as they can, which is why it is correct to categorize them as “financial first responders.”

Federal aid does not necessarily adequately compensate those who have suffered a loss. Following superstorm Sandy in 2012, the average FEMA assistance amount was \$7,821, and the FEMA assistance program had a cap of \$34,000.⁴ For those relatively few who had flood insurance under the National Flood Insurance Program (NFIP) during the period 1978 through 2017, the average claim paid was \$36,767.⁵ The maximum NFIP payment on a flooded home is \$250,000.

Fig. 1

After a catastrophe, will the government pay for damage to your home that isn't covered by your homeowners policy?



Source: Insurance Information Institute, Pulse survey, November 2012.

With the aid of more sophisticated technology, and therefore the ability to dispatch large amounts of information and greater productivity, insurers are able to provide even more efficient and effective claims service to policyholders. By expediting the claims process, individuals and businesses can be restored to normalcy more quickly.



2. Insurers are risk mitigators.

To educate consumers on safety concerns, insurers collect and analyze information and disseminate financial and non-financial knowledge.

They employ a wide variety of loss prevention personnel (e.g., safety engineers and fire prevention specialists) and medical professionals to study ways to protect lives and property. For example, life/health insurers continue to warn the public about the negative effects of smoking and opioids. On the property side, insurers evaluated the effectiveness of municipalities' fire suppression systems and provided incentives to upgrade them.

For example, Verisk Analytics publishes a Fire Suppression Rating Schedule that rates how well-equipped individual communities are to fight fires. It grades the quality of the fire department, its dispatchers, water supply and community efforts to reduce fire risk. Higher-rated communities pay lower insurance rates. A similar system grades building codes and was devised after Hurricane Andrew in 1992, when insurers realized that a rigorous building code is devalued if code enforcement is lax.⁶



Leading life insurers partner with a non-profit organization called Life Happens to educate consumers about life, disability and long-term care insurance. A few groups supported by the property/casualty industry include the Insurance Institute for Highway Safety (IIHS) and the Insurance Institute for Business & Home Safety (IBHS). Their state-of-the-art facilities allow them to study the crashworthiness of vehicles and the durability of home construction.

The research efforts of the above insurer-sponsored groups and their awareness campaigns clearly have made a positive impact. For example, the Centers for Disease Control and Prevention (CDC) report that the cigarette smoking rate among adults in the U.S. dropped from 20.9 percent in 2005 to 15.5 percent in 2016.⁷ Further, since 1959 (when IIHS was founded), roughly half a million deaths in auto crashes have been avoided.⁸ And after Hurricane Charley hit Florida in 2004, modern building codes promoted by IBHS and property insurers were found to reduce the cost of insured losses by 42 percent and the frequency of these losses by 60 percent.⁹

II. ECONOMIC/ FINANCIAL STABILITY



3. Insurers are capital protectors.

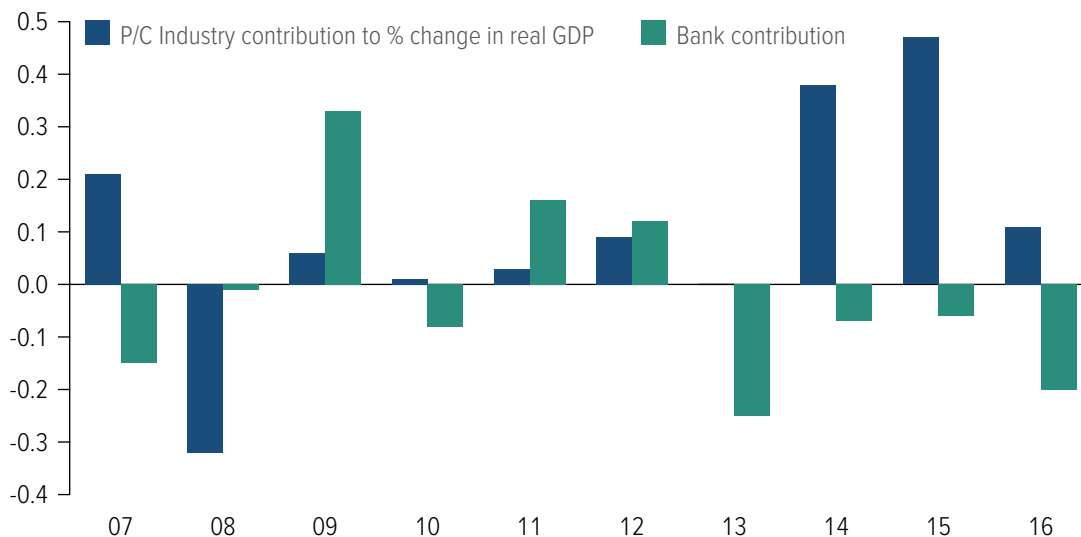
Insurers help to stabilize the economy, especially during times of a financial crisis. They are fundamentally different from investment banks and commercial banks. A sense of that difference, and an indication of insurers' greater stability in times following the "Great Recession"

(December 2007 through June 2009) is shown in **Figure 2**. From 2007 to 2016, there was only one calendar year (during the financial crisis in 2008) in which the insurance industry did not make a positive contribution to the GDP; in contrast, the banking industry retarded growth during seven of the 10 years.¹⁰

Insurers rarely fail. Between 2005 and 2016, A.M. Best identified 89 insurers who became "impaired."¹¹ Across a comparable period, (2006 to 2016) 525 banks were taken over by the Federal Deposit Insurance Corp. In many cases impaired insurers become the responsibility of one of the state guaranty funds, assisted by one of the two national guaranty associations—the National Conference of Insurance Guaranty Funds (for property/casualty insurers) or the National Life and Health Guaranty Association (for life/annuity and health insurers). Their work may be financed by assessments against insurers, with the result that roughly half of those impaired avoid liquidation, including some that are acquired by healthy insurers and other that are returned to full health.

Fig. 2

Value added by industry as a percentage of Gross Domestic Product



Source: Bureau of Economic Analysis, April 19, 2018.



4. Insurance is a partner in social policy.

Insurance serves socioeconomic purposes and, at times, takes on the role of a social institution that promotes the common good and helps to preserve social order. For example, every state has enacted a law that requires motorists to purchase auto liability insurance or show proof of financial responsibility to compensate accident victims. As a result of mandatory insurance, in 2015 about 203 million passenger cars in the U.S. were covered.¹² Without auto insurance, there might be less vehicle travel; but with insurance, people can readily drive to their jobs and trucks can deliver goods across the nation—clearly, these are benefits that promote a sound economy.

In addition, all states have workers compensation laws, requiring workers to be covered for illnesses and injuries arising out of their jobs, along with lost wages. The overall design of the workers compensation regime is sometimes called The Grand Bargain, because both employers and employees gain valuable things from it. Injured or ill employees do not sue employers for negligence to receive compensation (which they would receive only if they succeed in the suit), but instead are guaranteed to receive prompt payment and rapid access to medical attention that is intended to return them to work as soon as possible. Employers gain predictability of costs and freedom from the threat of lawsuit. In the few states in which insurance is not required to cover this peril, it is the risk management tool of choice. An additional benefit of insuring the workers compensation exposure is the analysis insurers perform in an effort to reduce future claim frequency and severity.



In 2015 about 135.6 million employees had coverage.¹³ Without workers compensation insurance, employment costs would likely become so unpredictable that employers may not want to hire more people, or might even downsize.



5. Insurance sustains the supply chain.

In today's modern world, businesses rely on far-flung supplies for a variety of goods and services. Stores rely on manufacturers to supply goods for them to sell, and manufacturers rely on stores to sell their products. Manufacturers rely on others to make components or supply goods that are not produced in their own country.

These risks stem from rapid advances in technologies (e.g., more sophisticated computerization and telecommunications) that lead to the exponential growth of economic interdependence among markets and nations. This growth is confirmed by the World Trade Organization, which states that the value of global trade in merchandise and commercial services in 2015 is nearly twice as high as it was in 2005.¹⁴

Insurers offer business interruption and contingent business interruption coverages to soften the financial impacts from disruptive events in the supply chain.

Commercial trade stimulates production and consumption, which in turn drives economic growth and efficiency. While this is a benefit, it comes with associated risks and costs.

As the system becomes faster and more complex, it becomes more vulnerable. As one textbook analysis noted, "The more sophisticated a technology, the

narrower the range of tolerable error because accidents and managerial failures have more severe consequences."¹⁵

The British Standards Institute reported that supply chain disruptions cost \$56 billion in 2015.¹⁶ One study reports that 41 percent of businesses had a supply-chain disruption from an unplanned outage of IT or telecommunications systems, 21 percent from a transport network disruption, 19 percent from civil unrest or an industrial dispute, and a majority from adverse weather.¹⁷ A survey by the Business Continuity Institute reported that "43 percent of respondents indicated that they have between 20 and 1,000 key suppliers that, if disrupted, could directly affect their own production."¹⁸

As technology emerges, complexity and interdependence increase. As they increase, risk grows, as does the value of insurance. Insurers offer business interruption and contingent business interruption coverages to soften the financial impacts from disruptive events in the supply chain.



6. Insurers are capital infusers.

Suppose there were no auto liability insurance, but states still had financial responsibility laws that required every driver to have a minimum amount of money to compensate any victim with an injury or property damage that resulted from his/her driving. This is actually the case in New Hampshire. So how do New Hampshire drivers meet their financial responsibility requirement? More than 90 percent have auto liability insurance, according to the Insurance Research Council.¹⁹

Without insurance, a fairly substantial “rainy day fund” of one’s own money or a loan would be required to pay for any unexpected losses. But with insurance, a relatively small premium payment can replace the need for a relatively large rainy day fund. For example, it is much more cost-effective for households to pay an annual premium of \$538.73 for bodily injury liability insurance than to have on hand \$16,642 for the average auto bodily injury loss.²⁰ Similarly, paying \$1,200 for flood insurance is much more economical than setting aside \$250,000 (the limit for NFIP’s insurance) in case of flood.

Instead of having money set aside in anticipation of a financial disaster, it can be used in other ways. In this sense, insurance stimulates the economy’s savings and investment function, and businesses and consumers can have a higher level of consumption and plan more confidently.

As the baby-boom generation ages, increasing attention is being paid to the possibility that many of its members will “outlive their incomes.” This is the problem of not having saved





enough to provide an income throughout one's retirement years, and/or withdrawing too much too soon, leaving no more income for some who live a long life.

The insurance industry—in the form of life annuities—offers the only financial product that completely transfers this risk from the individual to an insurer, providing both peace of mind and financial security. The benefit to the individual is obvious; the benefit to society is relief from the plight of a generation of aged paupers.

III. DEVELOPMENT



7. Insurers are community builders.

For most types of insurance, premiums are collected in advance of any claim payments, so insurers can convert most of their premium income into mid- and long-term investments. At the end of 2017, the U.S. insurance industry had cash and invested assets of \$5.8 trillion. Most of their investments are bonds (\$4.1 trillion), followed by common stock (\$512 billion), mortgages (\$495 billion), cash and short-term investments (\$388 billion) and other investments.²¹

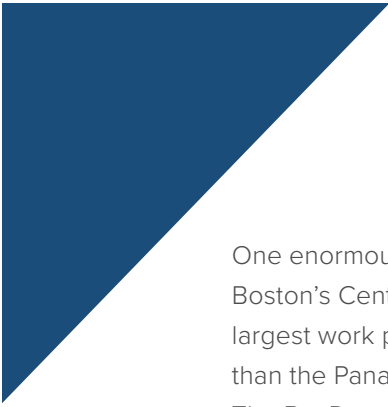
As investors, the insurance industry plays a notable role in the market for municipal bonds (sometimes called “munis”). Municipal Bonds for America reports that munis have financed three-quarters of the total U.S. investment in infrastructure.²² At year-end 2016, \$562 billion of the insurance industry's bonds were munis. The entire financial sector held \$2.0 trillion of all munis outstanding; the insurance industry held 28 percent.²³

By supporting state and local governments through buying and holding muni bonds, insurers help to lower borrowing costs that allow for greater investments, reduce tax rates for residents, and bolster job creation and economic growth. In the last decade, financing public works projects with muni bonds vs. taxable debt (that would have had to pay higher interest) has saved \$495 billion.²⁴



8. Insurance enables infrastructure improvements.

Developers cannot afford to risk the entire value of their firm to compensate victims of a wide variety of risks during and following the construction of new buildings, roadways and bridges, etc. If an abandoned industrial space (i.e., “brownfield”) is used as a building site, there may be a risk of unknown environmental contamination that requires cleanup. It is therefore essential to have adequate and appropriate insurance to cover any potential losses arising from damage to the property or equipment used, legal liability for bodily injuries, and so forth. Insurance also is necessary before large-scale public events such as music festivals, concerts, sporting events, and trade shows can take place in order to protect the sponsors from any third-party liability.



One enormous construction project that could not have gotten started without insurance was Boston’s Central Artery/Tunnel Project (aka the “Big Dig”), which was by some measures the largest work project in U.S. history. Completed in 2006, this \$14 billion megaproject was larger than the Panama Canal and more expensive than the Chunnel connecting France and England. The Big Dig workforce included 150 general contractors and 600 construction companies. Although the project went well, there were problems, including a fatality resulting from the collapse of the I-90 connector tunnel ceiling.²⁵ Without insurance, this massive project—that created numerous jobs, improved the city’s traffic congestion, and reduced greenhouse gas emissions—would not have been feasible.



9. Insurers are innovation catalysts.

We live in a world that is constantly evolving—lately, it seems, at a faster pace than ever. New risks continue to emerge, from nanotechnology, hydrofracturing, cybertechnology, genetic engineering, and even space travel for the public, to name just a few. The support insurance delivers can help bring these innovations to market quickly.

As an illustration, the science of nanotechnology²⁶ has a wide variety of applications in biomedicine, transportation, energy, electronics, household products, cosmetics, food and food packaging, and many other areas. According to BCC Research, the global nanotechnology market should more than double in value in five years, from \$39.2 billion in 2016 to \$90.5 billion by 2021.²⁷ More than 1,600 nano-influenced consumer products are now in the marketplace, and more are being developed. Although nanotechnology has great positive potential, the unusual properties of nano-materials may present harmful health risks that could go undetected for years or even decades, similar to asbestos (which, to date, has cost insurers hundreds of billions of dollars).²⁸

Ideally, insurers offer coverage based on a large volume of credible data that enables them to calculate prices and a probable range of losses related to specified classes of risk. But new and emerging risks by definition do not present such data. Yet innovation often involves taking

 Insurance has supported each different industrial revolution by offering risk transfer and risk analysis services that enable innovators to have the financial safety net they need to pioneer new ways of doing things.



large risks that potential innovators are not financially capable of bearing unaided. Enter the insurance industry, providing coverage even when data are scarce or nonexistent, as it has for hundreds of years.

Insurance has supported each different “industrial revolution”²⁹ by offering risk transfer and risk analysis services that enable innovators to have the financial safety net they need to pioneer new ways of doing things. Currently, insurance is driving the Fourth Industrial Revolution, as described by the World Economic Forum as a blend of physical, biological, and digital technologies. The still-emerging line of cyber insurance is an example, as is the use of wearables, predictive modeling of catastrophes, and other technology to spot (and prevent or mitigate) impending problems sooner than was ever possible.

Today insurers use computer models and other methods to estimate the claims that are likely to arise and how much they might cost. The ability to measure the cost of these new risks helps to generate price signals for the economy and target resources to productive uses. Without insurance, the uncertainty of outcomes and the potential catastrophic cost of a large claim could stifle innovation. With insurance, economic resources are allocated more efficiently so that individuals and businesses can be more confident in assuming developing risks, and economic growth and job creation are stimulated.



10. Insurers are credit facilitators.

Consumers and organizations often need to apply for a loan to make a significant purchase or start or expand

a business. Before a lending institution will finance a home or a car, or provide backing to entrepreneurs, proof of insurance is often required to cover any potential damage (e.g., fire) and assure that loans will be repaid. Lenders can offer a lower interest rate than they could if no insurance were available.

According to the Federal Reserve Bank, the value of commercial and industrial loans, real estate loans, consumer loans and all other loans at all U.S. commercial banks was \$9.1 trillion as

Reinsurance and economic growth

Most insurers transfer some of the risks they write to other companies – known as reinsurers. Like insurers, reinsurers spread the risk in order to reduce the financial impact of unexpectedly large losses. Without reinsurance, insurers would have to shoulder all of the risk, but with reinsurance, the potential depletion of their funds due to an enormous loss event (e.g., a huge natural disaster or fire, plane crash, etc.) is minimized. Insurer premiums and operating results become less volatile and their underwriting capacity is increased, enabling them to take on risks they normally might not accept.

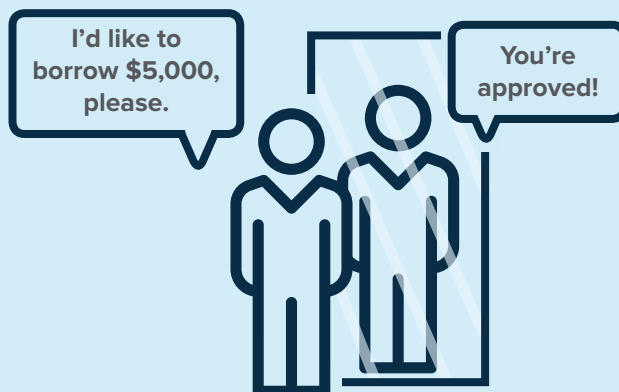


Reinsurers are also major investors, providing additional long-term capital into the markets. With reinsurance, primary insurers can free up some of their own money and use it to enhance their investments and offer affordable coverage to more consumers. In addition, primary insurers have greater confidence in writing new lines of business or entering new markets, possibly outside the U.S. Entry into foreign countries – especially developing ones – means greater opportunities to increase the financial capacity of these nations and boost their economies. This

of Jan. 2018.³⁰ Clearly, insurance in large part supports both the financial strength of the lending industry and facilitates consumer and business spending activities. If businesses cannot grow without additional funding, fewer jobs would be created or employees may be laid off; individuals without jobs would have less money to spend, which could slow the economy.

Another way in which insurance facilitates borrowing is found in life insurance. In a whole life or universal life insurance policy, part of the premium is used as an investment, referred to as “cash value.” As the policy continues, the cash value generally increases, enabling policyholders to borrow against the accumulated funds. One advantage of the investment option in whole or universal life insurance is that borrowing against the cash value does not require any credit application or evaluation; the cash value is full collateral for the loan, so even people or businesses with poor credit ratings can borrow. This type of insurance is a smart financial move for individuals and households, so that in addition to the protection against lost earning from a premature death, it also can provide cash to borrow for emergencies or other uses.

Whole life insurance policies allow you to be your own loan officer



would likely strengthen trade and economic engagement between the U.S. and other countries, resulting in improved globalization.

Reinsurers typically operate internationally, so they have a broad, in-depth knowledge of different risks, products and markets and can provide underwriting, actuarial, claims and product expertise to insurers. Their experience in claims handling is particularly valuable in helping insurers accelerate the recovery process for claimants, and their product development skills help insurers to be more innovative so they can offer new types of coverages to their customers. Reinsurers also are at the forefront in identifying and understanding emerging and unique risks to be able to manage them effectively.

The reinsurance industry is financially solid with strong resources to support the insurers that cede business to them. About 400 reinsurance establishments (single-location companies and units in multilocation companies) with 25,000 employees are located throughout the U.S.³¹ The U.S. reinsurance industry has a combined annual revenue of about \$56 billion, while the global industry generates annual revenues of about \$220 billion.³² In 2016 the U.S. ceded premiums written to non-affiliated reinsurers were \$83 billion. As of June 30, 2017, the amount of reinsurance capital on a global basis was at an all-time high of \$605 billion.³³ This amount is generally considered more than sufficient for reinsurers to be able to withstand extensive losses.



CONCLUSION

Insurance, including reinsurance, is an integral part of the economy, performing a variety of important functions. Not only do insurers provide financial security and peace of mind to households and businesses, but they are a vital source of long-term capital, providing stability to financial markets and the overall economy. Insurance is a necessary precondition for many economic activities that would not—or could not—take place otherwise. Without the guarantee of insurance (and reinsurance), most businesses could not operate as they do today, and construction projects could not go forward. Most consumers would not be perceived as good credit risks and could not borrow money from lending institutions. Indeed, the list of contributions made by the insurance industry is extensive, benefiting all aspects of the U.S. and global economy.

Sources and Endnotes

1. These numbers are for private insurers and do not include claims paid by government insurance programs. NAIC data, sourced from S&P Global Market Intelligence.
2. Insurance Information Institute, Pulse survey, November 2012. The I.I.I. asked this question annually from 2006 (perhaps earlier) until 2012. Responses were remarkably consistent.
3. [U.S. Small Business Administration. SBA's Disaster Loan Program Explained.](#) April 2014.
4. ["Notice Of Maximum Amount Of Assistance Under The Individuals And Households Program,"](#) Federal Register, 2018.
5. I.I.I. calculations, based on [NFIP data](#).
6. Verisk Analytics, ["Fire Suppression Rating Schedule."](#) Verisk Analytics, ["Building Codes."](#)
7. ["CDC, Current Cigarette Smoking Among Adults in the United States"](#), Smoking And Tobacco Use, 2016.
8. Robert Hartwig, ["Insurance Institute for Highway Safety 50th Anniversary Speech,"](#) 2009.
9. Institute for Business and Home Safety, ["Hurricane Charley: Nature's Force vs. Structural Strength."](#)
10. U.S. Commerce Department, Bureau of Economic Analysis: Excel file GDPbyInd_VA_1947-2016 (4).xlsx, tab "Contributions to Percent Change in Real Gross Domestic Product by Industry," lines 58 and 60 (rows 64 and 66).
11. A.M. Best, *Best Special Report*, "Best's Impairment Rate and Rating Transition Study – 1977 to 2016," p. 9. Impairment is defined as "state actions such as involuntary liquidation because of insolvency, as well as other regulatory processes and procedures such as supervision, rehabilitation, receivership, conservatorship,...and any other action that restricts a company's freedom to conduct its insurance business as normal."
12. AIPSO Facts 2016/2017.
13. Social Security Administration, ["Annual Statistical Supplement, 2017 - Workers' Compensation Program Description and Legislative History."](#)
14. World Trade Organization, ["World Trade Statistical Review, 2016,"](#) p. 10.
15. Peter Zweifel and Roland Eisen, *Insurance Economics*, Springer Texts in Business and Economics, p. 6.
16. Cited in AIR, ["Insuring Supply Chain Risk."](#)
17. Cited in The Business Continuity Institute, ["Supply Chain Resilience 2011."](#)
18. Cited in AIR, ["Insuring Supply Chain Risk."](#)
19. Insurance Information Institute, [Facts + Statistics: Uninsured Motorists.](#)
20. Calculation of average bodily injury premium taken from data in National Association of Insurance Commissioners, "Auto Insurance Database Report 2014/2015," December 2017, p. 48; ISO®, a Verisk Analytics® business.





21. National Association of Insurance Commissioners (NAIC) & The Center for Insurance Policy and Research, *Capital Markets Special Report*, August 24, 2017.
22. "[Testimony of Municipal Bonds for America Coalition](#)," submitted to the U.S. Senate Committee on Finance, July 17, 2017.
23. Total outstanding among all sectors was \$3.8 trillion. Federal Reserve, Z.1 Financial Accounts of the United States: Flow of Funds, Balance Sheets, and Integrated Macroeconomic Accounts, Third Quarter 2017 (December 7, 2017), Summary p. 3, line 17, column 11, and Insurance Information Institute calculations.
24. Municipal Bonds for America, "[What are Muni Bonds?](#)," 2016, citing National Association of Counties et alia, "[Protecting Bonds to Save Infrastructure and Jobs](#)."
25. Mark Hollmer, *Insurance Times*, "[THE BIG RISK - Insuring the Big Dig](#)," Sept. 17, 2002, Vol. XXI No. 19, and Raja Mishra, "[Insurance Could Ease Big Dig Costs](#)," *The Boston Globe*, Aug. 1, 2006.
26. Nanoparticles are invisible to the eye. There are 25.4 million nanometers in 1 inch; one sheet of newspaper is equivalent to 100,000 nanometers thick.
27. BCC Research, "[The Maturing Nanotechnology Market: Products and Applications](#)," Nov. 2016.
28. National Association of Insurance Commissioners and The Center for Insurance Policy and Research, "[Nanotechnology](#)," Nov. 15, 2017.
29. It is now common to say we're in the Fourth Industrial Revolution. The first was the harnessing of water and steam power to mechanize production. The second used electricity to create mass production. The third used electronics and information technology to automate production. The fourth blends physical, biological, and digital technologies to transform entire systems of production, management, and governance at unprecedented speeds. See Klaus Schwab, "[The Fourth Industrial Revolution: What It Means, How to Respond](#)."
30. Federal Reserve System, "[Assets and Liabilities of Commercial Banks in the United States](#)," Feb. 16, 2018.
31. Insurance Information Institute, "[Facts + Statistics: Industry Overview](#)," 2018, and Dun & Bradstreet, "[Reinsurance Carriers Industry Profile](#)," last updated Feb. 5, 2018.
32. Dun & Bradstreet, "[Reinsurance Carriers Industry Profile](#)," last updated Feb. 5, 2018.
33. Aon Benfield Analytics, "[Reinsurance Market Outlook](#)," Sept. 2017, pp. 7 and 2.