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Behavioral Economics and Insurance: Principles and Solutions

Abstract

It is easy for a consumer to make mistakes in insurance markets, especially when deciding whether to purchase insurance against low-probability, high-consequence (LP-HC) events. They have a hard time collecting and processing information to determine the likelihood and consequences of these risks which (by definition) they have had limited or no experience. Hence, people often rely on feelings and intuition rather than careful thought when it comes time to decide what coverage to purchase.

Disciplines

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Behavioral Economics and Insurance: Principles and Solutions

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February 2014

Introduction

It is easy for a consumer to make mistakes in insurance markets, especially when deciding whether to purchase insurance against low-probability, high-consequence (LP-HC) events. They have a hard time collecting and processing information to determine the likelihood and consequences of these risks which (by definition) they have had limited or no experience. Hence, people often rely on feelings and intuition rather than careful thought when it comes time to decide what coverage to purchase

On the supply side, insurance companies face the risk of experiencing large claims payments, only part of which can be spread or diversified away through the law of large numbers if losses are highly correlated. Decision makers in the insurance industry and those who regulate, litigate, and legislate about insurance are also likely to make mistakes for the same reasons that consumers do — they rely primarily on their intuition rather than undertaking deliberative thinking because they have limited information from past experience on which to base their decisions.

In this paper we take a realistic but optimistic view of the prospects for improving the functioning of insurance markets. Our primary goal is to specify, explain, and justify principles for structuring and governing insurance markets to account for buyers and sellers who make mistakes. A secondary goal is to propose market and regulatory structures in accordance with these principles.

We use two recent examples of legislation – the National Flood Insurance Reform Act and the Affordable Care Act – to illustrate how insurance could be redesigned to adhere to these principles much of the time—but not all the time. These public policies are intended to encourage consumers to purchase insurance that they ought to have, but often do not. We also consider other possible policies designed to correct systematic examples of people buying insurance at high premiums when deliberative decision making suggests that it would be more appropriate to go without coverage. We conclude by building on these examples to suggest future strategies involving either the public and/or private sector.

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Behavioral Economics and Insurance: Core Findings and Political Prospects

According to insurance theory, those at risk benefit from incurring a small cost in the form of a premium to obtain protection against an event that could produce significant financial losses but that has a low probability of occurrence. If insurance can be offered with relatively small administrative costs so it is reasonably priced, a risk averse individual should prefer a smaller certain premium to taking the chance of experiencing a large loss (*Arrow 1971*). If properly designed and priced, insurance also offers incentives in the form of premium reductions for people who mitigate their risk in a cost effective way, if the insurer can accurately incorporate the impact these mitigation measures will have on reducing the likelihood and/or consequences of events for which they offer financial protection (*Shavell 1979*).

There is considerable empirical evidence that many consumers fail to take advantage of insurance protection against losses of property and health, and do not invest in efficient loss reduction measures in the LP-HC setting. In both cases they fail to behave in ways that would not only benefit them personally *ex ante*, but might also enhance social welfare if there are societal concerns about people's *ex post* wellbeing. Behavioral economics offers some explanations for these decisions and suggests remedies. However, designing these solutions may require interventions by public and private institutions beyond just structuring information and options to take advantage of individuals' decision processes.

To illustrate this point, field and controlled experiments in behavioral economics reveal that consumers are sometimes more likely to select a default option rather than going to the trouble of opting out in favor of some other alternative. These findings have been used to encourage consumers to choose options that are in their best interests, such as better (dominant) 401(k) plans (*Madrian and Shea 2001*) and to adopt the "Save More Tomorrow" plans that encourage consumers to earmark a portion of their increased earnings into these plans (*Thaler and Benartzi 2004*). Default options have also been used to increase the number of organ donations (*Johnson and Goldstein 2003*) and in other programs detailed in the important book, *Nudge* (*Thaler and Sunstein 2008*). To date, this framing technique has been applied to situations where the outcome is either known with certainty, or when the chosen option (such as a recommended 401(k) plan), has a higher expected return than the other options.

For decisions under uncertainty that involve insurance, the economic benefits of having coverage are reaped only when the (low-probability) loss-producing event occurs. It is unlikely that most people who failed to purchase insurance would reverse course if a loss did not occur, or purchase coverage even if insurance were the default option.

In this regard, there is considerable empirical evidence that insurance behavior is guided by misperception of the risk, and the use of simple but inappropriate heuristic decision rules. Many who do not purchase property and health insurance perceive the likelihood of a serious event to be below their threshold level of concern. Individuals are often unwilling to voluntarily buy insurance coverage against a particular risk until after experiencing a loss. Many who purchased a policy are likely to cancel it if they have not

made a claim after several years because they consider their insurance purchase to be a poor investment decision (*Kunreuther, Pauly and McMorrow 2013*).

It may thus be necessary to utilize more stringent policy tools, such as premium subsidies or mandatory coverage, to induce individuals to protect themselves when they should have protection. Mandating insurance against losses from natural disasters or serious illnesses can also be justified from the vantage point of social welfare if the majority of citizens feel that those at risk should protect themselves financially before losses occur rather than relying afterwards on federal disaster relief covered by taxpayers' money. Justifying such requirements politically has proven to be difficult given individuals' lack of interest in voluntarily purchasing coverage against LP-HC events.

As noted above, two significant pieces of legislation in the last two years have recognized the biases and heuristics utilized by individuals at risk and have taken steps to address them. The Biggert-Waters Act in July 2012 (*112th Congress*) proposed major reforms to the National Flood Insurance Program (NFIP); the Affordable Care Act (ACA) passed in 2010 (*111th Congress*), is implementing reforms in health insurance to expand coverage. Both these Acts require consumers to buy coverage at reasonable or even favorable premiums while recognizing the need to make the purchase of insurance more feasible for low- and medium-income individuals; Biggert-Waters authorizes FEMA to fund a study on affordability of flood insurance by examining the role that means tested vouchers (in the same spirit as food stamps) and other financial arrangements could play in this regard.² The ACA offers insurance to individuals and small groups through exchanges to be subsidized with means-tested tax credits. Both Acts encourage the adoption of risk reducing measures.

Other countries have also incentivized individuals to undertake protective measures and mandated the purchase of insurance against natural disasters and health risks. In the case of natural hazards, in France, New Zealand and Spain, the government plays a key role by providing insurance coverage against all disasters and requiring those at risk to protect themselves with insurance (*OECD 2008*). With respect to health insurance, all developed countries have compelled virtually universal coverage of catastrophic medically-related expenses, with financing through tax or tax-like instruments.

Even so, challenges to such universal requirements persist in all countries. Mandates usually permit exceptions (for higher income people, for non-citizens, for certain classes of risk or types of medical care). Public support for mandates in the U.S. is still rather weak, and other countries are having second thoughts about some aspects of their programs. So it is clear that in a democracy, any normative theory will have to be linked to politics.

Intuitive Thinking by Consumers, Insurers and Regulators

For LP-HC events such as natural disasters, terrorism or catastrophic health-related expenses, not only consumers but also insurers and regulators often do not behave in

²This NRC study is currently underway with a first meeting held at the end of January 2013.

accordance with the normative theory of insurance theory but follow their intuitions. After a severe loss, insurers may refuse to continue to offer coverage against this risk because they focus on the losses from a worst-case scenario without adequately reflecting on the likelihood of this event occurring in the future. State insurance commissioners sometimes restrict insurers from setting premiums that reflect risk to address equity and fairness issues, sacrificing efficiency in the process.

If decision makers were to engage be more deliberative in their thinking when making choices under uncertainty, they would likely compare alternatives by estimating the likelihoods of different events occurring and their consequences, and make tradeoffs between the expected costs and benefits of each option.

The characterization of judgment and choice that distinguishes intuitive thinking from deliberative thinking builds on a large body of cognitive psychology and behavioral decision research. A recent summary has been provided by Daniel Kahneman in his stimulating book *Thinking, Fast and Slow* (Kahneman 2011) as detailed in Box 1:

Box 1: Intuitive and Deliberative Decision Making

Intuitive Thinking, System 1

Operates automatically and quickly, with little or no effort and no voluntary control.

Uses simple and concrete associations, including emotional reactions or simple rules of conduct that have been acquired by personal experience with events and their consequences.

Deliberative Thinking, System 2

Initiates and executes effortful and intentional abstract cognitive operations when needed.

Cognitive operations include complex computations and formal logic.

Intuitive thinking often draws upon the experiences, expectations, goals and beliefs of the parties involved in the decision. Such sources and heuristics typically require far less effort than more detailed analysis of the trade-offs among the options. Even when decision makers make an effort to think carefully, the intuitive appeal of some heuristics implies that they still make mistakes. While intuitive processes often lead to reasonably good decisions, they do *not* work well for LP-HC events, either because of a decision maker's undue focus on a recent event or because individuals perceive the likelihood of an extreme event to be below their threshold level of concern.

Deliberative thinking with respect to assessing risks requires considerable time and attention and the use of decision tools such as probability estimation, Bayesian updating, and the use of formal logic. Consumers at risk would ideally make their decision on whether to purchase insurance – and if so, how much coverage – by comparing the

expected costs and benefits of a set of different alternatives available to them using models of choice such as expected utility theory (*von Neumann and Morgenstern 1944*) or decision analysis (*Raiffa 1968*). If insurance premiums reflected risk and households used these more formal models, those facing an LP-HC event would purchase coverage. If all consumers at risk (rather than just a fraction of them) undertook deliberative (System 2) thinking, then flood insurance and catastrophic health insurance coverage would be viewed as highly valuable and would be purchased by almost everyone.

Consumer behavior

While intuitive perceptions of risk are relatively accurate over a broad range of situations where one has considerable experience, individuals are likely to deviate from expert assessments of unfamiliar risks that involve small probabilities and high degrees of uncertainty (*Cutler and Zeckhauser 2004; Kunreuther, Pauly and McMorro 2013*). These events are subject to the *availability bias* where the judged likelihood of an event depends on its salience (*Tversky and Kahneman 1973*). There is thus a tendency to ignore rare risks until after a disaster occurs.

This is a principal reason why individuals tend to purchase insurance only after a disaster and cancel their policies several years later when they have not suffered a loss and perceive the likelihood of a disaster as so low that they do not pay attention to its potential consequences. An in-depth analysis of the entire portfolio of the NFIP revealed that the median tenure of flood insurance was between two and four years while the average length of time in a residence was seven years (*Michel-Kerjan, Lemoyne de Forges, and Kunreuther 2012*). This behavior occurs even when homeowners are required to purchase flood insurance as a condition for a federally insured mortgage.

The relatively thin market for catastrophic coverage is due to the unwillingness of a majority of buyers to pay a relatively small additional premium for essentially unlimited coverage. This may be the reason that 55 to 60 percent of private group insurance (which covers more than 90 percent of those with private insurance) contained some kind of lifetime cap on benefits before health reform (*Musco and Somers 2012*). The choices to limit coverage of catastrophic health-related events for employment-based groups were generally made by employers or unions, not individual workers. These agents for the employees should have strong incentives to avoid mistakes but they still make them. This same mistake in insurance design has been made by the government for public Medicare Part A plan where there are lifetime limits for coverage of inpatient care.

Such coverage limits seem irrational given the low costs and high benefits of protection. In a large insurance plan, very few beneficiaries would reach this upper limit, usually in the millions of dollars. Those groups who self-insure could buy reinsurance at relatively low prices to cover the costs of these events. The incremental premium to remove such limits is very low – less than one percent of what the insurer is currently charging (*PricewaterhouseCoopers 2009*). For example, if health insurance costs \$2,000 a year, then removing the upper limit would add less than \$20 to the premium. And yet many consumers ended up with coverage that did not include this low cost of added protection.

The recent reform legislation requires all new private health insurance contracts to eliminate such limits (*Musco and Somers 2012*).

Insurer behavior

It is easy to understand how consumers make mistakes about insurance. Surprisingly, insurance managers, despite high levels of expertise and strong incentives to make logical decisions, also make errors with respect to situations where there is uncertainty or ambiguous information regarding the low probability risks they face. When insurers have limited data and limited past experience with extreme events, there is a tendency for them to engage in intuitive thinking when determining what coverage to offer against specific risks and how much to charge.

To illustrate, prior to the terrorist attacks of September 11, 2001, actuaries and underwriters, despite their mathematical expertise and experience, did not specify a price for protection against terrorism coverage nor did they exclude this coverage from their standard commercial policies. This implied that they were essentially covering this risk for the very modest add-on for unspecified events included in typical property insurance premiums. The failure to examine the financial risks associated with terrorism was surprising given the attempted bombing of the World Trade Center in 1993, the 1995 Oklahoma City bombing and other terrorist attacks throughout the world. This behavior by insurers is in the spirit of a safety first model originally proposed by *Roy (1952)*. It implies actuaries and underwriters do not focus on risks for which they perceive the probability of an event to be below their threshold level of concern (*Kunreuther, Pauly and McMorro 2013*).

Following 9/11, most insurance companies completely changed course and refused to offer coverage against terrorism, considering it to be an uninsurable risk despite increased buyer demand. The few who did provide insurance charged extremely high premiums for coverage (*Wharton Risk Center 2005*). Prior to these terrorist attacks Chicago's O'Hare Airport had \$750 million of terrorism insurance coverage at an annual premium of \$125,000. After 9/11, insurers offered the airport only \$150 million of coverage at an annual premium of \$6.9 million. This reflected an increase in the cost per dollar coverage of over 275 percent! The airport was forced to purchase this policy since it could not operate without coverage (*Jaffee and Russell 2003*). The Golden Gate Park in San Francisco was simply unable to obtain terrorism coverage at any price (*Smetters 2004*).

If actuaries and underwriters had used estimates based on more formal models of choice that characterize deliberative (System 2) thinking for determining protection against these extreme events, they would have more accurately estimated the change in likelihood of future terrorist attacks in different parts of the country and their potential consequences. Insurers could then have determined what types and amounts of coverage they would want to offer and the prices they would have to charge so as to maximize their expected future profits based on their current portfolio of policies. It seems implausible to us that they would have concluded that the likelihood of terrorist attacks took such a large jump as to call for the kinds of premiums just described.

In contrast, private insurers have been willing to offer catastrophic coverage for health insurance; its absence usually reflects inadequate demand by consumers as discussed above. Because illnesses that are financially catastrophic for patients are uncorrelated, even health insurers of moderate size are not concerned about a large loss relative to their portfolio from a single person's high medical expense.

Regulator behavior

Insurance regulators have aided Florida homeowners in hurricane-prone areas by keeping property insurance costs lower than they would be if private insurers were free to charge premiums that reflected risk. Following Hurricane Andrew in 1992, insurers were only allowed to raise rates gradually over the next decade and were restricted from canceling existing homeowners' policies. Moreover, political pressure from residents in hurricane-prone areas to reduce homeowners' premiums led the state legislature in 2007 to form a residual market mechanism, Citizens Property Insurance Corporation, which offers premiums at highly subsidized rates, thus undercutting the private market. Today, Citizens is the largest provider of wind coverage in Florida. There have been no severe hurricanes in the state since 2005, but if Citizens suffers a severe loss from a large hurricane in the coming years, it is likely to become insolvent. In this case, Florida will have to levy a tax on its residents and request disaster assistance from the Federal government.

This example illustrates behavior triggered by short-term intuitive thinking by regulators and legislators. The strategy yields positive returns if there is no hurricane damage in Florida in the near future, but the current premium structure will lead aggregate claims payments that exceed premiums in the long run. If regulators had undertaken a more systematic analysis of the long-term impacts of their behavior, they would not have formed Citizens in this manner by allowing it to charge highly subsidized premiums. They should have permitted insurers to charge premiums reflecting risk and found other ways to aid those residing in hurricane-prone areas needing special treatment. Just as low-income families are provided with food stamps to buy groceries, low-income residents could be given means-tested insurance vouchers so they can afford the higher risk-based premiums.

Challenges for Making Positive Changes

A key challenge in utilizing economic incentives for improving insurance choices is that they may be viewed by some citizens as being unfair or inequitable. Suppose, for example, the house that a homeowner purchased years ago is now categorized as being in a floodplain, or a family's vacation cottage on the coast faces a greater risk of hurricane damage due to climate change. At the time the property was bought, damage from hurricanes and floods were not considered a problem. Or suppose some people's current health status is adversely affected by past behavior or genetic disease propensities. Premiums that reflect their current property or health-related risk are likely to be viewed as unfair by the affected individuals who feel they are too high. But for insurance to operate efficiently, it is necessary for insurers to raise premiums for those now facing a higher likelihood of a property loss or illness. Insurers would then be in a position to charge lower premiums to those that have low expected claims, so that purchasing coverage is viewed as an attractive option for this group.

If premiums do *not* reflect the hazardous location of property or adverse genetic conditions, insurance will be *ipso facto* subsidized for these high-risk individuals. They will have less reason to undertake actions to reduce their risk because they will not be rewarded with lower premiums. Another result will be that lower-risk consumers who undertake deliberative thinking will tend to purchase less insurance. In fact, they will likely run away from coverage if premiums are set higher than they should be, perceiving insurance to be a bad buy. On the other hand, the high risks will insure even small losses because they consider coverage to be a bargain.

In summary, insurance is a policy tool that has two principal purposes – encouraging cost-effective investment in loss reduction measures via premium reductions, and providing financial protection should those at risk suffer severe losses. A system of insurance where premiums are not risk-based fails to address these two objectives effectively. Insurers will have limited or no financial incentive to offer reductions in premiums to individuals if they undertake loss reduction measures. In fact, insurers are losing money on these individuals in the long run and would prefer that they bought coverage elsewhere. Individuals who are charged too high a premium are unlikely to purchase coverage.

With respect to state regulation, insurance commissioners may feel compelled to restrict prices on those facing high risks because they rely on vocal consumers' support; their desire for re-election may override their concern for the common good (*Pauly, Kunreuther and Vaupel 1984*).

To address these challenges we propose the following guiding principles for making insurance more transparent, understandable and equitable with the dual objectives of improving individual and social welfare:

Principle 1: Require insurance against rare catastrophic risks. Given the reluctance of individuals to voluntarily purchase insurance against losses that are large relative to their wealth or income, catastrophic coverage should be required for all individuals who face this risk.

Principle 2: Premiums must reflect risk. Insurance premiums should accurately reflect risk to signal to individuals how safe and healthy they are and to encourage individuals to undertake measures to reduce their vulnerability to illness and/or property losses by reducing their premiums. Risk-based premiums should also reflect the cost of capital that insurers must integrate into their pricing to assure adequate return to their investors.

Principle 3: Dealing with equity and affordability issues. Any special treatment given to consumers at risk (e.g., low-income uninsured, high-risk moderate income groups, or inadequately insured individuals) should come from means-tested insurance vouchers financed by the federal government or at a state level through general taxes and ***not*** through subsidies generated by higher insurance premiums on lower-risk buyers.

Principle 4: Multi-year insurance. A multi-year policy provides stability of premiums since it prevents individuals from being reclassified into higher risk strata

during the term of the contract. Such policies currently exist for life insurance and long-term care coverage.

In the case of property insurance where only annual policies are currently marketed, a multi-year policy could be coupled with long-term loans for cost-effective hazard reduction measures. The homeowner will be rewarded for undertaking these investments, inasmuch as the yearly cost of the loan is likely to be less than the annual premium reduction. State insurance regulators would have to allow insurers to charge premiums that reflect the reduced risk for those who take the loans and higher premiums for those who do not.

Even before the Affordable Care Act (ACA) was passed, health insurance policies achieved multi-year premium stability by including guaranteed renewability at class average premiums as a policy feature. Under this arrangement, insurers promise not to single out those whose risk rises for selective premium increases. This gives the insurer an incentive to keep the insureds healthy, since the insurer is at risk for higher expenses that might be preventable. Guaranteed renewability also protects consumers from premium increases due to a deterioration in their health.

The above guiding principles are embraced by the reforms to the National Flood Insurance Program (NFIP) in the Biggert-Waters Act. Given that the federal government is the principal provider of flood coverage to homeowners, it should be feasible to require multi-year policies tied to the property, thus satisfying Principles 1 and 4. Given that many people cancel their policies if they haven't suffered a loss, this requirement needs to be well-enforced in the future. Over the next five years, NFIP premiums on second homes and those subject to repetitive flooding must reflect risk (*Principle 2*). This will require the Federal Emergency Management Agency (FEMA) to improve the accuracy of their flood maps as recommended by the Government Accountability Office (2004). FEMA's Map Modernization Program will result in digital format for 92 percent of the continental U.S. population. Land development and natural changes to the landscape and/or to hydrologic systems require continuous map maintenance and updates. The National Research Council (2009) and the National Academy of Sciences is now undertaking a study of means-tested insurance vouchers to deal with equity and affordability issues (*Principle 3*).

The ACA for health insurance, passed only after a major legislative and legal battle, embodies Principles 1 and 3. Insurance offered to individuals and small groups through exchanges is to be subsidized with means-tested tax credits (*Principle 3*). The ACA mandates penalties on those who do not purchase insurance to encourage the purchase of catastrophic protection (*Principle 1*). However, the penalties are weak and may not be enough to induce low-risk people to purchase coverage. The generous subsidies in the ACA should be enough to motivate the purchase of coverage by lower income people who undertake deliberative thinking, but the "outreach" (marketing) activities of the Health Insurance Marketplaces run by states or the federal government may also need to use insights from behavioral economics to address the problem of take-up of coverage; they need to frame the information they provide in a way that convinces people of the true loss probability and deters them from using the heuristics and biases discussed above. Specifically, it would be important to have a better understanding of why low-risk people

who could have afforded insurance did not purchase it because of imperfect information and imperfect understanding of insurance, and how they might be expected to change behavior as regulation increases their premiums but also imposes a mandate and markets coverage more aggressively.

The ACA does **not** adhere to *Principle 2*, as it permits only very limited risk rating of premiums (restricted primarily to smoking behavior). Healthy younger people who are not of low income will correctly regard the premiums they will be required to pay in the new regulated exchanges as high relative to the benefits they can expect to collect, and no amount of truthful outreach may convince them to buy. There is also some modest public subsidy of reinsurance to offset the cost to those with high lifetime risks. *Principle 4* (multi-year pricing) is, as noted, already required for individual health insurance but the additional limits on risk based pricing in the new legislation noted above may attenuate the value of the feature, since protection against premium increases has no value if people can pay low premiums even if they become higher risks.

Both laws exemplify much of what is needed to improve individual and insurer behavior. They are designed to move people's behavior from intuitive processes to more deliberative thinking with respect to LP-HC events. The contentious and continuing debate over both pieces of legislation, shows that the policy process does not automatically or easily generate such corrections; there needs to be persistent and dedicated political leadership based on skilled use of correct principles.

To be sure, both legislative proposals were directed at more than mistakes by insurers, consumers, and state regulatory officials that arise from behavioral biases and simplified heuristics. They are also designed to reduce losses and alleviate the fiscal burden on governments. But correcting some of those mistakes affected the nature of the legislation. However, as noted, some of the attempts to improve equity distort insurance premiums and so frustrate other features in the legislation that were designed to improve the decision making process. We feel that the guiding principles outlined above are lynchpins not only for improving the choice process between the insurers and the insured but also will encourage other stakeholders, such as lenders providing long-term property loans for encouraging those at risk to invest in preventive or protective measures, or health delivery systems encouraging cost effective prevention.

Toward a Taxonomy of Government Interventions to Deal with Insurance Anomalies

Property and health insurance are instructive cases for examining the rationale and design of effective government interventions, whether through insurance regulation, laws that provide mandates and/or subsidies, or nudges through reframing options that lead people to make better choices. The flood and health insurance legislation are at the aggressive end of the spectrum as they involve heavy regulation of offerings and required coverage. Is this kind of heavy weaponry appropriate for other insurance anomalies that arise from intuitive thinking?

We hypothesize that there are three features that suggest public intervention:

Feature 1: Anomalous behavior that involves under-purchase rather than over-purchase of insurance or protection

Feature 2: Anomalous behavior that causes large harm to a populations' wellbeing that is of concern to others

Feature 3: Settings where individuals have difficulty taking steps to reduce their risk

Health insurance for lower income people fits all three of these characteristics. Many low-income people do not have insurance and the absence of coverage can cause serious harm to health because it inhibits the use of effective care. These families' health levels and (perhaps) their financial status are of concern to their fellow citizens. Individuals are sometimes reluctant to undertake preventive health measures, such as their failure to take statin drugs after a heart attack, even when insurance fully covers the cost (*Choudhry et al. 2011*) or not having their children vaccinated against contagious disease.

Lower income homeowners present a similar case. Many of these families are uninsured because they cannot afford coverage. Few individuals in high-risk areas voluntarily invest in measures to reduce their losses from future disasters (*Kunreuther, Meyer and Michel-Kerjan 2013*). If they suffer serious damage from a severe disaster, the public is concerned with their plights and there is sympathy (if not funding) so these disaster victims can remain in their current location rather than moving to a safer spot.

When one or more of these three features are absent, the case for public intervention is weaker. We are usually most concerned about people whose use or consumption of some key good falls below some ideal level, not if it rises above the desirable amount (*Feature 1*). Purchasing overpriced warranties illustrates the case where there is an absence of all of the above features, since the impact on the person buying the warranty and others is likely to be minimal. In cases such as these, intervention usually involves warning consumers, providing them with better information and offering them a chance to get their money back after second thoughts. We conclude that in situations where the consequence of excessive insurance is just wasted money rather than physical impairment or significant reduction in assets or wealth, it is not worth the effort for governments to try (often unsuccessfully) to correct such modest mistakes. Indeed, the loss from mistakenly buying insurance that is overpriced or unneeded is simply the cost of the insurance. In contrast, the loss in welfare from not buying needed insurance could be very high indeed.

Risks (of any type) that primarily affect people in higher income brackets or risks that can be avoided that affect people across the income spectrum are also less likely to be candidates for intervention even if the consequences of under-purchasing insurance are large. In these cases, concern by others (*Feature 2*) is lacking. For example, if Warren Buffet, famously frugal, had decided not to buy health insurance before he was 65, there is unlikely to be a strong public policy interest in getting him to do so. There are no health insurance subsidies for the not-very-poor, though there is a mild penalty associated with not purchasing coverage for the purpose of maintaining the risk pool so as to subsidize high risks as a matter of social concern (*Feature 2*).

Another example commonly cited as an insurance anomaly is the under-purchase of annuities. People with accumulated assets should be interested in converting their wealth to annuities so they can maintain their standard of living for as long as they live. There were proposals in the early days of the Obama administration from a Treasury official to reframe choices people make when they retire so taking an indemnity was the default option for 401(k) accounts. And there is a great deal of academic literature in the subject that also points to framing as the cause of the problem—without explaining why the correct framing does not prevail in a competitive market (*Kunreuther, Pauly and McMorro 2013*).

The primary reasons for the lack of interest or enthusiasm for encouraging the purchase of annuities is that this is a problem facing the upper middle class elderly, who are not a population of major social concern. Almost everyone has a compulsory annuity in the form of Social Security, and its benefits are usually enough to keep people in all income classes above the poverty line (even if just barely). Utilizing some of the limited stock of political capital to mobilize government to solve a problem that affects primarily people with six-figure incomes does not have any traction.

The other example of under-protection is in the area of life insurance. Although most people do have some life insurance protection, they may buy too little and often make the mistake of dropping their coverage soon after purchasing it because they feel the premiums are too high given budget constraints (*Gottlieb and Smetters 2013*). Here again, life insurance is largely a concern of the middle class and above, and largely protects the bequests they leave to their middle class heirs so there is little concern by others (that is, *Feature 2* is lacking) and hence no public intervention. The availability of Social Security death and survivors' benefits further attenuates the public policy motivation to deal with this problem beyond applying Band-Aids in the form of disclosure information.

Over-purchasing insurance is another story. Sometimes people do so for good reason. For example, the partial payment of group medical and dental insurance by employers due to the tax advantages on group health insurance suggests that one should have more insurance than one would otherwise purchase.

On the other hand, many people purchase more coverage than would be implied by System 2 thinking. The most prevalent case is *deductible aversion*: the desire for low deductibles. By undertaking deliberative thinking, one would realize that he or she could save so much more on the premium reduction from purchasing a high deductible on automobile, homeowners', or individual health insurance when compared to the expected benefits in the form of additional claims payments should one suffer a loss.

There are many hypotheses about why people make this mistake: they overestimate the chances of collecting on the lower deductible, they want to increase the chances of collecting on their policy so they can view insurance as a positive investment, or they just want peace of mind and freedom from regret. There are some serious puzzles in the literature regarding this anomaly. Many individuals do not make a claim on their policy when their losses exceed the deductible, which suggests they should have taken a higher

one (*Braun et al. 2006*). If insurance markets are competitive, how can overpriced low deductible plans survive? Here again, there are few rules and few advocates for public policy to deal with this problem because purchasing a low deductible does not satisfy any of the three features listed above.

Then there are some cases where insurance or insurance-like arrangements can be bundled with other products. Individuals often go for the bundle even when portions of the package are overpriced. Insurance for rental cars, appliance warranties, or the purchase of flight insurance all exhibit this characteristic. We could not find a single public policy initiative intended to discourage this behavior when these examples show that individuals clearly misunderstand the purposes of insurance (*Liebman and Zeckhauser 2008*). These little mistakes in consumer purchasing just do not seem to rise to the level of social concern because they normally do not relate to behaviors that are of a concern to others (*Feature 2*). They also do not satisfy the characteristics of *Features 1* and *3*.

More specifically, there are almost no regulations beyond standard consumer protection rules that are intended to affect the usual cases of anomalous over-purchase. However, there are some exceptions. For example, the state of California does require disclosure that the driver's own automobile insurance normally applies to a rental car so that purchase of additional insurance to cover the collision damage waiver may not be needed. (www.ehow.com/facts_5753168_california-regulations-rental-car-insurance.html).

There is usually no requirement that sellers of automobiles or appliances that provide warranties hold reserves to assure payment of liabilities under those warranties should a manufacturer go bankrupt, although there are reserves and other insurance-type regulations for firms that sell "freestanding" warranties. (The United Kingdom does requiring a "cooling off" period after a warranty is purchased during which the purchase can be canceled (*Warranty Week 2004*). And there are no rules to forbid the purchase or warn consumers of the rationale for not purchasing low deductible insurance if it carries a very high incremental premium relative to the actuarial value of the additional coverage.

There have been some attempts by the U.S. Treasury to encourage the purchase of private annuities by workers with 401(k) accounts (*Lieber 2010*). Explicitly requiring that an annuity be the default option, as proposed in 2008 by one Treasury official, did not become law, but in February 2012 the rules for 401(k)s were changed to make it easier for employers to offer their own annuity option to employees who might wish to convert their 401(k), and to exempt payments for the "longevity insurance" form of an annuity (one in which annuity payments do not start until older ages) from the minimum distribution rules for IRA balances (*Ellis 2012*). For life insurance, there are no regulations regarding how premiums can be set for multi-year term insurance. Hence, there is no protection against a buyer paying a high frontloaded premium and then dropping coverage because of budget constraints.

Conclusion: in a world where the intrinsic imperfection of government intervention is both more in evidence and more frequently acknowledged than in the past, there is little call for policies designed to deal with insurance against events that mostly affect moderate risks for people in the higher income brackets.

Insurance When Bad Things Can Happen, But Not Often

As already noted, insurers have had a difficult time maintaining a steady and reliable supply of reasonably priced coverage against losses that are rare but correlated, with terrorism and natural disasters as two examples. Even if insurers examine past data in a systematic manner, there can still be a problem caused by imprecision in estimating future periods' loss probabilities when events are rare and the world is changing over time.

Consider the easy case where science and past information were sufficient to convince buyers of insurance, managers of insurance firms and insurance regulators of the true probability of the loss-producing event. To illustrate, suppose that one estimates that the likelihood of a flood next year is 1 in 100 and that this probability will remain constant for the foreseeable future. Then there will be no disagreement by the relevant parties as to what estimate to use for estimating the likelihood of a future flood occurring. There are some cases that satisfy this condition where our mathematical models are so well validated and so unambiguous and convincing that experts are in agreement, like the return of Haley's Comet.

But what if it has been 50 years since the last Big Flood, and we know that the world is changing. For example, there are data on global warming and its potential impact on sea level rise but with considerable uncertainty surrounding these estimates. In cases such as this one we cannot rely on either recent data and/or theoretical models to provide an assured, defensible, and unambiguous estimate of the loss probability.

If insurers charge premiums for windstorm or flood insurance based on a low but positive probability of a damaging event, it is likely that there will be no disaster for years, in which case the insurer will accumulate enormous underwriting profits. These reserves will be needed to pay claims when a serious disaster does occur. But the general public and regulators may become uncomfortable upon learning that the insurer's surplus has increased significantly from a series of disaster-free years, claiming that the premiums being charged are too high.

As discussed earlier, Florida addressed this issue by forming a state-backed insurer (Citizens Corporation) that charged subsidized premiums. Critics have rightly noted that this arrangement potentially puts all Florida taxpayers at risk should there be a severe hurricane and Citizens does not have enough surplus to pay all the claims. In other words, an intense minority of (often high wealth) property owners residing in hurricane-prone areas are being highly subsidized by all the residents in Florida.

There is another alternative: mutual insurance. Under this arrangement, if one subsidizes the premiums, everyone who purchases the insurance will be assessed if reserves and premiums are inadequate when a disaster occurs. Collecting this assessment ex post may be difficult, so an alternative (in effect) is to charge higher than actuarially fair premiums but tell purchasers that a portion of their payment is being held in a fund that they personally own. Dividends can be declared if the event does turn out to be rarer than originally anticipated. In this arrangement, policyholders bear the full cost of their

coverage if an event occurs, but get money back if it does not. In effect, they are protected with insurance sold at a moderate net price whether the probability turns out to be high or low.

Supplementing the Guiding Principles in Addressing These Challenges

The four guiding principles can be supplemented by utilizing approaches that alleviate some of the biases that constitute intuitive (System 1) thinking.

In the case of buyers, we recommend that when presenting information on the likelihood of an LP-HC event occurring, one stretches the time horizon. Rather than saying that there is a 1 in 100 chance next year of damage from a severe hurricane, reframe the same probability by saying that the chance that one's property will be damaged from a hurricane in the next 25 years is greater than 1 in 5. Empirical studies have shown that data presented in this fashion leads individuals to take protective measures (*Slovic, Fischhoff and Lichtenstein 1978; Weinstein, Kolb, and Goldstein 1996*).

One of the biggest challenges is to convince consumers that if they don't suffer losses from a disaster or incur health related expenditures next year, the purchase of insurance was not a waste of money. It is extremely difficult to get the message across that those at risk should celebrate not having collected on their insurance policy. One way to do this is to remind people that something serious could happen to them next year, so they should not cancel their insurance policy without good reason.

Before insurers decide to pull out of the market or raise rates significantly after a serious loss, they should characterize worst-case scenarios and then assign a best guess probability to each of these events occurring and the uncertainty surrounding these estimates.

Regulators should be appointed for limited terms, rather than being elected, so that they are less prone to be influenced by special interest groups, and have incentives to develop programs that improve overall social welfare. Regulatory decisions should make clear who gains and who loses from these actions and why some deserve to benefit from a given insurance program and others should have to pay part of the cost of protecting others.

Finally, providing transparent information related to the rationale for insurance should go a long way to helping the general public better understand this policy tool. Insurance can then fulfill the roles it is designed to play: reducing future losses and financially protecting those at risk.

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