

U.S. Terrorism Insurance Market: The Case of Government Intervention

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Abstract

This research project sheds light on the emergence of the U.S. terrorism insurance market after the terrorist attacks against the U.S. on September 11, 2001. It develops economic models to study the determination of terrorism insurance premiums before and after 9/11. In addition, this research project argues that the U.S. terrorism insurance market faced a major failure early on which was threefold: small number of demanders and suppliers, symmetry of disinformation, and negative externalities. The U.S. government reacted to this major failure by passing the Terrorism Risk Insurance Act (TRIA). In this research paper, I evaluate TRIA's effectiveness on dealing with the major failure the market experienced early on. I use empirical evidence compiled by the U.S. Department of the Treasury to test my hypotheses on TRIA's effectiveness. Finally, I propose my own solution which I believe corrects for the major failure and ensures a prosperous future for the U.S. terrorism insurance market. Overall, this research paper spurs discussion on the past, present, and future of the U.S. terrorism insurance market, a market with a growing impact on U.S. economic growth.

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1. Introduction

Terrorism has become an unavoidable threat to U.S. citizens and companies since the 9/11 terrorist attacks against the United States. The attacks on the World Trade Center and the Pentagon killed approximately 3,050 people and inflicted losses of nearly \$80 billion, less than half of which was insured. Specifically, only \$32.5 billion out of \$80 billion was insured, shared by nearly 150 insurers and reinsurers worldwide (Kunreuther, Michel-Kerjan and Porter, 4). The fact that only 41% of the losses were insured shows how little attention insurers, reinsurers and insured companies paid to the possibility of a terrorist attack. Even so, the U.S. Property and Casualty (P&C) insurance industry was economically devastated from the losses caused by these terrorist attacks. The 9/11 attacks signal the emergence of the U.S. terrorism insurance market, which faced great challenges early on.

In the aftermath of 9/11, the U.S. P&C insurance industry faces the challenge of offering terrorism coverage to U.S. companies. If it fails to do so, the consequences will be detrimental for the well-being of the U.S. economy. As the Joint Economic Committee argues, “the inability of some businesses to obtain suitable terrorism insurance can result in the cessation of business activity” (Joint Economic Committee, 8). There is concrete evidence which suggests that after 9/11 billion-dollar projects have been either postponed or cancelled due to lack of terrorism insurance. As Smetters mentions, “the Real Estate Roundtable (2002), a proponent of a government subsidy, “identified” \$15.5 billion in real-estate transactions as of September, 2002, that were delayed or cancelled due to concerns about terrorism insurance...” (Smetters, 9). Thus, it

has become evident that the lack of terrorism insurance in the U.S. needs to be addressed either by the private sector, or by the government, or by both.

This research project sheds light on the U.S. terrorism insurance market. It starts by presenting the emergence of terrorism insurance as a new market in the United States, and by classifying this market appropriately. Furthermore, it develops an economic model for pricing P&C and terrorism insurance policies. This research project moves on to present the various issues which plagued the U.S. terrorism insurance market early on and state the two factors, namely the U.S. government's intervention with TRIA and TRIEA and terrorism risk models, which tried to correct for these issues. Then, it points out the issues TRIA corrected for and the ones it did not. Finally, this research project proposes a solution which ensures a prosperous future for the U.S. terrorism insurance market.

2. Emergence and classification of the U.S. terrorism insurance market

This section presents the emergence of terrorism insurance as a new market in the United States. It begins with a discussion of the conditions that need to be present for a new market to emerge, and then goes on to analyze the emergence of the U.S. terrorism insurance market itself. In addition, the section classifies this new market as a market which involves imperfection.

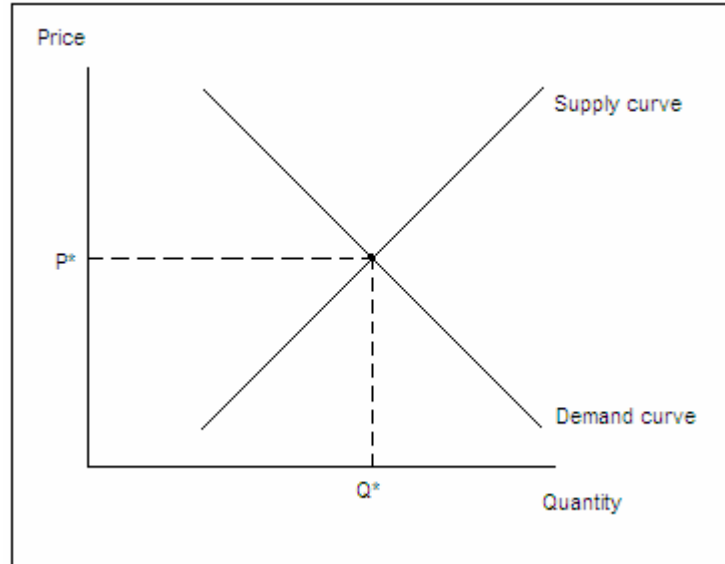
The conditions for the emergence of a new market

A new market emerges when three conditions are met. Firstly, at least one rational demander needs to appear who wants to buy a specific product and is willing to buy it at a price *less than* or *equal to* the benefits provided by the product. Similarly, at least one rational supplier needs to appear who wants to sell the product the demander wants to buy and is willing to sell it at a price *greater than* or *equal to* the costs of providing the product. Finally, the demander and the supplier need to agree on a price for this product that satisfies both of their rational behaviors. After these three conditions are met, the emergence of a new market is triggered by a single transaction between the demander and the supplier.

After the initial transaction takes place, multiple demanders and suppliers enter the new market. Buyers are represented by a demand curve, which is downward sloping since, *ceteris paribus*, as the product's price increases, the quantity demanded decreases. Sellers are represented by a supply curve, which is upward sloping since, *ceteris paribus*, as the product's price increases, so does the quantity supplied. At the point where the demand and supply curves meet, the market is said to be at equilibrium, which signifies a

perfectly efficient allocation of goods. In Figure 1, the P^* is the price at equilibrium and Q^* is the quantity at equilibrium.

Figure 1. Market equilibrium



The emergence of U.S. terrorism insurance as a new market

The 9/11 attacks signal the emergence of a new market for terrorism insurance in the United States. Prior to 9/11, terrorism coverage was an unnamed peril included in most standard commercial policies because losses from terrorist attacks had been insignificant (Kunreuther and Michel-Kerjan, 2). Despite the occurrences of the 1993 World Trade Center attack and the 1995 Oklahoma bombing, U.S. businesses received terrorism coverage free of additional charge prior to 9/11. Thus, there was no market for terrorism insurance before 9/11.

The U.S. terrorism insurance market emerged from a single transaction between a demander and a supplier. At least one company demanded terrorism coverage at a price less than or equal to the benefits provided by the product. In addition, at least one insurer supplied terrorism coverage at a price greater than or equal to the costs of providing

terrorism insurance. A single supplier interacted with a single demander to determine the price of terrorism coverage. Individual interactions between few demanders and suppliers determined prices early on rather than market forces. Thus, a range of prices for terrorism insurance existed in the early days of the market which depended on the bargaining power of demanders and suppliers.

As time passes, more demanders and suppliers enter the U.S. terrorism insurance market. Buyers want to insure themselves against future terrorist attacks because they realize that a future attack could greatly increase their total costs. The lack of terrorism insurance could also negatively affect their total revenue, since banks are reluctant to provide them with loans. Without loans, firms cannot grow, which will negatively affect their total revenue, and in turn their profits. Thus, companies which abide by the assumption of profit maximization enter this new market to buy a certain amount of terrorism insurance at a specific price (i.e. premium). In addition, P&C insurers enter this new market and become sellers of terrorism insurance because they realize that the selling of terrorism insurance would greatly increase their total revenues. They take advantage of the growing concern of firms for future attacks. Their challenge is to find an appropriate premium which would cover their expected claim payments to insured companies in the occasion of a terrorist attack. Thus, insurers enter this new market to sell a certain amount of terrorism insurance at a specific premium.

A necessary prerequisite for the entrance of insurers in any insurance market is the availability of reinsurance. Traditionally, there are two parties involved in reinsurance transactions: primary insurers which seek to spread the risk, and reinsurers which seek to buy part of the risk. The Insurance Information Institute suggests that

“[p]rimary insurers and reinsurers can share both the premiums and losses” (Hot Topics, 2006). In modern times, institutional investors, such as investment banks and hedge funds, assume part of the risk by selling catastrophe bonds. The institutional investor offers some money up-front to the insurer which will be used in the event of a terrorist attack. The institutional investor lends out this money for a higher rate than normal, but “faces the possibility of losing either a portion of or its entire principal invested in the catastrophe bond” (Kunreuther, Michel-Kerjan, and Porter, 24). Thus, the institutional investor takes up a great amount of risk by selling catastrophe bonds to primary insurers and plays the role of reinsurers in the market for terrorism insurance.

A Joint Economic Committee report underlines the key role reinsurance plays within this new market. It states that “without reinsurance, primary insurers would be forced to greatly reduce their exposure to losses (through lower limits or coverage restrictions), dramatically increase their premiums, or both” (Joint Economic Committee, 4). In the terrorism insurance market, insurers purchase reinsurance to share the losses of potential terrorist attacks. The amount of insurance insurers sell and the level of premiums they offer will greatly depend on their interaction with reinsurers. Thus, reinsurers should not be overlooked as they are the second tier of insurance in this market.

The U.S. terrorism insurance market reached a higher level of maturity with the existence of many buyers and sellers which were willing to interact within this new market. Buyers were willing to buy terrorism insurance at a specific premium, whereas sellers were willing to sell terrorism insurance at a specific premium. Normally, a market which includes many buyers and sellers would clear at equilibrium. Like any other

market, the market for terrorism insurance would reach its optimal point when demand equaled supply. However, for reasons that will be discussed later on, this market did not reach equilibrium immediately.

Classification of a new market

A new market can either be considered a perfectly competitive market or a market with some type of imperfection. Nicholson provides five prerequisites for a perfectly competitive market (Nicholson, 285). Firstly, there needs to be a large number of firms, each producing the same homogeneous product. Secondly, each firm should operate under the assumption of profit maximization. The third prerequisite states that each firm has no effect on the market price offered to the buyers, which means that each firm is a price taker. Fourthly, a perfectly competitive market includes perfect information between market participants. The final requirement is that transactions between buyers and sellers should be costless. If any of these five prerequisites is not satisfied, the new market is classified as a market which involves some type of imperfection.

Classification of the U.S. terrorism insurance market

The 9/11 attacks on the WTC and the Pentagon resulted in a structural change of the U.S. P&C insurance industry. Reinsurers were financially responsible for most of the 9/11 losses, and they decided to reduce the amount of terrorism reinsurance offered or even stop covering this risk after 9/11 (Kunreuther and Michel-Kerjan, 4). Insurers mostly responded by removing terrorism coverage from commercial packages. They claimed that terrorism was an uninsurable risk, since there is a lack of historical data (Kunreuther and Michel-Kerjan, 8).

Due to the denial of P&C insurers to provide terrorism coverage, fewer of them are left to determine premiums. This opposes the first and third prerequisites for perfect competition, which state that there should be a large number of firms in the market which are price takers. The remaining providers of terrorism coverage are able to charge prices which are above the point where marginal cost equals marginal revenue. This partially explains why the OECD “estimated a 30 percent rate increase across commercial and liability insurance, with exceptionally high increases for terrorism target structures such as iconic buildings and chemical and power plants” (Ericson and Doyle, 160). Furthermore, this market defies the assumption of perfect information between buyers and sellers since it is characterized by symmetry of disinformation. Insurers, insured companies and reinsurers do not receive information on terrorism from the U.S. government for national security reasons.

The exit of numerous insurers from the U.S. terrorism insurance market and the symmetry of disinformation show that this market involves some imperfection. This might explain why this market did not reach equilibrium immediately. Before I get into why this happened, I need to lay out how the U.S. terrorism insurance market calculates premiums.

3. Calculating premiums for the U.S. terrorism insurance market

This section presents how the U.S. terrorism insurance market calculates premiums. It begins by showing how the supply and demand sides determine premiums in any P&C insurance market and then moves on to show how they come together to determine premiums in the terrorism insurance market. The section points to the difference in treatment of terrorism coverage before and after 9/11.

How premiums are determined in the P&C insurance markets¹

a. Supply side

Kunreuther and Pauly argue that insurers nowadays offer P&C insurance in all-perils package policies that insure the policyholder against a wide range of named² and unnamed causes of losses, excluding some specific named risks, such as earthquakes, floods, and acts of war (Kunreuther and Pauly, 4). A supplier of insurance, j , calculates the premium for a specific demander of insurance, i , in two steps. First, insurer j calculates the probability it will have to compensate the policyholder i for losses due to events that are known and mentioned in the policy, $P_{K i}$, and the probability that it will have to compensate the policyholder i for losses due to events that are unknown and not mentioned in the policy, $P_{U i}$. The second step includes the supplier j calculating the potential losses incurred by demander i due to events that are known and mentioned in the policy, $L_{K i}$, and the potential losses incurred by demander i due to events that are unknown and not mentioned in the policy, $L_{U i}$. The supplier j ends up with the expected claim payments for the demander i :

¹ I consulted Karl Borch's article "The Economic Theory of Insurance" for developing my models which calculate premiums.

² Named causes of losses include natural catastrophes, such as hurricanes and tsunamis, and man-made disasters, such as oil platform explosions and aviation disasters.

$$E(c)_i = (P_{K_i} * L_{K_i}) + (P_{U_i} * L_{U_i})$$

The premium per dollar of property insured, X_{ji} , offered by the supplier j to demander i equals expected claim payments for demander i , $E(c)_i$, plus administrative costs, C_i , of selling and managing the policy of policyholder i , divided by the book value of the property insured, BV_i . The book value is the value of the asset (i.e. building or facility) carried on the balance sheet. The premium per dollar of property insured, X_{ji} , is determined by:

$$X_{ji} = [E(c)_i + C_i] / BV_i$$

Premiums per dollar of property insured offered by insurers vary because expected claim payments will also vary. A firm which seeks to insure its skyscraper in Manhattan should pay a higher premium than a firm which seeks to insure its eight-floor building in Omaha. The lack of reinsurance is another reason supplier j might offer a higher premium to demander i . Thus, premiums offered for all-perils package policies in the P&C insurance industry will differ from each other.

Conversely, there are some specific named risks that are not included in all-perils package policies. Examples of such named risks are earthquakes and floods. The major reason for excluding named risks from all-perils package policies is because they inflict highly correlated losses. If they were included in these policies, they would drain insurers of capital if they occur (Kunreuther and Pauly, 5). The premiums for insuring against these types of named risks are determined by separate equations. As will be shown later on, terrorism is also a risk after 9/11 which is determined by a separate equation.

The reinsurers participate in the supply side of insurance markets by sharing both the premiums and the losses of policies. They assume the responsibility to take on part of the expected losses, $E(c)_i$, insurers are obliged to pay policyholders if the event occurs in exchange for part of the premium, X_{ji} . This spreads the risk of the insurance policy. Insurers and reinsurers finalize a reinsurance transaction when they agree on the amount of losses each one is going to reimburse the company for and the amount of the premium per dollar of property insured each one is going to receive. In addition, the participation of reinsurers in the insurance market will most likely result in lower premiums offered to demanders. When the risk is spread to more bearers, insurers are more willing to offer lower premiums to demanders. When reinsurers denied covering any part of expected claim payments, $E(c)_i$, inflicted by future terrorist attacks, insurers either backed out of the terrorism insurance market or charged exceptionally high premiums so as to compensate for the increased risk they would bear (Kunreuther and Pauly, 3). When the risk of incurring losses from a harmful occurrence is born only by insurers, then their options are very limited. The Joint Economic Committee reported that “[o]nce the reinsurers stopped covering terrorism losses, the primary insurers had little choice but to follow” (Joint Economic Committee, 4). Thus, reinsurers are responsible for diversifying the risk of an occurrence in any insurance market.

Thus, the supply side of the P&C insurance industry consists of insurers and reinsurers. With the support of reinsurers, insurers offer either all-perils packages policies or separate policies involving specific named risks, such as floods and earthquakes.

b. Demand side

Hogarth mentions that “the word risk is typically associated with an activity that involves some chance of incurring a loss or “negative outcome”” (Hogarth, 3). Demanders of insurance try to insure themselves against incurring a loss due to a harmful occurrence. Under the assumption of profit maximization, demanders carry out their own calculations to determine whether the premiums per dollar of property insured offered by the supply side are fair or not.

Companies consider two scenarios. The first scenario is to proceed without insurance and the second one is to purchase insurance. Given that companies decide to assume the risk on their own and proceed without insurance, their expected profits are determined by the following equation:

$$E(\pi) = p (\pi - L) + (1 - p) (\pi)$$

Expected profits, $E(\pi)$, is the sum of two products. The first product reads as the probability p of the event occurring multiplied by the difference between profits π and losses L inflicted by the event. In addition, the second product reads as the probability $(1 - p)$ of the event not occurring multiplied by the profits π . Conversely, if companies decide to purchase insurance and let the insurance market deal with the risk, their expected profits are determined by the equation $(\pi - PR)$, where PR is the simple dollar premium of coverage. By paying premium PR , companies are compensated by insurers and reinsurers for any losses they incur from an occurrence.

By placing the equation $(\pi - PR)$ to be equal to or greater than the first equation, we can come up with insurance premiums that companies would be willing to pay. After solving for the premium PR , we end up with PR being equal to or less than the expected

losses of the occurrence, $(p * L)$.³ Thus, profit maximizing companies are willing to purchase insurance at a premium which is less than or equal to expected losses.

Finally, we assume that companies entering any insurance market are risk averse. Cummins argues that “[m]ost businesses, also have a demand for risk transfer, and, like consumers, are willing to pay more than the expected loss in order to transfer risk to another party” (Cummins, 5). Businesses are willing to purchase coverage at a premium which is greater than expected losses because they are risk averse to pure risk. They prefer transferring the pure risk to insurers than bearing it themselves. Thus, our equation gets modified as follows:

$$PR \leq (p * L) + \delta$$

where δ is the extra risk payment the demander is willing to pay on top of expected losses to transfer the risk to the insurer and the reinsurer. The more risk averse demanders are, the greater the δ they will be willing to pay.

How premiums are determined in the terrorism insurance market

a. Before 9/11

Prior to 9/11, terrorist attacks are included in all-perils package policies as events that are unknown and not mentioned in the policy. Terrorism coverage is contained in all-perils package policies in two ways. First, terrorism risk affects the probability insurer j will have to compensate the policyholder i for losses due to unknown events, P_{Uj} . The second way terrorism coverage is contained in this policy is through the calculation of the potential losses inflicted by an unknown event. Losses from terrorist attacks, L_{Ui} , affect the calculation of the potential losses incurred by policyholder i due to

³ $\pi - PR \geq p(\pi - L) + (1 - p)(\pi) \Leftrightarrow -PR \geq [p\pi - pL + \pi - \pi p] - \pi \Leftrightarrow -PR \geq -pL \Leftrightarrow PR \leq pL$

unknown events. Thus, terrorism risk in the pre-9/11 era affects the product $(P_{U_i} * L_{U_i})$ which is part of the calculation of expected claim payments, $E(c)_i$. Consequently, it also affects premiums per dollar of insured property, X_{ji} , for an all-perils package policy.

b. Immediately after 9/11

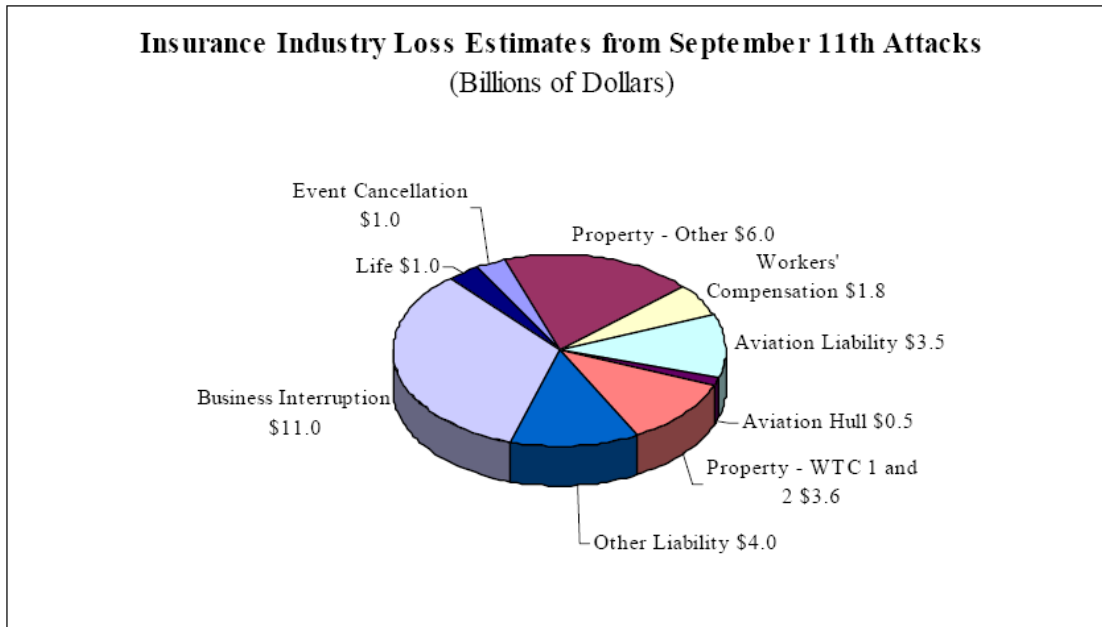
Terrorism coverage was not included in all-perils package policies immediately after 9/11. There were two options insurers followed: they either did not offer terrorism coverage at all or they offered terrorism coverage as a separate policy from all-perils package policies.

Most insurers decided not to offer any terrorism coverage because they could not assess the risk stemming from terrorist attacks due to the lack of historical data (Kunreuther, Michel-Kerjan and Porter, 7). Figure 2 shows that there have only been three major terrorist attacks on U.S. soil from 1970-2001. Also, losses due to terrorist attacks prior to 9/11 total \$4.1 billion, which is approximately one-tenth of the estimated losses due to the 9/11 attacks.

Figure 2. Largest Insured Losses from Terrorism, 1970-2001

Event	Country	Victims	Insured Loss*
Attack on World Trade Center and Pentagon (2001)**	U.S.A.	3,014	>\$40,000
Bombing in London's City (1993)	U.K.	1	907
Bombing in Manchester (1996)	U.K.	0	744
First World Trade Center bombing (1993)	U.S.A.	6	725
Bomb explodes in London's financial district (1992)	U.K.	3	671
Suicide bombing at Colombo Airport (2001)	Sri Lanka	20	398
Bombing at London's South Key Docklands (1996)	U.K.	2	259
Oklahoma City bombing (1995)	U.S.A.	166	145
PanAm Boeing 747 explosion at Lockerbie (1998)	U.K.	270	138
Three hijacked airplanes dynamited in Zerga (1970)	Jordan	0	127
*Losses in millions of 2001 dollars.			
**Estimates from Associated Press and Hartwig, "Impacts."			
Source Swiss Re.			

Figure 3 illustrates the estimates of the insurance industry's losses due to the 9/11 attacks. It states that total losses were \$33.5 billion before adjusting for reinsurance. When total losses are adjusted for reinsurance, they will certainly be higher than \$40 billion. Terrorist attacks lack a recorded history on U.S. soil which creates difficulties in estimating the probability of a terrorist attack occurring and the losses caused by terrorist attacks. As Figure 2 indicates, terrorist attacks on U.S. soil prior to 9/11 offer no warning of the potential size of losses and of their frequency.

Figure 3. Estimates of insurance industry losses due to the 9/11 attacks

Notes: Amounts are losses as of October 2004, before adjustment for reinsurance. Dollar amounts and percentages do not add to total due to rounding. WTC losses do not include \$1.1 billion due to a December 2004 Federal jury decision that the World Trade Center losses resulted from two separate attacks; this decision is subject to appeal. Including this amount would bring total losses to \$33.5 billion.

Source: Hartwig, "The Cost of Terrorism," Insurance Information Institute. See footnote this Chapter, page 17.

Moreover, terrorists carry out attacks in a random manner, which makes it much harder for insurers to estimate the probability of an attack occurring. It is very difficult to calculate the frequency of terrorist attacks (Brown et. al, 867). Cummins and Lewis touch upon the frequency of terrorist attacks around the globe. They state that over 10,000 terrorist attacks took place over the period 1977-2000. However, most attacks against the U.S. were directed at U.S. properties overseas (Cummins and Lewis, 157). The 9/11 attacks reveal the random manner terrorists carry out their attacks, since historical data does not support terrorist attacks on U.S. soil. Thus, most insurers decided not to offer terrorism coverage at all because they faced difficulties in pricing terrorism coverage.

Few insurers decided to offer terrorism coverage as a separate policy from all-perils package policies. They excluded terrorism coverage from these policies because they realized that losses inflicted by terrorist attacks would be highly correlated in the post-9/11 era because terrorists nowadays seem to have an agenda. Kunreuther and Pauly argue that prior to 9/11 “[a]ttacks of a domestic origin were isolated and carried out by groups or individuals with disparate agendas” (Kunreuther and Pauly, 11). Because terrorism losses were uncorrelated before the 9/11 attacks, insurers were able to include them as unnamed perils in all-perils package policies.

Suppliers determine terrorism premiums per dollar of property insured by using the following equation:

$$X_{Tji} \geq [(P_{Ti} * L_{Ti}) + C_i] / BV_i^4$$

In the post-9/11 era, few insurers offer terrorism coverage at a premium per dollar of property insured, X_{Tji} . In addition, demanders of terrorism coverage follow their own process to determine a fair terrorism premium. Companies which are profit maximizers and risk averse determine terrorism premiums by using the equation:

$$PR_T \leq (P_T * L_T) + \delta$$

Thus, in the terrorism insurance market, companies are willing to pay a premium that is greater than expected losses by δ , which is the extra risk payment.

After studying the supply and demand equations for simple dollar terrorism premiums, we can infer that they reconcile with one another. We end up with the following equation:

$$(P_{Ti} * L_{Ti}) + C_i \leq PR_T \leq (P_T * L_T) + \delta$$

⁴ After converting the terrorism premium per dollar of property insured to a simple dollar terrorism premium, we end up with $PR_T \geq (P_{Ti} * L_{Ti}) + C_i$.

With the support of reinsurers, insurers are willing to offer a simple dollar premium which is greater than or equal to the terrorism expected losses added to administrative costs. Demanders of terrorism insurance, which are risk averse, are willing to accept terrorism premiums which will be smaller than or equal to the terrorism expected losses added to the extra risk payment. For a transaction to take place, they need to agree on a premium which will satisfy this equation. For the supply side, a lot will depend on how effectively insurers will be able to spread L_{Ti} and how much they want to charge companies for administrative costs. Finally, for the demand side, a lot will depend on how risk averse companies are, which will determine the extra risk payment.

4. Major failure in U.S. terrorism insurance market early on

This section sheds light on the major failure the U.S. terrorism insurance faced early on. It argues that this major failure was threefold: small number of demanders and suppliers, symmetry of disinformation, and negative externalities.

Small number of demanders and suppliers

This problem plagued the terrorism insurance market early on because demanders and suppliers were reluctant to enter this market due to uncertainty concerning premiums. An East Bay Business Times article, published in 2001, states that “there’s a growing concern that the number of property and casualty insurers offering [terrorism] coverage will shrink so dramatically...” (Archambeault, 2001). The inability of suppliers to offer terrorism coverage led to demanders not being able to enter the market. Additionally, suppliers were reluctant to enter this market because of lack of available reinsurance. Mainly for these two reasons, a small number of companies supplying terrorism insurance and a small number demanding it arose in the early days of this market.

The problem with few demanders and suppliers is that they can both exert some market power in determining price. Early on, terrorism insurance premiums were determined by one-on-one interactions between a single demander and a single supplier. The price of terrorism insurance depended upon the bargaining capabilities of each party, which resulted in a range of prices for terrorism insurance and, thus, the market not reaching equilibrium. Because of few demanders and suppliers, this market was unable to reach a perfectly efficient allocation of goods.

Symmetry of disinformation

In the terrorism insurance market, both the demander and the supplier do not know enough, thus, their relationship is characterized by symmetry of disinformation. The reinsurers do not know enough either, which is the reason they are reluctant to offer terrorism reinsurance immediately after 9/11. Public information about terrorist activities is extremely limited, if not non-existent, for national security reasons. Symmetry of disinformation creates serious obstacles in the determination of premiums and might be one of the major reasons the market for terrorism insurance did not reach equilibrium immediately.

Some economists have argued that “[r]aising capital to pay losses following a large loss event also is difficult because informational asymmetries between capital markets [reinsurers] and insurers regarding loss exposure and reserve adequacy would raise the cost of capital to potentially prohibitive levels” (Brown et. al, 866). The relationship between reinsurers and insurers is not characterized by asymmetry of information but, nevertheless, the large loss event of the 9/11 attacks significantly raised the cost of capital. Both reinsurers and insurers did not know much at all, hence the symmetry of disinformation, which resulted in the private sector becoming reluctant to invest in this market. This symmetry of disinformation was responsible for the exit of reinsurers from the terrorism insurance market.

Modern information theory introduces two concepts for the study of information: moral hazard and adverse selection. Nicholson defines moral hazard as “the effect of insurance coverage on individuals’ decisions to take actions that may change the likelihood or size of losses” (Nicholson, 565). For example, an individual who purchases

a policy that protects him against theft may choose not to purchase any antitheft devices. However, buyers can do little to change the likelihood or size of losses of a terrorist attack. As Howard Chernick argues, buyers of terrorism insurance can take actions such as “installing blast structures on windows and doors, adding redundancy in security and safety systems, or training building personnel to provide counterterrorism services” (Chernick, 156-7). For attacks similar to 9/11, buyers of terrorism insurance can do much less. Thus, the moral hazard dilemma is not of particularly serious concern for the terrorism insurance market.

Furthermore, adverse selection arises when some groups enjoy different probabilities in experiencing the occurrence they are insuring against. In our case, some firms view themselves as facing a greater risk of experiencing a terrorist attack than others and will, therefore, seek terrorism insurance more persistently. As Chernick states, “[i]n such cases, there is a widening gap in demand between firms that purchase insurance and those that forgo the additional cost” (Chernick, 157). A company which owns a skyscraper in New York will be more willing to insure itself against terrorist attacks than a company which owns a four-floor building in Ardmore, PA. Adverse selection prevents insurers from spreading the risk between high- and low-risk companies since fewer low-risk companies tend to purchase terrorism insurance relative to high-risk companies over time. Thus, adverse selection can be considered as a plausible reason the terrorism insurance market did not reach equilibrium immediately.

Negative externalities

Nicholson defines externalities as occurring “whenever the activities of one economic agent affect the activities of another agent in ways that are not reflected in

market transactions” (Nicholson, 587). Externalities occur when participants in one market have effects on third parties of other markets that are not reflected in market transactions. The inability of U.S. demanders and suppliers to agree on a premium had a negative effect on U.S. economic growth. When terrorism premiums skyrocketed after 9/11, many companies were not able to purchase terrorism coverage. Consequently, as President George W. Bush noted, “billions of dollars of cancelled or postponed construction projects, downgraded financial ratings for mortgage-backed securities, and other severe economic consequences [were attributed] to the inability of businesses to secure insurance against terrorism risk” (Brown, Cummins, Lewis and Wei, 862). Thus, this market’s inability to reach equilibrium early on had the externality of negatively affecting U.S. economic growth.

Furthermore, the lack of terrorism insurance negatively affected U.S. economic growth through loans. Some banks denied giving out loans to companies that did not possess terrorism insurance. The Joint Economic Committee quotes the Philadelphia Business Journal reporting that “[t]he GMAC Commercial Holding Corp (which produced \$20 billion in loans in 2001) announced in February that it had stopped making loans for “trophy-type” projects that lacked terrorism insurance” (Joint Economic Committee, 8). U.S. companies were not able to grow without loans which had a devastating effect on U.S. economic growth.

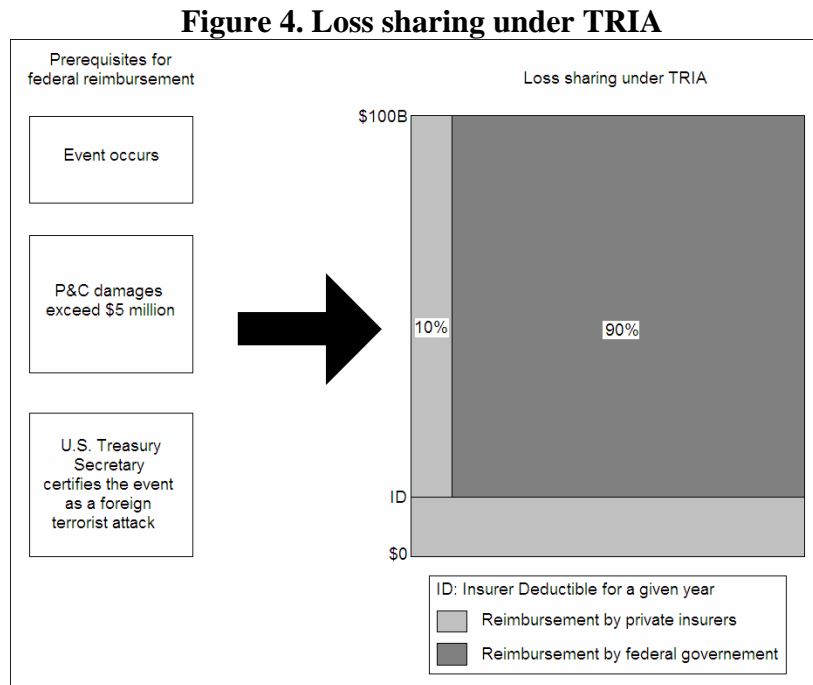
5. Factors correcting for major failure

This section discusses the two factors trying to correct for the major failure experienced by the U.S. terrorism insurance market, namely government intervention and the development of models to assess terrorism risk. The section will lay out the various characteristics of the Terrorism Risk Insurance Act (TRIA) and its extension (TRIEA). In addition, the section will present results of ISO’s Terrorism Loss Estimation Model (TLEM).

Government intervention

a. TRIA

The U.S. government intervened with the enactment of the Terrorism Risk Insurance Act (TRIA) on November, 2002 which obliges U.S. insurers to offer terrorism coverage to companies. Figure 4 illustrates TRIA’s prerequisites and loss sharing features.



Source: U.S. GAO

This act states that the U.S. Treasury is responsible for reimbursing insurers for a portion of terrorism losses on three conditions. One, an event needs to occur which can qualify as an act of terrorism. Two, the U.S. Secretary of the Treasury needs to certify that the act has been carried out by terrorists of foreign interests. Three, the losses for commercial property and casualty damages need to exceed \$5 million for a single event (U.S. GAO, 6). Given that these three conditions are satisfied, the U.S. government is obliged to pay 90% of each insurer's primary P&C losses during a given year above the applicable insurer deductible, up to a maximum of \$100 billion (Kunreuther, Michel-Kerjan and Porter, 9). The applicable insurer deductible is determined as a percentage of the direct commercial P&C earned premiums of each insurer the preceding year. The percentage varies over the three-year operation of TRIA: 7% in 2003, 10% in 2004 and 15% in 2005 (Kunreuther, Michel-Kerjan and Porter, 9). The U.S. government does not receive any premium for backing up the U.S. P&C insurance industry.

As stated by the U.S. General Accounting Office, TRIA seeks to accomplish two goals. First, it wants to "make terrorism insurance widely available and affordable to commercial policyholders for the duration of the act" (U.S. GAO, 2). TRIA seeks to increase the terrorism coverage offered and purchased. Second, it wants to "provide a transitional period during which insurance market participants could find ways to price terrorism insurance and develop market-driven resources and mechanisms that would offer terrorism insurance after TRIA expires on December 31, 2005" (U.S. GAO, 2). With the passing of TRIA, the U.S. government tries to give more time to demanders and suppliers to assess terrorism risk more effectively and agree on premiums. The government intervenes because it believes that the market for terrorism insurance cannot

grow without this extra time given to assess terrorism risk. Additionally, the government expresses its intention to give up its place to market-driven resources and mechanisms as soon as they are ready to be put into effect.

b. TRIEA

On December, 2005, TRIA was extended for another two years. This act is now referred to as Terrorism Risk Insurance Extended Act (TRIEA). Firstly, TRIEA includes that the minimum losses for the federal backstop to come to effect are \$50 million in 2006 and \$100 million in 2007. Secondly, the applicable insurance deductible is increased with TRIEA. The applicable insurer deductible is determined as a percentage of direct P&C earned premiums of each insurer the preceding year. With TRIEA, this percentage further increases to 17.5% in 2006 and 20% in 2007. Thirdly, the percentage of losses reimbursed by the U.S. government over the applicable insurer deductible remains the same in 2006, but decreases to 85% in 2007 (Foong, 2006). Overall, TRIEA's enactment in 2005 denotes the U.S. government's intention to gradually back out from the U.S. terrorism insurance market.

Development of models to assess terrorism risk

Companies, such as the Insurance Services Office (ISO) and Risk Management Solutions, embarked on projects to develop terrorism risk models. ISO assigned AIR Worldwide Corporation to develop TLEM, which tries to incorporate factors such as frequency and severity of attacks, likely targets and impacts on both the intended targets and on surrounding structures (Ericson and Doyle, 149). This model estimates terrorism insurance expected losses, $(P_{T i} * L_{T i})$. TLEM analyzed information on over 300,000 targets and developed detailed information on each terrorist group, including their

historic attack frequency and weapons used (Hunter, 3). Then, severity calculations were carried out which depended on the weapon used (i.e. conventional weapons, plane crashes, bombs, etc.). Finally, these severity calculations were applied to the 300,000 targets identified to estimate expected losses.

Based on AIR's model, ISO concluded that the risk of terrorism varied between geographical locations (Hunter, 3). They made the decision to split the U.S. into three tiers. The first tier with a high hazard included New York City (all boroughs), San Francisco County, Washington DC, and Cook County IL (Chicago). The second tier with a moderate hazard included Suffolk Country (Boston), King County (Seattle), Los Angeles County, Harris County (Houston) and Philadelphia County. Finally, the third tier with low hazard included the remaining of the U.S. Based on these three tiers, ISO estimated the percentage of risk bore by the private sector (i.e. insurers and reinsurers) in the first three years of TRIA's enactment. Figure 5 summarizes ISO's estimations. ISO predicts that by the time of TRIA's expiration on December 2005, the private sector will bear 70%, 95% and 100% of the risk of terrorism losses for the first, second and third tiers respectively. Thus, ISO argues that by the end of 2005, the private insurers and reinsurers will essentially need federal reinsurance only for tier one geographic locations.

Figure 5. Estimated percentage of risk retained by private sector depending on tier (2003-2005)

Tier	2003	2004	2005
1	40%	55%	70%
2	75%	85%	95%
3	90%	95%	100%

Source: ISO

Moreover, ISO makes predictions about the loss cost per \$100 of terrorism coverage under TRIA. They define loss cost as "the risk portion of the ultimate price a

policyholder might pay” (Hunter, 5). In my model, loss cost is calculated by $(P_{Ti} * L_{Ti})$. To that, ISO adds expenses of underwriting and a profit allowance to determine total terrorism premiums. I have accounted for expenses of underwriting in my model by adding C_i , which I consider to be the administrative costs of selling and managing the terrorism policy.⁵ For ISO, the loss cost accounts for 50% of the premium, whereas the underwriting costs plus the profit allowance account for the remaining 50%. Figure 6 summarizes ISO’s findings.

Figure 6. Loss costs per \$100 of terrorism coverage by tier (2003-2005)

Tier	2003		2004		2005	
	Building	Contents	Building	Contents	Building	Contents
1	0.108	0.078	0.145	0.106	0.183	0.134
2	0.018	0.012	0.021	0.014	0.023	0.016
3	0.001	0.001	0.001	0.001	0.001	0.001

Source: ISO

In 2005, the loss cost of a building per \$100 would be 18.3 cents. By doubling that amount, one gets the premium of a building per \$100, which would be 36.6 cents. A building of \$3 million in value would have a total terrorism premium of \$10,980 under TRIA in year 2005. An important observation is that the terrorism premiums for tier one and tier two buildings increases during the period 2003-2005.⁶ If we combine this observation with Figure 5, we can infer that as private insurers bear more and more of the terrorism risk, the premium charged increases. Thus, we can conclude from the ISO model that federal reinsurance plays a great role in keeping premiums lower.

⁵ I have not explicitly accounted for a profit allowance in my model. However, I do believe that a profit allowance could be included within C_i .

⁶ A tier one building of \$3 million in value would have a premium of \$6,480 in 2003, of \$8,700 in 2004 and of \$10,980 in 2005. A tier two building of \$3 million in value would have a premium of \$1,080 in 2003, \$1,260 in 2004 and \$1,380 in 2005.

In addition, Risk Management Solutions (RMS)⁷ developed a model which catalogues 1,000 buildings across the U.S. as prime targets and runs simulations using different types of weapons (Ericson and Doyle, 149). This model calculates severity estimates which are based on the different types of weapons and their projected damages on the 1,000 buildings studied. RMS “used about two dozen different weapons in its scenarios, for example, airplanes of different design and capacities, trucks loaded with explosives, cake boxes loaded with explosives, and so on” (Ericson and Doyle, 150). Thus, RMS’s model focuses on determining the losses incurred due to a terrorist attack, which is what I specify in my model as L_{Ti} . The development of such models enables demanders and suppliers to assess terrorism risk more effectively, which will allow them to agree on premiums. Specifically, these models shed light on expected claim payments ($P_{Ti} * L_{Ti}$).

⁷ Risk Management Solutions charges money for their reports, thus, I was unable to attain their results.

6. TRIA's effectiveness on correcting for major failure

This section evaluates the effectiveness of TRIA on correcting for the major failure experienced by the U.S. terrorism insurance market in its early stages. The major failure includes three aspects: small number of demanders and suppliers, symmetry of disinformation, and negative externalities. The section deals with each aspect separately by presenting a hypothesis and then comparing it with the empirical data compiled by the U.S. Department of the Treasury.

Small number of demanders and suppliers

a. Hypothesis

I predict that TRIA will encourage more suppliers of insurance to enter the market. TRIA is meant to provide suppliers with more time to estimate premiums by creating a “free” federal reinsurance backstop. It makes insurers not to worry about attaining reinsurance and it also gives it to them for free. Because it is free, insurers may re-allocate resources in assessing terrorism risk more effectively, which can eradicate some of the uncertainty around premiums.

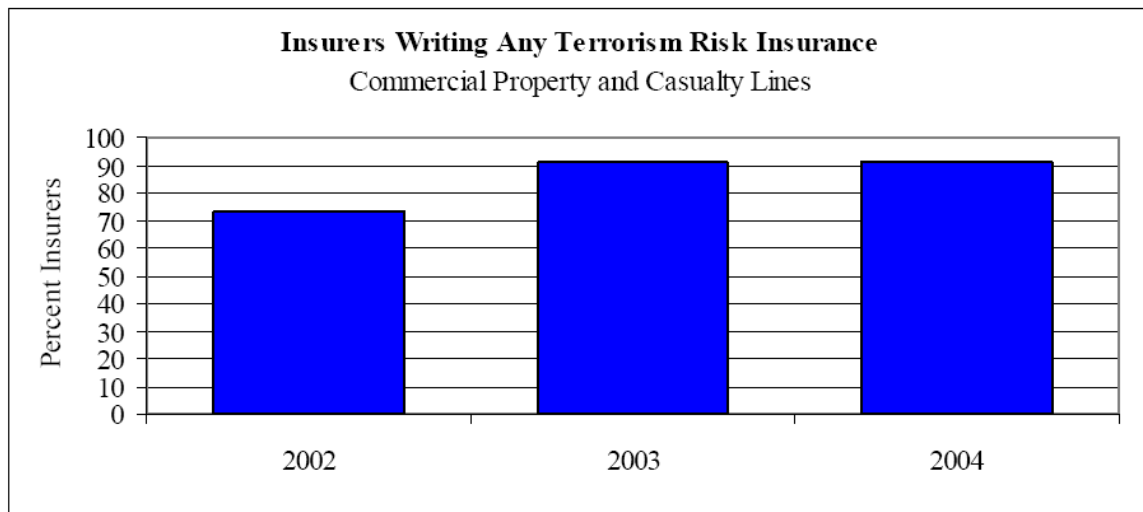
I also predict that TRIA's effect on demanders would be positive as well. Since TRIA obliges insurers to provide terrorism insurance, demanders will have more policies to choose from. Not having many policies to choose from before TRIA, “businesses were left vulnerable to not being able to maintain lines of credit, their expansion plans and other forms of risk-taking were inhibited, their employee benefit programmes were threatened, and they were exposed to total loss in the event of another terrorist attack” (Ericson and Doyle, 167). I judge that TRIA provides businesses with more options to

choose from which will ultimately lead to more businesses insuring themselves against terrorism risk.

b. Actual results

The data compiled by the U.S. Department of the Treasury supports the view that TRIA encouraged the entrance of suppliers in this market. Figure 7 illustrates that the percent of commercial P&C insurers writing terrorism coverage in TRIA-eligible lines increases from roughly 73% in 2002, which was before TRIA, to 91% in 2003 and 2004. There is a 25% increase in the percent of insurers writing terrorism insurance from 2002 to 2003. The increase in the share of insurers writing terrorism coverage is proof of more suppliers entering the terrorism insurance market.

Figure 7. Terrorism insurance written in TRIA-eligible lines by any type of insurer (2002-2004)

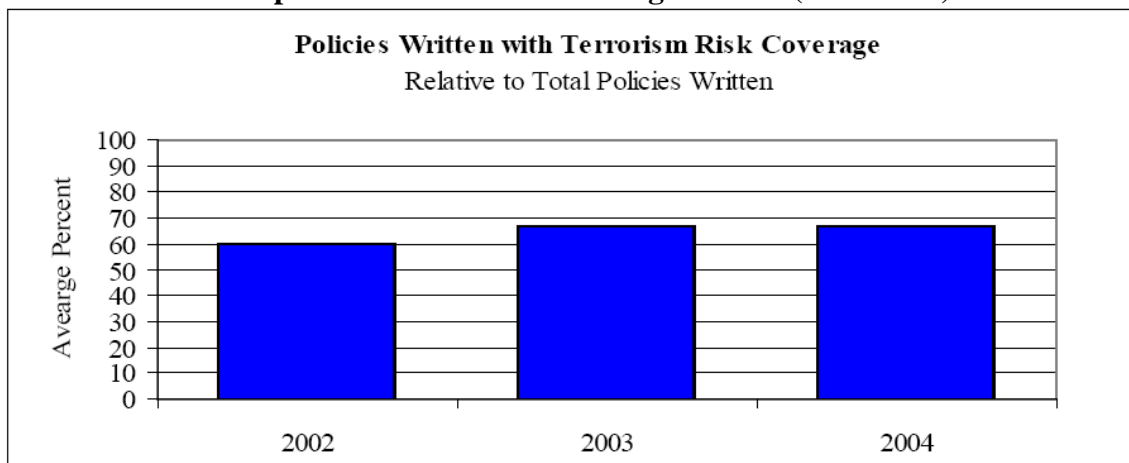


Source: Assessment of TRIA by the U.S. Department of the Treasury

Moreover, Figure 8 shows that the average share of policies in TRIA-eligible lines which include terrorism insurance increases over the period 2002-2004. In 2002, insurers write terrorism coverage in approximately 60% of their policies. After TRIA, this percent increases to 67% in 2003 and 2004, which constitutes a 12% increase. Thus, this data

suggests that the availability of terrorism coverage increases over time since it is written in more policies. However, the U.S. Department of the Treasury clarifies that this increase might not be attributed to TRIA, since it might be occurring because of the natural underwriting cycle. They define the natural underwriting cycle as the cycle which “reflects the general response of premium and surplus following a catastrophic event, in which the sudden loss in surplus is followed by reductions in amounts of coverage offered by insurers and higher premiums” (U.S. Department, 15). The average share of policies in TRIA-eligible lines which include terrorism insurance might have decreased in 2002 as part of the natural underwriting cycle. Thus, I cannot draw a coherent conclusion from Figure 8 as to whether the availability of terrorism coverage increases because of TRIA.

Figure 8. Policies written in TRIA-eligible lines by any type of insurer relative to total policies written in TRIA-eligible lines (2002-2004)

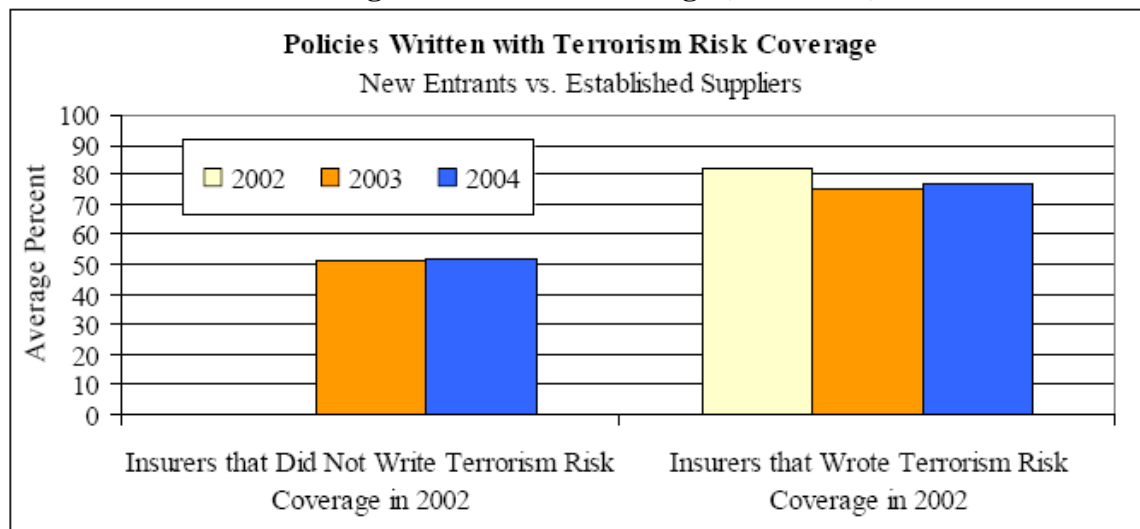


Source: Assessment of TRIA by the U.S. Department of the Treasury

Furthermore, Figure 9 provides more data about the new and established suppliers of terrorism insurance after 2002. It constitutes a comparison between the percentage of written policies including terrorism insurance in 2003 and 2004 with this percentage in 2002. Two observations need to be made. Firstly, insurers which are the new market

entrants in 2003 and 2004 write policies that include terrorism coverage 50% of the time in both years. This represents a significant entrance of new suppliers after TRIA. In addition, the insurers that had written terrorism coverage in 2002 maintain a stable percentage of policies including terrorism coverage during the period 2002-2004 which ranges from 75% to 80%. Both observations are evidence that the number of suppliers of terrorism insurance greatly increases after TRIA.

Figure 9. New entrants versus established suppliers writing terrorism risk coverage (2002-2004)



Source: Assessment of TRIA by the U.S. Department of the Treasury

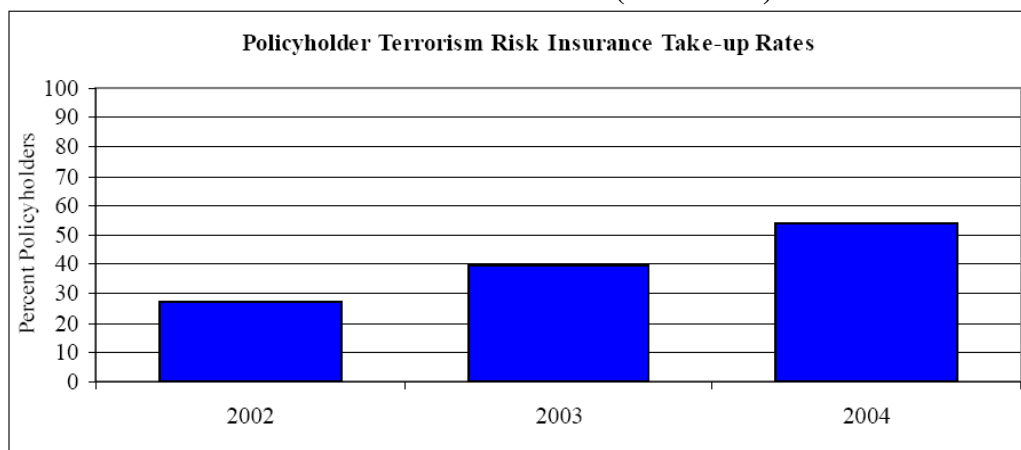
To study the effect of TRIA on terrorism coverage purchased, the Department of the Treasury uses policyholder take-up rates which are “the share of policyholders who purchased *any* amount of terrorism risk insurance, either as stand-alone coverage or in conjunction with a regular policy in TRIA-eligible lines” (U.S. Department, 84). Figure 10 shows that TRIA encourages demanders to enter the market for terrorism insurance.⁸ In 2002, roughly 27% of surveyed policyholders said they had purchased some type of

⁸ Appendix A includes a figure developed by Marsh & McLennan illustrating the terrorism insurance take-up rates from Q2, 2003 to Q4, 2004. After comparing this figure with Figure 10, we can infer that they are very similar.

terrorism coverage. After TRIA, this percent increases to 39% in 2003 and 54% in 2004.

There is a 44% increase from 2002 to 2003 and a 38% increase from 2003 to 2004.

Figure 10. Policyholder take-up rates for terrorism risk insurance (2002-2004)

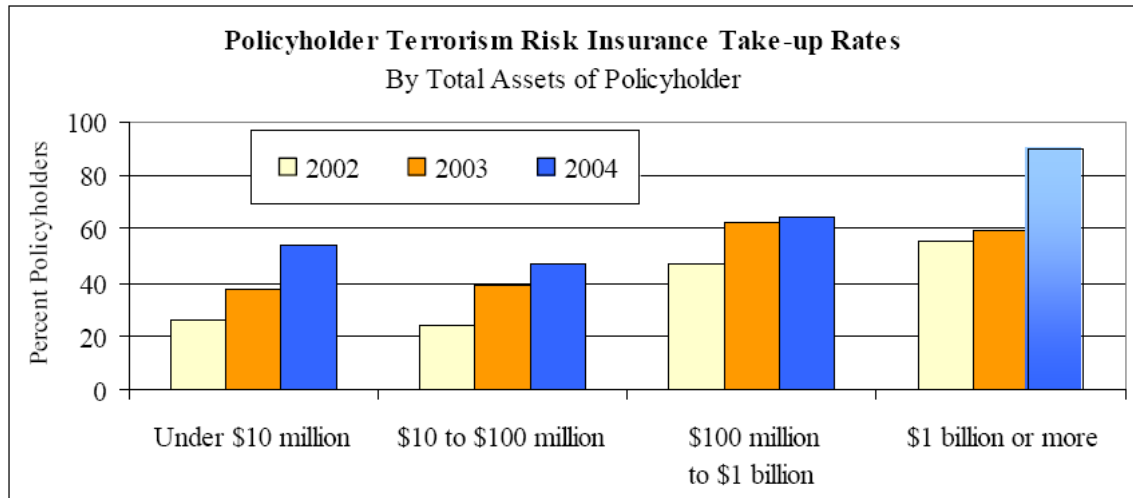


Source: Assessment of TRIA by the U.S. Department of the Treasury

Without a doubt, the federal backstop plays some role in this increase in terrorism coverage purchased. However, “the data reported here do not eliminate other factors that might drive take-up of such insurance, such as the underwriting cycle or increasing awareness of terrorism risks” (U.S. Department, 84). Thus, this data establishes a correlation between TRIA and terrorism coverage purchased, but does not establish causation since it does not isolate TRIA’s effect.

Figure 11 sheds light on the type of buyers of terrorism coverage depending on their total assets. During the period 2002-2004, take-up rates of the largest and second largest asset size classes (i.e. \$1 billion or more and from \$100 million to \$1 billion) are the highest among all policyholders. This suggests a positive relationship between terrorism policies purchased and policyholders’ asset size. Moreover, roughly 90% of the policyholders in the largest asset size class purchase terrorism insurance in 2004. This is an outstanding number which should be attributed to some extent to TRIA.

Figure 11. Terrorism risk insurance take-up rates by total assets of policyholder (2002-2004)



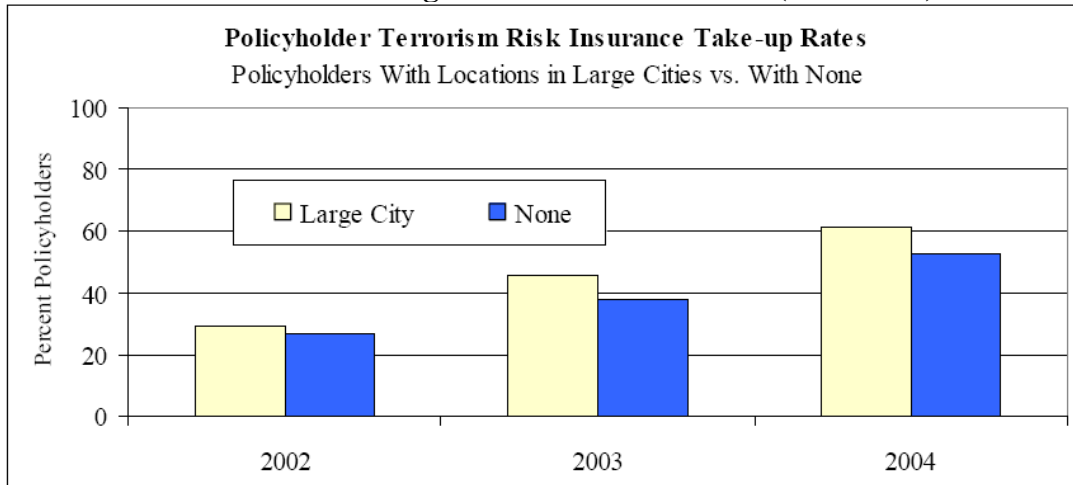
Note: Take-up rates for 2004, for policyholders in the largest asset size class, may be unreliable. The bar is shaded to reflect the tentative nature of the estimate.

Source: Assessment of TRIA by the U.S. Department of the Treasury

However, the U.S. Department of the Treasury clarifies that the 2004 take-up rates for policyholders in the largest asset size class may be inaccurate (U.S. Department, 89). Nevertheless, the fact remains that take-up rates increase for every policyholder size class during this period.

Figures 12, 13 and 14 include data on the purchase of terrorism insurance by policyholders depending on their locations. Figure 12 illustrates that policyholders with locations in large cities have higher take up rates than policyholders with none. In 2002, about 29% of policyholders with locations in large cities purchase terrorism insurance compared to about 27% without locations in large cities. The difference in take-up rates between the two increases over the period 2002-2004. After TRIA, in 2003 there are 45% large-city policyholders compared to 38% of non-large-city policyholders and in 2004 there are 61% large-city policyholders compared to 52% of non-large-city policyholders.

Figure 12. Policyholder terrorism risk insurance take-up rates with locations in large cities versus with none (2002-2004)

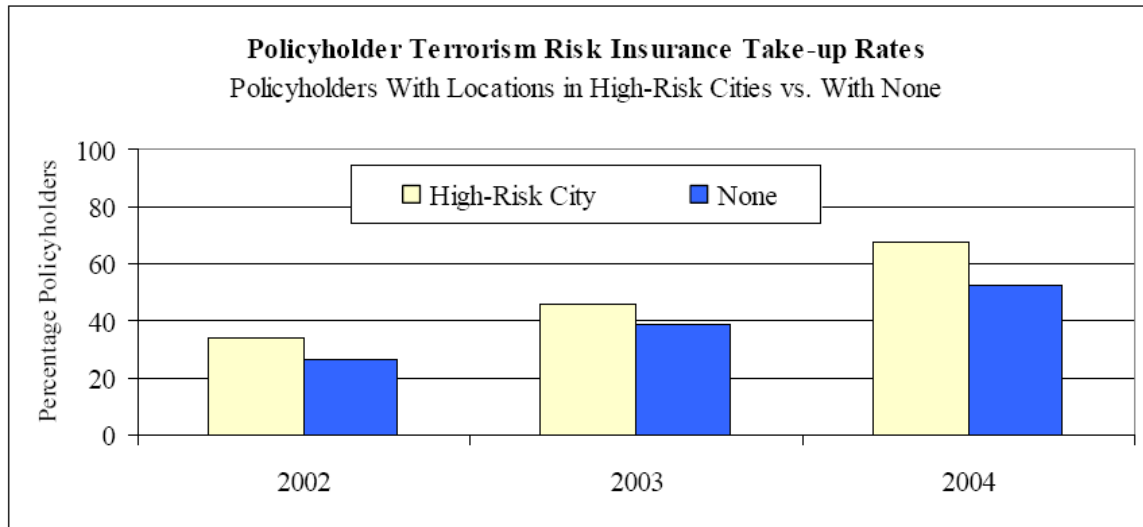


Source: Assessment of TRIA by the U.S. Department of the Treasury

TRIA has a positive effect on both demanders with large-city locations and demanders without large-city locations. Yet, the predominance of policyholders with locations in large cities over policyholders without locations in large cities in this market increases over time.

Figure 13 shows that take-up rates for policyholders with locations in high-risk cities are consistently higher than those for policyholders without locations in high-risk cities. In 2002, which is before TRIA's enactment, take-up rates for policyholders with locations in high-risk cities are roughly 34% compared to 26% for policyholders with no locations in high-risk cities. In 2003 and 2004, take-up rates for policyholders with locations in high-risk cities are 46% and 67% respectively compared to 39% and 52% respectively for policyholders without locations in high-risk cities. TRIA has a stronger positive effect on the amount of terrorism insurance purchased by policyholders with locations in high-risk cities. Thus, the difference in take-up rates between policyholders with locations in high-risk cities and those without increases over the period 2002-2004.

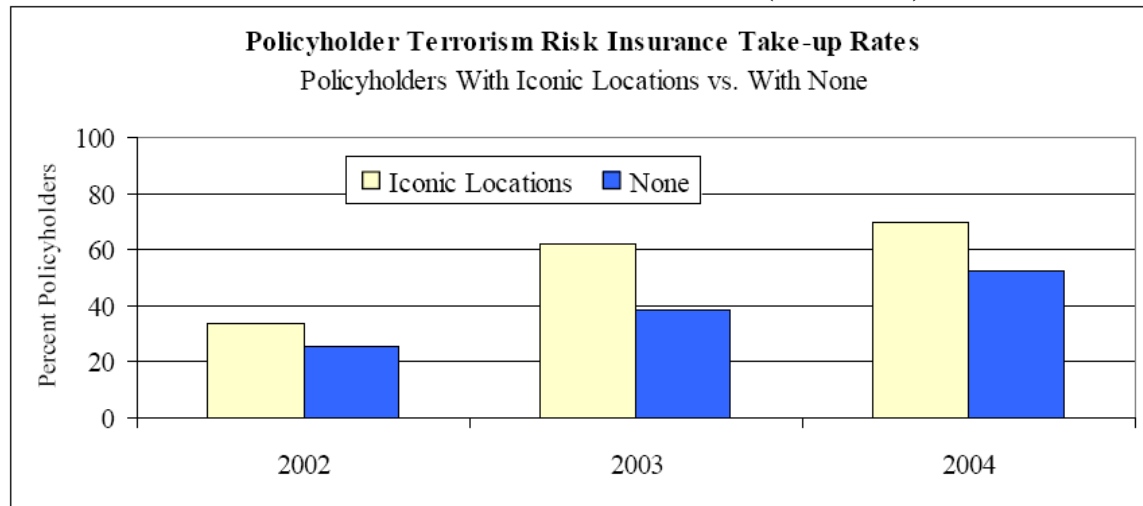
Figure 13. Policyholder terrorism risk insurance take-up rates with locations in high-risk cities versus with none (2002-2004)



Source: Assessment of TRIA by the U.S. Department of the Treasury

Figure 14 illustrates that take-up rates for policyholders with iconic locations are consistently higher than those for policyholders without iconic locations. In 2002, take-up rates for policyholders with iconic locations are 34% compared to 25% for policyholders without iconic locations. In 2003 and 2004, take-up rates for policyholders with iconic locations are 62% and 70% respectively, compared to 38% and 53% for policyholders without iconic locations. Take-up rates for policyholders with iconic locations more than doubled during this period, since there is a 106% increase. The difference in take-up rates between policyholders with iconic locations and those without increases from 2002 to 2003 and slightly decreases from 2003 to 2004.

Figure 14. Policyholder terrorism risk insurance take-up rates with iconic locations versus with none (2002-2004)



Source: Assessment of TRIA by the U.S. Department of the Treasury

Thus, the data compiled by the U.S. Department of Treasury supports my hypothesis that TRIA would significantly increase the number of suppliers and demanders of terrorism insurance. The greatest proof of the considerable entrance of suppliers is Figure 9 which shows that the new terrorism insurance market entrants in 2003 and 2004 write policies which include terrorism coverage 50% of the time in both years. TRIA also has a stronger positive effect on the entrance of demanders with locations in large cities, with locations in high-risk cities and with iconic locations than on the entrance of demanders without locations in large cities, without locations in high-risk cities and without iconic locations.⁹ Thus, the data suggests that TRIA corrects for the market imperfection of a small number of demanders and suppliers.

⁹ This might mean that there is a problem of adverse selection. The difference in the take-up rates of high-risk policyholders and those of low-risk policyholders increases during the period 2002-2004, which means that the terrorism insurance market is increasingly dominated by high-risk policyholders. Adverse selection makes it difficult for insurers to spread the risk among high-risk and low-risk policyholders.

Symmetry of disinformation

a. Hypothesis

I predict that the government would relieve the market from symmetry of disinformation between insurers, reinsurers and companies. It can alleviate this problem because it has “the greatest information resources about terrorism, and, therefore, its participation in an insurance programme is vital to both underwriting and preventive security measures in an overall protection package for both insurers and insured” (Ericson and Doyle, 167). Various governmental institutions such as the FBI and the CIA update the government on terrorist activity. Insurers, reinsurers and companies do not have access to this type of information for national security reasons.

Specifically, the government’s participation in the market can create a positive and a negative moral hazard situation. Starting with the positive one, as Cummins argues, “the likelihood of terrorist attacks interacts with governmental homeland security, foreign, and defense policies...” (Cummins, 48). There is a direct relationship between U.S. foreign policy and the probability of a terrorist attack occurring. In addition, Kunreuther and Michel-Kerjan state that the “[g]overnment can influence the level of risk of future attacks through appropriate counter-terrorism policies and international cooperation to enhance general security and reduce the probability that attacks will occur” (Kunreuther and Michel-Kerjan, 11). Given that the U.S. government is responsible for reimbursing companies for a share of their losses, it will be even more motivated to undertake policies that decrease the probability of a terrorist attack occurring. Thus, the government’s involvement provides them with more incentives to potentially decrease the probability of a terrorist attack occurring.

Conversely, the U.S. government's involvement in the market could create a negative moral hazard situation. The government's intervention can have the indirect consequence of companies not undertaking actions that might decrease the likelihood or size of losses of terrorist attacks. Cummins believes that "[s]ubsidized insurance also tends to create moral hazard problems whereby policyholders under-invest in loss prevention" (Cummins, 40). Policyholders are confident that the government will reimburse them for any losses due to terrorist attacks after TRIA. Therefore, they do not feel inclined to invest money in insuring their facilities against terrorist attacks, which creates the negative moral hazard situation. Thus, the government intervention discourages companies from undertaking actions to decrease the likelihood and/or size of losses of terrorist attacks. Note that the argument for the government creating a negative moral hazard situation holds only when we consider terrorist attacks with significantly lesser repercussions than the 9/11 attacks. For attacks similar to 9/11, companies can do much less to prevent them, thus, the negative moral hazard situation is virtually non-existent.

After comparing the two possible moral hazard situations, I suggest that the positive one is more likely to outweigh the negative one. I believe that is the case because the negative moral hazard situation is not as significant in a market which includes events inflicting very high losses. Thus, I predict that TRIA will relieve the market from symmetry of disinformation by creating a positive moral hazard situation.

b. Actual Results

Symmetry of disinformation between insurers and reinsurers creates the problem of high and inefficient premiums. Immediately after 9/11, some insurers charged high

and inefficient premiums because reinsurers were reluctant to invest in the market due to disinformation. Thus, whether premiums have been efficient during the period 2002-2004 can demonstrate whether the U.S. government corrected for symmetry of disinformation.¹⁰ To study premiums, I use average cost shares.¹¹ I consider average costs shares to be a good proxy for the terrorism premium per dollar of property insured.¹²

Figure 15 illustrates that there is a gradual increase in the average terrorism coverage premium relative to total premium for policies with terrorism insurance.¹³ Policyholders who purchased policies including terrorism coverage in 2004 paid more for terrorism coverage than they would have paid in 2003. The average terrorism cost shares increase from 0.9% in 2002 to roughly 1.2% in 2003. Then, it reaches roughly 1.9% in 2004. The cost of terrorism coverage increases in the post-TRIA era, which is evidence that TRIA did not achieve its goal of affordability.

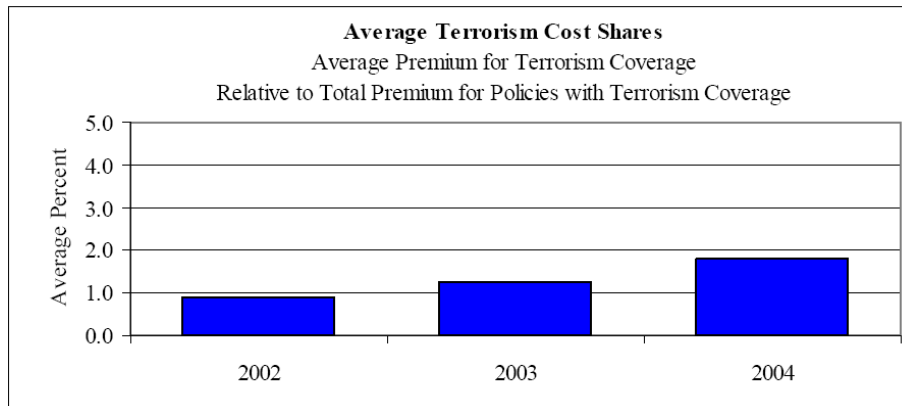
¹⁰ I consider efficient premiums to be those which depend on each policyholder's risk. An efficient market would offer a greater terrorism premium to high-risk policyholders than to low-risk policyholders.

¹¹ The U.S. Department of the Treasury prefers the measure of cost shares from a simple dollar value to study terrorism premiums because "the ratio of terrorism coverage to total coverage provides some control for differences in average risk and insured value among different insurers" (U.S. Department, 61).

¹² The main difference between average cost shares and premiums per dollar of property insured is that the latter incorporates the volume of premiums, whereas the former does not. Unfortunately, I was unable to find data on how terrorism premiums per dollar of property insured have changed during the period 2002-2004.

¹³ Appendix B includes a figure developed by Marsh & McLennan illustrating the terrorism insurance price as a percentage of property insurance premiums during the period 2003-2004. Note that both Appendix B and Figure 15 study terrorism premiums, but use different measures, since Figure 15 uses average cost shares. After comparing these two figures, we can infer that they support similar conclusions. Appendix B shows that terrorism insurance prices increased in all but one total insured value categories from 2003 to 2004. Similarly, the U.S. Treasury figure shows an increase in the average cost shares from 2003 to 2004. For the Marsh figure, only for terrorism policies insuring a total insured value ranging from \$100 to \$500 million did the terrorism insurance price decrease from roughly 4.5% in 2003 to 4.2% in 2004.

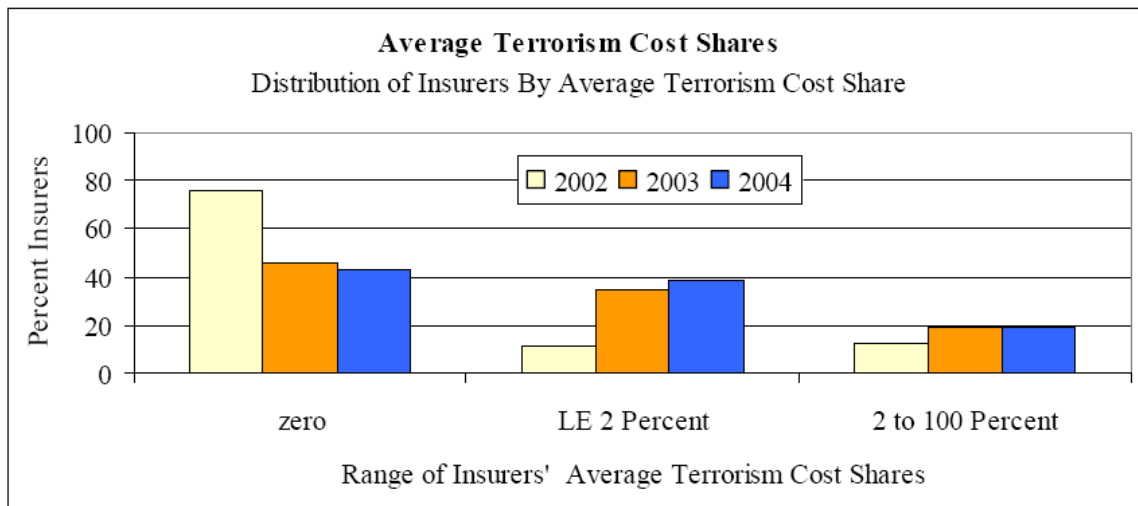
Figure 15. Average terrorism coverage premium relative to total premium for policies including terrorism coverage (2002-2004)



Source: Assessment of TRIA by the U.S. Department of the Treasury

Figure 16 sheds more light on the increase in average cost shares during this period. It provides us with the distribution of insurers by average terrorism cost shares.

Figure 16. Distribution of insurers based on their average terrorism cost share (2002-2004)



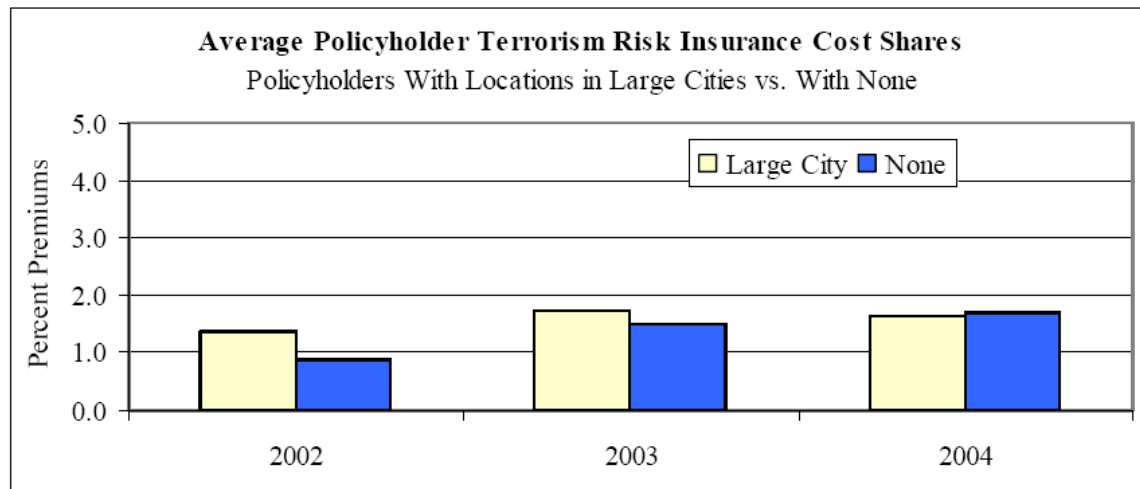
Source: Assessment of TRIA by the U.S. Department of the Treasury

Prior to TRIA's enactment in the end of 2002, terrorism coverage is provided for free from roughly 75% of insurers. After TRIA, this percentage goes down to roughly 43% in 2003 and 2004. The reduction in free terrorism coverage offered after 2002 may be the reason more insurers start charging higher premiums in 2003 and 2004. As Figure 16 illustrates, the percentage of insurers with average cost shares of less than 2% increased

from approximately 12% in 2002 to 35% in 2003 and then to nearly 40% in 2004. Furthermore, the percentage of insurers with average cost shares of 2% to 100% increased from 10% in 2002 to 20% in 2003 and 2004. By obligating all insurers to offer terrorism coverage, TRIA “may have encouraged insurers who otherwise would have charged for terrorism risk insurance coverage implicitly in the overall cost of coverage to adopt an explicit price in 2003” (U.S. Department, 62). TRIA might have encouraged suppliers to exclude terrorism insurance from all-perils package policies and instead create a separate terrorism policy. This is a movement which had occurred earlier in history with earthquakes and floods.

Figures 17, 18 and 19 present how terrorism risk insurance average cost shares vary depending on the insured company’s location. Figure 17 illustrates that in 2002 and 2003, policyholders with locations in large cities have to pay higher premiums than those without locations in large cities. In 2002, average cost shares are roughly 1.4% for policyholders with locations in large cities compared to 0.9% for those without. In 2003, average cost shares are roughly 1.8% for policyholders with locations in large cities compared to 1.5% for those without. Finally, in 2004, both policyholders with and without locations in large cities have to pay roughly 1.8% for terrorism coverage. It does not seem logical that policyholders without locations in large cities would have to pay the same amount for terrorism insurance as those with locations in large cities.

Figure 17. Policyholder terrorism risk insurance cost shares with locations in large cities versus with none (2002-2004)

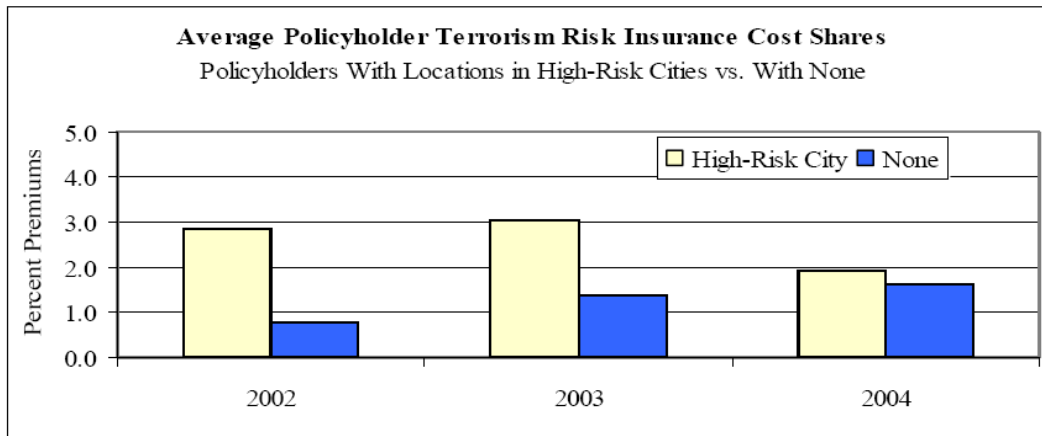


Source: Assessment of TRIA by the U.S. Department of the Treasury

Figure 18 suggests the same point as Figure 17 but only this time we are talking about high-risk cities versus non-high-risk cities. In 2002 and 2003, policyholders with locations in high-risk cities have to pay a higher premium than those without locations in high-risk cities. In 2002, average cost shares are roughly 2.9% for policyholders with locations in high-risk cities compared to 0.8% for policyholders without locations in high-risk cities. In 2003, average cost shares are roughly 3.0% for policyholders with locations in high-risk cities compared to 1.3% for those without. Finally, in 2004, policyholders with locations in high-risk cities have to pay roughly 1.9% for terrorism coverage compared to 1.7% for those without. The difference between the average cost shares of policyholders with and without locations in high-risk cities shrinks over this period. Again, it does not seem logical that policyholders without locations in high-risk cities would have to pay close to the same terrorism premium as policyholders with locations in high-risk cities in 2004.¹⁴

¹⁴ Recall that ISO's model predicted that a tier one (high-risk) building of \$3 million in value would have a premium of \$8,700 in 2004, whereas a tier two (moderate-risk) building of \$3 million in value would have

Figure 18. Policyholder terrorism risk insurance cost shares with locations in high-risk cities versus with none (2002-2004)



Source: Assessment of TRIA by the U.S. Department of the Treasury

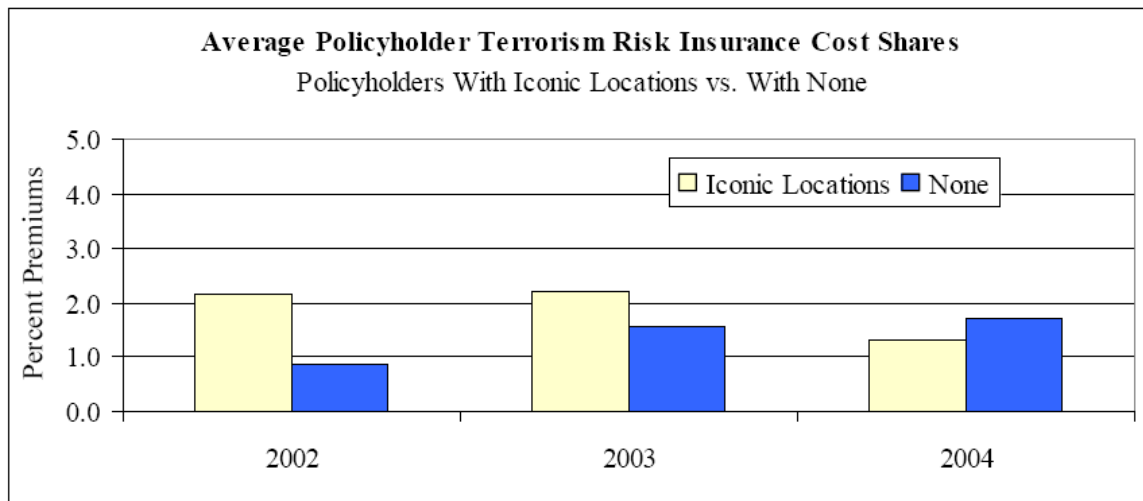
Finally, Figure 19 constitutes the stronger proof that TRIA did not encourage efficient premiums depending on the location of the insured company's buildings. It illustrates that policyholders with iconic locations have to pay a higher premium than those without iconic locations in 2002 and 2003, whereas this pattern is reversed in 2004. In 2002, average cost shares are roughly 2.1% for policyholders with iconic locations compared to 0.8% for policyholders without iconic locations. In 2003, average cost shares are roughly 2.1% for policyholders with iconic locations compared to 1.6% for those without. Finally, policyholders with iconic locations pay roughly 1.4% for terrorism coverage compared to 1.8% for those without in 2004. It does not seem logical that policyholders without iconic locations would have to pay a higher premium for terrorism coverage than policyholders with iconic locations in 2004.¹⁵ Thus, the data

a premium of \$1,260 in 2004. The premium for a moderate-risk building is roughly one seventh of the premium for a high-risk building. It is obvious that the model's predictions about premiums in 2004 were way off when compared to the reality depicted in Figure 18.

¹⁵ It should be noted that on August 1, 2004, Homeland Security raised the threat level to orange, which signifies a high risk of terrorist attacks, for financial sites in New York City, northern New Jersey and Washington, D.C. This increase in the threat level of these cities might have encouraged both policyholders with iconic locations and without iconic locations to enter the market. Since the number of policyholders without iconic locations is significantly higher than those with iconic locations, the vast increase in demand for terrorism insurance by policyholders without iconic locations might have fueled the

suggests that TRIA did not encourage efficient premiums depending on each policyholder's risk, and, therefore, did not deal with the problem of symmetry of disinformation.

Figure 19. Policyholder terrorism risk insurance cost shares with iconic locations versus with none (2002-2004)



Source: Assessment of TRIA by the U.S. Department of the Treasury

In order to study why average cost shares for low-risk policyholders are either greater than or close to equal to those of high-risk policyholders in 2004, we need to further explore what an average cost share is. An average cost share, ACS, is the total premiums for terrorism insurance as a share of total premiums for policies with terrorism insurance included. Using our model, this translates as follows:

$$ACS = (P_{Ti} * L_{Ti}) / [(P_{Ti} * L_{Ti}) + (P_o * L_o)]$$

where P_{Ti} is the probability of a terrorist attack occurring, L_{Ti} is the loss inflicted by this terrorist attack, P_o is the probability of all other events occurring, and, finally, L_o is the loss inflicted by all these other occurrences.¹⁶ Then, we take the derivative of an average

increase in their terrorism premiums. Suppliers might have taken advantage of their urge to purchase coverage by charging them higher terrorism premiums (U.S. raises threat, 2004).

¹⁶ Note that I have excluded C_i as a determinant of total terrorism premiums and total premiums for all other causes for simplification purposes.

cost share with respect to P_{Ti} to establish the rate of change of ACS with respect to P_{Ti} . After using Mathematica to calculate this derivative, we end up with

$$\delta ACS / \delta P_{Ti} = (L_{Ti} * P_o * L_o) / [(P_{Ti} * L_{Ti}) + (P_o * L_o)]^2$$

This derivative will always be positive. Assuming that policyholders with locations in large cities, with locations in high-risk cities and with iconic locations have a greater P_{Ti} , they should always experience higher premiums than those without locations in large cities, without locations in high-risk cities and without iconic locations. Figures 17 and 19 illustrate that this is not true for year 2004. In Figure 18, the policyholders with locations in high-risk cities experience a greater premium than those without, but the difference between the two premiums is small and decreasing. Thus, there clearly is inefficiency in the market in terms of the premiums offered.

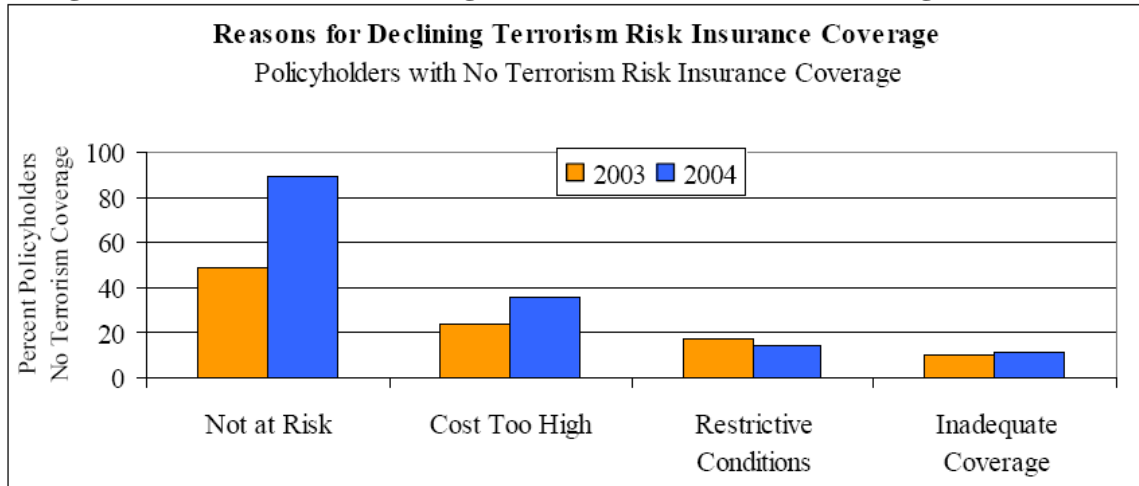
I believe that the reason causing this inefficiency is the problem of adverse selection. The terrorism insurance market is divided into high- and low-risk policyholders. As we move away in time from 9/11, fewer low-risk policyholders purchase terrorism coverage relative to high-risk policyholders.¹⁷ They view terrorism coverage as an unnecessary expense.¹⁸ Figure 20 states that the number one cause for companies not purchasing terrorism insurance during 2003-2004 was their perception that they were not at risk. The number of companies under this perception increases as we move away in time from 9/11. Roughly 50% of policyholders stated that they did not purchase terrorism coverage because they did not think they were at risk in 2003. In

¹⁷ Figures 12, 13 and 14 illustrate that the difference in take-up rates between high- and low-risk policyholders is increasing over the period 2002-2004. This means that the U.S. terrorism insurance market is increasingly dominated by high-risk policyholders.

¹⁸ TRIA does not require companies to purchase terrorism coverage, thus, giving them the option to exit the U.S. terrorism insurance market. It only requires insurers to offer terrorism coverage.

2004, this percentage increases to 90%. Thus, the data suggests that the terrorism insurance market gets increasingly dominated by high-risk policyholders.

Figure 20. Reasons for declining terrorism risk insurance coverage (2003-2004)



Source: Assessment of TRIA by the U.S. Department of the Treasury

Insurers are unable to spread the risk between high- and low-risk policyholders because fewer low-risk policyholders purchase terrorism coverage relative to high-risk policyholders. As the data shows, insurers then charge low-risk policyholders still in the market with higher premiums to compensate for the increased risk they are assuming. This worsens the problem of adverse selection since fewer low-risk policyholders will decide to purchase terrorism coverage relative to high-risk policyholders because of high premiums. Thus, I suggest that adverse selection is the reason lower-risk policyholders still in the market pay terrorism premiums that are higher than or close to equal to premiums offered to higher-risk policyholders in 2004.

Overall, the effect of TRIA on encouraging efficient premiums in the U.S. terrorism insurance market has been weak. The data suggests that terrorism pricing depending on the insured company's location is inefficient. The presence of inefficient premiums due to the problem of adverse selection proves that the U.S. government did

not take care of the symmetry of disinformation. Disinformation between insurers and companies continues to plague the market for terrorism insurance in the post-TRIA era.

Negative externalities

a. Hypothesis

I predict that TRIA will correct for the negative externality on U.S. economic growth. By obliging all insurers to offer terrorism insurance at some cost, TRIA achieves its goal of wide availability. Consequently, businesses will have more terrorism policies to choose from which might increase the amount of terrorism coverage purchased. If the amount of coverage purchased increases, fewer construction projects will be cancelled and fewer businesses will not be given loans, which means that there will be a smaller negative effect on U.S. economic growth. Whether greater availability will lead to an increase in terrorism coverage purchased will greatly depend on the effect TRIA has on terrorism premiums. Generally speaking though, greater availability means that more insurers will enter the market, resulting in more competition which normally drives prices down. A decrease in premiums will encourage more companies to purchase coverage.

b. Actual Results

The data compiled by the U.S. Department of the Treasury suggests that TRIA has a strong positive effect on terrorism insurance purchased. Figure 10 shows that take-up rates for businesses increase during the period 2002-2004. This means that the number of firms which purchase terrorism coverage increases during this period. Moreover, TRIA has a strong positive effect on the entrance of both high- and low-risk

policyholders in this market.¹⁹ Thus, I believe that TRIA corrects for the negative externality of U.S. economic growth by increasing the amount of terrorism coverage purchased.

However, the data also suggests that the pricing of terrorism insurance remains inefficient after TRIA's enactment. If pricing was more efficient, this would result in even more companies purchasing terrorism insurance. For instance, more companies with non-iconic locations would purchase terrorism insurance if they were charged more efficient premiums. With even more companies buying coverage, fewer real-estate transactions would be cancelled and fewer companies would be denied loans by banks.²⁰ Thus, government intervention does alleviate the problem of negative externalities, but does not fully correct for it, since inefficient premiums still keep some companies out of this market.

¹⁹ Note that TRIA's effect is stronger for high-risk policyholders than it is for low-risk policyholders. Nevertheless, it is strong for both.

²⁰ Unfortunately, I was unable to find reports which quantitatively showed that fewer construction projects were cancelled or postponed and/or fewer banks denied giving out loans to companies after TRIA's enactment.

7. My proposal

This section lays out my proposal that ensures long-term prosperity for the U.S. terrorism insurance market. The section argues that the three issues which plagued the market in its early days can be corrected for by following a twofold strategy: requiring mandatory purchase of terrorism insurance for companies by law and further continuing the gradual backing out of the federal backstop.

Mandatory purchase of terrorism insurance

To deal with the problem of adverse selection which results in inefficient premiums, the government needs to find a way to increase the take-up rates of low-risk policyholders relative to high-risk policyholders. I believe the best way to achieve that is to make the purchase of terrorism insurance mandatory for all companies. This policy would take care of adverse selection since all low-risk policyholders would be obligated by law to enter this market. Kunreuther and Michel-Kerjan argue that mandatory coverage “would expand the market for terrorism insurance, stabilize premium income and enable [insurers] to diversify [their] risks across structures and geographical areas” (Kunreuther and Michel-Kerjan, 15). With both high- and low-risk policyholders being present in the market, insurers would be able to diversify the risk much more effectively. This would result in more efficient premiums for low-risk policyholders. A Rand report also argues that mandatory terrorism insurance would enable insurers to spread the risk over high- and low-risk companies (Dixon et. al, 16). In my opinion, this policy seems to be the best solution to ensure efficient pricing of terrorism insurance in the United States.

Mandatory terrorism insurance would be very comparable to mandatory car insurance in the U.S. Car insurance has been mandatory “since accidents by their nature

are difficult to predict and individual drivers have unobservable driving behaviors” (Chernick, 178). Terrorist attacks are similar to car accidents in that sense, since they are very difficult to predict and depend on the behavior of terrorists, which is hard to understand. By mandating car insurance, insurers are able to “sprea[d] the risk of accidents across the entire pool of drivers, thus lowering the cost of insurance and making it available to everyone” (Chernick, 178). They are able to spread the risk and offer more efficient auto premiums because mandatory car insurance circumvents the problem of adverse selection. Mandatory terrorism insurance would have a similar effect. Since mandatory car insurance has been effective in the U.S. auto insurance market, I argue that it could also be applied to the U.S. terrorism insurance market.

The French government adopted this policy in its terrorism insurance market. As Michel-Kerjan and Pedell mention, “[t]errorism insurance is mandatory in France, so every single firm is covered by its insurer, which then can be reinsured by the pool GAREAT” (Michel-Kerjan and Pedell, 148). GAREAT is a co-reinsurance pool consisting of four layers. The first layer includes an annual aggregate capacity of €400 million supported by private insurers. The second layer includes an annual capacity of €1,250 million supported by reinsurers and few insurers. The third layer includes an additional €350 million supported by the international reinsurance markets. Finally, the fourth layer includes an unlimited guarantee supported by the French government (Michel-Kerjan and Pedell, 148). This co-reinsurance pool reinsures all terrorism insurance policies offered by insurers to companies in France.

The French market circumvents the problem of adverse selection due to mandatory terrorism insurance. Other countries which have not adopted this policy have

been experiencing very low demand for terrorism coverage. In Germany, terrorism insurance is offered by one company, Extremus AG, which receives reinsurance by both private and public reinsurers. Michel-Kerjan and Pedell note that, as of August 2004, there was “an estimate of only 2.5 per cent of contracts covered for terrorism” (Michel-Kerjan and Pedell, 161). There is a very small number of terrorism policyholders in Germany because premiums are roughly 0.029% of the amount insured, which is two to three times the cost of terrorism coverage in the U.S. (Demand for terror, 2005).

I believe that premiums are that high in Germany because the market consists of only high-risk companies and insurers are unable to spread the risk among high- and low-risk policyholders. A study by Thomann and Graf von der Schulenburg states that “[c]ompanies that buy coverage from Extremus tend to be attracted by the “one-risk class” aspect of the coverage, meaning they can cover a specific location or production technology that is seen as having a high risk...” (Demand for terror, 2005). Inevitably, insurers are obliged to charge very high premiums to compensate for the higher risk they take on. Mandatory terrorism coverage would solve this problem by obliging both high- and low-risk policyholders to be present in the market for terrorism insurance. The U.S. government should learn from the German terrorism insurance market’s inability to sell coverage to all companies at affordable premiums. Thus, the U.S. government should follow the French government’s policy of mandating the purchase of terrorism coverage to circumvent the problem of adverse selection and solve its problem of inefficient premiums.

However, there is also the other side of the coin in mandating the purchase of terrorism coverage. This policy constitutes an increase in government involvement in the

market, which leads to less economic efficiency. As the Rand report suggests, “mandatory insurance restricts the ability of buyers to tailor coverage to their own circumstances, potentially running counter to the goal of economic efficiency” (Dixon et. al, 16). The purchase of terrorism coverage for some companies might represent an inefficient way of allocating their resources. For example, the opportunity cost of purchasing terrorism coverage could be the revenues the firm would have made by advertising more heavily. Thus, mandatory terrorism coverage does not give companies the choice to decide whether to purchase insurance based on their needs, which hinders economic efficiency.

Now, in order to establish mandatory purchase of terrorism coverage, the U.S. government needs to regulate premiums more heavily. The Rand report suggests that “[m]andatory insurance would likely result in insurance rates for commercial lines being more heavily regulated...” (Dixon et. al, 16). This calls for the creation of a governmental institution which would exist for the sole purpose of determining efficient premiums for each policyholder. This institution would make sure that policyholders were charged premiums depending on their terrorism risk. It would not allow for inefficient pricing of terrorism insurance as illustrated in Figures 17, 18 and 19. This new governmental institution would ensure the determination of efficient premiums for all policyholders in the U.S., and, thus, solve the problem of symmetry of disinformation.

There are economists who argue that it is impossible to offer different premiums depending on each policyholder’s risk. They base this view on the absence of historical data that would be able to justify this difference in premiums. The Rand report argues that “[b]ecause good data are not available to justify differences in rates between low-

and high-risk areas, insurance regulators may not allow significant differences in rates” (Dixon et. al, 16). The insurers’ inability to offer different premiums to high- and low-risk policyholders would result in the low-risk subsidizing the high-risk policyholders. This constitutes a major inefficiency for the U.S. terrorism insurance market. However, I believe that this government institution would be able to centralize all data on terrorism risk and justify differences in premiums offered to policyholders under the government’s supervision, which is the most informed entity on terrorism.

Although I recognize that mandatory terrorism coverage does to some extent hinder economic efficiency, I argue that it is a necessary evil to solve the problem of adverse selection in this market. Ultimately, without government intervention, the U.S. market would end up resembling the German market, which consists of only high-risk policyholders.²¹ Even though the U.S. market would offer efficient premiums in such a case, the lack of coverage among the greater majority of U.S. companies would result in negative externalities. Moreover, the small number of demanders and suppliers in the market would enable market participants to exert power on premiums. Thus, the government should intervene in order to prevent this scenario from happening.

Gradual backing out of the federal backstop

I suggest that TRIA should remain active in the market for terrorism coverage because this market would not be able to function effectively without it, at least for now. Without government intervention, the market would face the problems of a small number of demanders and suppliers and of negative externalities. Until the private market is ready to take control of this market, the federal backstop should continue to be in effect.

²¹ It should be pointed out that since my model allows for risk averse companies, this will ensure that few risk averse low-risk companies will stay in the market in the long run. Thus, the U.S. terrorism insurance market will never absolutely resemble the German market.

Nevertheless, the U.S. government should have in mind that it ought to gradually pass on responsibilities to the private sector because if it does not do so, this would imperil the private sector's ability to take control of the market one day.

TRIEA is a good step towards minimizing the government's interference with the private insurance industry. I believe that the government should continue to back out of this market in three ways. One, it should keep increasing every year the minimum amount of terrorism losses necessary for the federal backstop to come to effect.²² Two, it should continue to raise the insurer deductible every year, which is the level of losses over which the U.S. government starts reimbursing insurers.²³ Three, it should keep reducing the government's co-payment of losses over the insurer deductible every year.²⁴ The gradual backing out of the federal government from this market decreases the risk of the U.S. government substituting for private solutions. As a Consumer Federation of America report mentions, the successor of TRIA "should minimize interference with the development of private insurance and reinsurance markets" (Hunter, 10).

The gradual backing out of the U.S. government from this market resembles TRIA's purpose of facilitating the development of private solutions. The U.S. government wanted with TRIA to provide private insurance with more time to assess terrorism risk more effectively. It is imperative for the market's prosperity in the long-run that government intervention facilitates the development of the private sector, which

²² TRIEA includes that the minimum losses for the federal backstop to come to effect are \$50 million in 2006 and \$100 million in 2007 compared to \$5 million during the period 2002-2005. This gradual increase of minimum losses should continue in the years to come.

²³ The applicable insurer deductible is determined as a percentage of direct P&C earned premiums of each insurer the preceding year. The percentage varied over the three-year operation of TRIA: 7% in 2003, 10% in 2004 and 15% in 2005. With TRIEA, this percentage further increases: 17.5% in 2006 and 20% in 2007. This means that the applicable insurer deductible will also increase, which means that private insurers and reinsurers are taking on more of the losses.

²⁴ With TRIA, the government would pay 90% of losses over the applicable insurer deductible during the period 2002-2005. With TRIEA, this percentage remains the same in 2006, but decreases to 85% in 2007.

can ultimately come up with more efficient solutions. Cummins states that the market-enhancing view “holds that public policy should facilitate the development of the private market, but not create new governmental institutions to substitute for private solutions” (Cummins, 41). The gradual minimization of federal interference in private reinsurance ensures the development of private solutions which will lead the market to long-term prosperity.

8. Conclusion

On September 11, 2001, terrorist attacks were carried out against the United States that inflicted massive property damage and civilian casualties. These attacks delivered a severe hit on the U.S. economy and signaled the beginning of an era where terrorism poses an unavoidable threat for the U.S. The insurance industry played a critical role in the U.S. economy's recovery from these acts of war by reimbursing companies for the majority of their losses. Even though the industry was able to respond to the 9/11 attacks quite effectively, there is no guarantee it will be able to respond in a similar way to a future terrorist attack of analogous magnitude. In the aftermath of September 11, 2001, the U.S. economy is left vulnerable to a future terrorist attack.

The U.S. terrorism insurance market was developed to enhance the insurance industry's ability to respond to a future terrorist attack. This structural change in the P&C insurance industry was necessary since insurers realized that the risk of a terrorist attack occurring on U.S. soil is real. In its early days, this new market faced a major failure which was threefold: small number of demanders and suppliers, symmetry of disinformation, and negative externalities. Combined, these cripple the market's ability to achieve wide availability and affordability of terrorism coverage in the U.S. The major failure this market experienced early on placed at risk the recovery of the U.S. from a future terrorist attack.

Anticipating the worst, the U.S. government intervened in this market on November 2002 with the enactment of TRIA. This act states that the U.S. Treasury is responsible for reimbursing insurers for a portion of losses in the occasion of a terrorist attack. The U.S. government became the reinsurer of last resort for the private insurance

market. With TRIA, the government hoped that it would help the market achieve wide availability and affordability of terrorism coverage. It hoped that it would provide the private sector with some breathing space to assess terrorism risk and assume full control of the market sometime in the future. Thus, the U.S. government intervened to provide this market with a temporary cushion which would ensure both short- and long-term prosperity.

This research project evaluates TRIA based on its effect on the threefold failure the U.S. terrorism insurance market experienced in its early days. It formulates the hypothesis that TRIA would correct this failure to a great extent. This research project predicted that TRIA would take care of the problems of a small number of demanders and suppliers, of symmetry of disinformation, and of negative externalities. In absence of empirical data on the effect of TRIA on this market, this research project only utilized data compiled by the U.S. Department of the Treasury. The empirical data was used to evaluate whether my hypothesis was right or wrong.

After studying the data compiled by the U.S. Department of the Treasury, I suggested that TRIA corrected for the problem of a small number of demanders and suppliers. In the post-TRIA era, there has been a significant entrance of suppliers and demanders in this market. Consequently, neither demanders nor suppliers will be able to exert any market power in determining premiums, which eradicates part of the market imperfection. However, the available data allowed me to only establish a correlation rather than a causation between TRIA and the number of demanders and suppliers. Thus, as more empirical data is published, future research should focus on establishing a causation between these two.

Furthermore, the data suggested that TRIA corrected to a large extent for the problem of negative externalities. Since TRIA had a positive effect on coverage purchased, this would deal with the negative externality on U.S. economic growth. The increase in coverage purchased would result in fewer cancelled or postponed construction projects and fewer companies being denied loans by banks. However, I was unable to find empirical data on cancelled or postponed construction projects and denied bank loans before and after TRIA. Future research could focus on establishing a stronger relationship between TRIA and negative externalities.

The data compiled by the U.S. Department of the Treasury illustrates that TRIA failed to address the problem of symmetry of disinformation. In the post-TRIA era, government intervention did not correct for this problem since the market continued to offer inefficient premiums. In 2004, the cost of terrorism coverage was either virtually the same or greater for low-risk policyholders as compared with high-risk policyholders. However, it should be noted that I used average costs shares to study premiums. Future research could try to look at premiums by using premiums per dollar of property insured. It would be interesting to see whether similar results are attained with different measures of premiums.

I argue that adverse selection caused the inefficiency in premiums because it prevents insurers from spreading the risk between high- and low-risk policyholders. I suggest that making the purchase of terrorism coverage mandatory for companies in the United States will eradicate the adverse selection problem. Since both high- and low-risk policyholders will be obligated by law to purchase terrorism coverage, insurers will be able to spread premiums among both types of policyholders. Sustaining this market

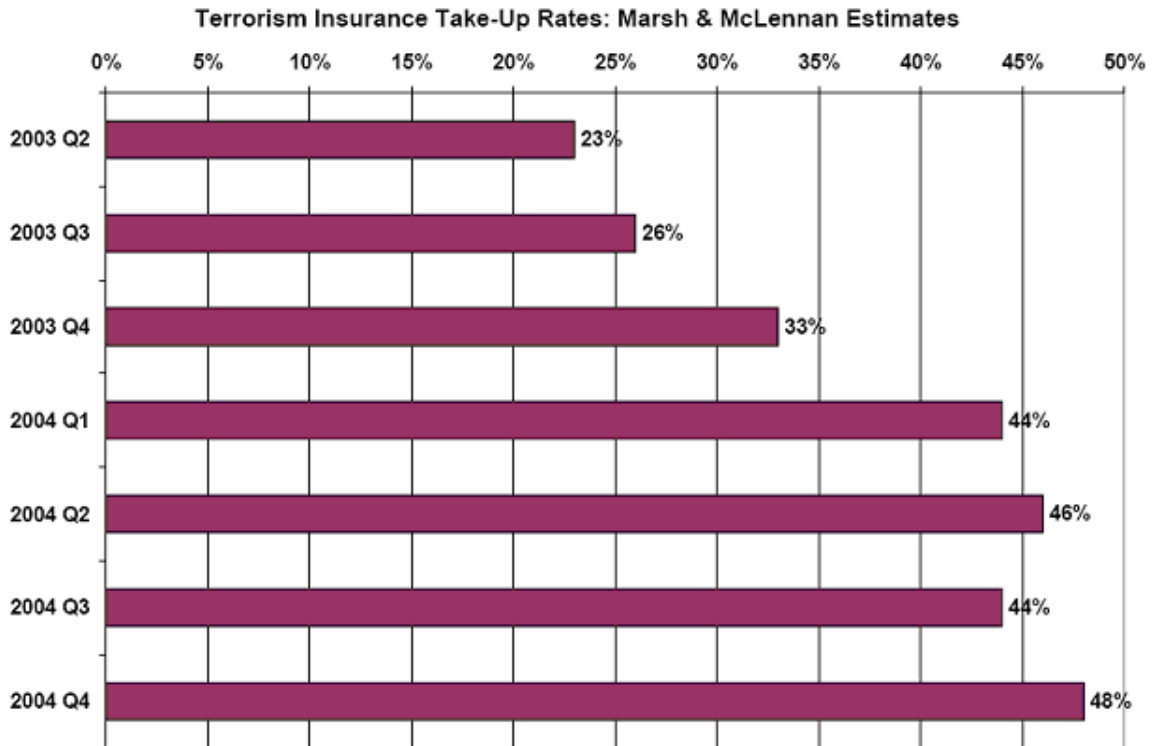
under the new requirement of mandatory terrorism coverage would involve the creation of a governmental institution responsible for determining efficient premiums. Under the supervision of the U.S. government, which is the only entity with considerable knowledge on terrorist activity, this institution would be able to justify differences in premiums based on each policyholder's risk. The mandate of terrorism coverage and development of this new governmental institution can correct for the inefficient premiums observed in 2004. However, it should be stated that I do not actually believe that absolutely all U.S. companies should be obliged by law to purchase terrorism insurance. For instance, I would not argue for a small chain of stores in Omaha to be obliged by law to purchase coverage. Coverage should be mandatory only for some types of companies. Maybe the cutting point should be the book value of a company's building. If the book value of a building is over a certain level, then the company should be obligated by law to insure it against terrorist attacks. Future research should focus on this cutting point for mandatory terrorism coverage.

In addition to mandatory terrorism coverage, the government should also continue to gradually back out from this market. TRIEA's enactment is a step towards the right direction. It is imperative that the public sector does not incapacitate the ability of the private sector to take control of this market one day. The government intervention should facilitate the development of private solutions rather than substitute for them. TRIEA should be considered to be a temporary solution since the most efficient market involves minimal government intervention. The vision of this market should be to stand up on its feet one day with minimal help from the government.

The United States continues its war against terrorism by occupying Iraq. It is also considering its military options in case diplomacy does not prevent Iran's nuclear program from further developing. In an era when U.S. foreign policy can greatly encourage future terrorist attacks, the government should work together with the insurance industry and companies to strengthen the U.S. market for terrorism insurance. Only then will the United States be certain that its economy will be able to rebound again from a future terrorist attack. By ensuring the short- and long-term well-being of its terrorism insurance market, the United States secures the prosperity of its economy and can, thus, focus on its foreign agenda with less distractions and uncertainties.

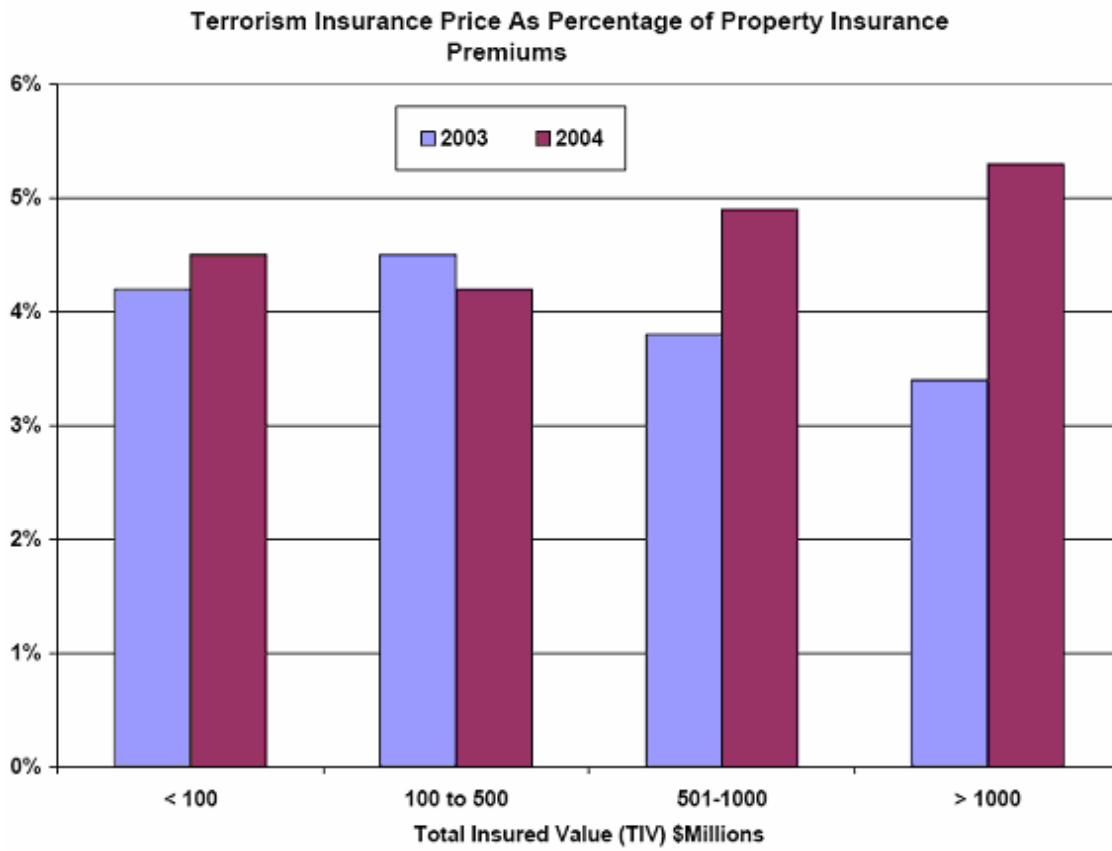
Appendix

A.



Source: Marsh (2005a).

B.



Source: Marsh (2005a).

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