Insuring Against Terrorism: The Policy Challenge

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This Draft: February 2, 2004

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1. Introduction

The terrorist attacks during the past decade in London, Israel, the United States and elsewhere have spurned an interest in understanding not only how governments can mitigate terrorism risk but also how governments might help finance future losses. A burgeoning academic literature – and, not surprisingly, an intense lobbying effort by various industries -- has argued that government assistance is needed due to a host of problems: The large size of potential losses; the difficulty of pricing the losses; the government's already-existing role as the guarantor of last resort; asymmetric information; the relationship between terrorism losses and government military policies; and other reasons. These arguments served as an important catalyst for the Terrorism Risk Insurance Act (TRIA) that President Bush signed into law in November, 2002. Although TRIA's passage was held up in Congress for almost a year over a debate on limiting tort actions, TRIA was supported by Democratic and Republican leaders.

Over the past 50 years, the public has accepted a larger role for the government in insuring *natural* catastrophic losses (Moss, 1999, 2002). The general acceptance of the U.S. government's role in financing *non-natural* terrorist losses, therefore, is probably not surprising, especially since the losses are partly in the government's control.

This paper takes a contrarian view. I argue that *mostly unfettered* insurance and capital markets are capable of insuring large terrorism losses, even losses 10 times larger than the $40 billion loss that occurred on September 11, 2001. A $400 billion loss in capital markets is common. U.S. capital markets alone routinely gain or lose $100 billion on a *daily* basis, and often several *trillion* dollars on a monthly basis. Moreover, a significant amount of these risks can be traced to new companies that have very little

history or close substitutes with which investors can accurately assess future earnings. Furthermore, a significant amount of net earnings of most corporations are influenced by the government's non-military policies through a vast sea of tax regulations, oversight regulations and torts. Despite these numerous problems and government policy risks, investors provide enormous liquidity to U.S. firms, producing one of the most efficient mechanisms for financing risks that has ever existed in the history of the world. Product and environmental liability markets have also remained vibrant despite shifting court standards during the 1970s and 1980s that generated large, correlated losses to insurers. Indeed, shifts in legal standards are probably less predictable than many terrorist acts.

So why do insurers *appear* to have a hard time providing insurance against a large loss that is "chicken scratch" in comparison to daily losses in other capital markets? This paper argues that capital and insurance markets are not the blame. Rather, if there is any "failure," it rests with *government* policies. Government tax, accounting, and regulatory policies have made it costly for insurers to hold surplus capital. They have also hindered the implementation of instruments that could securitize the underlying risks. In other words, the "market failures" that appear to justify government intervention into the terrorism insurance market could be best viewed as "government failures." Correcting these policies would likely enable private insurers to cover both terrorism and war risks.

To be clear, the purpose of this paper is not to be provocative. In general, I believe that government policy -- including progressive income taxation -- can sometimes play an important role in enhancing risk sharing (Nishiyama and Smetters, 2003). Indeed, one of the justifications for the government's largest historic intrusion into insurance markets -- the creation of the Social Security system -- is that people are either

too myopic (if they don't anticipate retirement) or too smart (if they strategically under-save in order to rely on public aid) for their own good or the good of society. But the idea that government tax and regulatory policies could frustrate the development of insurance markets and securitization should not be surprising. For example, whereas the Commercial Mortgage Back Securities market was very small a decade ago, deregulation and tax reforms played an important role in its phenomenal growth over time (Riddiough and Chiang, 2003), reaching a new record issuance of almost $100 billion in 2001.

Rather than adopting a particular political view, I approach this topic with an eye toward identifying deviations from the First Welfare Theorem (FWT) of economics. The FWT shows that the private market without government is Pareto efficient unless property rights fail (e.g., externalities), or if trading markets are incomplete – such deviations are generically referred to as "market failures." Section II documents many of the ways that private insurance markets appeared to have "failed" after September 11, 2001, which helped motivate the creation of the TRIA legislation, which is discussed in Section III. The market reaction to TRIA is then discussed in Section IV.

Section V critiques several theoretical arguments in favor of government-subsidized terrorism insurance. The most common arguments lack a clear explanation of why the FWT theorem fails and how the government can cover terrorism losses more efficiently: To rationalize government intervention, it is not enough to simply argue that the private market has a difficult time insuring terrorism losses. Probably the most compelling argument for government intervention stems from incomplete markets between generations. But, even here, general-equilibrium considerations suggest that the

government's optimal policy might be radically different – in fact, completely *opposite* -- from the subsidized insurance approach taken in TRIA. Section VI concludes.

II. Insurance Markets Before and After September 11, 2001

In theory, the Terrorism Risk Insurance Act of 2002 was a response to the inability of the insurance industry to provide coverage against terrorist acts. Before turning to how the insurance industry reacted to the terrorist acts of September 11, 2001, this section first discusses the provision of terrorism insurance before these attacks.

The Insurance Industry Prior to September 11, 2001

It has often been noted that terrorism coverage was essentially provided for "free" before September 11, 2001 as a part of standard commercial property-causality policies since these policies did not contain specific terrorism exclusions.[1] This claim was buttressed by Warren Buffet's admission in a letter to Berkshire Hathaway shareholders that he and management did not even price terrorism losses into its premium structure.[2]

It is not obvious, however, that major insurers, much less Mr. Buffet, failed so miserably. Indeed, Buffet already had some experience with large catastrophic (cat) exposures in the past: Just five years earlier in 1996, he wrote a $1.5 billion reinsurance contract that provided reinsurance to the Californian Earthquake Authority. It is especially unimaginable that any insurer of the World Trade Center (WTC) itself would have never considered the possibility of *another* attack. Just 8½ years earlier on February 26, 1993, a 1,200 pound bomb exploded inside of a rented Ryder van positioned in the WTC's parking garage, producing about $550 million in insured losses. When the attack

mastermind, Ramzi Ahmed Yousef, was eventually captured in February, 1995, he announced his only regret: The 110-story tower did not collapse into its twin tower as planned. The entire WTC complex, therefore, was clearly a marked target for terrorists. The second WTC bombing in 2001 was also the culmination of over a dozen terrorist attacks on U.S. interests, although mostly foreign, during the previous decade.

One possible explanation of the insurance industry's ex post "plea of ignorance" following September 11, 2001, was that it was an integral part of their lobbying strategy to secure a government subsidy to finance future losses. After all, it is hard to argue for a government subsidy for losses that are "hard to predict" if you rationally anticipated the vicious attacks on that day. But, in light of the earlier bombing, this plea seems to lack credibility *unless* insurers believed that they were not on the hook for a larger loss.

Another complementary explanation, therefore, is that, prior to September 11, 2001, insurers believed that a larger and more coordinated attack, like the one that actually occurred on September 11th, could have only been a bi-product of a larger "act of war" that is expressly excluded under most commercial general liability policies. Since the Vietnam War, war exclusions have been written very broadly by including "declared or undeclared" sub-clauses intended to bar claims even if the U.S. Congress does not formally declare war under the Article I, Section 8, of The U.S. Constitution. Most war exclusions also include sub-clauses such as "warlike operations" that attempt to exclude the types of acts that would normally be part of a war, such as a large coordinated attack.

The legal applicability of war exclusion clauses appears to hinge on whether the violent action was taken under the direction or knowledge of a sovereign nation. (Pan American World Airways, Inc. v. Aetna Casualty & Surety Co., 505 F.2d 989, 2nd Circuit

1974, applying New York law; Holiday Inns, Inc. v. Aetna Insurance Co., 571 F. Supp. 1460, 1499 – 1503 S.D.N.Y. 1983). In particular, the U.S. 2nd Circuit Count found in Pan American that the hijackers of a single aircraft "were the agents of a radical political group, rather than a sovereign government" (Id. at 1015) (upheld on appeal).

In the case of September 11, 2001, insurers could have argued, maybe consistent with their expectations, that such a large and coordinated attack *did*, in fact, require and receive the help of a sovereign nation. The Afghanistan Taliban government was clearly complicit in the actions of Osama Bin Ladin and al-Qaeda by providing them with land and the resources to train for terrorist attacks. For example, President Clinton signed an Executive Order in 1999 prohibiting transactions with the Taliban "for allowing territory under its control in Afghanistan to be used as a safe haven and base of operations for Usama bin Ladin and the Al-Qaida organization who have committed and threaten to continue to commit acts of violence against the United States and its nationals."[3] The Taliban always understood that al-Qaeda intended to harm the U.S. While in Afghanistan, Bin Ladin issued numerous Fatwahs before 2001 urging attacks on the U.S.:

> "We -- with God's help -- call on every Muslim who believes in God and wishes to be rewarded to comply with God's order to kill the Americans and plunder their money wherever and whenever they find it. We also call on Muslim ulema, leaders, youths, and soldiers to launch the raid on Satan's U.S. troops and the devil's supporters allying with them, and to displace those who are behind them so that they may learn a lesson." (In Al-Quds al-'Arabi, February 23, 1998.)

The relationship between the Taliban and Bin Ladin was certainly less than arms length. Although Bin Ladin has never been directly tied to the 1993 WTC bombing, evidence linked him to 1997 truck bombing of the U.S. military barracks in Khobar, Saudi Arabia, and some earlier attacks. After a retaliatory attack by the U.S. military on Afghan training camps as well as a Sudan pharmaceutical plant in 1998, the Taliban leadership demoted Bin Ladin's status from an "official guest" to simply a "guest." However, the change in rhetoric rang hallow with the rest of the world: While Mullah Mohammed Omar was the Taliban's spiritual leader, it is widely accepted that Bin Ladin was the movement's financier and de facto political leader.[4] After the 2001 U.S. attack, Omar along with the Supreme Council continued to accept Bin Ladin as a guest even though it ensured a war with the U.S. The Taliban prepared the Afghanistan people:

> "Stay united and prepare for jihad against U.S. invaders" (Taliban's Bakhtar News Agency reported, quote by The Associated Press, September 18, 2001)

For insurance policy purposes, the Taliban appears to have been "a sovereign government" at the time of the 2001 attack. To be sure, the United States has never officially recognized the Taliban as the rulers of Afghanistan. However, thirty years earlier, the U.S. government also did not officially recognize the North Vietnamese government during the Vietnam War, a conflict that motivated much of the broad language in the modern war exclusions. Moreover, the 1999 Clinton Executive Order noted above gives de facto political status to the Taliban: "the term 'the Taliban' means the political/military entity headquartered in Kandahar, Afghanistan that as of the date of this order exercises de facto control over the territory of Afghanistan…"[5]

Indeed, there seems to be little material difference between the Taliban and the "cult-like" Japanese Imperial government in power 62 years ago during the attack on Pearl Harbor. After both attacks, the sitting U.S. President described each one as an "act of war."[6] Moreover, Presidents Roosevelt and Bush received Congressional approval for war, authorizations that would have not been required for defending the country from a gang of terrorists without at least de facto legal standing. In fact, the Afghanistan War had more legal standing with Congress than the Vietnam conflict.

If there was any "failure" on the part of insurers, it was probably their lack of understanding how difficult it would be to enforce war exclusions ex-post in the presence of some potential ambiguity regarding their meaning. First, ambiguity tends to be resolved by courts in favor of the insured rather than insurers, and so insurers were not guaranteed a victory despite the strong connection between the Taliban and al-Qaeda. Insurers, therefore, were not willing to risk a loss in face of a potential enormous public backlash. Indeed, insurance companies are generally very sensitive to public perception about them. For example, after the Vietnam War ended, most life insurers dropped war exclusions from their policies and, for example, paid death benefits to families of military personnel killed during the Gulf War. After the WTC attack, insurers had no real choice but to take the "high ground," a decision for which they received only limited fanfare -- mostly self-generated in the form of newspaper ads. If I were an insurer, I would have unquestionably also paid the claims. Second, insurers received pressure from the Administration along with hope for a subsidized backdrop for future losses.

Reaction of Insurance Market after September 11, 2001

After the terrorist attacks on September 11, 2001, an extreme "hard market" for terrorism-related losses emerged. By February, 2002, 45 states had approved terrorist loss exclusions in commercial policies; the exceptions were California, Florida, Georgia, New York, and Texas (GAO, 2002*a*). Fire losses produced by terrorists' acts, though, were not excluded. For other lines such as workers compensation and personal lines such as life insurance, exemptions were not typically allowed. The approved commercial terrorism exclusions formalized what many insurers had probably previously taken for granted: They were not responsible for losses caused by "warlike" actions.

While major insurers of small and medium-sized risks with annual premiums below $1 million, including Travelers Inc., typically did not write terrorism exclusions into property-causality policies for non-landmark properties,[7] exclusions began to be routinely enforced in 2002 for larger and more obvious targets. An anonymous survey by 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: 24 office projects, 10 retail projects, 8 apartment buildings, 6 hotel and industrial projects, and 3 mixed-use developments.

To be sure, it is likely that many of the postponed projects were on the verge of being delayed anyway due a sharp reduction in commercial fixed investment before September 11, 2001:[8] increased insurance costs were probably at most "tip factors" for delay. Moreover, even if this suspended activity was mostly due to terrorism concerns, it constituted only a small fraction of the almost $4 trillion in annual commercial and residential combined construction. Still, commercial construction activity had started to

shrink before September 11, 2001, and so the terrorist attacks only seemed to make things worse. The President argued that "300,000 jobs" hung in the balance unless Congress passed a government backdrop.[9] New York Democratic Senators Chuck Schumer and Hilary Clinton also had a vested interest in government action.

Not only were some new projects cancelled or put on hold, some existing ones found it hard to obtain terrorism coverage when they renewed their policies in 2002. A 2002 survey by The Risk and Insurance Management Society, which represents larger companies and is a leading proponent of a federal government terrorism insurance backdrop, found that two-thirds of its respondents (about 14% of those surveyed) had no terrorism coverage. The Miami Dolphins and New York Giants and some other NFL teams were unable to insure their stadiums. Amtrak also went without terrorism coverage when its $500 million property insurance policy came up for renewal on December 1, 2001. Amtrak claimed that it was not able to get enough coverage at reasonable rates.

In many other cases, terrorism coverage was eventually obtained but at much higher premium costs and with less coverage. Just days before the Salt Lake City Games were to begin on February 9th, 2002, the U.S. Olympic Committee (USOC), for example, was able to secure terrorism coverage equal to only five percent of its expiring general liability limit. Yet it paid the full price of its former broader coverage, for about a 20-fold increase in cost per dollar of coverage. It agreed to these terms only because 40 different insurance companies previously refused coverage. The Mall of America was finally able to re-obtain terrorism coverage in March, 2002, but with severely restricted limits and at much higher costs (the owner is prohibited from discussing exact details). While, as the old legalese cliché goes, "hard cases make bad law," the seemingly

uninsurable nature of some of the nation's preexisting commercial and non-commercial landmarks provided further motivation for a government subsidy.

While the prices of commercial property-liability insurance were beginning to rise prior to September 11, 2001,[10] the terrorist attacks appeared to harden the general liability market even more. The Golden Gate Park, for example, was unable to obtain terrorism coverage and yet saw its premiums for *non-terrorism* coverage rise to $1.1 million in 2002 from $500,000 in 2001. Moreover, coverage was reduced from $125 million to $25 million. The magnitudes of this price increase and coverage reduction, however, were *not* common in most other commercial policies that where less obvious terrorist targets. Insurers likely sharply increased premiums even for non-terrorism losses for potential targets like The Golden Gate Park because of the potential legal ambiguity of loss classification ex-post. Insurers are understandably cautious. During the previous two decades, insurers suffered large environment liability losses when courts began limiting the applicability of "sudden and accidental" clauses that were intended to exclude fairly predictable and, hence, non-insurable toxic emissions (e.g., City of Albion v. Guaranty National Insurance Co., No. 1:98-XC-676 [W.D. Mich. Oct., 15, 1999]). Similarly, many insurers would reasonably be concerned that they would be forced to pay for a seemingly violent act that they believed was excluded under their policies.

Toward the Creation of a Federal Backdrop

With just a few days after September 11, 2001, insurance company officials met with U.S. Treasury officials and then with the President at the White House. Being one of the few Treasury officials in the first consultative meeting with the insurance

executives, it was fairly clear to me that the initial mood among policymakers within Congress and the Administration was quite favorable toward providing a government backdrop, with only a couple exceptions. The insurance executives understood that as well. Since prominent members of both of the major political parties, including Democratic then-Senate Majority Leader Daschle and the President, agreed on the need for a backdrop including, its creation was not really in doubt early on.[11]

This initial optimism was dimmed somewhat by a House-Senate disagreement that emerged on tort liability. The Republican-majority House wanted to limit tort actions while the Democrat-majority Senate objected. Republicans hoped that prominent Democratic senators from states with large cities would eventually blink. Senate Democrats, however, recognized that the federal backdrop was an integral part of the President's job creation program. Since Democrats were not in a hurry to secure an agreement before the 2002 midterm elections, they wanted the Republicans to concede. In the end, Democrats essentially won: The language on tort limitations was eased in conference committee after the midterm elections -- even though Republicans knew at that point they would soon control both chambers, in January, 2003. The President signed the Terrorism Risk Insurance Act (TRIA) of 2002 on November 26, 2002.

<u>But Did Insurance Markets Really Fail So Badly?</u>

A major part of the impetus in Washington toward reaching an agreement in the fall of 2002 was a major lobbying effort by representatives of construction unions, business executives, realtors, and insurers armed with "evidence" of higher premiums and lower coverage levels such as the anecdotes mentioned above. Often their facts were

outdated or misleading. For example, an often-cited September 4, 2002, survey by the Real Estate Roundtable claimed that terrorism coverage accounted for *42 percent* of insurance premiums among "survey respondents who reported being able to obtain terrorism coverage."[12] The Real Estate Roundtable, however, failed to disclose in their press release that their "survey" was unscientific (almost anyone can answer Roundtable surveys by going to their website) and not even remotely representative of the market conditions in September, 2002. Other industry groups -- The Financial Services Roundtable, the American Insurance Association, and the Coalition to Insure Against Terrorism -- also presented gloomy statistics, often focusing on isolated "hard cases."[13]

A more objective reading of the facts, however, paints a very different picture. By September, 2002, premiums dropped as much as 75 percent per unit of coverage from the beginning of the year. Limits as high as $1 billion were available and were increasing over time.[14] At least 10 startup insurers were formed (Guy Carpenter, 2003) and other insurers continued to add capital. Two months before TRIA become law in November, 2002, insurers already added $30 billion of capital with another $10 billion in new issues pending. Moreover, even the Building Owners and Managers Association, a proponent of TRIA, acknowledged that three-quarters of larger commercial and residential building owners had secured terrorism coverage.[15] The Shadow Financial Regulatory Committee, an independent group of leading U.S. academic scholars and experts, concluded,

> "private insurance, reinsurance, and lending markets have made and are continuing to make substantial progress in adjusting to the post-September 11 world. Given those developments, the case for a federal backstop for terrorism insurance, which was not clear-cut late last year, is certainly less compelling

now." (Shadow Financial Regulatory Committee, Statement No. 182, "A Proposed Federal Backstop for Terrorism Insurance and Reinsurance", 9-23-02)

It was not even clear that the supply restrictions in early 2002 provided much evidence of an insurance market failure as opposed to a *government* failure. Quite impressively, insurers raised $21 billion only three months after September 11, 2001 in order to replace lost capital (Morgan Stanley, 2001). But the appearance of a general agreement of a government backdrop in late 2001 likely slowed the entry of *even more* capital into the insurance industry, thereby itself creating "evidence" in support of the need for the backdrop – a "self-fulfilling prophecy." Taxes on insurer's capital income alone would naturally discourage insurers from raising much capital "just in case" Congress failed to pass a backdrop. Moreover, as discussed later, the inability to have previously securitized these risks created added pressure. A similar type of "expectations effect" had previously been a concern with the investment tax incentives – i.e., anticipation of future incentives reduces investments immediately -- that were passed earlier in 2001. The Bush Administration dealt with this problem by allowing the tax incentives to cover investments in 2001 done prior to the passage of the legislation. No clear mechanism existed, however, for government-backed terrorism reinsurance.

A sharp short-term reduction in insurance supply also followed Hurricane Andrew in August 1992 which caused $15.5 billion in insured losses (Froot and O'Connell, 1999). Reinsurance rates increased 75 percent between January 1992 and July 1994. Primary insurers and state regulators lobbied Congress and the Clinton Administration intensely for a federal backstop (CBO, 2001). Five Congressional bills were introduced

over the next several years -- which likely slowed the inflow of capital into the market -- although none became law. Within five years, though, the capacity available for paying for catastrophes was almost double relative to before Andrew.

While landmark targets, in particular, faced higher premiums after September 11th, it's not obvious that even these "hard cases" reflected a market failure. Indeed, theoretically, insurance supply restrictions can be an efficient short-run response of insurers operating within a dynamic setting with implicit contracts if moral hazard exists in the loss adjustment phase (Doherty and Posey, 1977; Doherty, Lamm-Tennant and Starks, 2003). Such "ex-post moral hazard" could be especially relevant for the almost $10 billion in business interruption claims produced by the WTC attack (Morgan Stanley, 2001) that are difficult to verify. Three additional factors are worth considering.

First, soon after September 11, 2001, insurers increased their subjective priors of another attack. Even fair premiums would be expected to significantly increase if insurers believed that the world fundamentally changed on September 11, 2001, as did many Americans. Insurers were likely especially averse to the short-run *ambiguity* about the underlying loss probability *distribution* (Kunreuther, et al, 1995; Cummins and Lewis, 2003), which could produce even higher premiums (although Froot and Posner, 2002, argue that this secondary effect is probably small for some cat exposurers). This aversion is not itself inefficient unless the government can more accurately estimate loss distributions, which I doubt (Section V). While large insurers could have quoted higher premiums for landmark properties – the values of the properties themselves being obvious upper bounds -- insurers would have been accused of "price gouging," which might have triggered a regulatory response. Already many states started to regulate

terrorism premiums in commercial lines; it made little sense to antagonize the regulators even more.[16] Hence, insurers chose to "close the pumps" rather than sell "gas at $10 a gallon." Large insurers could also then be victims instead of victimizers. Very few large insurers defected from this strategy in the short run.

Second, after September 11th but before TRIA, the government *might* have bailed out uninsured landmarks if yet *another* attack occurred (although see the caveats discussed in Section V). This type of moral hazard was first referred to as the "Samaritan's dilemma" by Nobel laureate James Buchanan (1975) and has received a large amount of attention in the subsequent public finance and insurance literature. The idea is as follows. The "Good Samaritan" (here, the government) wants to help after a loss, but, in so doing, creates a moral hazard problem by encouraging inefficient risk taking by those who are implicitly insured – hence, the "dilemma." The possibility for ex-post financing of losses by the government would have reduced the shadow premiums that property owners were willing to pay to a level below the minimum reservation price across insurers. It, therefore, might have made little sense for insurers to offer policies – even if fairly priced -- that would likely be rejected by property owners, especially when the offers themselves could be potentially detrimental to the image of insurers.

Third, and probably most importantly, some of the evidence of a "supply restriction" based on low take-up rates might be better interpreted as evidence of low demand. Indeed, it is likely that it is *not* even efficient for many property owners to purchase terrorism insurance. Most landmark and large properties are owned by diversified shareholders whose demand for insurance mainly stems from asymmetric information problems and the costs associated with financial distress. As discussed in

Section V, these motives are less important for terrorism risks relative to other risks, and they are likely to be dominated by large underwriting and loss adjustment costs. Indeed, as discussed in Section III, the demand for terrorism insurance has not increased much even *after* the TRIA subsidy even though the pricing has been fairly good.

III. The Creation of a U.S. Federal Backdrop

This section outlines the TRIA bill that was signed into law in November of 2002 as well as potential alternatives that were also considered.

The Terrorism Risk Insurance Act (TRIA) of 2002

Although The Terrorism Risk Insurance Act (TRIA) of 2002 does not impose any pricing requirements on insurance companies, it does require them to provide coverage for "certified"[17] foreign acts of terrorism in property and causality lines under the same conditions as the underlying policy. For example, if the policy covers business interruption for non-terrorism losses then it must provide the same coverage for terrorist losses. Although TRIA gave the Treasury Secretary discretion to extend this mandatory coverage to group life contracts, Treasury announced on August 15, 2003, that it did not see a need to do so (United States Treasury, 2003). Moreover, as recently clarified by the Treasury, the "make available" also rule does not require insurers to provide protection for chemical, biological or radioactive losses if such exemptions are allowed for non-terrorism losses under state law or if the insurer is outside direct State regulatory oversight (Federal Register, 2003). The "make available" rule expires at year-end 2004 but the Treasury Secretary can extend it one year until year-end 2005.

In exchange for this mandate, the federal government agreed to indemnify 90 percent of the insurer's losses above a retention level equal to 7% of direct earned premiums in 2002. This retention level is scheduled to increase in 2004 to 10% of 2003 direct earned premiums. In 2005, the retention will increase to 15% of the 2004 direct earned premiums. Covered losses, however, are limited to $100 billion; Congress can use its discretion in financing losses above that amount.

The TRIA subsidy is financed out of general revenue. But, similar to state-level guarantee funds, the Treasury Secretary can recoup some of the government's losses with policyholder surcharges provided that the aggregate value of these charges plus the retention of insurers falls below $10 billion in 2003; this limit is scheduled to increase to $12.5 billion in 2004, and to $15 billion in 2005, when TRIA sunsets.

TRIA contains very few of the restrictions on tort claims that were originally desired by Republicans. Instead, TRIA established an exclusive federal cause of action for claims arising from a certified terrorism attack and it consolidates all claims into a federal district court where the attack occurs. It also bans the federal government from paying punitive damages awarded by courts in actions certified under TRIA.

Key Elements of TRIA

The Administration's original terrorism insurance proposal, which provided the framework for the bill passed in the Senate (S. 2600), did not include a mechanism for charging the private sector for any of the government's liability either ex-ante or ex-post, which, not surprisingly, drew the ire of academics (e.g., Cummins, 2001). This free coverage was largely motivated by the Treasury Secretary who made it very clear in

public that he viewed the backdrop as a financial obligation of the government stemming from its war on terrorism. In contrast, the Council of Economic Advisers as well as some other members of the Administration initially argued for explicit pricing of the coverage. The Administration, though, was also interested in a "receding" plan that would sunset: an *ex-ante* pricing mechanism would require forming a new bureaucracy that could later attempt to justify its continued existence before Congress -- egged on, of course, by industry. In sharp contrast, the pre-conference House bill (H.R. 3210) was mostly a loan program financed by *ex-post* assessments on insurers as well as premium surcharges, which eventually mostly found their way into the legislation but with stricter aggregate caps. While ex-post assessments do not control moral hazard as well as risk-based ex-ante premiums, they require less government involvement. State-level guarantee funds (except in New York) also rely on ex-post assessments.

The Administration's original proposal did, however, cap covered losses at $100 billion. During the pre-decisional phase, I originally believed that a ceiling on the government's liability wasn't needed because the government would already be "on the hook" for larger losses. A phone call to David Cummins at The Wharton School, however, quickly changed things. Cummins pointed out that this reasoning cut both ways: if the government is really implicitly obligated for large losses anyway, then it makes more sense to give the government some more flexibility. He suggested a cap of $100 billion, a feature that was immediately incorporated into the proposal.

The small deductible in TRIA reflected the Treasury Secretary's publicly-stated belief that terrorism coverage was the obligation of the government. In sharp contrast, the Council of Economic Advisers initially argued for a much larger deductible.

The overarching designing principle of TRIA was that it would only provide help on a temporary basis to the private insurance market. Whether TRIA will really go away as planned in 2005, however, is unclear. Not surprisingly, several industry groups hope that that TRIA will be extended after it officially sunsets. If history is any guide, they might get their wish. Indeed, TRIA is not so different than the 1957 Price-Anderson Act (42 U.S.C. 2014) almost a half century earlier which provided third party "public liability arising from a nuclear accident." The Price-Anderson Act relied on pro-rata ex-post assessments on 110 nuclear reactors if damage from a nuclear incident exceeded the $200 million insurance policy limit that each reactor was required to purchase. The Act also capped the ex-post assessments (at $10 million per reactor) and contained some tort reforms. This Act was originally designed to last for only 10 years with the hope that the private sector would eventually provide coverage. But the Act was renewed and amended in 1966, 1969, 1975, 1988, and eventually expired on August 1, 2002. The Energy Policy Act of 2003 (H.R. 6) would extend the Price-Anderson Act until 2023.

Possible Alternative Designs

Shortly after September 11, 2001, insurance executives lobbied the Administration and Congress for a reinsurance pool ("Pool Re"). In theory, insurers would agree to create a $10 billion pool; the government would cover terrorism losses above that amount. The Pool Re approach had some precedence. The British government, for example, established a Pool Re in 1993 to finance terrorism losses after terrorist bombings in London in 1992 and 1993 that produced $1 billion and $500 million in insured damages, respectively. The British Pool Re *appears* to be working fine,

although its efficiency has been questioned (Brice, 1994) and it has never been tested by a major loss. But the Pool Re model advocated by U.S. insurance executives differed from the British model in one startlingly way: U.S. insurers evidentially never intended to actually fund the pool! Their plan omitted a schedule of private sector payments into the pool, and they were quite cagy when asked about it. Despite getting some initial traction within the Administration and the Senate, the Pool Re structure was quickly dropped from serious consideration. The pool became viewed as backdoor excessive-of-loss policy with *no* deductible or coinsurance – and a freebie that would likely stick around.

My own preferred "second best" approach for a government backdrop (the "first best" being no backdrop) was for the government to sell excess-of-loss contracts similar to the catastrophic call options that previously traded on the Chicago Board Of Trade. The payoffs in CBOT contracts were linked to aggregate regional or national insured losses as determined by the Property Claims Service. To be sure, the CBOT options, in particular, suffered from "basis risk" due to the imperfect correlation between aggregate losses and an insurer's actual losses (Cummins, Lalonde, and Phillips, 2003). They also suffered from limited capital backing from CBOT, thereby producing credit risk for large trades. The CBOT market might have also suffered from coordination problems discussed below. But these problems were less applicable to the government, especially if they were purchased by reinsurers that held a largely diversified portfolio.

A similar type of plan had been proposed by the Clinton Administration to deal with natural catastrophic losses after Hurricane Andrew, and has been analyzed in Lewis and Murdoch (1996, 1999), Cummins, Lewis and Phillips (1999) and Cummins and Doherty (2001).[18] Like the PCS options, government payouts would have been linked to

an aggregate index of losses rather than firm-specific losses, thereby reducing ex-post moral hazard by eliminating a buyer's incentive to inflate losses. The government could also collect money ex-ante for the protection that it provided instead of passing yet another unfunded liability to future generations in the form a state-contingent guarantee. Using loss probability estimates by the CBO, Russell (2002) estimates that a bill like TRIA is not cheap: It is expected to cost about $6 billion, or about $92,000 per job saved!

Selling excess-of-loss contracts, though, had some practical problems. First, it would have required new regulations for a new auction. Second, the contracts would have generated some basis risk unless the contracts were purchased by reinsurers who were geographically diversified. Most of the larger reinsurers, though, were *foreign*. Since these contracts would have likely been subsidized, this approach would not have sold well with Congress. Third, since the reinsurance market is fairly concentrated, competitive pressures might have been insufficient to ensure that any subsidy would be passed to U.S. ceding insurers. Fourth, as Cummins and Doherty (2001) note, foreign insurers would be hard to audit. Fifth, even if the government collected money ex ante for the backdrop, the money would likely have been added to the "unified budget surplus," thereby allowing Congress to spend it as they had other trust funds (Smetters, Forthcoming). TRIA's eventual excess-of-loss design, therefore, was as a compromise between this ideal market and the Pool Re wanted by insurers.

IV. Demand for TRIA Terrorism Insurance

TRIA was not exactly the legislative outcome desired by U.S. insurers. Their dissatisfaction with TRIA might explain the startlingly empirical results recently found

by Brown, Cummins, Lewis, and Wei (2003). Their paper shows that TRIA appeared to *reduce* insurer share prices at key points in the legislation's consideration, reflecting the possibility that insurers had hoped for something better than TRIA.

Stylized Facts

On the demand side, large property owners do not seem particularly impressed with TRIA either. According to a March, 2003, survey by The Council of Insurance Agents and Brokers, about half of the respondents indicate that fewer than 20 percent of their larger property and casualty clients have purchased terrorism coverage. Related, in June, 2002, Zurich Financial Services, XL Capital Ltd., Swiss Re, Scor, Hannover Re, and Allianz established a new company to insure property against acts of terrorism. The company, Special Risk Insurance and Reinsurance Luxembourg SA, was out of business in just one year due to a low demand for terror coverage. The low take-up rate of TRIA-subsidized terrorism insurance is sometimes interpreted as a sign of the legislation's failure to provide adequate coverage (e.g., Hofmann, 2003).

High prices probably do not explain the low demand for TRIA insurance, especially in light of the fairly generous subsidies. To be sure, in late 2002, some insurers had difficulty purchasing reinsurance to cover their retention and co-payments. However, by May of 2003, the reinsurance market continued to soften, allowing primary insurers to generally follow the pricing guidelines for terrorism coverage established by the Insurance Services Office, an advisory firm to the industry.[19] ISO ranks cities into three risk tiers. Tier 1 includes cities for which the risk of an attack is 100 times more than average: New York, Washington, D.C., Chicago and San Francisco. Tier 2 includes

for which the risk of an attack is 5 times more than average: Los Angeles, Philadelphia, Boston, Seattle and Houston. Tier 3 includes all other cities. As of May, 2003, ISO recommend a 3 cent premium per $100 worth of terrorism coverage in Tier 1 cities. For Tier 2 and 3 cities, the recommended premium was 1.8 cents and 0.1 cent, respectively. An analysis by Marsh Inc. in February, 2003, of about 1,500 accounts representing a range of risks in terms of type and geography shows that terrorism pricing is between 8 – 10 percent of the all-risk premium. Overall, premiums are viewed as reasonable.[20]

Other mechanisms than price, therefore, likely explain the low take-up following TRIA. One possibility is the Samaritan's dilemma mentioned earlier. But this theory is less believable *after* the government made subsidized catastrophic insurance available. While policymakers may continue to bail out homeowners without flood insurance after a flood, they are probably less likely to bail out a large corporation that gambles and loses, except maybe after a very large *cataclysmic* shock (e.g., a thermo-nuclear blast). Instead, we need to first start with a theory of the demand for terrorism insurance.

Theory

It's not obvious that many large firms should rationally even purchase terrorism coverage. Individuals and firms buy insurance for different reasons. *Individuals* purchase insurance to hedge an asset (e.g.., their house, body, or car) that is hard to diversify in the capital market due to moral hazard. But large *firms* affected by TRIA are typically owned by diversified shareholders who should place little weight on firm-specific losses. In fact, with *perfect* insurance and capital markets, insurance is

"spanned" by the portfolio choices made by investors. So, insurance doesn't increase shareholder value (Cummins, 1976; Doherty and Tinic, 1981).

The field of corporate risk management concerns itself with deviations from perfect markets that might explain why firms owned by diversified shareholders purchase insurance. The most important motivations (besides tax incentives) for business insurance focus on a firm's desire to reduce financial distress costs as well as principal-agent problems (see surveys in Doherty [2000] and Meulbroek [2002]).

Financial distress costs include expected bankruptcy costs, which insurance reduces. Another cost of financial distress includes the premiums that a firm must pay for the risks that it imposes on parties that have a non-diversified relationship with the firm (e.g., employees, dedicated suppliers, business customers, and creditors that incurred large underwriting costs). By reducing the chance of bankruptcy, insurance gives non-diversified parties more confidence in the firm's survival, reducing these premiums.

The most important principal-agent problem that insurance helps alleviate is the "underpricing effect" that a firm faces if it instead chooses to self-insure and then raise new capital after a loss. Since shareholders (the principals) cannot perfectly observe the actions of managers (the agents), shareholders might misinterpret a short-term loss for a longer-term loss, i.e., that is more correlated over time. Shareholders, therefore, might incorrectly "underprice" the firm's value after a temporary shock. As a result, managers facing a takeover risk tend to insure against losses that are more *temporary* in nature, which helps resolve this asymmetric information problem (Doherty and Sinclair, 2003).

High underwriting and loss adjustment costs, however, discourages the purchase of insurance. Again, personal and business lines of insurance differ dramatically here.

With *personal* lines of insurance, underwriting and adjustment costs are typically a small share of the premium. The reason is that human beings, cars, and houses are fairly homogenous entities. With just a few variables, an accurate premium can be given in most personal lines, which is why personal insurance can often be purchased over the Internet. With *business* insurance, though, underwriting for lines like general liability is very expensive because the nature of the risks varies dramatically between firms. For example, GM, Inc., is more worried about product liability than Yahoo!, Inc., whereas Yahoo!, Inc., is more worried about copyright infringement and denial of service attacks. Loss adjustment for business insurance, especially business interruption, is also costly. Underwriting and loss adjustment costs can account for a third or more of the premium.

Combining these competing forces, a firm owned by diversified shareholders rationally purchases insurance only if the sum of the benefits from lowering financial distress and principal-agent costs is larger than the underwriting and adjustment costs. Otherwise, foregoing terrorism insurance is efficient and not a sign of a market failure.

Terrorism Insurance is Probably not Efficient for Many Companies

Although I have not yet found exact figures, the marginal costs of underwriting terrorism insurance and loss adjusting are likely to be larger than for other losses even though insurers do not have as much incentive to be aggressive in the presence of TRIA. So, buying terrorism insurance would be rational only if it significantly reduces a firm's financial distress costs and underpricing risks – which I doubt. We consider each in turn.

The most important financial distress cost for many firms stems from its creditors. Traditionally, creditors demanded "full" general liability insurance coverage in order to

ensure repayment. In early 2002, some property owners were in default of their bank loans because they could not find terrorism coverage. Some property owners, including the owners of the Mall of America, appealed for court protection because they believe that the tight market for terrorism insurance was the cause of their non-compliance.

But within 6 months following the WTC attacks – well before TRIA – creditors began to yawn at terrorism exclusions that were being written into some commercial insurance contracts – much like the war exclusions in the past. Indeed, the Federal Reserve's Board of Governor's April 2002 Senior Loan Officer Opinion Survey on Bank Lending Practices found that most creditors have diversified away most of their high-risk properties. About 70 percent of domestic lenders indicated that less than 5 percent of the dollar volume of their commercial real estate loans outstanding (on books or securitized) is backed by "high profile" or "heavy traffic" commercial real estate properties. Another 20 percent of lenders indicate that such loans comprise between 5 and 10 percent of their portfolio; the remaining 10 percent of lenders listed such loans as accounting for 10 to 20 percent of their portfolios. The same survey shows that almost three-quarters of domestic banks require terrorism insurance on less than 10 percent of loans financing even "high profile" or "heavy traffic" commercial real estate properties. Of the few banks that generally require terrorism insurance coverage, the most common response to a lack of coverage was to rewrite the lending contract to require more collateral or to allow for partial coverage. Terrorism insurance was not required for loans less than $10 million.

The Commercial Mortgage Backed Securities (CMBS) market also seemed to relatively unphased by terrorism risk. After CMBS issuance reached a record high of $97 billion in 2001, issuance fell to only $36 during the first half of 2002. While some

observers blamed the weak economy and terrorism risk as the main culprits (e.g., Muldavin, 2002), the ease at which investors can diversify terrorism risks with CMBS suggests that most of the blame probably lied with the weak economy. Indeed, in their Monetary Report to the Congress on July 16, 2002, the Federal Reserve noted that the low risk spreads observed in the CMBS market "suggests that concerns about terrorism insurance have not been widespread in the market for commercial mortgages."[21]

Turning now to underpricing, this problem is important in general. It alone probably motivates corporations to purchase insurance as much if not more than financial distress costs and tax incentives (e.g., Hoyt and Ho, 2000). But the underpricing effect is less important for terrorism losses: A terrorist strike will likely be interpreted by investors precisely for what it is, and not be confused with a larger or shock that is more correlated over time. Hence, the motivation for purchasing insurance is reduced.

V. Is there a rational for government provision of terrorism reinsurance?

A recent and growing literature has examined the potential role of the government as a reinsurer for large catastrophic and terrorism losses and/or the difficulty that the private sector has in insuring extreme events. See, for example, Lewis and Murdock (1996); Priest (1996); Jaffee and Russell (1997); Cummins, Lewis, and Phillips (1999); Cutler and Zeckhauser (1999); Froot (1999); Froot and O'Connell (1999); Gron (1999); Kleindorfer and Kunreuther (1999); Lewis and Kevin C. Murdock (1999); CBO (2001); Cummins and Doherty (2001); Froot (2001); Moss (2001); American Academy of Actuaries (2002); Brown, Kroszner and Jenn (2002); General Accounting Office (2002); Kunreuther (2002); Russell (2002); Brown, Cummins, Lewis, and Wei (2003); Cummins,

David J. and Christopher Lewis (2003); Doherty, Lamm-Tennant and Starks (2003); Kunreuther, Michel-Kerjan, Porter and Woo (2003); Kunreuther, Michel-Kerjan, Porter (2003); and, Woo (2003). Although is not obvious that private insurance markets failed after September 11th, this section argues that any problems probably stem from a failure in *government* policies. A mostly unfettered insurance market combined with sensible government policy should be able to provide insurance against terrorism and war losses.

Future Losses are Difficult to Forecast

The most popular argument that has been put in favor of government-subsidized terrorism insurance is that private insurers have a difficult time constructing loss distributions for future terrorists due to a lack of *reliable* time series evidence. The emphasis on "reliable" is important because a time series on losses from past terrorist attacks *does* exist, as documented in Blomberg et al (2003). Unlike most losses, though, terrorists avoid past techniques in order to increase their likelihood of a costly attack. These strategic choices render the time series evidence less reliable. In statistical language, the time series of terrorism losses is fraught with "structural breaks."

This argument, however, does not *alone* support a role for the government since it does not explain why the government can do a *better* job financing the losses. The government's main advantages stem from its superior access to information and its ability to tax, both of which we consider in more detail below. But the argument that the private market sector has difficultly insuring losses does not alone rationalize government action.

Prevalence of Other Risky Markets

Indeed, many private markets seem to work fine despite the apparent lack of reliable time series evidence. The market for *Initial Public Offerings*, for example, has raised *trillions* of dollars in venture capital even though most IPO underwriters have no concomitant time series or close substitutes upon which to reply. Furthermore, a significant amount of net earnings of most corporations are influenced by government policy. For example, Kemsley and Nissim (2002) show that about 10 percent of the value of U.S. firms can be traced solely to the tax deductibility of corporate interest payments on debt. Yet investors provide enormous liquidity to U.S. firms.

Indeed, capital markets routinely take bets on very novel risks. For example, while models of hurricane losses are becoming better over time, *earthquake* models are still in their infancy. Yet a private market exists for insuring earthquake losses even outside of state-level subsidies. In 1996, National Indemnity, the super-cat reinsurance unit of Berkshire Hathaway, underwrote the California Earthquake Authority (CEA), with a three-year $1.5 billion reinsurance contract.[22] Cat bonds have also been devised to insure against losses earthquake losses in the U.S. Midwest and in Tokyo and other regions. *Commercial aircraft and satellites* were insured long before a viable time series on losses became available (Borch, 1990). The *marine insurance market* developed long before accurate weather models became available (Jaffee and Russell, 1997).

Environment liability insurance also operates in a highly uncertainty setting since courts often change standards, producing large *correlated* losses for insurers (Viscusi et al, 1993). Although estimates before 1991 are less reliable,[23] estimates of total losses for abandoned hazardous waste sites and asbestos through just 1995 are as high as $150

billion.[24] Most of these payments were indemnified under occurrence-based insurance contracts written before 1986 and were not reasonably anticipated by insurers.[25] Yet the Commercial General Liability insurance market is still vibrant. To be sure, "absolute" environmental exclusions are now being routinely written into new CGL policies. But those exclusions were a response to the courts narrowly interpreting "sudden and accidental" exclusions intended to exclude pollution that was more deterministic in nature. Environmental protection is still available through "environmental impairment liability" policies that cover all emissions whether "sudden and accidental" or not.

The *product liability* insurance market also operates in a very unpredictable environment. This market became very unpredictable ever since the 1981 famous mass tort case, Grimshaw v. Ford Motor Company, which awarded $128 million ($125 million in punitive damages), the largest jury verdict ever in a personal injury case at that time. The jury found Ford negligent by putting aside cost-benefit safety analysis demonstrating that the cost of a safer gas tank *exceeded* the marginal benefit. Their reasoning was upheld on appeal (Grimshaw v. Ford Motor Company [1981] 119 Cal. App. 3d 757):

> "There was evidence that Ford could have corrected the hazardous design defects at minimal cost but decided to defer correction of the shortcomings by engaging in a cost-benefit analysis balancing human lives and limbs against corporate profits. Ford's institutional mentality was shown to be one of callous indifference to public safety. There was substantial evidence that Ford's conduct constituted 'conscious disregard' of the probability of injury to members of the consuming public." (Id. at 813)

The displacement of clear cost-benefit standards in Grimshaw and subsequent decisions has thrown the product liability insurance market into disarray -- yet the market still exists. According to the actuary-consulting firm Tillinghast-Towers Perrin (2002), the inflation-adjusted tort cost per U.S. citizen has grown by over eight times from 1950 to 2001. According to the same study, *insured* tort claims in the year 2001 *alone* amounted to $146.30 *billion*, a figure that excludes four big ticket items: Payments for medical malpractice; self-insured losses; "one time" tobacco settlements; and, punitive damages. Punitive damages in just the largest ten cases in 1997 alone exceeded $100 billion (Thornburgh, 2000). Although punitive damage awards are not insurable in all states, appeals courts have produced additional uncertainty into the product liability insurance market by often ignoring the guidelines that the Supreme Court set forth in BMW of North America Inc. vs. Gore (S Ct. US 1995, 5-4 Decision). This decision, although admittedly somewhat vague, was intended to limit punitive damages. Only recently did the Supreme Court "clarified" its position in State Farm Mutual Automobile Insurance Co. v. Campbell (S Ct. US 2003, 6-3 Decision), which many observers have interpreted as setting a ceiling on punitive damages equal to nine times actual damages.

The continued operation of environment and product insurance market should give proponents of a government terrorism backdrop considerable pause. New legal precedents produce large and correlated risks to insurers in these markets. My own reading of the historical evidence is that court decisions – acts completely in the government's control -- are probably *more novel* and *less predictable* than many terrorist acts, including the 2001 WTC bombing that occurred just 8½ years after the 1993 attack.

The Ninth Judicial Circuit, the largest circuit court in the nation with jurisdiction from Arizona to Guam, alone provides ample evidence. Most recently, this court reinstated a lawsuit against gun manufacture Glock Inc. (Ileto v. Glock Inc., No. 02-56197). This suit alleges Glock committed "distribution negligence" by selling a gun that was eventually used in a murder -- even though Glock sold the gun in question to a police department which later resold it on the open market. The Ninth Circuit found that this novel theory of negligence could proceed: The plaintiffs could reasonably argue that Glock should have anticipated the resale of their products! Not surprisingly, the Supreme Court routinely overturns the Ninth Circuit's decisions. But even if Glock successfully defends itself, it will have to incur large litigation costs. According to the Tillinghast-Towers Perrin survey cited earlier, defense costs -- not including plaintiff costs -- and administrative costs compose 35% of insured liability costs.

Why is Time Series Evidence Even Useful?

Not only do many non-terrorism capital and insurance markets operate in a very risky environment, it is important to recall why time series evidence is even important in the insurance industry. Historical evidence is especially relevant if an insurer must fund its losses using *ex-ante* premiums. In this case, the insurer must accurately assess its total losses and the distribution of those losses across insured parties (Kunreuther, 2002). Ex-ante premiums are required, for example, in most *personal* lines of insurance where the credit risk of the insured party is a major concern. But such projections are less important for the large firms actually affected by TRIA. (As previously noted, terrorism

exclusions are typically not written into contracts with annual premiums below $1 million.) Large firms have better credit, allowing for more flexibility in contract design.

For example, either loss-sensitive contracts with retroactive premiums or reciprocal relationships can be constructed so that ex-post *aggregate* shocks are shared by insured firms. The only determination that must be made ex-ante is how to distribute the weights of ex-post losses among the insured. (One exception is if the contract embeds loss caps that would pass some risk to the shareholders of the insurance company.) But assigning these weights only requires estimating the *relative* differences in expected losses, which is much easier than estimating the absolute value of expected losses. Indeed, the tiered city-level risk structure estimated by ISO, as discussed earlier in Section IV, provides the exact information that is required for determining the weights.

Consider, for example, two buildings, B1 and B2. Suppose B1 resides in Washington, D.C., while B2 resides in Manhattan. It might be challenging to estimate the probability of an attack in either city, making it difficult to rely only on ex-ante premiums – although not necessarily more difficult for the private sector than the government. But it would be reasonable for the market to believe, as does ISO, that the probability of an attack in both cities is *similar*. So B1 and B2 would receive the same loss weights per dollar of coverage. If B2, however, resides in Des Moines, Iowa, then B1 might be assigned a weight 100 times larger than B2. Weights can also be adjusted to control for moral hazard (e.g., building design) that might be relevant for some types of attacks. Retro premiums can also be partially sensitive to one's own losses.

Summary

In sum, capital markets and insurance lines already provide considerable liquidity under conditions when future losses are very difficult to predict based on time series evidence. Moreover, the historical record is most useful when the credit risk of the insured undermines the potential for ex-post risk sharing. Credit risk is a large problem in personal insurance lines but less of a problem for firms of the size affected by TRIA.

Large risks

Another common argument for government intervention is that potential terrorist losses can produce large and correlated losses in relation to the insurance industry's capital. Of course, as noted above, changing legal standards also produce large and correlated risks in the environmental and product liability insurance markets; both markets appear to continue to operate vigorously. But I will not belabor this point.

Just how large of a loss can the property and causality insurance industry currently absorb? The U.S. property and causality surplus stood at $334 billion in 1999 and $290 billion at the end of 2001 (which includes about $10 billion in WTC losses paid by that point).[26] But these estimates alone do not really address insurance *capacity* because they ignore the distribution of the capital and limited liability. Cummins, Doherty and Lo (2002), therefore, use a novel options pricing approach to estimate that U.S. insurers would be able to finance about 92.8 percent of a $100 billion catastrophic loss. While a majority of a $300 billion loss could probably be paid, it would place a substantial strain on the industry at current levels of insurance capitalization.

Of course, the insurance market's capacity is an endogenous variable that responds to market conditions. When at least some of losses are funded using ex-ante premiums, relevant market conditions also include expectations of future losses based on historical losses. In other words, the supply of insurance capital is not fixed. As discussed earlier in Section II, catastrophic insurance capacity doubled within five years after Hurricane Andrew, even though it was probably discouraged by possible legislation of a government backdrop. Insurers also began to rapidly replace capital that was lost on September 11th, although TRIA presumably discouraged even more capital inflow.

Besides providing insurance such as TRIA, government policies, however, constrain the private market's effort to increase capital after a loss. Many states, for example, cap insurance rates or require insurers to underwrite various lines below costs. Insurers in the United States are particularly hit hard by regulations that require them to insure terrorist-related workers compensation claims at premiums well below actuarial costs. Rates are often restricted in other property and causality lines as well. Three additional types of federal and state policies also make it costly for insurers to hold capital or to securitize the underlying risks: Taxes, accounting / regulations, and their concomitant enhancement of agency problems.[27]

Government Tax Policy Constrains Insurance Capital Accumulation

The first large capital cost stems from taxes. Shareholders of *non-insurance* companies already face a "double tax" in the form of corporate income taxes plus personal taxes (dividends or capital gains). Shareholders of *insurance* companies face a "third layer" of taxes on their capital income: The insurer must pay taxes on the capital

income that it receives even though it was already taxed as corporate income. Since the deadweight loss from taxes increases with the *square* of the tax rate, the distortion caused by this "third layer" of taxation is likely larger than the distortion caused the first two layers *combined*. While part of this third tax layer can be reduced by holding reserves offshore in places like Bermuda, this solution is very imperfect since offshore locations do not provide the same investment opportunities as onshore. For example, an offshore insurer cannot invest their capital back in the U.S. and escape U.S. taxes. Moreover, if the insurer is not admitted (licensed to do business) in the U.S. then premiums are subject to federal excise taxes, and premiums might not be deductible against state income taxes.

Government Accounting Policy Reduces Onshore Securitization

Tax reform alone, however, will *not* likely expand catastrophic protection dramatically. Insurers presumably must also be able to tap into the multi-*trillion* dollar capital market by securitizing their risks. Securitization gives investors, in the words of Cummins (2002), a "pure play" on the underlying insured risk, much like a "tracking stock." These tailored risks allow investors to achieve better portfolio diversification with lower information costs. Also, when the security's payoff is indexed to *aggregate* (not firm) losses or some other trigger outside of the firm's control, securitization can reduce ex-post moral hazard that exists between primary insurers and reinsurers (as documented in Doherty and Smetters, 2002) but at a cost of some basis risk reflecting the mismatch between aggregate and individual losses (Froot, 1999).

The most important factor inhibiting the development of risk-linked securitization is state-level regulation. In 1999 and 2001, the NAIC's Insurance Securitization Working

Group recommended that state insurance regulators encourage alternative sources of capacity by examining the use of risk-linked securities.[28] But only a few states currently allow a U.S. insurer to include a derivative instrument as a claim-amount recoverable asset on its balance sheet. But only securities with no basis risk have been allowed, i.e., indemnity-based securities. Illinois, for example, gave INEX its permission to complete its first securitization in 1999 in which Kemper Insurance Group used a special-purpose vehicle to cover $100 million of top-level New Madrid earthquake exposures in the U.S. Midwest. Payoffs were paid on an excessive-of-loss basis and have no basis risk.

The development of a vibrant onshore securitization market in the U.S. might, though, require the legal acceptance of risk-linked securities that incorporate *basis risk*, i.e., non-indemnity securities. These instruments give investors a "super pure play" since the payoffs depend on more easily-measured indexes and are not subject to moral hazard. But such a development would require additional regulatory changes in the face of considerable resistance. While the NAIC Securitization Working Group is also examining these types of securities, intense lobbying by the Reinsurance Association of America, for example, have raised concerns about basis risk, which could hamper the approval of trigger-based risk-linked securities by state regulators.[29] Moreover, even the regulatory jurisdiction of instruments with basis risk is not clear. While the 1945 McCarran-Ferguson Act leaves the primary authority of insurance regulation with the states, the federal government plays a much more active role in the securities market. The state jurisdiction over securities with basis risk is not clear since it is not obvious that these instruments satisfy the triplicate standard for insurance set by the Supreme Court in

Union Labor Life Insurance Company v. Pireno 458 U.S. 119 (1982).[30] My own reading is that Court's tests are *probably* satisfied but there is certainly some room for debate.

Concerns over Equitable Tax Treatment

Reinsurers claim to resist onshore securitization, in part, out of concerns that it could lead to an unequal tax treatment of reinsurance capital and securitized assets, especially if onshore securitization is given the same tax advantages as offshore securitization (Klein, Grace, and Phillips [2000]). To be sure, many of these concerns could be addressed by allowing traditional reinsurers to deduct *expected* catastrophic losses, as in some European nations (Jaffee and Russell, 1997), rather than just actual losses. In the U.S., only reserves allocated to actual (or highly predictable) losses can be deducted (Bradford and Logue, 1999, outline the impact of tax law on reserve capital).

But a strong case can be made, at least in the short run, for *unequal* tax treatment that gives preference to securitization. The reason is that the current securitization market likely suffers from a coordination failure. In particular, the relationship between a reinsurer and a ceding insurer is an implicit long-term contract that is costly to abandon, maybe due to fixed underwriting costs (see, for example, Doherty and Muermann in the current volume). A rational ceding insurer will desert this long-term relationship for the securitization spot market only if the spot market will likely remain liquid in the future, which, in turn, requires other ceding insurers to make the same choice. In other words, the securitization spot market is potentially being inhibited by demand externalities that produce multiple equilibriums: There is little incentive to be the first player in the spot market. The government can use preferential tax treatment in the short run to potentially

move the insurance market from the "inferior" equilibrium, where insurers primarily cede their risks to traditional reinsurers, toward the "superior" equilibrium with securitization.

Government Tax and Accounting Policies Enhance Agency Problems

Besides taxes and regulations, insurers also face agency costs when holding capital produced by asymmetric information between shareholders and managers. Some agency costs (e.g., potential theft of assets) are no different than with a mutual fund. But insurer shareholders must additional worry about the insurer's credit risk in the face of potential losses and bankruptcy costs since, unlike a mutual fund, an insurer's losses are not necessarily fully passed through to the insured ex post using retro premiums, etc.

Government state regulation is intended to reduce some of these agency costs. But, ironically, the government tax and regulations discussed above *enhances* agency costs by giving insurers incentives to locate offshore outside of the accounting and legal arm of the U.S. government. As noted above, offshore insurers avoid some of "triple tax" but at a cost of portfolio restrictions and other taxes. Offshore insurers also have more latitude to issue risk-linked securities, including those with basis risk.

To be sure, a firm domiciled in a U.S. state usually cannot purchase insurance from an offshore insurer unless the insurer is admitted to do business in that state and is regulated. But an important exception is often granted to alien insurers that finance the upper layers of large losses if it can be proven that a suitable admitted insurer does not exist in the state – a very relevant exception in the discussion herein. In particular, excess coverage is often provided by alien insurers outside of the U.S. jurisdiction. At best, states can attempt to regulate the brokers through which the insurance is purchased.

Summary

In sum, the capital capacity of insurers is a legitimate concern for financing terrorism losses. But important frictions can be traced to government policy itself. The government could significantly increase insurance capacity through a combination of tax and regulatory reforms that would increase the capacity of traditional insurers and reduce the barriers toward broader securitization.

Asymmetric Information

Another potential argument for the government provision of terrorism insurance is that it has more access to sensitive information relative to the private sector. This superior information might allow the government to more-accurately assign prices for reinsurance than a private market reinsurer. Moreover, since the government plays a unique role in mitigating terrorist risks, a government-subsidized backdrop gives politicians the incentive to invest in the proper level of loss control: More mitigation reduces the likelihood of having to make politically unpopular decisions like raising taxes, cutting other spending, or producing larger deficits after a terrorism loss.

Can the Government Really Construct More Accurate Loss Distributions?

This line of reasoning, though, raises several issues. First, the argument's basic premise is suspect. To be sure, the U.S. government can more easily monitor al-Qaeda "chatter" than the private sector -- although the chatter itself and the costs of associated with "code orange" security might be the newest form of terrorism. But it is unlikely that

the government holds closely the information that would allow it to systematically construct superior loss distributions relative to private firms that have money on the line.

Even the U.S. Department of Defense evidentially doesn't believe that it has a monopoly on information as well as the ability to *process* it better than the private sector. In July, 2003, the DoD's Defense Advanced Research Project Agency announced an initiative, "The Policy Analysis Market," as an attempt to improve its human intelligence. This market would have allowed participants to bet on futures contracts over various political and civil outcomes including the assassination of Palestinian leader Yassar Arafat and a missile attack by North Korea. The DoD defended its plan, saying that a market system was highly accurate at predicting such outcomes. The plan was abandoned only after pressure from some members of Congress, including Senator Byron Dorgan (D-North Dakota) who referred to it as "unbelievably stupid" and Senator Ron Wyden (D-Oregon) who referred to it as "ridicules and grotesque."[31]

Since the DoD market was not implemented, it is impossible to determine how well it would have actually worked. But the "Saddam Hussein futures market," created by TradeSports Exchange, LTD., in Ireland earlier in the year gives *some* initial clue. As of February 10, 2003, it predicted there was only a 43% chance that Hussein would be disposed as the ruler of Iraq by March 31, 2003, but an 82% chance he would be gone by May 30, 2003.[32] These accurate predictions were made by the market (after 42,000 trades) well before ground troops invaded Iraq in March, 2003, and obviously well before President Bush declared an end to major military operations in May, 2003.

The widespread belief that the U.S. government secretly holds vastly superior information was buttressed by media reports after the September 11th attacks suggesting

that the government had access to key information that should have helped it predict these attacks. To be sure, the Department of Defense's National Security Agency collects more information *every day* than stored in the Library of Congress. But most of this ex-post criticism of the NSA and FBI – some of it coming from "whistleblowers" – appears to be "20/20 hindsight," including the observation that some foreigners of Arabian background were training at American flight schools. When viewed objectively, the government likely knew very little more than the private sector about the risks.

Even the ideas of simultaneously hijacking multiple aircrafts or using an aircraft as a missile against a U.S. landmark were not novel. Similar missions were previously attempted but were either of smaller scale or mitigated. In 1994, Islamic terrorists, for example, hijacked an Air France plane in Algiers with the intention of crashing it into the Eiffel Tower. In the same year, a small aircraft operator purposely crashed his plane on the White House grounds with the intent on hitting the White House. In 1995, the Philippine government uncovered "Project Bojinka" in which Islamic terrorists planned to blow up 11 American airlines as well as crash an aircraft with explosives into CIA headquarters. All of these events were widely reported well before September 11th.[33]

Private sector anti-terrorism specialists had also discussed the possibility of crashing aircraft into U.S. landmarks including the World Trade Centers before the actual attacks.[34] A more personal anecdote relates to a case study that I conducted of the 1993 World Trade Center attack as part of an undergraduate course in 1998, three years before the 2001 attack. One student, marveling at the fact that the main tower could withstand a 1,200 bomb exploded at its base, asked me what *would* had it taken to bring down one of the buildings. In response, I conjectured that even flying a jumbo aircraft into the main

tower probably would *not* have collapsed it. To be sure, I was clearly wrong. But I am also not an expert in structural engineering, and I was only partly familiar with the structural details of the WTC. (If the Empire State Building were instead attacked in a similar fashion, there is a good chance it would have not collapsed given its higher concentration of cement relative to metal as well as other design differences.) Insurance companies, though, often hire structural engineers as part of their underwriting.

Exploiting any Informational Advantage Would be Difficult

There is a second problem with the "asymmetric information justification" for government-subsidized terrorism insurance. For the sake of argument, suppose that we accept the premise the government *does* hold closely superior information that would allow it construct more-accurate terrorism loss distributions. This information advantage, however, gives the government an advantage in *financing* terrorism losses only if the government attempted to charge ex ante for the reinsurance that it provides, which it did not in TRIA due to the practical reasons discussed earlier in Section III.

Even if the government *did* attempt to price terrorism reinsurance it provides, considerable care would be needed. For example, the government could *not* sell this insurance at auction if it really wanted to take advantage of its superior information. An efficient auction solution would not depend on the information set of the government serving as the Walrasian auctioneer of such a market: The auctioneer simply increases or decreases prices in response to positive or negative excess demands. Achieving a socially efficient auction requires the *buyers* to have valid information, which, by

assumption, they don't. For the same reason, a secondary market won't produce efficient prices either if the buyers in this market really have inferior information.

Instead, government bureaucrats would have to construct a system of subsidies or taxes to ensure that the private market was purchasing enough -- but not too much! -- terrorism coverage. The government's experience running other insurance backdrops (e.g., the Pension Benefit Guarantee Corporation; the Federal Insurance Savings and Loan Corporation; and, the Federal Emergency Management Agency) gives reason for considerable pause about the ability of the government to operate so efficiently.

Backdrop Does Not Correctly Align Policymakers Incentives

Finally, while the government provision of terrorism insurance might appear to give politicians the incentive to invest in the optimal amount of loss control, it would likely work in the *wrong* direction. Policymaker's already have an enormous amount of non-diversifiable "human capital" invested in fighting terrorism vis-à-vis their reelection prospects. Indeed, the rhetoric in Washington after September 11th was that terrorism should be fought at any cost. For example, The September 11th Victim's Compensation Fund, which will pay almost $5 billion to victims of this attack but not previous attacks, was debated for only 1½ hours by Congress before passage.[35] Forcing politicians to raise taxes, cut spending, or increase deficits after a terrorist loss would likely move mitigation even further away from a proper weighing of the costs against the benefits.

Time Inconsistent Policies

Another common argument for a subsidized federal backdrop is the Samaritan's dilemma noted earlier: Many people will rationally forgo insurance since they believe the government will bail them out after a major loss. By assumption, the government cannot *credibly* commit ex ante to *not* bailing out the non-insured ex post. In other words, any such commitment would fail to be subgame perfect. In still other words, a no-bailout policy is not *time consistent*, i.e., any "hard knuckles" promise will be broken ex post.

In theory, subsidized government insurance could encourage some "freeriders" without insurance to purchase insurance before a loss actually occurs. Many households and firms, though, may continue to assume that the government will bail them out even if they don't buy insurance. Still, subsidized insurance should increase coverage if some participants believe that they can get a better deal relative to the free bailout. Coverage could also increase if politicians themselves believe that the provision of cheap insurance strengthens the popular "moral case" against ex-post bailouts. This latter "defensive" position, for example, might have motivated some fiscally conservative policymakers to support TRIA in light of the hardening market for terrorism insurance in 2002. In both cases, however, a fairly generous subsidy is needed in order to sharply increase coverage.

While TRIA *subsidizes* terrorism insurance, the French government *mandates* catastrophic coverage as part of virtually every property-liability policy (Moss, 1999). In other words, the only way to avoid terrorism coverage in the French system is to forgo coverage altogether, if allowed. This subsection compares both approaches. But, in doing so, it is critical to distinguish between non-diversifiable and diversifiable risks.

Mandatory Coverage is More Efficient than Price Subsidies for Non-Diversifiable Risks

The Samaritan's dilemma is an often-cited reason why the U.S. government subsidizes some forms of insurance including flood, hurricane and earthquake insurance. But these subsidies are not without problems. For example, as of 2001, the National Flood Insurance Program (NFIP) had 4½ million policies in force with over $570 billion in coverage.[36] The NFIP loses about $800 million on average each year due to the subsidy it provides by setting premiums below their actuarially-fair value; much of this loss comes from "older properties."[37] (Many new properties are effectively covered as well by "remodeling" existing properties.) While the NFIP technically does not have a formal appropriation in the budget to cover this shortfall, the surplus is financed with federal income taxes that distort labor and saving decisions of households. The insurance also causes adverse selection problems, and encourages the inefficient development of vacation homes, rental properties, and small businesses in high-risk locations.

Since most properties, such as houses, covered by the NFIP are hard to diversify in the private capital market, the purchase of flood insurance is likely rational, especially since the underwriting costs are pretty low. So a more efficient approach than subsidized pricing would be to simply *mandate coverage* for homeowners' losses stemming from floods. Mandatory coverage would address the Samaritan's dilemma without distorting prices if premiums are actuarially fair. For example, the NFIP has resisted charging fair prices out of concern that people would select out of the program.[38] Mandatory coverage would prevent this problem. Moreover, mandatory coverage is more efficient than a subsidy that encourages poor households – as well as wealthy households with vacation homes -- to build in risky areas; indeed, the NFIP, for example, is now planning to relocate over 10,000 households to safer geographic locations.

Mandatory coverage is probably the most efficient approach for insuring hurricane and earthquake losses as well. Indeed, the state-sponsored windstorm pools in Florida and Texas along with the California Earthquake Authority exist in large part to deal with the Samaritan's Dilemma problem. A more efficient solution would simply mandate coverage from private insurers without any government subsidy.

Mandatory coverage is not novel. About 170 countries mandate participation in a social security system (Mulligan and Sala-i-Martin, 1999). Mandatory coverage in this case prevents people from rationally under-saving for retirement and then relying on the government for provisions during retirement. Some U.S. states, such as Pennsylvania, also mandate the purchase of a minimum amount of auto insurance in order to prevent people from exploiting limited liability protection after causing an automobile accident.

Interestingly, the decision by some state insurance commissioners to mandate coverage of terrorist-caused deaths in life insurance policies might have been fortuitous in light of Congress' peculiar design of The Victim's Compensation Fund after September 11th. The Fund's payments to severely injured victims or their survivors (in the case of death) are determined in four steps. First, the lost economic value of the victim is determined. Second, the victim or survivor is given $250,000 in non-economic benefits for pain and suffering plus an additional $100,000 for each surviving dependent. Third, the award is reduced dollar-for-dollar by "collateral income," which includes a small Social Security death benefit as well as life insurance policies. Fourth, the Fund's Special Master (Kenneth Feinberg) can adjust the awards at his discretion. But the third step is probably the most problematic: Private life insurance policy distributions are

effectively taxed 100% by the government. If allowed, future life insurance policies could have excluded terrorist losses to reduce costs without reducing ex-post coverage.

No Policy is Probably Most Efficient for Diversifiable Risks

While mandatory coverage of earthquake, hurricane, and flood losses is probably the most efficient policy since the underlying assets are *non-diversifiable*, firms affected by TRIA tend to be owned by *diversified* shareholders for whom a loss of a property is less severe. It follows that it is not even obvious that a Samaritan's dilemma really exists for diversified risks. Moreover, the terrorism exclusions before TRIA were generally not written into policies with annual premiums below $1 million except for rather high-risk properties. Hence, unlike the NFIP, hurricane, and earthquake state subsidies, terrorism exclusions did not affect politically-sensitive groups such as farmers and homeowners.

The Samaritan dilemma justification, therefore, for government intervention into the terrorism insurance market seems fairly weak to me especially since, unlike the case of non-diversifiable risks considered above, it is not obvious that the purchase of insurance is actually rational (Section IV). A subsidized rate could encourage some firms to purchase insurance even though it is more efficient for their shareholders or creditors to instead diversify terrorism risk in the capital markets. Indeed, the current low demand for TRIA coverage documented in Section IV could easily reflect an inefficient *excess* demand for terrorism protection, and not an insufficient demand.

Summary

Although *subsidized* insurance, as in TRIA, is difficult to justify on efficiency grounds under a wide range of circumstances, *mandatory coverage* probably makes sense for certain risks that (i) are hard to diversify in capital markets *and* (ii) are borne by interest groups such as homeowners and farmers that are likely to be bailed out after a significant loss. Before TRIA, terrorism exclusions in U.S. property and casualty policies, however, did not generally affect shareholders satisfying these conditions.

Myopia

Another argument for government intervention is that household and firms might not rationally purchase adequate amounts of terrorism coverage if they suffer from a lack of foresight, i.e., myopia. Kunreuther et al (1978) and Kunreuther (1996), in particular, presents compelling evidence that many people apparently need to experience some previous exposures to losses in order to properly plan for similar future risks. Of course, when a government backdrop exists, myopia is observationally equivalent to the Samaritan's dilemma discussed above unless the "rationality" of the economic agent can be measured by actions independently of the insurance decision itself. Hence, it is sometimes difficult to distinguish between evidence of the Samaritan's dilemma and myopia. Still, the evidence suggests that many people might indeed be myopic.

The possibility of myopia can rationalize some paternalistic government policies, including, for example, controls over the safety of the workplace. While, in theory, workers in riskier occupations should be compensated with higher wages, many workers might not have enough foresight to fully investigate the underlying risks. As another example, compulsory social security programs protect myopic households from entering

retirement with too few assets. While myopia cannot rationalize the price distortions caused by TRIA's subsidy, one could, in theory, also imagine a role for government intervention in the terrorism insurance market in the form of mandatory coverage.

It seems reasonable that paternalism can justify government controls over some *personal* decisions such as choice of workplace conditions and retirement savings. Personal choices are not subjective to the competitive pressures of the marketplace. Nor can many mistakes be easily corrected in the future: One cannot, for example, learn from his or her previous inadequate preparation for retirement and try again. Moreover, personal mistakes can be very costly since the underlying asset, such as a person's life, is difficult to diversify. Furthermore, the non-diversifiable nature of the underlying asset implies that a government requirement to insure the asset will likely be optimal.

Most *business* decisions, however, are subject to competition and repetition. Moreover, the assets of large firms, like those firms mostly affected by TRIA, are owned by a diversified set of shareholders: Even the bankruptcy of a large firm would have a small impact on the total rate of return of a broadly diversified portfolio. The diversifiable nature of those assets also implies that self-insurance might be more optimal than insurance in the presence of large underwriting and adjustment costs (Section IV). Justifying government intervention becomes substantially more difficult: Government bureaucrats would have to be (i) armed with better information than the private sector or (ii) more concerned about the well-being of the private sector than its own managers.

Presence of Landmark externalities

Certain landmarks such as the Sears Tower in Chicago and the Golden Gate Bridge in San Francisco are more obvious targets for terrorists than other structures. Landmarks, therefore, may create positive production externalities for other structures by forming a "focal point buffer" of sorts. These externalities might not be compensated with Coasian side payments due to large transaction costs when there are many property owners. As a result, the production of new buildings could be distorted. For example, a developer might decide to build the "second tallest" building in a particular area rather than the tallest in order to avoid becoming the new terrorist focal point.

In theory, the government could attempt to reproduce the efficient market solution by subsidizing the production of landmarks with taxes on non-landmarks, thereby mimicking the Coasian side payments that would exist if transaction costs were zero. Unlike TRIA, however, it would not be optimal for the government to distort the prices of terrorism insurance itself: the efficient prices would still reflect the underlying risks.

But several problems arise even with a tax-and-transfer program. First, the government's information set would have to be extensive. The government would have to determine the terrorist-related landmark qualities of each property; determine the reservation prices of builders; properly distinguish between new and existing buildings; and, much more. Of course, this process would also have to be unhindered by lobbying efforts from the property owners and their legislative representatives. Failing to make correct estimates could cause more economic damage than not estimating at all.

Second, attempting to "fix" this non-market externality potentially contradicts the "theory of second best," which states that it is not always optimal to remove distortions in specific sectors of the economy when the distortions cannot be removed in all sectors.

Specifically, landmark properties are already better positioned to leverage their status in order to earn economic rents. Since the government does not currently levy taxes on "landmark status rents," it is not necessarily efficient to further subsidize landmarks.

Incomplete trading markets

Another potential argument for the government provision of catastrophic coverage is that governments can more easily smooth large shocks inter-temporally relative to the private sector. This argument for government intervention is really about time diversification and not about the "size of shocks" considered earlier. As a practical matter, however, government actions would still be presumably limited to larger shocks.

Unfortunately, the underlying theoretical model that supports this argument has not clearly specified in the previous literature. This omission is important. For example, in the standard neoclassical (Ramsey) growth model, the representative household has an infinite planning horizon and production is constant returns to scale. In this setting, the government has no particular advantage over the private market at smoothing shocks over time. Hence, we must look elsewhere to rationalize government involvement: There must be a source of *incomplete trading markets* either between or within generations. This section considers the potential for incomplete *inter*-generational markets since that case seems more compelling than the case of incomplete *intra*-generational markets.

Incomplete inter-generational markets can be motivated by abandoning the standard neoclassical model in favor of the more realistic overlapping-generations (OLG) model in which households live a finite length of time. But even here some care in modeling is needed. For example, if household parents are purely altruistic toward their

children *and* parents could, hypothetically speaking, legally pass *negative* transfers (inter-vivos transfers or bequests) to their children during bad times then, by the process of recursion, households again have infinite horizons, as in the standard neoclassical model. Inter-generational trading markets are, therefore, effectively complete, and the government once again has no particular advantage over the private market. Of course, parents cannot pass negative bequests during bad times. But the inter-generational linkage would still exist if children were also altruistic toward their parents and, hence, were willing to make "gifts" (reverse transfers) to their parents during bad times.

However, the evidence appears to show that households are not so altruistically linked (Altonji, Hayashi, and Kotlikoff, 1997). It follows that incomplete trading markets effectively exist between generations since people alive today cannot write legally binding risk-sharing agreements with the unborn. The government, however, can complete this missing market using its taxation authority (Smetters, 2003).

Still, the exact nature of the terrorist loss is crucial in determining the government's optimal policy. In particular, if the terrorist loss is best viewed mostly as a "depreciation shock" that lowers the return to existing capital owners but doesn't depress the wages of workers, then the efficient policy *may* involve the government subsidizing the returns of capital owners with higher taxes on workers. One could view TRIA as an imperfect attempt at doing this. The government's optimal response depends, though, on the various underlying parameter assumptions since the government's policy induces additional general-equilibrium effects on factor prices. For some parameter assumptions, government risk sharing in the form provided by TRIA is not pareto improving.

The best available macro evidence, though, suggests that terrorist shocks depress national output, presumably beyond just capital income returns (Blomberg et al, 2003; Eckstein and Tsiddon, 2003). If the terrorist loss is best viewed as mostly a "total factor productivity shock" that lowers capital returns *and* wages, then the efficient policy is likely just *opposite* of the type of risk sharing provided by TRIA. In particular, the optimal policy would *additionally* tax the already-lower returns of capital owners in order to increase the after-tax wages on the next generation of workers by lowering their wage taxes. In other words, capital owners get hit twice: First, by the initial terrorist shock and then again by an additional tax. (Policy-induced general equilibrium effects reinforce this optimal policy.) The intuition for this surprising result is that the shock to workers is actually costlier than the shock to capital owners and so the optimal ex-ante policy helps workers at the cost of capital owners.

The analysis thus far, however, assumes that the government does not run additional deficits after a shock. The possibility of debt policy could allow for some inter-temporal sharing of losses with generations beyond the next generation. But deficit financing of losses may not improve efficiency unless the pre-loss loss mitigation was suboptimal and improved significantly after a loss. Once, again, though, the nature of the shock is crucial in the analysis. A depreciation-like terrorist loss would, in partially equilibrium, be optimally shared across *many* future generations. General-equilibrium effects, however, complicate matters since deficit financing will also cause general-equilibrium effects by increasing interest rates and lower wages. But sharing a productivity-like terrorist losses over several generations would simply lead to a "deficit gamble" since each loss has a permanent (i.e., "unit root"-like) impact on national output.

In general, most terrorist losses can be likely described as a *combination* of a depreciation loss and a reduction in productivity. It follows that there might be some scope for government intervention once general equilibrium effects are considered. The exact combination of underlying model parameters, though, is critical in determining whether there is a valid role for the government in sharing terrorist losses across generations, and so some caution is required. Indeed, the theoretical results described above suggest that government-subsidized insurance could actually do more harm than good by effectively compensating the wrong generations. This research area deserves more attention in the future using calibrated OLG models.

VI. Conclusions

Private commercial property and casualty insurance markets are likely able to insurance against terrorism and even war losses if government tax, accounting, and regulatory policies were changed in order to reduce the insurer costs of holding capital, securitization of large risks and allow prices to freely adjust. To be sure, the Administration and Congress created TRIA within a constrained environment where these changes were not envisioned. But modifying these fiscal policies would likely be much more efficient than the approach taken in TRIA, which has created several potential problems: Crowding out the development of private insurance; excess demand for subsidized insurance by diversified shareholders; ex-ante and ex-post moral hazard, and, unfunded liabilities on future generations. Changing the tax, accounting, and regulatory policies, however, will require considerable coordination between the federal government and the states. The recent movement by the insurance industry toward federalization of

insurance regulations[39] would likely help speed things along but at a risk of more lobbying by insurers at the federal level.

The most common arguments in favor of direct government intervention into the terrorism insurance market tend to focus on the difficulties that the private market faces in providing terrorism insurance. These arguments, however, do not explain why the private market solution is actually inefficient. Probably the most compelling "market failure" can be traced to incomplete trading markets between generations. In theory, the government can complete this missing market using its taxation authority. But considerable care must be taken since the optimal policy might be exactly *opposite* that of subsidized insurance, and so additional research is still required. Furthermore, although this theoretical argument deals with time diversification and not the "size of losses," government intervention would, in practice, only be limited to very large losses – probably well beyond the current TRIA $100 billion ceiling – due to the other administrative inefficiencies that government intervention could produce.

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[1] Real Estate Roundtable (September 4, 2002).
[2] Warren Buffet (November 9, 2001)
[3] William J. Clinton, EXECUTIVE ORDER, "BLOCKING PROPERTY AND PROHIBITING TRANSACTIONS WITH THE TALIBAN." July 4, 1999.

[4] See, for example, Newsweek, "Helping Hand: Where did the Taliban come from? How did they finance the drive to impose an Islamic state?" October 13, 1997.
[5] William J. Clinton, EXECUTIVE ORDER, "BLOCKING PROPERTY AND PROHIBITING TRANSACTIONS WITH THE TALIBAN." July 4, 1999.
[6] See, for example, Elaine Sciolino, "After the Attacks: The Overview; Long Battle Seen." The New York Times, September 16, 2001: Section 1, Page 1, Column 6.
[7] See BestWire Services (September 12, 2002).
[8] See Bureau of Economic Analysis, *Survey of Current Business*, August 2001, Table 1.
[9] See, for example, Houston Chronicle News Services, "Agreement close on aid to insurance industry." October 19, 2002: Section A; Pg. 24
[10] See, for example, American Academy of Actuaries (2002).
[11] Some exceptions include Senator Phil Graham of Texas.
[12] Real Estate Roundtable (September 4, 2002).
[13] See, for example, "Making the Case for a Federal Backstop for Terrorism Insurance," Jointly produced by The Financial Services Roundtable, the Real Estate Roundtable, the American Insurance Association, and the Coalition to Insure Against Terrorism, September 1, 2002. (Available at www.fsround.org.)
[14] Shadow Financial Regulatory Committee, Statement No. 182, "A Proposed Federal Backstop for Terrorism Insurance and Reinsurance", 9-23-02
[15] See PR Newswire 9/20/02, "Terrorism Insurance Survey Reveals Disturbing Trends."
[16] Florida regulators capped terrorism charges for property insurance at 1% of the premium (see, for example, http://www.radeylaw.com/articles.cfm?Articleid=71). Many other states de facto capped terrorism rates at the amount filed by rating services. I am grateful to Debra Ballen for this information.
[17] Only violent acts in the interest of foreigners against the U.S. can be certified by the Treasury Secretary in concurrence with the Secretary of State and the U.S. Attorney General.
[18] Cummins and Doherty (2001), though, consider a slight modification that they call "Excessive of Relative Loss" contracts which payout *relative* to the insurance industry's available surplus.
[19] See, for example, the interview of ISO spokesman, Dave Dasgupta, by Knowledge@Wharton, May 7, 2003.
[20] See Hofmann (2003).
[21] P. 17.
[22] Buffet, however, received a very good return on this particular investment: The premium was equal to 530% of the expected loss (Stulz, 1998).
[23] Note 24 to the Annual Statement that insurers submitted to state insurance regulators does not require reporting information on payments prior to 1991.
[24] Referenced in "ISO REPORTS LATEST DATA ON INSURERS' ENVIRONMENTAL AND ASBESTOS LIABILITIES." Press Release, April 2, 1996. ISO estimates that about $40 billion was paid between 1991 and 1995.
[25] ISO (1996).
[26] See, for example, American Academy of Actuaries (2002).
[27] See Jaffee and Russell (1997) for a complementary discussion.
[28] The NAIC adopted the Protected Cell Model Act in 1999 and a working group within the NAIC proposed the Onshore Special Purpose Reinsurance Vehicle (SPRV) Model Act in 2001. Currently, the SPRV entity is illegal in the United State, and faces considerable legal uncertainty (GAO, 2002*b*). One advantage of the SPRV is that it can be used by non-insurers whereas protected cells are generally available to insurers. Another advantage of the SPRV is that it legally is more effective at isolating the assets from other potential claims during bankruptcy.
The advantage of the
[29] See, for example, the presentation by Bradley Kading (2000), Senior Vice President of Reinsurance Association of America.
[30] The triplicate standard: (1) Does the instrument transfer or spread policyholder's risk?; (2) Is the instrument an integral part of the relationship between the policyholder and the insurer?; (3) Is the practice limited to entities within the insurance industry.
[31] Josh Meyer, "Trading on the Future of Terror; A market system would help Pentagon predict turmoil. To critics, it's 'gambling' on security." *Los Angeles Times*, July 29, 2003, Main News; Part 1; Page 1.
[32] Bloomberg News, "Saddam Hussein Futures Offer Bets on His Removal." February 10, 2003.

[33] James Bone and Alan Road, "Terror by degree." The Times, October 18, 1997, Features Section.
[34] Steve Fainaru, "Clues Pointed to Changing Terrorist Tactics; Foiled Plots, FBI Data Showed Al Qaeda Groups Might Use Airplanes as Missiles." Washington Post, May 19, 2002.
[35] See "September 11 Fund Claims Top 98 Percent." FoxNews.com, Friday, January 16, 2004.
[36] "Insurance Management Solutions Group 10th Annual Catastrophe Conference." Remarks By Howard Leikin, Deputy Administrator, Mitigation Division, November 29, 2001, St. Petersburg, Florida.
[37] Ibid.
[38] Ibid.
[39] See, for example, Joseph B. Treaster, "Insurers Want One Regulator Instead of 50." *The New York Times*, December 26, 2003.