Toxic Torts:
How the Asbestos Litigation is Undermining US Competitiveness, Destroying Jobs and Short-Changing Victims

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Introduction

In 1925, then President Calvin Coolidge famously said that “the business of America is business.” Now, over 90 years later, the business of America is increasingly conducted in courthouses among trial lawyers and insurance executives. The asbestos litigation has already caused nearly 80 corporate bankruptcies in the US, and has impacted the earnings and operations of hundreds of other firms. The US tort system has become an anchor dragging down America’s economic growth at a time when the competitive challenges from a globalized economy are stronger than ever.

American business leaders have to confront an array of competitive challenges as they formulate their business strategies and seek to increase their returns. Many of these challenges are the normal sort of problems that any business could be expected to face – a competitor comes out with an improved product, for example, or a manufacturing process needs to be improved. In the present era of globalization, the competitive challenges from abroad, which can include low labor costs, undervalued exchange rates and (all too often) public subsidies and tax breaks, are forcing American companies to become ever more efficient.

Unfortunately, these external challenges are now being compounded by internal costs that no other country faces. US firms now have to contend with a legal system that has lost sight of justice and fairness, and instead looks after the interest of the lawyers and consultants who earn their paychecks through litigation. Thanks to ill-conceived product liability and joint and several liability rules, the US tort system now inhibits risk taking among businesses, increases insurance costs, and creates incentives for plaintiffs lawyers to target firms with healthy cash flows and profits instead of going after unprofitable firms that make dangerous products.
Nowhere is this more true than the ongoing saga of the asbestos litigation, the longest running and most expensive mass tort in the history of the American legal system. Already, over $70 billion has been spent on legal fees, damage awards and settlements, and the estimates of the total costs of the asbestos litigation run from $200 billion to over $275 billion. Moreover, because many of the original defendant firms have been forced to declare bankruptcy due to their asbestos related liabilities, the bulk of the responsibility for these liabilities is now falling to peripheral second or third tier companies – firms that were only peripherally involved in the manufacture and distribution of asbestos – and which never expected to be embroiled in the asbestos litigation.

As one might expect, the costs associated with the asbestos litigation have become a drag on the US economy – and their impact is likely to increase in the future. Many of the costs are direct and easily measured. Legal fees, damage awards and settlements are all paid for out of a company’s bottom line – or through insurance policies. Bankruptcies and lost jobs can be totted up and calculated to come up with aggregate figures for the domestic economy. But many of the costs associated with asbestos litigation are indirect: business opportunities foregone, management’s attention diverted away from new markets or management issues to more pressing legal concerns.

It is not merely the size of the total costs associated with asbestos litigation that are problematic in terms of the overall strength and competitiveness of the US economy. It is who is bearing the costs. Unfortunately, because of the dynamics of the asbestos litigation and the legal environment surrounding it, asbestos liabilities are being shifted from the original producers and manufacturers of asbestos (firms which were, by any reasonable measure, guilty of some of the most egregious and negligent treatment of their employees and customers) to firms that merely used asbestos in some of their products, or who owned facilities where asbestos had been installed. These firms are not responsible for the injuries that have been caused through exposure to asbestos, but they are being forced to pay the price for others’ negligence and ill-will.

Manufacturing firms in particular are now bearing the brunt of the litigation, and given the troubles they have been having with global
competition, they are among the firms least able to afford it. Manufacturing firms in the US are already faced with an array of problems that are undermining their competitiveness and leading to the closure of factories, the loss of jobs, and the outsourcing of production to foreign countries where costs are lower. The strength of the US dollar, tax holidays, financial incentives, cheap labor, and lax or non-existent environmental standards have all played a role in the downsizing of the US manufacturing sector, but the impact of the asbestos litigation has been a factor overlooked in the analysis of US competitiveness.

As US manufacturers struggle to maintain their competitiveness in the global economy, one of the key weapons in their arsenal is capital investment. While US based manufacturers cannot compete with emerging market producers on labor costs, they can overcome this deficit by investing in new machinery and manufacturing methods that vastly increase their output, and hence productivity, per worker. By leveraging highly trained, highly skilled workers with modern machinery and technology, US manufacturers can maintain their international competitiveness even while paying high wages. This is the secret behind the success of most of America’s successful exporters and manufacturers.

But it is this very ability to invest in the latest capital improvements that is now being threatened by the asbestos litigation. Money that should be spent on investment is instead finding its way into the pockets of trial lawyers, and in too many cases, plaintiffs will no manifested physical impairments. Money that should be spent on new capital equipment or new technology is being diverted to higher insurance premiums that are the direct result of changes to US product liability and tort law pioneered in the asbestos litigation. As reduced capital expenditures eats into American firms’ competitive advantages, many companies are responding by transferring their operations offshore – an outcome that will further damage the US economy.

This study has two main goals. One is to document and quantify the costs of the asbestos litigation to the US economy, with a particular focus on the manufacturing sector. The second is to highlight the impact these costs have had on US employment – again, with a particular emphasis on employment in the manufacturing sector. We believe this is important for two reasons. On the macro economic
level, manufacturing is a crucial component of the US economy and an integral part of the ‘innovation ecosystem’ – the process by which new products and technologies are created and commercialized. Without a strong manufacturing sector, the US will not be able to reduce the massive trade and current account deficits it is currently facing, and will cease to be the world leader in developing and applying new technologies. Future American wealth, living standards and productivity growth are all threatened by the weakening of our manufacturing sector, and improving the competitiveness of the sector should be one of the primary policy goals of our political and business leaders. Resolving the asbestos litigation is one way to do this.

On a more asbestos-specific level, much of the recent growth in asbestos cases has been driven by a perverse alliance of plaintiffs' attorneys and labor unions. The two groups have cooperated to sign up hundreds of thousands of new asbestos plaintiffs (many of whom do not have any physical impairment) by inviting medical screening companies to union halls and meetings to recruit union members to the ranks of asbestos plaintiffs. While labor unions do have a duty to protect the health and fiduciary interests of their members, the bargain they have entered into with the plaintiffs attorneys will come back to haunt them. By reducing the competitiveness of US manufacturing firms, the asbestos litigation has had a major impact on manufacturing employment. Jobs are being lost because of the wave of bankruptcies, loss of capital, and rising insurance premiums associated with the asbestos litigation.

To be fair, the labor unions did not anticipate the impact the asbestos litigation would have on US corporations. The bankruptcies and job losses that have been caused by the litigation are more directly the result of a broken tort system than by labors' association with the plaintiffs' bar. Nonetheless, labor unions are pursuing short-term gains that undermine their long-term viability – by undermining the financial standing of the firms they work for, labor unions are literally writing their own pink slips.

This is not to suggest that there are not real victims of asbestos exposure who deserve compensation. Indeed there are. But the US tort system has failed as a means of solving the asbestos problem. Courts have become clogged with hundreds of thousands of claimants who exhibit...
no signs of physical impairment. These plaintiffs are drawing funds away from the people who need and deserve them most – those who actually have been diagnosed with asbestosis, mesothelioma, or some other asbestos-related cancer. In addition, because of the way that the asbestos litigation has transformed the legal environment, firms with little or no responsibility for these injuries are being held accountable for the mistakes of others who have by now declared bankruptcy. The tort system has thus failed to provide justice to asbestos victims, failed to assign accountability fairly, and failed to provide incentives to ensure that corporations protect their workers and customers from danger.

For all the failures of the tort system, part of the blame must also be laid at the feet of the US government. Not only has the Congress failed to come up with a workable legislative solution to the asbestos litigation, but the federal government is partly responsible for the mess in the first place. US safety regulations mandated the use of many products containing asbestos in the last century, but then failed to protect workers from being exposed to asbestos in the workplace. Moreover, government owned shipyards were the location where many workers were exposed to asbestos in the first place. But because of sovereign immunity and overly strict rules governing workers compensation, many asbestos victims have been unable to receive compensation for the injuries they received at the hands of the US government, and have been forced to target private sector companies instead. All this has contributed to the erosion of the competitiveness of the US manufacturing sector and a broken tort system that threatens to cripple the US economy in the future.

Going forward, even as the asbestos litigation crisis slowly works its way towards a finale, the underlying dynamics of the asbestos litigation have not been dealt with. The litigiousness of American society, combined with the ineffective and inefficient incentives in place in the US tort system, have put enormous sums on the line for scores of companies. Already, trial lawyers are casting about for ‘the next asbestos,’ the tort, toxic or otherwise, that will bring the next big payday and put a new sector of the US economy on trial.

In its current form, the asbestos litigation is no longer about justice; it is no longer about helping injured workers or ensuring that the correct incentives are in place to prevent greedy companies from injuring
their customers of employees. Rather, it is about the US legal system shaking down corporate America to pad the paychecks of lawyers on both sides. Indeed, the interests of American workers, consumers and companies are being cast aside as lawyers rush to file new claims before the next major corporation files bankruptcy and the spigot of easy money is closed behind a wall of bankruptcy protection. The lessons of the asbestos litigation should be very clear: the regulatory system failed to protect workers in the first place, and then the tort system compounded that failure by allowing unimpaired victims to file claims, and targeting companies that had little or nothing to do with the underlying injuries caused by asbestos exposure.

**History of the Asbestos Problem**

**Uses of Asbestos**

Asbestos is a naturally occurring silicate with widely available deposits that are relatively easy to mine. For many years asbestos was considered a ‘miracle’ fiber because of its resistance to heat and its usefulness in insulation, fireproofing and sealing. It found numerous applications in the industrial and construction industries, becoming a component in everything from brake linings, roofing materials, and gaskets to various types of insulation. During World War II, the U.S. government classified asbestos as a strategic material, and its use was widespread, particularly in the ship building industry. To this day, although many alternatives to asbestos have been introduced, many do not perform as well, and despite an attempt by the U.S. Environmental Protection Agency to ban the use of asbestos in the early 1990’s, products containing asbestos are still legal in the U.S.

Ironically, the use and adoption of products containing asbestos was driven in the early days largely by safety considerations. Fire was one of the major worries in densely populated cities and on board ships over the course of the 19th century. Major fires caused tens of thousands of deaths and led to much stricter building and safety regulations across the Untied States. Reacting to the public’s demand for safer workplaces and residential areas, cities and municipalities craft-
ed new building codes. The new building codes emphasized the use of fire resistant or non-flammable building materials, and thanks to some technological innovations, asbestos became a standard ingredient in insulation, roofing and flooring materials.

In another application, because of its heat-resistant properties, asbestos became the material of choice for brake linings and brake pads. It stood up much better than other materials to the harsh conditions found in automotive brake systems and resulted in significant improvements in the effectiveness and reliability of vehicles’ brakes. It is impossible to quantify the number of lives that have been saved because of more effective automotive braking systems, but the numbers are likely significant. Moreover, despite the health risks, asbestos is still used as a material in many automotive brake systems to this day – no other cost-effective material has been found that perform as well as asbestos in brake linings.

Estimates of the number of Americans exposed to asbestos in the workplace range from 27.5 million to over 100 million people. Most of these individuals will never come down with an asbestos-related disease, but a significant minority will be impaired as a result of their exposure to asbestos. No one knows how many court filings will eventually be made against asbestos defendants, but the estimates range from 1.1 million to up to 2 million.

**Asbestos-Related Diseases**

There are three main categories of injury that stem from asbestos exposure: malignant cancers, such as mesothelioma, and lung cancer; asbestosis; and pleural plaques. In all of these cases, exposure results from inhaling small asbestos fibers in the air. While sustained and intense exposure to asbestos increases the chances of developing an asbestos related disease, evidence suggests that in many cases, asbestos related diseases were triggered by relatively brief exposures.

The latency period for mesothelioma and other asbestos related diseases can last a long time. It is not uncommon for individuals exposed to asbestos in the workplace to wait 20 to 40 years before coming down with a disease. Moreover, though most asbestos diseases occur through exposure in the workplace, asbestos diseases can also affect
workers families and friends, for example by breathing asbestos dust found on work clothing or vehicles.

Mesothelioma is a cancer of the lining of the lungs. Asbestos exposure is the only scientifically proven cause of mesothelioma, although there is some debate as to whether there are other possible causes. Mesothelioma is a horrible and painful disease for which there is no cure, and that always results in death, usually within a year or two of the diagnosis.

Through 2004, over 81,000 deaths in the United States were caused by mesothelioma. A further 51,000 deaths are expected to be caused by mesothelioma through 2029. Over 2,000 new cases of mesothelioma are diagnosed each year (although the number of cases approached 3,000 per year for several years in the 1990's), and most occur concurrently with asbestosis.\(^4\)

Other cancers associated with asbestos exposure include lung cancer, leukemia, and cancers of the larynx, esophagus and colon, among others. One of the difficulties in determining the principal cause of any of these types of cancer, however, is that they all have other causes besides asbestos exposure. Lung cancer, for example, is most commonly associated with smoking. Since smoking was very prevalent in the United States, particularly among blue-collar workers most likely to be exposed to asbestos, determining the principal cause of the lung cancer can be difficult. Indeed, the links between asbestos exposure and many of these types of cancer are in contention. Defendants routinely dispute allegations that asbestos exposure caused plaintiffs’ lung cancer in court cases.

Nonetheless, several studies have attempted to estimate the total number of asbestos related cancer deaths in the U.S. The most widely cited estimate comes from Nicholson et al (1982).\(^5\) According to Nicholson, over the past forty years, over 180,000 cases of lung cancer are attributable to asbestos exposure. In addition, over 50,000 cases of gastrointestinal and other cancers were caused by asbestos. They estimate that over the next 25 years, a further 54,000 cases of lung cancer and 14,000 cases of ‘other’ cancers will be manifested.

Asbestosis is a scarring of the lung tissue caused by breathing in asbestos fibers. Its symptoms include decreased lung capacity and the
existence of inflamed cells in the linings of the lungs. Asbestosis can be fatal, but is not always so, and the degree of impairment is an important issue in determining damage awards and settlements. To complicate matters further, asbestosis is very similar to other types of lung disease known as fibrosis. Inhalation of silicates in occupations ranging from mining, quarrying, sandblasting, and even cotton production can produce similar scarring of the lungs – scarring that is difficult even for trained medical professionals to distinguish from asbestosis.

The National Institute for Occupational Safety and Health has reported that, from 1968 through 1999 deaths attributable to asbestosis totaled over 18,000. Moreover, the annual death rate has increased substantially, rising from 77 deaths in 1968 to 1,265 in 1999. Of course, since asbestosis does not always result in death, these figures significantly underreport the incidence of asbestosis cases.

The vast majority of asbestos plaintiffs show no signs of malignant cancers or asbestosis, but have been diagnosed with pleural plaques. Pleural plaques are deposits of collagen fibers in the lungs that lead to a thickening of the lungs' linings or pleura. Most of the time, pleural plaques do not cause physical impairment. Indeed, most cases show no symptoms or disabilities at all. Moreover, there is no way to distinguish between pleural plaques caused by asbestos and those caused by smoking or other environmental factors. Some analysts believe that most residents of urban areas could be shown to have some measure of pleural thickening in their lungs.

As noted above, one of the unique attributes of asbestos related diseases is the long latency periods associated with these diseases. The onset of illness can frequently take 30-50 years after the exposure to asbestos first occurred. This fact has influenced a number of attributes of the asbestos litigation. First, it led to the reform in many states of statutes of limitations rules. Since the statute of limitations could have run out before any disease or illness was detectable, many states changed their rules to time the statute of limitations to begin with the discovery of the disease itself, not the original exposure.

Second, long latency periods have contributed to the curious phenomena that 80 to 90 percent of all asbestos plaintiffs show no signs of malignancy or serious illness. Instead, they have been diagnosed
(often under questionable circumstances, more about which below) with ‘pleural plaques,’ or conditions “consistent with asbestosis.” In some cases, pleural plaques may lead to more serious cancers or asbestos related diseases, but in most cases do not. By the same token, most individuals who have been deemed to exhibit “conditions consistent with asbestosis” have not in fact been diagnosed with asbestosis. In most court filings, these cases tend to be merely the opinion of an x-ray reader that the x-ray of a given subject shows signs “consistent with asbestosis.” Some may later come down with the disease, but as with pleural plaques, most will never face any physical impairment. Nonetheless, many courts have allowed individuals with such documentation and histories of asbestos exposure to join in the litigation.

**FAILURE OF THE TORT SYSTEM**

Tort laws exist both to provide compensation and justice to victims and to ensure that firms or individuals engaged in dangerous behavior or manufacturing hazardous products take every possible precaution against harm. Dangerous products that cause illness or injury impose costs on society, and holding manufacturers accountable for these costs, it is thought, will encourage them to stop producing dangerous products or putting their workers in harms way. In the case of asbestos however, this principle has been badly twisted, to the point that many companies are now being held liable either for the wrongdoing of other companies (which they had no control over), or for merely the ‘fear of future injury’ that their employees or customers now claim.

Indeed, many companies that did everything in their power to abide by government regulations, protect their workers and customers, and manufacture safe and effective products are now facing huge liabilities. The role of the judicial system, and for that matter government regulation, in providing incentives for corporations to protect their workers and consumers has failed miserably and resulted in perverse outcomes that now threaten the health of the American economy in general.
Failure of Regulation

The adoption of asbestos as a ‘miracle mineral’ that had thousands of industrial applications was, ironically, driven not just by market forces, but also by the belief that in many cases asbestos would improve the safety and reliability of many products.

Take, for example, the ship building industry. Up until the 1930’s, the interiors and furniture installed on ships were largely made from wood – as it had been for thousands of years. But on September 8, 1934, the SS Morro Castle, a luxury cruise ship that sailed between New York and Havana, caught fire off the coast of New Jersey. 137 people died in the tragedy, and the fire focused attention on the materials used to construct the ship. As a luxury liner, the Morro Castle made extensive use of veneered wood and plywood paneling – highly flammable materials that contributed to the severity of the fire. In the aftermath of the Morro Castle disaster, the US Coast Guard mandated that non-flammable materials be used in ship joinery.

And what were these non-flammable materials? Well steel of course, but also the new ‘marine veneer,’ a drywall used for walls and paneling that was made from asbestos. The use of marine veneer became so important to the ship joinery industry that it led to asbestos being declared a ‘strategic material’ in World War II as the need for new merchant ships to run supplies to Great Britain exploded. Asbestos materials were diverted away from consumer uses and towards activities like shipbuilding deemed crucial to America’s war effort. Materials containing asbestos became pervasive on both commercial and naval ships. Heating pipes, air vents, insulation panels, sleeping compartments, mess halls, passageways, gun mouths, engine rooms, and boiler rooms all contained asbestos, and the fire-resistant qualities of asbestos likely saved many lives as the number and severity of shipboard fires was greatly reduced.

At the same time, however, government safety regulations did not protect the workers who installed or worked with asbestos from being exposed to asbestos in the workplace. Regulations that could have protected workers, like regulating and limiting the amount of asbestos fibers in the air or mandating the use of ventilators by workers, either did not exist at all or were not enforced. Asbestos usage remained...
widespread in the shipbuilding industry through the 1970’s, and although its use made life onboard ships safer, many workers involved in the construction or decommissioning of ships were exposed to asbestos fibers in the course of their work, which eventually led to many cases of mesothelioma and asbestosis among shipyard workers.

But when shipyard workers began to be diagnosed with asbestos related diseases, they were faced with a dilemma. Because of sovereign immunity, asbestos lawsuits cannot be brought against the US government. Since many workers were exposed to asbestos in government owned shipyards (and were installing asbestos in government owned ships), victims were forced to seek out private firms to seek compensation for their injuries. The US government, while mandating the use of products containing asbestos, did not produce or manufacture asbestos itself – it purchased the products through government contracts or used sub-contractors who purchased and installed products containing asbestos. This fact has allowed plaintiffs to sue firms who manufactured products containing asbestos because they were mandated by government regulations as a safety measure. Worse, it left the private sector responsibility for all the liabilities associated with asbestos usage by the US Navy and Coast Guard. Thus, the US government has left the private sector holding the bag for thousands of asbestos related injuries originating in government owned facilities.

The dangers of asbestos exposure have been known about for quite some time. Asbestosis was described and identified in British medical journals by the late 1920’s. Insurance companies in the U.S. and Canada had stopped selling life insurance policies to asbestos industry workers by the 1930’s. The British government took steps to regulate the use of asbestos in the workplace beginning in the early 1930’s. The British established safety procedures, workers compensation programs and began screening workers for evidence of asbestosis.\(^7\)

In the United States, widespread knowledge of the dangers of asbestos increased substantially after the publication of several studies conducted by Dr. Irving Selikoff of Mount Sinai School of Medicine. His influential studies documented the link between many cancers and asbestos exposure, and were the first to gain widespread public attention as to the dangers of asbestos.
Despite mounting evidence of the dangers of asbestos, use in the U.S. continued to increase for many years, rising from 100,000 metric tons in 1931 to a peak of 750,000 metric tons in 1974. While asbestos use has declined substantially since then, the EPA’s failure to ban its use means that it is still used in certain applications to this day. In 1994, 25,000 metric tons were consumed in the U.S.\textsuperscript{8}

Beginning in the 1970’s, however, the U.S. government did take steps to regulate the use of asbestos in the workplace. Beginning with the establishment of the Occupational Health and Safety Administration (OSHA), and the EPA in 1970, regulatory agencies began to monitor and regulate asbestos use. Unfortunately, due in large part to pressure from industry, the safety standards introduced by OSHA and the EPA were not strict enough to prevent exposure to asbestos among millions of workers.

For example, although OSHA mandated that the air in workplaces contain a maximum of two asbestos fibers per cubic centimeter of air, that still meant that a worker could be exposed to as many as 10 million asbestos fibers in a single workday.\textsuperscript{9} Although the industrial use of asbestos did begin to decline in the 1970’s, the stage had already been set for sustained and far reaching asbestos litigation. The failure of any regulatory agency to prevent occupational exposure to asbestos meant that millions of workers in the 1970’s were going to come down with asbestos related diseases 20 to 40 years in the future. At the same time, the peculiarities of the workers’ compensation system in the U.S. left the door open for victims to try to seek redress in the justice system.

Beginning in the 1930’s, states launched workers’ compensation programs that established funds to pay compensation to workers injured on the job. These programs were not designed with asbestos in mind, they were meant to cover all types of occupational hazards and accidents. However, workers’ compensation schemes were designed to limit the liability of employers for workers accidents. Not only were compensation levels set relatively low, but the eligibility requirements were such that many workers did not qualify for compensation because their injuries did not meet the standards in some way. As asbestos related diseases have extremely long latency period, this made it very difficult for workers to file claims against employers for
whom they had worked many years in the past. Even worse, the workers’ compensation rules prohibited workers from suing their employers for damages, whether or not they were eligible for compensation under the system. Thus, with nowhere else to go, many victims resorted to the legal system to seek redress for their injuries.

**BEGINNINGS OF THE ASPEROS LITIGATION**

When the first trial to award damages to a worker exposed to asbestos was concluded in 1973,\(^{10}\) few foresaw the tidal wave of litigation that the trial would unleash. Since the landmark Borel v. Fibreboard decision in 1973, over 730,000 individuals have filed asbestos claims and over 8,400 companies had been named as defendants. To date, over $70 billion have been spent by defendants and insurers on legal fees, damage awards and settlements. The total estimated costs of the asbestos litigation range from $250 billion to $275 billion.\(^ {11}\)

Although the dangers of asbestos exposure have been known for quite a while, evolving legal doctrine and standards were just beginning to lay the groundwork for the largest and most costly mass tort in American history. During the 1960’s, a number of changes in the legal landscape prepared the way for victims of asbestos exposure to seek compensation and redress through the courts.

First, because of the long latency period for several asbestos related diseases, many states changed the terms governing statute of limitations for bringing asbestos-related lawsuits. Instead of applying the statute of limitations from the date of exposure, the date of discovery of disease was used. Second, product liability law was changing. Previously, manufacturers had only been held liable for products that harmed their users through ‘negligence.’ But over the course of the 1960’s, a number of courts moved the legal standard away from negligence and towards a ‘strict liability’ standard. In this case, a product manufacturer can be held liable if the product in question is ‘unreasonably dangerous,’ or if the user had not been adequately warned of the dangers of using the product. Finally, the scientific evidence documenting the links between asbestos exposure and diseases like mesothelioma and asbestosis became overwhelming.
The evolution of product liability law turned out to be key to the asbestos litigation. As mentioned above, most asbestos victims had been exposed to asbestos in the workplace, but were barred from suing their employers due to the workers’ compensation procedures. They were not, however, barred from suing companies whose products they had been exposed to at their workplace. Put another way, companies were not liable to their own employees who had been exposed to asbestos as a result of the company’s products. The companies were, however, potentially liable for any injuries their products caused to outside clients and their employees. This, then, was the tack many plaintiffs attorney took as they pursued the initial stages of the asbestos litigation.

At first, the major defendants were the manufacturers of asbestos – firms like Johns-Manville and Raybestos. These were large, profitable firms with the ability to fund long-term litigation and employ a diverse array of legal tactics. Indeed, in the early days, the legal doctrine and standards surrounding the asbestos litigation had not yet been developed, and the burden was very much on the plaintiffs to establish causal links between asbestos exposure and diseases. But as more and more scientific evidence accumulated, the position of the asbestos manufacturers became increasingly tenuous. With the revelation that many of these firms had known of the dangers of asbestos for years but had done little or nothing to protect their workers, large damage awards began to be awarded, and plaintiff’s attorneys began to search intensively for new plaintiffs to sign up.

The case of Johns-Manville was particularly egregious. It was eventually revealed in court that the company had known very early of the dangers of asbestos exposure, and had in fact monitored their workers and conducted physical examinations to test for asbestosis. But Johns-Manville had not bothered to inform the workers if they had tested positive for asbestosis – a tactic that they employed to keep their workers compensation costs down. So not only had the company failed to protect its workers from environmental hazards that the firm was well aware of, it had actually connived to deny its employees access to its workers compensation fund.12

The Borel v. Fibreboard decision was instrumental in setting up many of the legal standards that came to be applied to subsequent asbestos
litigation. First, the case was key in expanding the scope of the litigation from workers’ compensation claims to much broader product liability claims. The case held that Johns-Manville, Raybestos-Manhattan Corp and others had conspired to suppress information regarding the dangers of asbestos, and introduced the standard of ‘strict liability’ as the companies had failed to adequately warn workers of the dangers of using asbestos products. As a result, the scope of the asbestos litigation expanded to include not just employers, but the manufacturers, suppliers and installers of materials containing asbestos as well.  

By 1982, Johns-Manville was facing over 16,000 asbestos claims and decided to file for bankruptcy protection. Its reorganization became a model for other defendants. In 1986, the US Bankruptcy Court for the Southern District of New York approved Manville’s restructuring plan and the creation of the Manville Personal Injury Settlement Trust. The Trust was funded with over $3 billion in assets, which came from stock from the Johns Manville Corporation, the firms’ insurance coverage, a portion of the firms’ future profits, and other company assets with the stated goal of compensating individuals who had suffered personal injury from exposure to asbestos or asbestos-containing products manufactured or sold by Manville. The Trust anticipated that it would process between 50,000 to 100,000 future claims, in addition to the 16,000 already pending against Manville at the time of its bankruptcy, and would shield the reorganized company from any future claims. At its inception, the Trust estimated that it would face roughly $2 billion in total asbestos related liabilities.  

The Trust began paying out claims in 1988, but it soon ran into trouble. It became clear that the Trust did not have sufficient funds to pay out the claims against it. After a new reorganization plan was submitted to the courts, the Trust began to pay out claims at the rate of one-tenth of the liquidated litigation value of the claim (as opposed to the 100% rate it began with). These new payment rates were necessary because of the huge and unexpected increase in claims filed against Manville. By 2001, the Trust was estimating that it would face between 1.5 million and 2.5 million additional claims. As a result, in addition to reducing the rates it would pay to claimants, the Trust eventually either disallowed or sharply reduced payments to most non-malignant claimants. As of July 2006, the Trust had received 773,713 claims and made $3.4 billion in payments.
While the Manville bankruptcy and subsequent establishment of the trust were contentious and fraught with difficulties, they did provide a model for future bankruptcies. Indeed, the Manville bankruptcy contributed greatly to many other companies’ decisions to file Chapter 11 reorganizations, largely because the standard of joint and several liability left remaining firms on the hook for asbestos liabilities even after others had declared bankruptcy.

So there are in fact two major legacies of the Manville Trust. On the one hand it provided a template for other firms seeking to get a handle on their asbestos liabilities through bankruptcy protection. On the other hand, it was no secret that the Trust was running out of money and would be forced to reduce its payouts and restrict the eligibility of claimants. Ambitious plaintiff’s attorneys knew that, regardless of the particular experiences of their clients, continuing to pursue Johns Manville was likely to result in a dead end — or at least greatly reduced compensation both for the plaintiffs themselves and the lawyers representing them. There simply wasn’t enough money in the Trust. So they followed the money, and started to target non-bankrupt firms — particularly those with plenty of insurance coverage — as defendants in their suits.

In a related development, just before Johns-Manville filed for bankruptcy protection, a court in the District of Columbia issued a ruling that would greatly expand the potential amount of insurance coverage that could be used to settle claims or damage awards. It turns out that many insurance companies had issued general liability policies to many firms that later became asbestos defendants. And while many of the policies had contained caps as to the total amount of payments that could be made for each individual claim or injury, there was often no overall or aggregate cap to the size of the policy. The court ruled, in Keene v. Insurance Company of North America, that insurance companies that had issued comprehensive general liability policies to firms that later became asbestos defendants were jointly and severally liable up to the policy limits for each instance of injury for every single policy issued from the time that asbestos exposure began through to the onset of illness. In effect, this ruling meant that there would henceforth be tens of billions of dollars worth of asbestos insurance coverage available to plaintiffs.
**PROCEDURAL INNOVATIONS**

As the number of asbestos cases began to overwhelm courts in the 1980’s, the courts began to take steps to manage their caseloads more effectively and encourage settlements. Unfortunately, many of the procedural innovations they came up with led to abuses. On the one hand, these procedural innovations created an environment whereby hundreds of thousands of non-impaired claimants have clogged up the judicial system and absorbed payments and damage awards that would have been better spent on those suffering from asbestos related illnesses. On the other, they have forced many firms into bankruptcy and left many remaining firms with the liabilities that were the responsibility of others.

**Consolidation**

Many jurisdictions began to consolidate trials due to the overwhelming caseloads they were facing. Judges in most states have the ability to consolidate similar or related cases without the consent of the plaintiffs or defendants. Many have done just that in an attempt to clear their caseloads and get asbestos cases off their desks. Unfortunately, consolidation of cases allows unimpaired claimants to be lumped in with impaired claimants, and increases pressure on defendants to settle. From the defendants point of view, consolidated trials are so risky that they are essentially a ‘bet the company’ proposition. If they win, fine. But losing such a large case with so many claimants runs the risk of bankrupting the company then and there. So many defendants chose instead to settle these consolidated cases instead of running the risk of bringing them to trial. But because unimpaired claimants are mixed in together with impaired claimants, the settlement often neglects to adequately document the bulk of the claims, allowing unmeritorious claims to be settled and encouraging plaintiffs’ attorneys to file new cases on behalf of unimpaired claimants. This legal procedure has thus encouraged a huge increase in the number of claims being filed and the number of cases being settled out of court.
Venue Shopping

Plaintiffs’ attorneys are generally given the choice of where to file suit over a particular claim. They can choose, for example, between state or federal courts, between different states, and between different jurisdictions within the same state. It turns out that this initial decision is extremely important for the plaintiffs – not just in terms of the ultimate verdict or settlement that resolves their case, but in the size of the damage awards (if any) that they eventually receive. Studies have shown that a select few venues (which change over time) are particularly friendly to plaintiffs.

There are several reasons why particular jurisdictions may strongly favor plaintiffs. On the one hand, many areas are pro-plaintiff for economic reasons. Damage awards or settlements represent income transfers from ‘foreign’ defendants to ‘local’ plaintiffs. And high-profile court cases bring in lots of outsiders – who need lodgings and restaurants during their stay. Another, more dubious reason, was perhaps best put by Professor Michelle White, who has published extensively on the asbestos litigation: “Since [many] state court judges are elected…plaintiffs’ lawyers contribute generously to judges’ re-election campaigns in jurisdictions where they frequently file claims. Plaintiffs lawyers have an advantage over defendants’ lawyers as contributors, since they choose where to file claims and tend to file in particular jurisdictions repeatedly.”

State Versus Federal Courts

Until the late 1980’s over 40% of all asbestos lawsuits were filed in federal courts. But in 1991, every federal asbestos case was transferred to Judge Charles Weiner of the Eastern District of Pennsylvania for pretrial management. In part, this was an effort to manage the huge caseload that had sprung up around asbestos, and it was hoped that by aggregating the tens of thousands of cases before the federal courts, pretrial processing could proceed much quicker than would otherwise have been possible, and that it would encourage plaintiffs and defense attorneys to negotiate settlements to the cases. Indeed there were high hopes that Judge Weiner would help negotiate a ‘global settlement’ that would deal with the asbestos litigation once and for all.
But while the move to consolidate all federal asbestos cases did succeed in reducing the numbers of federal asbestos cases filed, it did so merely because plaintiffs’ attorneys shifted the focus of the litigation onto the state courts. Plaintiffs’ attorneys apparently considered Judge Weiner’s court to be unsympathetic to their clients’ interests, and responded to the consolidation by filing in state jurisdictions that they considered more ‘friendly’ to plaintiffs.

As for the effort to achieve a global settlement, that too ended in failure. In an attempt to force all the asbestos lawsuits into a class action framework, twenty of the biggest asbestos defendants tried to negotiate a settlement with many, but not all, of the major plaintiffs’ attorneys. The deal had two components: First, the parties attempted to settle all the then-existing asbestos claims. Second, they sought a class action settlement of all the future claims that might be filed with regard to asbestos. This effort brought forth a lawsuit by plaintiffs’ attorneys who were not party to the class action settlement, which eventually went all the way to the U.S. Supreme Court in Georgine v. Amchem Products.

In 1997, the Supreme Court threw out the class action settlement and ruled that the interests of the various plaintiffs were too diverse to be consolidated into one class action. Another attempt at a class action settlement in 1999, Ortiz v. Fibreboard, was also rejected by the Supreme Court. These two decisions ended the attempt to negotiate a single, global settlement that could take care of all existing and future asbestos claims, and led to a massive increase in asbestos filings in state courts across the country.

**Plaintiff Strategies**

By the mid-1980s then, a series of important court decisions had transformed the legal landscape surrounding the asbestos litigation. With the evolution of product liability law, rulings that held asbestos manufacturers jointly and severally liable for asbestos claims, and rulings that had expanded the scope of insurance coverage for asbestos claims, plaintiffs attorneys had succeeded in turning the legal environment to their advantage. Taking advantage of this environment, they...
developed new litigation strategies that further increased the pressure on firms and insurance companies. One strategy employed was to file huge numbers of individual claims against multiple defendants, and then group the claims together in order to gain negotiating leverage with defendants and their insurance companies in the hope of forcing them to settle. Faced with huge numbers of claims that included both victims with serious diseases and hence the potential for huge payouts along with non-impaired claims that had much smaller potential liabilities, many defendants chose to settle all of the cases brought against them without demanding much in the way of proof or documentation as to the medical condition of the non-impaired claimants. Plaintiffs attorneys reportedly offered deals in which they would accept lower payments for their most serious cases in exchange for small payments to their non-impaired clients.18

For the plaintiffs’ attorneys, this lowered their legal costs and the risks associated with bringing cases to trial. For the defendants, settling these cases seemed like a good deal at first. Insurance companies, who figured that they were already on the hook for damage fees due to previous court decisions against them, wanted to minimize their legal costs. They also calculated that the risks associated with losing a few of the more serious cases were high – several multi-million dollar damage awards could quickly add up – and hence decided that it was more prudent to settle the bulk of the claims and avoid the legal costs and risks of taking all the claims to trial.

In retrospect, this decision seems unwise. It sparked an avalanche of new claims as plaintiffs’ attorneys smelled blood in the water: all they needed to do was sign up hundreds or thousands of non-impaired claimants, bundle them with a few more serious cases, and force the defendants to settle. Plaintiffs’ attorneys then began to promote mass screenings of potential plaintiffs. Plaintiff law firms began to show up at union meetings with mobile medical screening companies, offering free medical screenings to the union members.
Entrepreneurial Screening Companies

In most tort cases, legal action begins only after an individual has visited with a doctor and been diagnosed with a disease. In asbestos cases, however, plaintiffs’ attorneys have reversed this process.

First, plaintiffs’ attorneys either hired or set up medical screening companies that could perform x-rays and pulmonary function tests to determine the existence of pleural plaques or other conditions associated with exposure to asbestos.

With the cooperation and help of many labor unions around the country, plaintiffs’ attorneys brought these medical screenings companies to union meetings and other events where large numbers of construction and manufacturing workers were present. The firms offered ‘free screenings’ to potential plaintiffs and advertised heavily in local newspapers and media outlets. Subjects who agreed to the screening would be required to sign agreements providing that the law firm that had organized the screening would be the subjects’ legal representative in any future asbestos lawsuit on a contingency fee basis.

Many of the medical screening companies hired by the plaintiffs’ attorneys had a financial interest in finding evidence of asbestos related illnesses in as many of the x-rays and medical screenings as they could. X-rays and pulmonary function tests were given out to anyone who was interested, and then the screening companies would ‘analyze’ the results and determine whether or not any evidence of asbestos exposure existed. It is important to note that these mass screenings were not held with the intention of treating any diseases found. Rather, they were conducted with the express purpose of signing up new clients for the plaintiffs’ law firms.19

As such, the methods and procedures used by the mass screening companies often deviated from normal medical practice. Since interpreting x-rays is a subjective task, the people who perform such tasks tend to be insulated from any claim of malpractice or wrongdoing. Nonetheless, the standards used by the mass screening companies often differ from those published by the American Thoracic Society to administer pulmonary function tests. For example, ATS standards for performing pulmonary function tests suggest that one to one and a half hours be spent implementing the tests and reviewing the results.
But many screening companies have admitted in court to spending as little as three minutes in total administering and interpreting the tests. The focus on speed is indicative of the financial incentives that these firms were operating under.

Indeed, the organization and management of these mass screenings was riddled with conflicts of interest and dubious incentives. Law firms made tens of million of dollars in annual payments to medical screening companies, and in many cases the labor unions themselves were given financial incentives to agree to hold the mass screenings at their meetings or on their property. For example, the union might receive rental payments for the use of their facilities, or union members or their relatives might be hired temporarily to help out with the screenings. Usually, prior to the mass screenings either the screening company or a law firm would send out letters to union members advertising the screening, warning of the dangers of asbestos related diseases, and urging them to sign up.

According to Lester Brickman, these mass screenings tend to find evidence of asbestosis or pleural plaques in 60%-80% of the subjects that they test. From a statistical standpoint, these numbers strain credulity, but they do provide the plaintiffs attorneys with the steady stream of new litigants that their litigation strategies require. These mass screenings have accounted for nearly 90% of the new asbestos claims filed in recent years.

These entrepreneurial screening companies have generated a lot of controversy, most recently when it was revealed that they had been ‘double counting’ asbestos victims for a new round of silicosis lawsuits.

**Non-Malignant Claimants**

Much of the controversy surrounding the asbestos litigation is due to the huge number of people who have filed suit despite having no demonstrable impairments. The vast majority of these claimants have been diagnosed with pleural plaques or conditions “consistent with asbestosis,” (note that this is not the same as a diagnosis of asbestosis) and of these, the vast majority will never come down with asbestosis or an asbestos related cancer.
Non-impaired claimants both significantly increase the size of defendants’ asbestos liabilities and reduce the size of the payouts to the true victims – those who have come down with serious asbestos related diseases. Estimates of the total proportion of unimpaired claimants to impaired claimants vary, but it is generally acknowledged that 80% to 90% of all recent claimants have been unimpaired.\textsuperscript{23}

**RECENT DEVELOPMENTS**

**FAIR Act**

At the beginning of 2006, much speculation centered around a bill pending in the Senate that would have brought a legislative solution to the asbestos litigation. The F.A.I.R Act, for Fairness in Asbestos Injury Resolution, would have established a large trust fund that would have taken over the job of providing compensation to asbestos victims from the courts. The trust was to have been funded to the tune of $140 billion, and would have created a US Court of Asbestos Claims that was supposed to streamline the claims resolution process, establish medical criteria, and reduce the legal fees paid out to attorneys.

The FAIR Act was controversial, not least because of the ways in which it portioned the costs of the trust fund among the various interested parties. Large companies were seen as doing particularly well under the terms of the Act, as were insurance companies. Many small and medium sized companies, by contrast, were strongly opposed to the bill because they believed that their payments to the trust fund would have been much higher than costs they faced in the continuing asbestos litigation.

There was another major problem with the FAIR Act, however, in that it was unclear whether the Act would actually halt the asbestos litigation. Many doubted whether $140 billion would be enough to cover all the outstanding and future asbestos claims. If the fund ran out of money, there was nothing to prevent new claimants from returning to the courts to file their claims.
In any event, the FAIR Act failed to garner enough support in Congress, and it now seems to be dead. With the failure of the federal government to craft a legislative solution to the asbestos problem, attention has turned to the states.

**State Tort Reform**

If there is any good news surrounding the asbestos litigation, it comes from the recent efforts that several states have made to reform their tort systems and change or limit the tactics employed by plaintiffs’ attorneys. Ever since federal efforts to get a handle on the asbestos litigation pushed plaintiffs’ attorneys to file their new cases in states courts, states have been at the center of the asbestos litigation. This of course complicates efforts aimed at creating an overarching solution to the litigation, but it also presents opportunities in that the states can experiment with different solutions.

In particular, states have targeted the practice of including large numbers of unimpaired claimants in asbestos lawsuits; the bundling of large number of impaired and unimpaired claimants together; and forum-shopping by trial attorneys. Several states, perhaps most notably including Mississippi, Ohio, Texas and West Virginia, where many of the most problematic jurisdictions (in terms of their friendliness to plaintiffs) were located, have undertaken significant reforms. The reforms include bills that lay out medical criteria for asbestos claimants that make it more difficult for new claims to be filed on behalf of non-impaired victims; putting existing unimpaired claimants on inactive court dockets; rules stipulating that the venue where asbestos cases are tried must correspond in some way with the location of the asbestos exposure, defendant or plaintiff; and rules limiting the ability of attorneys to consolidate cases with different types of plaintiffs.

It is too soon to say whether these reforms will be successful in bringing the asbestos litigation under control and limiting its economic fallout. Clearly, though, these reforms are a step in the right direction.
IMPACT OF ASBESTOS LITIGATION ON US COMPANIES

In its initial stages, the asbestos litigation targeted the major producers and manufacturers of asbestos and uncovered unpardonable behavior on the part of a few firms that knew of the dangers associated with asbestos yet did nothing to warn or protect their workers from those dangers. As judgments against these firms grew in size and number, the viability of these companies as ongoing concerns was destroyed, and bankruptcy protection and the establishment of trusts to pay out asbestos related claims became the preferred method of dealing with their asbestos liabilities.

An unfortunate outcome of bankruptcy protection, however, was that plaintiffs’ lawyers were forced to turn their attention to peripheral firms that had no or little responsibility for the dangerous working conditions that led to so many asbestos related diseases. Bankrupt firms necessarily have limited resources with which to pay out existing and future claims, and plaintiffs attorneys, keen to protect the interests of their clients (and indeed the interests of their law firms) focused on targeting firms that had the means (either in terms of cash flow, assets or insurance coverage) to pay out asbestos claims.

ESI has conducted extensive interviews with several of these firms to uncover the ways in which the asbestos litigation has affected their businesses. We have found that the impact of the asbestos litigation on these ‘peripheral’ firms have severely impacted not just their bottom lines, but have also changed the way they make business decisions and plan for the future. The competitiveness of American manufacturing firms and their ability to fund and support research and development, new products and business lines, and in some cases, their ability to operate profitably in the future, have all been adversely affected by the litigation.

Unfortunately, due to the challenging legal environment and ongoing uncertainty regarding legislative solutions to the asbestos litigation, we need to protect the identities of these firms so as not to open them up to new lawsuits or negatively impact their standing in ongoing litigation. Thus, in our discussion of the effects of the asbestos litigation...
on these firms’ business practices, we will refrain from identifying these firms by name or revealing any sensitive information. While we regret the need to keep the subjects of our study anonymous, we do believe that the information we gleaned in interviews with these firms remains useful to understanding the full extent of the impact of the asbestos litigation and in working towards some public policy solutions that can resolve the asbestos litigation.

One firm that epitomizes the unintended consequences of the asbestos litigation is a domestic manufacturer of various components used in industrial, information technology and medical applications. From World War II through to the 1970’s, it manufactured a small number of components that contained asbestos. The firm did not produce or manufacture the asbestos itself – it was merely an ingredient in the materials the firm used to create its products. The numbers involved were small – in the mid 1950’s the firm was doing roughly $100,000 a month in sales of products containing asbestos, or roughly 50% of the firm’s revenues. By the 1970’s, asbestos-containing products accounted for less than 10% of the firm’s revenues.

Moreover, as a maker of seals and gaskets, the type of products the firm manufactured were extremely unlikely to have caused any illnesses. Asbestos fibers need to be inhaled in order to cause harm, and small seals and gaskets that contain embedded asbestos are unlikely to release large amounts of dust or particles into the air. Even so, as a precaution, by the time the firm became aware of the dangers of asbestos in 1973 it began to attach warning labels to all of its products containing asbestos.

The firm’s first asbestos related lawsuit was filed in 1976. An employee of a nearby shipyard had come down with as asbestos-related disease, but because of the workers compensation rules, he was barred from suing his employer. Instead, his attorneys targeted firms that had supplied products containing asbestos to the shipyard – they cast a wide net, and there were many other defendants besides the sealing company named in the suit - even though it was likely that his asbestos exposure had occurred as a result of his installation of dry asbestos insulation products, which were not manufactured by the sealing company at all. As a legal tactic, this move made a lot of sense:
the more companies named in the suit, the more likely a large settlement paid out of insurance coverage would be.

Indeed, this in fact turned out to be the result, as insurance companies decided that in most cases it was safer to settle the asbestos claims than contest them in court. Note that in many cases the firms themselves for the most part had no voice in the decision of the insurance companies to settle the lawsuits.

In the 1980's, the number of claims started to build up, and after the ‘tier I’ asbestos manufacturers had all gone bankrupt by the early 1990’s, the plaintiffs attorneys started reaching out to sue the peripheral firms that had manufactured products containing asbestos.

By 1985, the firm was totally out of the asbestos business. Perhaps surprisingly, worries over future liabilities were not the main reason for exiting the business. On the one hand, their asbestos related product line had never been particularly profitable, and they had stayed in the business as long as they had partly as a favor to valued customers who still wanted some of the products. Still, while there was still some demand for the products, especially from international customers, there had been a secular decline in demand overall.

On the other hand, once asbestos lawsuits began to enter the legal system, insurance companies either stopped providing coverage for new asbestos liabilities or raised premiums sharply. Ultimately, it was their inability to find any type of asbestos coverage at all that forced the company’s hand. Still, the firm did have insurance coverage for all of the years they had manufactured products containing asbestos, so the claims kept coming in and the insurance company handled them.

To date, this company’s insurance providers have settled between 30 and 40 thousand claims worth over $40 million in payments. There are 55,000 cases are currently pending against the firm, and of these, it is estimated that 15,000 or so are serious cases. The rest of the cases involve plaintiffs who have not manifested any physical impairment and are either on inactive dockets or are expected to be settled for relatively small amounts.

The company currently has roughly $52 million in insurance coverage left that will cover settlement payments, and has unlimited cover-
age for its legal fees. This creates an incentive for the insurance companies to settle as many cases as possible in order to limit the amount of legal fees they have to pay for. The question then, is whether and how fast the firm will burn through its insurance coverage, leaving it to pay out future asbestos related expenses out of the bottom line. They estimate that they could run out of coverage within ten years. As firms have to plan ahead, this could begin to impact its R&D spending soon.

Moreover, how should the firm provide for its future liabilities? If they put their future liabilities on their balance sheet, lenders will become much less inclined to lend them at all, and will surely charge higher lending fees. Even worse, the company doesn’t even know what its future liabilities are: it is wary of undertaking any internal audits of its exposure because such audits are potentially ‘discoverable’ in a court of law, and hence could become admissible evidence in the legal proceedings against the firm.

**Economic Costs**

**Estimates of Total Costs**

There is no single agreed upon number of the total costs of the asbestos litigation. Part of the problem is in figuring out the total number of claims that will be filed. In recent years, the number of claims being filed has been much higher than analysts were expecting, although most of the new claims do not involve any physical impairment and will thus be cheaper than claims involving serious diseases like mesothelioma and asbestosis.

In any event, there are two widely cited estimates of the total cost of the asbestos litigation. Tillinghast Towers-Perrin estimates that there will be 1.1 million claims filed in total, with a total cost of $200 billion. Milliman USA, while agreeing with the Tillinghast estimate of 1.1 million claims, believes that the total costs of these claims will be higher – in the neighborhood of $275 billion. Perhaps more worryingly, Milliman believes that a large portion of the total costs of the lit-
igation remain uninsured. They estimate that, of the $275 billion, only $100 billion will be covered by insurers (with roughly $70 billion covered by US based insurers and $30 billion by overseas insurance companies). That leaves $175 billion in uninsured costs – a figure that could forewarn of many more bankruptcies to come.

Bankruptcies

To date nearly 80 companies in the US have declared bankruptcy as a result of the asbestos litigation. Of these, nearly 90% are in the manufacturing sector. Many companies followed the Johns Manville example and entered into bankruptcy protection in order to get a handle on their asbestos liabilities and create trusts that could make payments to claimants. In some cases though, corporate bankruptcies have been caused, at least in part, by the failure to purchase enough insurance coverage that could have protected the firm from having to pay asbestos liabilities through cash flow. In other cases, the long latency periods associated with asbestos related diseases has meant that companies have had difficulty producing the documentation that proves they had insurance coverage for the periods forty or fifty years ago when the exposure occurred, or else the insurance company that originally provided the coverage has merged or been bought by a rival or simply disappeared.

The direct costs to the economy of these bankruptcies have been steep. A 2002 study by Joseph Stiglitz, Jonathan Orszag and Peter Orszag found that the total direct cost of these bankruptcies was between $325 million and $650 million. The effect on these companies' employees, however, was much more severe. 60,000 jobs have been lost as a direct result of asbestos related bankruptcies, and each displaced worker is estimated to have taken a hit of $25,000 to $50,000 in lost wages and $8,300 in pension losses.

Of course, the job losses caused by corporate bankruptcies are not limited to those jobs at the company itself. Especially in communities that are home to large manufacturing or headquarters operations, there are always scores of service sector jobs that depend on the existence of the factories or offices for their business – restaurants, cleaning services and the like. For every ten jobs lost as a direct result of
asbestos bankruptcies, another eight are lost indirectly through the loss of these service and support jobs.\textsuperscript{27}

The economic costs continue after the initial job losses, however. Of the workers laid off after asbestos bankruptcies, 11\% remain unemployed three years after they initially lost their jobs, and a further 14\% dropped out of the labor force entirely. 42\% of displaced workers enroll in worker retraining programs, at a cost of $2,000 to $3,000 each, and of those who do find new jobs, on average they earn less – up to 20\% less – than they did originally. Other costs include increased spending on health care due to the higher rates individuals and families have to pay after losing their employer provided group plans, increased government spending on unemployment benefits, and decreased local government tax revenues in communities affected by plant closures.\textsuperscript{28}

**Insurance Industry**

Apart from the manufacturing sector, the economic impact of the asbestos litigation has been felt most keenly by the insurance industry, which has been hit hard by asbestos liabilities and has consistently underestimated the level of exposure it faced. Milliman Global Insurance, an actuarial firm, estimates that the insurance industry as a whole is facing total losses of $100 billion over asbestos claims, out of a total economic cost of $275 billion (the rest is the responsibility of the firms themselves). Out of this $100 billion figure, probably $70 billion is the responsibility of US based insurers while foreign insurance firms (mainly in London) are on the hook for $30 billion.\textsuperscript{29}

A.M. Best has estimated that as of 2004, insurers ‘incurred to date losses’ had reached $55 billion and asbestos related losses seemed likely to continue into the future.\textsuperscript{30} These numbers mask a sharp increase in both total estimated liabilities and reserve increases over the past few years. In 1997, insurance industry asbestos losses seemed to be stabilizing. They had declined to $885 million that year after reaching a high of $3.4 billion in 1995. However, the losses soon rebounded, hitting $8 billion in 2002, $6 billion in 2003, and roughly $4 billion in 2004.\textsuperscript{31}
For the most part, all the major insurance companies are expected to be able to absorb their asbestos losses and survive. Although they have had to increase the amount of reserves set aside to cover their asbestos losses, many insurance companies have also been able to lay off some of their liabilities on reinsurers. Some analysts believe that, based on the note 33 data (US based insurance companies are required to report their projected asbestos liabilities and their strategies for funding these liabilities in their SEC filings under ‘note 33’) there is a discrepancy between the amount of coverage insurance companies have ceded to reinsurance companies and the amount of capital set aside by reinsurers to cover these liabilities. Since many of these reinsurers are offshore – many are based in London and hence have different reporting requirements, it is difficult to get an accurate accounting of the distribution of liabilities across firms. It is likely, though, that there will be legal disputes and court cases among and between different insurance companies over what the various insurance and reinsurance policies will cover.

Apart from the impact the asbestos litigation has had on insurance companies’ bottom lines, however, it has transformed the way insurance companies think about and price risk. Going forward, it is this change that will likely have the greatest impact on the American economy and manufacturing sector. The legacy of the asbestos litigation has transformed many aspects of tort law and the legal system more generally. Product liability, statutes of limitation, workers compensation programs, and plaintiffs’ strategies in toxic torts have all evolved as a result of asbestos, and the implications of these changes will have continuing effects on the US economy.

Fundamentally, insurance companies are in the business of putting a price on risk. In the case of asbestos, insurance companies did not accurately predict the size of the liabilities that would arise. Granted, it would have been very difficult, if not impossible, to foresee the ways in which the asbestos litigation played out, but the experience is forcing insurance companies to take a closer look at their products liability coverage and the potential for new mass tort cases down the road. Ultimately, there are a lot of variables to consider when determining how to price risk. Insurance companies have to figure out what the likelihood is that any particular product will cause injuries to the con-
sumers who use the product or the workers who produce it, who will be ultimately liable for any injuries that do occur, and how to spread these risks through reinsurance contracts and other means.

Now, because of their experience with asbestos and US tort system, many insurance companies are deciding that insurance premiums across a range of coverage types need to increase. Increased insurance premiums are a drag on corporate profits, especially in many cutting edge high tech fields like medical devices and bio-technology, where new innovations hold the potential for great advances in health and welfare but also contain great risks. If insurance premiums rise too much, and if the tort system continues to allow itself to be exploited by plaintiffs attorneys at the expense of justice and fairness US companies might shy away from investing in the most promising new technologies due to the high costs of protecting themselves from future liabilities.

**Indirect Costs**

American manufacturing companies have had to adapt their business strategies as a result of the asbestos litigation in a number of ways. While many of the costs associated with the asbestos litigation are obvious – money spent on legal fees or damage awards, for example, much of the impact manifests itself in more subtle, less quantifiable ways.

First, the insurance industry has played an important role in the decisions corporations make about what types of products to manufacture and what new business lines to enter. For example, in many cases it was the fact of rising insurance premiums or the inability to find asbestos coverage – as opposed to regulatory decisions – that led many companies to cease manufacture of products containing asbestos by the mid-1980’s. As insurance premiums rose or coverage became impossible to find, it became uneconomic to manufacture many products containing asbestos. By the same token, in part because of the changes to product liability laws that the asbestos litigation helped to bring about, other types of insurance coverage have become more expensive in recent years.
Second, many firms, especially those that find their insurance coverage coming to an end or those that did not purchase enough coverage originally, are concerned that their exposure to asbestos liabilities have put not just their future earnings, but their entire companies at risk. As a result, plans to enter new business lines or create new products might be pursued with an entirely new company – one that separate and shielded from the ‘tainted’ original company’s assets. The question is whether investments in new products, technologies and business lines should be pursued within the existing firm or whether they should establish new corporations that are shielded from their existing asbestos liabilities.

Third, given the litigious nature of American society, many companies are questioning whether it might not be safer to remove their manufacturing facilities from the United States entirely. By the mid-1990’s, after the wave of asbestos-related bankruptcies had engulfed the original producers and began making its way through the peripheral firms, many companies were forced to confront their asbestos liabilities and include such risks in their calculations as to where to locate their manufacturing operations. With offshoring and outsourcing already in full swing throughout the American manufacturing sector, the asbestos litigation did not encourage anyone to keep their operations in the US when foreign countries already offered cheaper labor and other advantages.

Fourth, although much of the legal doctrine surrounding the asbestos litigation is particular to asbestos, the ways in which product liability law have been transformed have left many worrying that the next multi-billion dollar tort is just around the corner. This has the effect of making US companies more risk averse and is hurting American companies ability to innovate and create new products and services. For example, much cutting edge research and innovation being undertaken these days involves bio-technology and medical devices. Some firms with previous experience manufacturing industrial sealants are now considering whether they should apply their knowledge base to, for example create seals for new medical devices that can be placed in the body. But because of their experience with asbestos, they are very reluctant to enter that field. They are wary of opening themselves up to future product liability lawsuits, especially because
they are worried that they could be targeted through no fault of their own, but because of the mistakes of another firm. Insurance companies as well are worried about future product liability lawsuits in the medical devices field, and premiums for coverage have recently shot up as a result, increasing the costs of entering a field that has the possibility of lengthening and improving the lives of many people.

**Estimated Economic Impact of Future Asbestos Litigation**

Economists have used different methodologies to measure the economic impact of asbestos litigation. Some of these methodologies have been limited to certain economic sectors or groups of companies, or have focused on specific types of costs (e.g., employment related costs at bankrupt firms). Some studies that have attempted to assess the impact of asbestos litigation on an economy-wide basis have been criticized for their lack of transparency or for utilizing a framework that overstates the impact of litigation on jobs and economic growth.

This chapter proceeds as follows. First, we describe the GTAP database and how it was configured for the experiments discussed in this chapter. The underlying theory and equations of the GTAP applied general equilibrium model is presented in Hertel, ed., *Global Trade Analysis Modeling and Applications* and expanded in various technical papers and working papers at the GTAP website. Second, the four policy experiments are described, including the policy shocks implemented to incorporate the various aspects of asbestos litigation costs, the changes made to the standard GTAP model closure, and the rationale for those changes. Third, we present and interpret the results of each experiment. Fourth, we synthesize the various results and what they mean for the U.S. economy going forward.

**The Model and Database**

The GTAP model is a multisector, multiregion general equilibrium model that makes use of a fully documented global database. The
model and database enable researchers to conduct quantitative analysis on economic issues in an economy-wide framework. Although the model is geared toward the analysis of international economic issues, such as tariff reduction, the rich variety of variables in the model enable users to assess the national and international dimensions of country-specific policies and trends. Use of the model is facilitated by a visual interface program, RunGTAP, which enables users to run policy simulations interactively in a Windows environment.

At the heart of the GTAP suite is the GTAP 6 database. The database covers 57 commodities/sectors, 87 regions, and five factors which can be aggregated to fit the needs of the experiments at hand. The base year for the data is 2001. For the experiments in this chapter, the database has been re-aggregated into 2 regions, the United States (“USA”) and Rest of the World (“ROW”); 22 sectors, which are shown below; and four factors of production, land, natural resources, labor, and capital. The rationale for including only two regions is simply that we are not concerned with the various trade flow changes with individual countries, but with the overall change in trade flows that may result from a given experiment. The underlying rationale for the sector re-aggregation was the desire to assess the economic impact of these experiments on various sectors, particularly in manufacturing. In general, the sector aggregation strategy aimed to combine related industries with similar levels of asbestos exposure. As for the factors of production, variables for skilled and unskilled labor were combined into a single labor factor. This change was implemented to facilitate interpretation of the impact of the various simulations on U.S. labor as a whole.
Before proceeding, it would be wise to offer a general caveat. By its nature, GTAP and most other general equilibrium models are comparative static in nature. That is, the model output of a particular experiment depicts how the base-year economy would look if the proposed policy changes were enacted. The model itself does not contain a mechanism for capturing changes to capital stock (or their impact on output) a feature that is necessary to determine the longer-term impact of changes in investment levels.

Thus, the model is not well suited to capture the full impact of events that will occur over a 25 year period unless adjustments are made to the model’s closure. On the other hand, by manipulating the model’s closure, the model outputs can be interpreted as occurring over different time periods. For example, changes to the model’s basic general equilibrium closure can produce partial or general equilibrium clo-

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<tr>
<td>2</td>
<td>Livestock</td>
<td>Livestock</td>
</tr>
<tr>
<td>3</td>
<td>Oth_mn</td>
<td>Mining of metals and non-metallic minerals</td>
</tr>
<tr>
<td>4</td>
<td>Energy</td>
<td>Energy-related mining and production</td>
</tr>
<tr>
<td>5</td>
<td>Construction</td>
<td>Construction</td>
</tr>
<tr>
<td>6</td>
<td>Fd_bv_tb</td>
<td>Food, beverage, tobacco</td>
</tr>
<tr>
<td>7</td>
<td>Tx_app_lt</td>
<td>Textile, apparel, leather products</td>
</tr>
<tr>
<td>8</td>
<td>Wd_ppr_oth</td>
<td>Lumber, wood and paper products, publishing</td>
</tr>
<tr>
<td>9</td>
<td>Chemicals</td>
<td>Chemicals, rubber, plastic</td>
</tr>
<tr>
<td>10</td>
<td>Nmm</td>
<td>Stone, clay, glass, concrete products</td>
</tr>
<tr>
<td>11</td>
<td>Pr_mt</td>
<td>Primary metal industries</td>
</tr>
<tr>
<td>12</td>
<td>Fb_mt</td>
<td>Fabricated metal products</td>
</tr>
<tr>
<td>13</td>
<td>Elc_ind</td>
<td>Machinery and equipment (industrial, electronic)</td>
</tr>
<tr>
<td>14</td>
<td>Tr_mc</td>
<td>Transportation equipment</td>
</tr>
<tr>
<td>15</td>
<td>Oth_mfg</td>
<td>Other manufacturing not classified elsewhere (nec)</td>
</tr>
<tr>
<td>16</td>
<td>Transport</td>
<td>Transportation services</td>
</tr>
<tr>
<td>17</td>
<td>Utility</td>
<td>Electricity, gas distribution, and water</td>
</tr>
<tr>
<td>18</td>
<td>Trade</td>
<td>Wholesale and retail trade</td>
</tr>
<tr>
<td>19</td>
<td>Fn_ins</td>
<td>Finance and insurance</td>
</tr>
<tr>
<td>20</td>
<td>Bsn_srv</td>
<td>Business services</td>
</tr>
<tr>
<td>21</td>
<td>Oth_pr_srv</td>
<td>Other private services</td>
</tr>
<tr>
<td>22</td>
<td>Gv_srv</td>
<td>Government services</td>
</tr>
</tbody>
</table>
sures that can mimic a short-run adjustment to a shock – that is, the period of time before a new equilibrium is reached. With a special short-run closure, one can interpret the lost employment from a shock, such as the cost of large asbestos litigation, as the immediate change in employment that would result from a shock before the new equilibrium – with job losers becoming re-employed – is reached.\textsuperscript{43} Similarly, a closure can be implemented to allow capital accumulation or a reduction in capital stock, thereby serving as a proxy for the long run. Such closures offer a way to overcome many of the hurdles to using a comparative-static general equilibrium model to examine a long-run phenomenon.

**Experiments**

In this section we examine various costs that are expected to be imposed on the U.S. economy if the current path of asbestos litigation continues. These costs include the payment of settlements and transactions costs expected to be borne over the next 25 years; frictional unemployment costs; reduced technological advancement due to lower investment and research and development expenditures; and lower research and development expenditures in certain industries.

**Costs of Asbestos Litigation and Their Distribution**

As an initial matter, the direct costs of litigation to defendants must be calculated and distributed to the various economic sectors in some rational manner. Although the actual future cost of litigation is unknown, there are currently two estimates deemed credible in the literature. Analysts from Tillinghast-Towers Perrin in a 2001 study concluded that settlements to individuals exposed to asbestos and related expenses would total approximately $200 billion.\textsuperscript{44} Another study conducted by Milliman Global estimated the ultimate cost would be $275 billion.\textsuperscript{45} RAND estimates that through 2002, defendants and their insurers had spent $70 billion on asbestos litigation.
Together, these estimates imply a range of future costs ranging from $130 billion to $205 billion.

But not all of these costs will be paid by defendants. The study by Tillinghast-Towers Perrin indicates that defendants will pay $70 billion to $90 billion of the $200 billion cost, while U.S. and non-U.S. insurers will pay the rest.\textsuperscript{46} Milliman Global places the defendant share of the $275 billion cost (i.e., the share that is not covered by insurance) at $175 billion.\textsuperscript{47} If these costs are scaled downward to account for payments made through 2002, they imply defendant firms will have to spend anywhere from $51 billion to $131.2 billion from 2002 onward. A.M. Best estimates that the U.S. insurance industry’s unfunded asbestos position at year-end 2004 was $10 billion.\textsuperscript{48} In order to fund these reserves, the industry must take charges to earnings over time. Additional costs to the U.S. economy will rise to the extent that the insurance industry raises premiums to offset such losses. The following table combines this information to derive a direct cost to asbestos defendants after 2002 as a result of asbestos litigation. The estimates range from $60.7 billion to $141.2 billion.

### Estimated Direct Costs of Asbestos Litigation

<table>
<thead>
<tr>
<th>Item</th>
<th>High</th>
<th>Low</th>
<th>Unit</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>A Future cost range</td>
<td>205.0</td>
<td>130.0</td>
<td>billion</td>
<td>RAND ’05 at 106</td>
</tr>
<tr>
<td>B Defendants’ share</td>
<td>64.0</td>
<td>39.0</td>
<td>percent</td>
<td>RAND ’05 at 106</td>
</tr>
<tr>
<td>C Future defendants’ cost</td>
<td>131.2</td>
<td>50.7</td>
<td>billion</td>
<td>A * B</td>
</tr>
<tr>
<td>D Unfunded insurance liabilities</td>
<td>10.0</td>
<td>10.0</td>
<td>billion</td>
<td>A.M. Best at 2</td>
</tr>
<tr>
<td>E Future defendants’ cost (plus higher premiums)</td>
<td>141.2</td>
<td>60.7</td>
<td>billion</td>
<td>C + D</td>
</tr>
</tbody>
</table>

We distribute this estimated cost to the affected sectors in a way that reflects the estimated number of defendant firms in each industry as well as the weight of the affected industries in the economy. First, RAND’s distribution of defendants across U.S. industries is used to estimate the number of defendants per GTAP sector.\textsuperscript{49} Second, using U.S. Census and other official figures, we derive the share of defendant firms in total firms by GTAP sector. The relevant data appear in the following exhibit.

The data indicate that most defendants are in the trade, construction, water transportation, chemical, electrical and industrial machinery sectors. Approximately one-third of the defendants are in manufactur-
ing industries. Considering the number of firms in each industry, two points stand out. First, only a small percentage of firms in most sectors have been involved in litigation through 2002. In most of the listed sectors, the number of defendant firms accounts for less than 1 percent of the total firms in the sector. In all but one of the nine sectors in which the defendant firms account for more than 1 percent of the U.S. firms, the share of defendant firms is less than 4 percent of the total firms in that sector. In water transportation, it appears that more than half of the firms in that sector have been defendants in asbestos litigation.

**Estimated Number of Defendants Based on GTAP Aggregation and Number of U.S. Firms in each GTAP Sector, 2002**

<table>
<thead>
<tr>
<th>GTAP Sectors</th>
<th>Number of Firms</th>
<th>Distribution of Defendants</th>
<th>Defendants as a Share of U.S. Firms</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Est. defendants</td>
<td>United States</td>
<td></td>
</tr>
<tr>
<td>Ag_crp(1)</td>
<td>319</td>
<td>1,364,993</td>
<td>3.79%</td>
</tr>
<tr>
<td>Oth_mn</td>
<td>117</td>
<td>4,258</td>
<td>1.39%</td>
</tr>
<tr>
<td>Energy</td>
<td>260</td>
<td>15,548</td>
<td>3.09%</td>
</tr>
<tr>
<td>Construction(2)</td>
<td>1,285</td>
<td>710,307</td>
<td>15.28%</td>
</tr>
<tr>
<td>Fd_bv_tb</td>
<td>278</td>
<td>25,877</td>
<td>3.31%</td>
</tr>
<tr>
<td>Tx_app.lt</td>
<td>109</td>
<td>24,247</td>
<td>1.30%</td>
</tr>
<tr>
<td>Wd_ppr_oth</td>
<td>185</td>
<td>87,638</td>
<td>2.20%</td>
</tr>
<tr>
<td>Chemicals</td>
<td>487</td>
<td>21,946</td>
<td>5.79%</td>
</tr>
<tr>
<td>Nmm</td>
<td>361</td>
<td>11,519</td>
<td>4.29%</td>
</tr>
<tr>
<td>Pr_mt</td>
<td>126</td>
<td>4,146</td>
<td>1.50%</td>
</tr>
<tr>
<td>Fb_mt</td>
<td>412</td>
<td>58,017</td>
<td>4.90%</td>
</tr>
<tr>
<td>Eic_ind</td>
<td>555</td>
<td>44,953</td>
<td>6.60%</td>
</tr>
<tr>
<td>Tr_mc</td>
<td>126</td>
<td>10,514</td>
<td>1.50%</td>
</tr>
<tr>
<td>Oth_mfg</td>
<td>25</td>
<td>31,264</td>
<td>0.30%</td>
</tr>
<tr>
<td>Other Transportation(3)</td>
<td>276</td>
<td>160,743</td>
<td>3.28%</td>
</tr>
<tr>
<td>Water Transportation(3)</td>
<td>748</td>
<td>1,416</td>
<td>8.89%</td>
</tr>
<tr>
<td>Utility</td>
<td>109</td>
<td>21,734</td>
<td>1.30%</td>
</tr>
<tr>
<td>Trade</td>
<td>1,587</td>
<td>1,367,689</td>
<td>18.87%</td>
</tr>
<tr>
<td>Fn_ins</td>
<td>235</td>
<td>238,635</td>
<td>2.79%</td>
</tr>
<tr>
<td>Bsn_srv</td>
<td>436</td>
<td>965,820</td>
<td>5.18%</td>
</tr>
<tr>
<td>Oth_pr_srv</td>
<td>250</td>
<td>1,083,463</td>
<td>2.97%</td>
</tr>
<tr>
<td>Gv_srv</td>
<td>83</td>
<td>N/A</td>
<td>0.99%</td>
</tr>
<tr>
<td>N/A</td>
<td>42</td>
<td>N/A</td>
<td>0.50%</td>
</tr>
</tbody>
</table>

(1) Data on the number of U.S. firms are not available. The number of firms with harvested crops and the number of establishments is used instead.
(2) Data on the number of U.S. firms are not available. The number of establishments is used instead.
(3) Transportation sector has been disaggregated for presentation, but is aggregated for the GTAP simulations.

The third step in the process is to estimate the weight of each industry in the economy. This is accomplished by multiplying the defendant share of U.S. firms by the U.S. payroll of the industry in question. This calculation, shown in the exhibit below, yields the implied payroll of the defendant firms for each GTAP sector. The intuition behind the calculation is simple. Defendants in the GTAP sector other mining, *oth_mn*, account for 2.75 percent of the total firms in that sector. The payroll of that sector in 2002, according to Economic Census, was $5.544 billion. Assuming equal payrolls across firms, the implied payroll of the firms in this sector subject to asbestos litigation is $152.3 million (2.75% * $5.544 billion).

The implied payroll is a proxy for the weight of the defendants in each sector in the U.S. economy. The shares in the right hand column of the table below were calculated by dividing the implied payroll of each sector by the total implied payroll. We use these shares to distribute the estimated $141.2 billion in potential asbestos-related costs. The share accounted for by manufacturing industries is approximately 60 percent, with the chemical, electrical and industrial machinery, transportation machinery, primary metals all with payroll shares in excess of 5 percent. The high shares in manufacturing industries and manufacturing overall is consistent with the observation of Stiglitz, *et al.*, that firms that declare bankruptcy are concentrated in manufacturing industries. The Stiglitz paper also observed that the firms declaring bankruptcy report particularly high unionization rates.
This exercise is not precise because of the nature of the raw data being used and the necessary simplifying assumptions. These shortcomings are not critical, however, because they only affect how the $141.2 billion cost is distributed across various sectors. Different assumptions would yield different distributions and somewhat different sector costs in the subsequent simulations. However, as long as the full $141.2 billion is distributed, the overall distortion is not likely to be very large.
This distribution of the estimated future costs to be used in the GTAP experiments is shown in the following exhibit. Eighty-five billion dollars out of the estimated $141.2 billion in asbestos litigation costs are born by the manufacturing sectors of the economy.

**Estimated Future Sector Litigation Costs Based on Payroll Shares**

<table>
<thead>
<tr>
<th>GTAP Sectors</th>
<th>Share of Payroll</th>
<th>Cost of Litigation</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>High ($ bil)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Low ($ bil)</td>
</tr>
<tr>
<td><strong>Ag_crp</strong></td>
<td>0.20%</td>
<td>0.3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.1</td>
</tr>
<tr>
<td><strong>Livestock</strong></td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td><strong>Oth_mn</strong></td>
<td>1.35%</td>
<td>1.9</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.8</td>
</tr>
<tr>
<td><strong>Energy</strong></td>
<td>3.22%</td>
<td>4.6</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2.0</td>
</tr>
<tr>
<td><strong>Construction</strong></td>
<td>4.07%</td>
<td>5.8</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2.5</td>
</tr>
<tr>
<td><strong>Fd_bv_tb</strong></td>
<td>4.99%</td>
<td>7.0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3.0</td>
</tr>
<tr>
<td><strong>Tx_app_lt</strong></td>
<td>0.84%</td>
<td>1.2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.5</td>
</tr>
<tr>
<td><strong>Wd_ppr_oth</strong></td>
<td>1.54%</td>
<td>2.2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.9</td>
</tr>
<tr>
<td><strong>Chemicals</strong></td>
<td>15.16%</td>
<td>21.4</td>
</tr>
<tr>
<td></td>
<td></td>
<td>9.2</td>
</tr>
<tr>
<td><strong>Nmm</strong></td>
<td>4.97%</td>
<td>7.0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3.0</td>
</tr>
<tr>
<td><strong>Pr_mt</strong></td>
<td>5.76%</td>
<td>8.1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3.5</td>
</tr>
<tr>
<td><strong>Fb_mt</strong></td>
<td>3.62%</td>
<td>5.1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2.2</td>
</tr>
<tr>
<td><strong>Elc_ind</strong></td>
<td>14.48%</td>
<td>20.4</td>
</tr>
<tr>
<td></td>
<td></td>
<td>8.8</td>
</tr>
<tr>
<td><strong>Tr_mc</strong></td>
<td>8.71%</td>
<td>12.3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>5.3</td>
</tr>
<tr>
<td><strong>Oth_mfg</strong></td>
<td>0.19%</td>
<td>0.3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.1</td>
</tr>
<tr>
<td><strong>Transportation</strong></td>
<td>16.84%</td>
<td>23.8</td>
</tr>
<tr>
<td></td>
<td></td>
<td>10.2</td>
</tr>
<tr>
<td><strong>Utility</strong></td>
<td>2.43%</td>
<td>3.4</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1.5</td>
</tr>
<tr>
<td><strong>Trade</strong></td>
<td>4.77%</td>
<td>6.7</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2.9</td>
</tr>
<tr>
<td><strong>Fn_ins</strong></td>
<td>3.28%</td>
<td>4.6</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2.0</td>
</tr>
<tr>
<td><strong>Bsn_srv</strong></td>
<td>1.74%</td>
<td>2.5</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1.1</td>
</tr>
<tr>
<td><strong>Oth_pr_srv</strong></td>
<td>1.83%</td>
<td>2.6</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1.1</td>
</tr>
<tr>
<td><strong>Gv_srv</strong></td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>100.00%</td>
<td>141.2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>60.7</td>
</tr>
</tbody>
</table>

**Methodology**

Now that the necessary distribution of costs has been calculated, the experiments can be described. While it is tempting to produces a one or two headline numbers in terms of lost jobs and lost GDP, there are significant uncertainties in terms of how the economy would adjust to such costs over a 25-year period. Instead, we pursue a strategy that aims to put the expected costs into context by using GTAP to assess
various types of economic impacts from the litigation. The experiments focus on short-run employment costs, and longer-run effects on productivity and competitiveness due to lower levels of capital stock.

Before describing the experiments in detail, it is necessary to describe the technique for imposing the expected asbestos costs on the economy. The version of GTAP used for this experiment cannot directly “shock” corporate profits to mimic the effect of litigation costs on corporations. Instead, the shock is applied as an output tax on the various economic sectors. To prevent the model from converting the output tax into increased government purchases, it is assumed that government expenditures do not increase as a result of the tax. In essence, the part of the tax is assumed to pay-down the deficit rather than finance new expenditures. This solution is implemented by modifying the model closure to fix government spending at the base-year level.\(^5^4\)

The first experiment, EXP1, is a short-run experiment that attempts to assess the employment effects of litigation costs. The shock applied is an output tax of $141.2 billion with the sector distribution shown above. For this experiment, a partial equilibrium closure is used to capture the short-run employment effects of the asbestos costs as if they were imposed all at once.\(^5^5\) This closure is intuitively appealing because labor is a mobile factor and would be expected to bear the brunt of any large shock to the production side of the economy in the short run.\(^5^6\) The short run nature of the closure implies that resources have not fully adjusted to the asbestos costs imposed on firms.

The second experiment, EXP2, is a medium-run experiment that attempts to assess the impact of asbestos costs on investment levels. Unlike EXP1, a general equilibrium closure is used so that factors of production, including labor, adjust to a new, equilibrium. Labor resources let go by one sector would find employment in other sectors. This experiment is useful for assessing which sectors would suffer permanent employment losses in the event as a result of the asbestos costs, even under the favorable general equilibrium assumption that there are no short-run costs in terms of aggregate unemployment.

The third experiment, EXP3, implements a long run closure that facilitates investigation of the impact of asbestos-related costs on capital stock. In contrast to the standard general equilibrium closure, which
holds capital stock fixed, the long run closure allows for changes to capital stock in response to the higher costs imposed on businesses. The changes to capital stock in various industries also lead to shifts in employment levels across industries.

The fourth experiment, EXP4, applies the standard GTAP closure to the database generated by EXP3 to investigate the impact of lower productivity growth that theory and evidence suggest would arise from the reductions in U.S. capital stock and research and development expenditures. To simulate this effect, a negative shock of 0.87 percent was imposed on an output-reducing technical change variable for each of the sectors affected by asbestos litigation.\(^{37}\)

The magnitude of this change was based on the U.S. Bureau of Labor Statistics’ multifactor productivity index, which measures output per combined unit of labor and capital inputs.\(^ {38}\) Specifically, the impact of the decline in U.S. physical capital stock and real GDP from simulation EXP3 was used to estimate a revised multifactor productivity index for the U.S. economy for 2001.\(^ {39}\) The calculations indicate that a 4.69 percent reduction in capital stock and lower GDP associated with simulation EXP3 reduces the multifactor productivity index for 2001 from 100.1 to 99.2, a reduction of 0.87 percent.\(^ {60}\) This shock is imposed on the \textit{aoall}, the output augmenting technical change variable, using the EXP3 database and a standard general equilibrium closure.

The full $141.2 billion cost is imposed at one time. To get a better idea of the single-year impacts, the total impacts from each scenario can be divided by 25 to approximate an average annual impact of the litigation costs.

Finally, a sensitivity analysis is performed on the four experiments to assess a potential downside scenario that was mentioned during interviews undertaken for this study. As noted above, some executives claim that their experience with asbestos litigation costs has made them reluctant to pursue business opportunities in cutting edge manufacturing. There is no way of knowing now whether the inputs used to manufacture some cutting edge products, or the cutting edge end-use products themselves, might be subject to long-term litigation costs in the future. Such uncertainty regarding future litigation costs discourages certain U.S. firms from producing new products that
would require additional investments and confer other benefits on the U.S. economy. At the same time, these same companies are being pursued by foreign governments trying to secure such advantages for their own economies. The chilling effect of the current asbestos morass on product development and advanced manufacturing could prove to be the most significant cost to the U.S. economy in both the medium term and the long-term.

It is difficult to quantify the impact of this chilling effect directly, but evidence on U.S. productivity suggests the impact is substantial. For example, the U.S. economy has achieved early mover advantages in many cutting edge industries, such as semiconductors, aerospace, computers and peripherals, and medical equipment. The benefits that such industries confer upon the U.S. economy are substantial. They accounted for 10 percent of the value added in U.S. manufacturing in 2004, even though they accounted for only five percent of hours worked. Without these industries, manufacturing productivity in 2004 would have been 5.4 percent lower. Given that improvements in living standards depend on productivity in the long run, losing such industries would harm the U.S. economy.

In the context of GTAP, there are a variety of ways to incorporate the impacts of lost U.S. product development and output due to the chilling effect of asbestos litigation. For example, if firms decide to perform new product development and output abroad, there may be less overall capital investment in the United States and more investment abroad. This dynamic can be simulated in the GTAP framework by reducing capital stock in the United States and increasing capital stock in ROW by an equivalent amount. This approach is used for EXP1 and EXP2.

For EXP3, the long-run experiment, we assess the possibility of an even greater impact of litigation on U.S. capital stock, along with an increased capital stock in ROW. The approach used for EXP1 and EXP2 is inappropriate because domestic capital stock is endogenous in EXP3. Instead, we further increase the risk premium associated with investing U.S. assets in order to simulate a greater sensitivity of investors to supporting new products and processes that could invite further litigation in the United States. This simulation is implemented by increasing the rate of return on investment in the United States to reflect the higher risk associated with investing in the United States,
and by increasing capital stock in Rest of World to simulate foreign
direct investment from the United States. The database generated by
this experiment is used to generate a “worst-case scenario” for EXP4,
in which a reduction in physical capital is reflected results in lower
U.S. productivity growth.

**RESULTS**

**Experiment 1: Partial Equilibrium Using Short-Run Simulation**

As noted above, this simulation deviates from the standard general
equilibrium model closure to facilitate the assessment of short-run
effects of the costs imposed by asbestos litigation on the U.S. economy.

The affect of the litigation costs on the key macroeconomic variables
is shown in the exhibit below. Investment and export levels decline by
approximately 5.8 percent, while consumption and imports rise
somewhat. The current account deficit deteriorates by approximately
$57.6 billion. The decline in GDP, 1.67 percent, represents the change
in the value of GDP in current dollars. That is, it does not factor in
changes in prices. The decline in real GDP associated with this simu-
lation is a 2.07 percent, or $208.6 billion.

**EXP1: Impact of Asbestos Costs on Key Macroeconomic Variables**

<table>
<thead>
<tr>
<th>Item</th>
<th>Base Case</th>
<th>Simulation</th>
<th>Change</th>
<th>% Change</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Billions of Dollars</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Consumption</td>
<td>6,956.3</td>
<td>6,962.4</td>
<td>6.2</td>
<td>0.09%</td>
</tr>
<tr>
<td>Investment</td>
<td>1,990.6</td>
<td>1,866.4</td>
<td>-124.2</td>
<td>-6.24%</td>
</tr>
<tr>
<td>Government</td>
<td>1,528.6</td>
<td>1,528.6</td>
<td>0.0</td>
<td>0.00%</td>
</tr>
<tr>
<td>Exports</td>
<td>907.5</td>
<td>847.9</td>
<td>-59.6</td>
<td>-6.57%</td>
</tr>
<tr>
<td>Imports</td>
<td>1,300.9</td>
<td>1,306.4</td>
<td>5.5</td>
<td>0.43%</td>
</tr>
<tr>
<td>GDP</td>
<td>10,082.2</td>
<td>9,899.0</td>
<td>-183.2</td>
<td>-1.82%</td>
</tr>
</tbody>
</table>

The impact of asbestos related costs on the various U.S. industries
under this simulation is shown below. All but three industries experi-
ence declining output. The hardest hit industries in terms of dollar
value are electrical and industrial machinery ($92.1 billion); construc-
tion ($66.9 billion); transportation machinery ($50.5 billion); chemicals, plastic, and rubber ($48.7 billion); and wholesale and retail trade ($40.7 billion). Lost output in manufacturing industries amounts to nearly $275 billion. In percentage terms, the industries experiencing the largest declines are primary metals (10.56 percent); non-metallic minerals (9.68 percent); electrical and industrial machinery (8.09 percent); transportation machinery (7.64 percent); and other mining (7.46 percent). The severity of these losses reflects the imposition of all the costs in a single year, as well as the partial equilibrium nature of this simulation. However, the simulation makes clear which industries are most vulnerable to asbestos-related costs over the coming years. This experiment also underscores the findings of the RAND and Stiglitz, et al., studies that these costs are widespread. For many industries, the costs in lost production are likely to be significant even if they are imposed over a 25-year time frame.

<table>
<thead>
<tr>
<th>Item</th>
<th>Base Case</th>
<th>Simulation</th>
<th>Change</th>
<th>% Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ag_crp</td>
<td>111.0</td>
<td>111.1</td>
<td>0.2</td>
<td>0.15%</td>
</tr>
<tr>
<td>Livestock</td>
<td>92.8</td>
<td>92.3</td>
<td>-0.5</td>
<td>-0.59%</td>
</tr>
<tr>
<td>Oth_mn</td>
<td>34.6</td>
<td>31.9</td>
<td>-2.7</td>
<td>-7.93%</td>
</tr>
<tr>
<td>Energy</td>
<td>224.8</td>
<td>216.2</td>
<td>-8.6</td>
<td>-3.83%</td>
</tr>
<tr>
<td>Construction</td>
<td>1,351.1</td>
<td>1,279.2</td>
<td>-71.8</td>
<td>-5.32%</td>
</tr>
<tr>
<td>Fd_bv_tb</td>
<td>744.7</td>
<td>740.1</td>
<td>-4.6</td>
<td>-0.62%</td>
</tr>
<tr>
<td>Tx_app_Lt</td>
<td>270.7</td>
<td>263.8</td>
<td>-6.9</td>
<td>-2.54%</td>
</tr>
<tr>
<td>Wd_ppr_oth</td>
<td>636.7</td>
<td>620.4</td>
<td>-16.3</td>
<td>-2.56%</td>
</tr>
<tr>
<td>Chemicals</td>
<td>716.3</td>
<td>664.5</td>
<td>-51.8</td>
<td>-7.24%</td>
</tr>
<tr>
<td>Nmm</td>
<td>127.3</td>
<td>114.4</td>
<td>-12.9</td>
<td>-10.15%</td>
</tr>
<tr>
<td>Pr_mt</td>
<td>253.0</td>
<td>224.5</td>
<td>-28.5</td>
<td>-11.27%</td>
</tr>
<tr>
<td>Fb_mt</td>
<td>289.6</td>
<td>269.3</td>
<td>-20.3</td>
<td>-7.01%</td>
</tr>
<tr>
<td>Elc_ind</td>
<td>1,158.7</td>
<td>1,037.8</td>
<td>-100.9</td>
<td>-8.86%</td>
</tr>
<tr>
<td>Tr_mc</td>
<td>661.0</td>
<td>607.0</td>
<td>-54.1</td>
<td>-8.18%</td>
</tr>
<tr>
<td>Oth_mfg</td>
<td>64.5</td>
<td>62.9</td>
<td>-1.6</td>
<td>-2.47%</td>
</tr>
<tr>
<td>Transport</td>
<td>670.4</td>
<td>637.4</td>
<td>-33.1</td>
<td>-4.93%</td>
</tr>
<tr>
<td>Utility</td>
<td>390.1</td>
<td>380.3</td>
<td>-9.8</td>
<td>-2.52%</td>
</tr>
<tr>
<td>Trade</td>
<td>2,455.5</td>
<td>2,408.7</td>
<td>-46.7</td>
<td>-1.90%</td>
</tr>
<tr>
<td>Fn_ins</td>
<td>1,482.4</td>
<td>1,462.1</td>
<td>-20.4</td>
<td>-1.37%</td>
</tr>
<tr>
<td>Bsn_srv</td>
<td>1,962.6</td>
<td>1,934.6</td>
<td>-27.9</td>
<td>-1.42%</td>
</tr>
<tr>
<td>Oth_pr_srv</td>
<td>1,823.7</td>
<td>1,831.9</td>
<td>8.2</td>
<td>0.45%</td>
</tr>
<tr>
<td>Gv_srv</td>
<td>2,450.5</td>
<td>2,446.1</td>
<td>-4.5</td>
<td>-0.18%</td>
</tr>
</tbody>
</table>
These output declines are reflected in firm purchases of labor. As firms spend money on asbestos-related claims, they have less money to spend on the purchase of inputs, such as includes labor. The table below shows the base case and simulation change in labor purchases, by industry. In dollar terms, the most significant losses occur in electrical and industrial machinery ($28.0 billion); wholesale and retail trade ($27.1 billion); construction ($23.9 billion); business services ($14.2 billion); and transportation services ($11.0 billion). In percentage terms, the largest declines in payments for labor occur in primary metals (11.28 percent); non-metallic minerals (10.79 percent); electrical and industrial machinery (9.07 percent); other mining (8.52 percent); and transportation machinery (8.28 percent). Manufacturing industries experience a decline in payroll of $73.6 billion, compared to an overall decline of $176.7 billion. In other words,

**EXP1: Impact of Asbestos Costs on Industry Labor Demand**

<table>
<thead>
<tr>
<th>Item</th>
<th>Base Case</th>
<th>Simulation</th>
<th>Change</th>
<th>% Change</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Billions of Dollars</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ag_crp</td>
<td>25.1</td>
<td>25.0</td>
<td>0.0</td>
<td>-0.17%</td>
</tr>
<tr>
<td>Livestock</td>
<td>7.8</td>
<td>7.7</td>
<td>-0.1</td>
<td>-0.95%</td>
</tr>
<tr>
<td>Oth_mn</td>
<td>8.6</td>
<td>7.9</td>
<td>-0.8</td>
<td>-9.06%</td>
</tr>
<tr>
<td>Energy</td>
<td>12.9</td>
<td>12.1</td>
<td>-0.8</td>
<td>-6.34%</td>
</tr>
<tr>
<td>Construction</td>
<td>418.9</td>
<td>393.0</td>
<td>-25.9</td>
<td>-6.19%</td>
</tr>
<tr>
<td>Fd_bv_tb</td>
<td>104.2</td>
<td>101.7</td>
<td>-2.5</td>
<td>-2.40%</td>
</tr>
<tr>
<td>Tx_app_lt</td>
<td>58.4</td>
<td>56.3</td>
<td>-2.1</td>
<td>-3.51%</td>
</tr>
<tr>
<td>Wd_ppr_oth</td>
<td>140.8</td>
<td>135.3</td>
<td>-5.6</td>
<td>-3.95%</td>
</tr>
<tr>
<td>Chemicals</td>
<td>128.3</td>
<td>116.9</td>
<td>-11.4</td>
<td>-8.89%</td>
</tr>
<tr>
<td>Nmm</td>
<td>32.9</td>
<td>29.1</td>
<td>-3.8</td>
<td>-11.42%</td>
</tr>
<tr>
<td>Pr_mt</td>
<td>52.1</td>
<td>45.8</td>
<td>-6.3</td>
<td>-12.09%</td>
</tr>
<tr>
<td>Fb_mt</td>
<td>79.3</td>
<td>73.0</td>
<td>-6.3</td>
<td>-7.90%</td>
</tr>
<tr>
<td>Elc_ind</td>
<td>309.1</td>
<td>278.3</td>
<td>-30.8</td>
<td>-9.97%</td>
</tr>
<tr>
<td>Tr_mc</td>
<td>128.8</td>
<td>117.4</td>
<td>-11.5</td>
<td>-8.90%</td>
</tr>
<tr>
<td>Oth_mfg</td>
<td>15.6</td>
<td>15.0</td>
<td>-0.6</td>
<td>-3.73%</td>
</tr>
<tr>
<td>Transport</td>
<td>184.7</td>
<td>172.8</td>
<td>-11.9</td>
<td>-6.44%</td>
</tr>
<tr>
<td>Utility</td>
<td>72.8</td>
<td>69.4</td>
<td>-3.4</td>
<td>-4.73%</td>
</tr>
<tr>
<td>Trade</td>
<td>945.3</td>
<td>914.2</td>
<td>-31.1</td>
<td>-3.29%</td>
</tr>
<tr>
<td>Fn_ins</td>
<td>515.3</td>
<td>502.7</td>
<td>-12.6</td>
<td>-2.44%</td>
</tr>
<tr>
<td>Bsn_srv</td>
<td>455.8</td>
<td>439.2</td>
<td>-16.6</td>
<td>-3.64%</td>
</tr>
<tr>
<td>Oth_pr_srv</td>
<td>287.6</td>
<td>281.1</td>
<td>-6.4</td>
<td>-2.23%</td>
</tr>
<tr>
<td>Gv_srv</td>
<td>1,402.7</td>
<td>1,392.2</td>
<td>-10.5</td>
<td>-0.75%</td>
</tr>
</tbody>
</table>
more than 40 percent of the decline in labor payments occurs in man-
ufacturing, even though manufacturing employees accounted for only
12.6 percent of U.S. employment in 2001, the base year for the GTAP
database.\textsuperscript{67}

In sum, this partial equilibrium experiment indicates that the costs of
asbestos litigation, if imposed during a single year, would have a sig-
nificant impact on the U.S. economy in the short run. Real GDP
would decline by 2.07 percent, investment and exports would decline
by close to six percent, and imports would increase somewhat. Nearly
all industries would experience short run declines in output and
employment. Employment and output in manufacturing industries
would be affected disproportionately to their weight in the domestic
economy. In other words, the short-run effects of applying such large
costs suggest severe economic consequences. For the industries expe-
riencing relatively large output and employment effects, this simula-
tion suggests that the annual economic drag of litigation, even if the
costs are phased in over a number of years, is not insignificant.

The estimates produced by this simulation seem reasonable when
compared to those of other studies. The Kerr study of 400 businesses
exposed to asbestos claims risk estimated an employment impact of
30,770 jobs lost per year.\textsuperscript{68} The study by Stiglitz, et al., found that
firms declaring bankruptcy due to asbestos claims experienced job
losses of approximately 60,000 jobs.\textsuperscript{69} The results of simulation
\textit{EXP1}, which are based on costs being applied over approximately
8,400 firms, imply employment effects equivalent to approximately
90,000 jobs lost per year.\textsuperscript{70} The three studies employ different
methodologies and are not directly comparable. However, they all
support the notion that the costs of asbestos claims have noticeable
employment effects.

**Experiment 2: General Equilibrium Using Medium-
Run Simulation**

This simulation maintains the general equilibrium character of GTAP,
with the only closure modification being to fix government spending
so that the output tax does not result in additional government pur-
chases. As with , the full expected cost of asbestos litigation is applied
at one time. A common criticism of general equilibrium models is that they minimize the costs of certain policies by assuming the economy reabsorbs factors of production, such as labor, that are no longer used by other industries. In the case of employment, the model assumes that no unemployment results from the asbestos-related payments. In considering the cost of asbestos litigation, this property of GTAP enables us to consider how resources in the economy will shift in response to the shock. Some industries will use more resources, while others will use less.

The affect of the litigation costs on the key macroeconomic variables is shown in the exhibit below. As one would expect, the changes are smaller than those shown in the partial equilibrium approach. Consumption, exports, and imports experience modest increases, while investment levels decline by 3.3 percent. The decline in GDP, 0.63 percent, is only $63.2 billion. In real terms, the decline is even smaller. The asbestos “tax” on businesses still imposes a cost in the form of reduced output because it shifts resources to other sectors where they are used less efficiently. The costs to overall GDP are also lower because the general equilibrium closure ensures that some of asbestos “tax” supports additional spending in the economy, just as recipients of asbestos payments from industry are likely to increase their spending levels.

**EXP2: Impact of Asbestos Costs on Key Macroeconomic Variables**

<table>
<thead>
<tr>
<th>Item</th>
<th>Base Case</th>
<th>Simulation</th>
<th>Change</th>
<th>% Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Consumption</td>
<td>6,956.3</td>
<td>6,961.5</td>
<td>5.2</td>
<td>0.07%</td>
</tr>
<tr>
<td>Investment</td>
<td>1,990.6</td>
<td>1,924.6</td>
<td>-66.0</td>
<td>-3.32%</td>
</tr>
<tr>
<td>Government</td>
<td>1,528.6</td>
<td>1,528.6</td>
<td>0.0</td>
<td>0.00%</td>
</tr>
<tr>
<td>Exports</td>
<td>907.5</td>
<td>907.9</td>
<td>0.4</td>
<td>0.05%</td>
</tr>
<tr>
<td>Imports</td>
<td>1,300.9</td>
<td>1,303.7</td>
<td>2.8</td>
<td>0.22%</td>
</tr>
<tr>
<td>GDP</td>
<td>10,082.2</td>
<td>10,018.9</td>
<td>-63.2</td>
<td>-0.63%</td>
</tr>
</tbody>
</table>

The table below shows the industries that experience output losses in this simulation. In dollar terms, the largest losses are experienced by the construction industry ($30.8 billion); electrical and industrial machinery ($27.6 million); chemicals ($26.0 billion); transportation machinery ($24.5 billion); and transportation ($24.5 billion). The
total output losses experienced by the firms in the table below equal $162 billion, a total which exceeds the asbestos “tax” imposed on the economy. In the CGE framework, the output losses experienced by these industries are partially offset by output gains in other industries. The industry which experiences the largest output gain in this simulation is government services. Whether this is a reasonable outcome is left for the reader to decide. In percentage terms the largest declines are experienced by the following industries: non-metallic minerals (6.22 percent); primary metals (5.32 percent); other mining (4.03 percent); transportation machinery (3.71 percent); and chemicals, plastic, and rubber (3.63 percent). Even in the context of a general equilibrium approach, the output effects of the asbestos tax are significant to a core group of industries.

**EXP2: Impact of Asbestos Costs on the Output of Selected Industries**

<table>
<thead>
<tr>
<th>Item</th>
<th>Base Case</th>
<th>Simulation</th>
<th>Change</th>
<th>% Change</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Billions of Dollars</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Construction</td>
<td>1,351.1</td>
<td>1,320.3</td>
<td>-30.8</td>
<td>-2.28%</td>
</tr>
<tr>
<td>Elc_ind</td>
<td>1,158.7</td>
<td>1,111.1</td>
<td>-47.6</td>
<td>-2.42%</td>
</tr>
<tr>
<td>Chemicals</td>
<td>716.3</td>
<td>690.3</td>
<td>-26.0</td>
<td>-3.63%</td>
</tr>
<tr>
<td>Tr_mc</td>
<td>661.0</td>
<td>636.5</td>
<td>-24.5</td>
<td>-3.71%</td>
</tr>
<tr>
<td>Transport</td>
<td>670.4</td>
<td>654.5</td>
<td>-16.0</td>
<td>-2.38%</td>
</tr>
<tr>
<td>Pr_mt</td>
<td>253.0</td>
<td>239.6</td>
<td>-13.5</td>
<td>-5.32%</td>
</tr>
<tr>
<td>Nmm</td>
<td>127.3</td>
<td>119.4</td>
<td>-7.9</td>
<td>-6.22%</td>
</tr>
<tr>
<td>Fb_mt</td>
<td>289.6</td>
<td>282.1</td>
<td>-7.5</td>
<td>-2.57%</td>
</tr>
<tr>
<td>Energy</td>
<td>224.8</td>
<td>219.9</td>
<td>-4.9</td>
<td>-2.18%</td>
</tr>
<tr>
<td>Utility</td>
<td>390.1</td>
<td>388.1</td>
<td>-2.0</td>
<td>-0.52%</td>
</tr>
<tr>
<td>Oth_mm</td>
<td>34.6</td>
<td>33.2</td>
<td>-1.4</td>
<td>-4.03%</td>
</tr>
</tbody>
</table>

The employment effects of the asbestos “tax” are concentrated in the same core group of industries, as one would expect. In fact, the total net change in payroll across all industries in the EXP 2 simulation is zero. The industries that experience adverse employment effects in EXP2 are shown in the table below. The magnitude of the losses is significantly smaller than in the EXP1 simulation, ranging from 9 percent of the EXP1 simulation total (utility) to 54 percent of the EXP1 simulation (non-metallic mineral). The largest losses are felt by workers in construction ($9.4 billion); electrical and industrial machinery ($7.3 billion); transportation machinery ($4.7 billion); chemicals,
plastic, and rubber ($4.6 billion); and transport ($4.3 billion). The largest percentage losers in terms of employment are in non-metallic minerals; primary metals; other mining; transportation machinery; and chemicals, plastic, and rubber. The combined payroll reduction for the industries in the table below amounts to $38.2 billion. The combined net payroll reduction for manufacturing, including the industries that experience small payroll increases in this simulation, is $21.2 billion.

**EXP2: Impact of Asbestos Costs on Labor Demand in Selected Industries**

<table>
<thead>
<tr>
<th>Item</th>
<th>Base Case</th>
<th>Simulation</th>
<th>Change</th>
<th>% Change</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Billions of Dollars</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Construction</td>
<td>1,351.1</td>
<td>1,320.3</td>
<td>-30.8</td>
<td>-2.28%</td>
</tr>
<tr>
<td>Elc_ind</td>
<td>1,138.7</td>
<td>1,111.1</td>
<td>-27.6</td>
<td>-2.42%</td>
</tr>
<tr>
<td>Chemicals</td>
<td>716.3</td>
<td>690.3</td>
<td>-26.0</td>
<td>-3.63%</td>
</tr>
<tr>
<td>Tr_mc</td>
<td>661.0</td>
<td>636.5</td>
<td>-24.5</td>
<td>-3.71%</td>
</tr>
<tr>
<td>Transport</td>
<td>670.4</td>
<td>654.5</td>
<td>-16.0</td>
<td>-2.38%</td>
</tr>
<tr>
<td>Pr_mt</td>
<td>253.0</td>
<td>239.6</td>
<td>-13.5</td>
<td>-5.32%</td>
</tr>
<tr>
<td>Nmm</td>
<td>127.3</td>
<td>119.4</td>
<td>-7.9</td>
<td>-6.22%</td>
</tr>
<tr>
<td>Fb_mt</td>
<td>289.6</td>
<td>282.1</td>
<td>-7.4</td>
<td>-2.57%</td>
</tr>
<tr>
<td>Energy</td>
<td>224.8</td>
<td>219.9</td>
<td>-4.9</td>
<td>-2.18%</td>
</tr>
<tr>
<td>Utility</td>
<td>390.1</td>
<td>388.1</td>
<td>-2.0</td>
<td>-0.52%</td>
</tr>
<tr>
<td>Oth_mn</td>
<td>34.6</td>
<td>33.2</td>
<td>-1.4</td>
<td>-4.03%</td>
</tr>
</tbody>
</table>

The medium run, general equilibrium depiction of the asbestos tax is relatively benign from a macroeconomic standpoint in comparison to the partial equilibrium depiction in **EXP1**. The GDP loss, for example, is relatively minor, as is the reduction in investment levels. However, even the general equilibrium simulation indicates there are losers among certain industries and their workers, with lost wages of $38.2 billion and lost industry output of $162 billion. The relatively benign outcome of this simulation rests on large increases in the output and employment of the government services sector that may not be practical in a real world situation, and a 2.07 percent decline in the market price of labor compared to the base case scenario. In other words, to maintain full employment in the context of this simulation, wages must decline by 2.07 percent. Thus, there are clear costs to U.S. labor as a whole even in this optimistic simulation of the economic costs of asbestos claims.
Experiment 3: General Equilibrium Using Long-Run Simulation

This simulation maintains the general equilibrium character of GTAP, with two modifications to the standard macroeconomic closure. First, government expenditures are fixed, as with the prior two simulations. Second, the level of capital stocks in the U.S. economy is allowed to adjust in response to the asbestos tax. As with EXP2, the post-simulation market for employment clears, so there is no net change in employment levels. There are, however, significant distributional changes in employment across sectors and more significant changes in economic output due to the changes in capital stock.

The impact of the asbestos-related costs on the key macroeconomic variables is shown in the exhibit below. Investment in the new equilibrium is 3.78 percent lower than in the base case, while exports are 6.25 percent lower. Imports rise by 1.14 percent. Overall, the U.S. current account deficit deteriorates by $71.6 billion. GDP is $140.2 billion lower as a result of this simulation, with the decline nearly equal to the imposed asbestos tax. Real GDP in this simulation is 1.79 percent ($180.9 billion) lower than in the base case scenario.

EXP3: Impact of Asbestos Costs on Key Macroeconomic Variables

<table>
<thead>
<tr>
<th>Item</th>
<th>Base Case</th>
<th>Simulation</th>
<th>Change</th>
<th>% Change</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Billions of Dollars</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Consumption</td>
<td>6,956.3</td>
<td>6,963.0</td>
<td>6.7</td>
<td>0.10%</td>
</tr>
<tr>
<td>Investment</td>
<td>1,990.6</td>
<td>1,915.3</td>
<td>-75.3</td>
<td>-3.78%</td>
</tr>
<tr>
<td>Government</td>
<td>1,528.6</td>
<td>1,528.6</td>
<td>0.0</td>
<td>0.00%</td>
</tr>
<tr>
<td>Exports</td>
<td>907.5</td>
<td>850.8</td>
<td>-56.7</td>
<td>-6.25%</td>
</tr>
<tr>
<td>Imports</td>
<td>1,300.9</td>
<td>1,315.8</td>
<td>14.9</td>
<td>1.14%</td>
</tr>
<tr>
<td>GDP</td>
<td>10,082.2</td>
<td>9,942.0</td>
<td>-140.2</td>
<td>-1.39%</td>
</tr>
</tbody>
</table>

The impacts on industry output shown in the table below are significant, with all but one industry experiencing reduced output. The loss in manufacturing output is $250 billion. The top five industries in terms of lost output are electrical and industrial machinery ($80.4 billion); chemicals, plastic, and rubber ($51.8 billion); construction ($46.0 billion); transportation machinery ($41.4 billion); and wholesale and retail trade ($30.7 billion). In percentage terms, the largest output reductions occur in primary metals (9.43 percent); non-metallic...
minerals (9.00 percent); chemicals, plastic, and rubber (7.23 percent); electrical and industrial machinery (7.06 percent); and other mining (6.69 percent). The transportation machinery and fabricated metals industries also experience output reductions exceeding five percent.

**EXP3: Impact of Asbestos Costs on Industry Output**

<table>
<thead>
<tr>
<th>Item</th>
<th>Base Case</th>
<th>Simulation</th>
<th>Change</th>
<th>% Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pr_mt</td>
<td>253.0</td>
<td>229.2</td>
<td>-23.9</td>
<td>-9.43%</td>
</tr>
<tr>
<td>Nmm</td>
<td>127.3</td>
<td>115.8</td>
<td>-11.5</td>
<td>-9.00%</td>
</tr>
<tr>
<td>Chemicals</td>
<td>716.3</td>
<td>664.5</td>
<td>-51.8</td>
<td>-7.23%</td>
</tr>
<tr>
<td>Elc_ind</td>
<td>1,138.7</td>
<td>1,058.3</td>
<td>-80.4</td>
<td>-7.06%</td>
</tr>
<tr>
<td>Oth_mn</td>
<td>34.6</td>
<td>32.3</td>
<td>-2.3</td>
<td>-6.69%</td>
</tr>
<tr>
<td>Tr_mc</td>
<td>661.0</td>
<td>619.6</td>
<td>-41.4</td>
<td>-6.26%</td>
</tr>
<tr>
<td>Fb_mt</td>
<td>289.6</td>
<td>274.1</td>
<td>-15.5</td>
<td>-5.35%</td>
</tr>
<tr>
<td>Transport</td>
<td>670.4</td>
<td>641.4</td>
<td>-29.1</td>
<td>-4.33%</td>
</tr>
<tr>
<td>Energy</td>
<td>224.8</td>
<td>215.7</td>
<td>-9.1</td>
<td>-4.05%</td>
</tr>
<tr>
<td>Construction</td>
<td>1,351.1</td>
<td>1,305.0</td>
<td>-46.0</td>
<td>-3.41%</td>
</tr>
<tr>
<td>Utility</td>
<td>390.1</td>
<td>380.4</td>
<td>-9.7</td>
<td>-2.49%</td>
</tr>
<tr>
<td>Wd_ppr_oth</td>
<td>636.7</td>
<td>624.2</td>
<td>-12.5</td>
<td>-1.96%</td>
</tr>
<tr>
<td>Oth_mfg</td>
<td>64.5</td>
<td>63.3</td>
<td>-1.1</td>
<td>-1.77%</td>
</tr>
<tr>
<td>Tx_appLt</td>
<td>270.7</td>
<td>266.6</td>
<td>-4.1</td>
<td>-1.52%</td>
</tr>
<tr>
<td>Bsn_srv</td>
<td>1,962.6</td>
<td>1,935.9</td>
<td>-26.7</td>
<td>-1.36%</td>
</tr>
<tr>
<td>Trade</td>
<td>2,455.5</td>
<td>2,424.7</td>
<td>-30.7</td>
<td>-1.25%</td>
</tr>
<tr>
<td>Fd_bv_tb</td>
<td>744.7</td>
<td>736.2</td>
<td>-8.5</td>
<td>-1.14%</td>
</tr>
<tr>
<td>Livestock</td>
<td>92.8</td>
<td>91.9</td>
<td>-0.9</td>
<td>-0.98%</td>
</tr>
<tr>
<td>Fn_ins</td>
<td>1,482.4</td>
<td>1,470.0</td>
<td>-12.5</td>
<td>-0.84%</td>
</tr>
<tr>
<td>Oth_pr_srv</td>
<td>1,823.7</td>
<td>1,810.0</td>
<td>-13.8</td>
<td>-0.76%</td>
</tr>
<tr>
<td>Ag_crp</td>
<td>111.0</td>
<td>110.9</td>
<td>0.0</td>
<td>-0.02%</td>
</tr>
<tr>
<td>Gv_srv</td>
<td>2,450.5</td>
<td>2,474.3</td>
<td>23.8</td>
<td>0.97%</td>
</tr>
</tbody>
</table>

Because EXP3 imposes a long run, general equilibrium closure, labor markets clear. Thus, the employment effects in the long run are not as severe as the output effects. Every worker finds a home. However, certain industries experience significant long-run losses, the largest of which occur in electrical and industrial machinery ($16.9 billion); construction ($9.0 billion); transportation machinery ($6.7 billion); chemicals, plastic, and rubber ($6.3 billion); and primary metals ($4.3 billion). The net long run reduction in manufacturing payments to labor totals $38.3 billion in this simulation. In percentage terms the
largest reduction occur in primary metals (8.25 percent); non-metallic minerals (7.18 percent); other mining (7.17 percent); energy (5.50 percent); and electrical and industrial machinery (5.45 percent). The other industries experience moderate gains in labor payments, but, as was the case in EXP2, the sector that experiences the largest gains is government services.

**EXP3: Impact of Asbestos Costs on Labor Demand in Selected Industries**

<table>
<thead>
<tr>
<th>Item</th>
<th>Base Case</th>
<th>Simulation</th>
<th>Change</th>
<th>% Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pr_mt</td>
<td>52.1</td>
<td>47.8</td>
<td>-4.3</td>
<td>-8.25%</td>
</tr>
<tr>
<td>Nmm</td>
<td>32.9</td>
<td>30.5</td>
<td>-2.4</td>
<td>-7.18%</td>
</tr>
<tr>
<td>Oth_mn</td>
<td>8.6</td>
<td>8.0</td>
<td>-0.6</td>
<td>-7.17%</td>
</tr>
<tr>
<td>Energy</td>
<td>12.9</td>
<td>12.2</td>
<td>-0.7</td>
<td>-5.50%</td>
</tr>
<tr>
<td>Elc_ind</td>
<td>309.1</td>
<td>292.3</td>
<td>-16.9</td>
<td>-5.45%</td>
</tr>
<tr>
<td>Tr_mc</td>
<td>128.8</td>
<td>122.1</td>
<td>-6.7</td>
<td>-5.22%</td>
</tr>
<tr>
<td>Chemicals</td>
<td>128.3</td>
<td>122.1</td>
<td>-6.3</td>
<td>-4.87%</td>
</tr>
<tr>
<td>Fb_mt</td>
<td>79.3</td>
<td>76.1</td>
<td>-3.2</td>
<td>-4.07%</td>
</tr>
<tr>
<td>Transport</td>
<td>184.7</td>
<td>180.6</td>
<td>-4.0</td>
<td>-2.19%</td>
</tr>
<tr>
<td>Construction</td>
<td>418.9</td>
<td>409.9</td>
<td>-9.0</td>
<td>-2.15%</td>
</tr>
<tr>
<td>Livestock</td>
<td>7.8</td>
<td>7.7</td>
<td>0.0</td>
<td>-0.62%</td>
</tr>
<tr>
<td>Tx_app_lt</td>
<td>58.4</td>
<td>58.3</td>
<td>-0.1</td>
<td>-0.13%</td>
</tr>
</tbody>
</table>

In general, the employment effects are much smaller than the output effects in this simulation. The logic of the general equilibrium approach reconciles this apparent disparity. Returns from economic activities flow to factors of production. In this simulation, the level of capital stock in the economy has declined by 4.69 percent. As a result, the decline in *total* returns to capital (as opposed to per-unit returns) “cushions” the blow to labor in all industries. Another interesting outcome is that with less capital in the economy, the per unit returns to capital increase. The simulation database indicates that per-unit real returns to capital going forward are 1.41 percent higher than in the base case. In contrast, the per-unit real returns to labor decline by 2.76 percent. This loss in wage income is the general equilibrium cost of maintaining full employment.
The increase in the returns to capital in this simulation is consistent with the findings of the Kerr study, which argues that the cost of capital would rise for businesses that face asbestos claims. According to Kerr, the cost of capital for the firms examined increased by 4 to 14 percent, depending on their debt rating. The analogous variable in GTAP is \( rorc(\text{"USA"}) \), which is the percent change in the rate of return on capital investment in the United States. The results in the long-run simulation EXP3 indicate that imposing a $141.2 billion asbestos penalty on the U.S. economy leads to a long-run, 0.96 percent increase in \( rorc(\text{"USA"}) \). This increase in the cost of capital is considerably smaller than the one estimated in the Kerr report, but that should be expected given that the Kerr estimate covered a smaller universe of firms. The point of this comparison is not to criticize the Kerr estimate, but to emphasize that the underlying rational of the Kerr study, that the direct costs associated with asbestos claims are likely to have adverse effects on capital costs in the United States, is correct and supported by economic theory.

In short, the U.S. economy that emerges from this simulation is more labor intensive than the base case economy. The economic output is smaller, the trade deficit is higher, and jobs have shifted from manufacturing and toward services, government services in particular. Per-unit returns to workers have declined, as there is now less capital in the U.S. economy for them to operate. With less capital in the economy, the U.S. economy’s growth path has been permanently altered. Thus, even in the general equilibrium framework, the economic impact of the asbestos tax is severe when likely changes in capital stock are taken into account.

**Experiment 4: General Equilibrium, Productivity Shock Using Long-Run Database**

On of the many useful aspects of the GTAP model and database is the ease with which one can create a new database using the results of a prior simulation. In this experiment, we explore the potential impact of lower productivity levels on the U.S. economy using the data from EXP3, the long-run simulation characterized by a drop in U.S. capital stock. Theory and empirical research suggest that a reduction in physical capital stock should translate into lower productivity
Productivity growth is also a function of research and development expenditures. Though GTAP does not explicitly model such expenditures, the model does include a variety of productivity related variables than can be utilized to explore the impact of reduced R&D expenditures and investments on technological advancement of the U.S. economy.

The exhibit below details the impact of the litigation costs on the key macroeconomic variables compared to the original base case scenario. Consumption is 1.53 percent lower as a result of the decline in productivity, while investment in the new equilibrium is 5.67 percent lower than in the base case. The reduction in productivity also implies a 1.75 percent reduction in government purchases. Exports are 3.96 percent below base case levels, while imports rise slightly, despite the fall in GDP. Overall, the U.S. current account deficit deteriorates by $71.6 billion. GDP is $287.4 billion lower as a result of this simulation, with the decline double the magnitude of the imposed asbestos tax. Real GDP in this simulation is 3.10 percent ($312.6 billion) lower than in the original base case scenario.

**EXP4: Impact of Asbestos Costs on Key Macroeconomic Variables**

<table>
<thead>
<tr>
<th>Item</th>
<th>Base Case</th>
<th>Simulation</th>
<th>Change</th>
<th>% Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Consumption</td>
<td>6,956.3</td>
<td>6,849.5</td>
<td>-106.8</td>
<td>-1.53%</td>
</tr>
<tr>
<td>Investment</td>
<td>1,990.6</td>
<td>1,877.7</td>
<td>-112.9</td>
<td>-5.67%</td>
</tr>
<tr>
<td>Government</td>
<td>1,528.6</td>
<td>1,501.9</td>
<td>-26.8</td>
<td>-1.75%</td>
</tr>
<tr>
<td>Exports</td>
<td>907.5</td>
<td>871.5</td>
<td>-36.0</td>
<td>-3.96%</td>
</tr>
<tr>
<td>Imports</td>
<td>1,300.9</td>
<td>1,305.8</td>
<td>5.0</td>
<td>0.38%</td>
</tr>
<tr>
<td>GDP</td>
<td>10,082.2</td>
<td>9,794.8</td>
<td>-287.4</td>
<td>-2.85%</td>
</tr>
</tbody>
</table>

To assess the changes in industry output associated with this experiment, dollar values from EXP4 were stripped of inflationary effects, and are directly comparable with the base case dollars of the other three experiments. The impacts of industry output are shown in the table below. Output declines are widespread, affecting all private-sector industries. The loss in manufacturing output is $263.4 billion. The top five industries in terms of lost output value are electrical and industrial machinery ($77.2 billion); construction ($69.5 billion); wholesale and retail trade ($57.3 billion); chemicals, plastic, and rub-
ber ($51.1 billion); and transportation machinery ($50.3 billion). In percentage terms, the largest output reductions occur in manufacturing industries: non-metallic minerals (8.95 percent); primary metals (8.74 percent); transportation machinery (7.61 percent); chemicals, plastic, and rubber (7.13 percent); and electrical and industrial machinery (6.78 percent). The net lost output of all industries is $529.5 billion.

**EXP4: Impact of Asbestos Costs on Industry Output**

<table>
<thead>
<tr>
<th>Item</th>
<th>Base Case</th>
<th>Simulation</th>
<th>Change</th>
<th>% Change</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Billions of Dollars</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ag_crp</td>
<td>111.0</td>
<td>110.9</td>
<td>-0.1</td>
<td>-0.08%</td>
</tr>
<tr>
<td>Livestock</td>
<td>92.8</td>
<td>92.0</td>
<td>-0.8</td>
<td>-0.91%</td>
</tr>
<tr>
<td>Oth_mn</td>
<td>34.6</td>
<td>32.5</td>
<td>-2.2</td>
<td>-6.22%</td>
</tr>
<tr>
<td>Energy</td>
<td>224.8</td>
<td>214.4</td>
<td>-10.4</td>
<td>-4.63%</td>
</tr>
<tr>
<td>Construction</td>
<td>1,351.1</td>
<td>1,281.6</td>
<td>-69.5</td>
<td>-5.14%</td>
</tr>
<tr>
<td>Fd_bw_tb</td>
<td>744.7</td>
<td>730.3</td>
<td>-14.4</td>
<td>-1.93%</td>
</tr>
<tr>
<td>Tx_app_lt</td>
<td>270.7</td>
<td>264.4</td>
<td>-6.3</td>
<td>-2.32%</td>
</tr>
<tr>
<td>Wd_ppr_oth</td>
<td>636.7</td>
<td>623.0</td>
<td>-13.7</td>
<td>-2.16%</td>
</tr>
<tr>
<td>Chemicals</td>
<td>716.3</td>
<td>665.2</td>
<td>-51.1</td>
<td>-7.13%</td>
</tr>
<tr>
<td>Nmm</td>
<td>127.3</td>
<td>115.9</td>
<td>-11.4</td>
<td>-8.95%</td>
</tr>
<tr>
<td>Pr_mt</td>
<td>253.0</td>
<td>230.9</td>
<td>-22.1</td>
<td>-8.74%</td>
</tr>
<tr>
<td>Fb_mt</td>
<td>289.6</td>
<td>273.8</td>
<td>-15.8</td>
<td>-5.45%</td>
</tr>
<tr>
<td>Elc_ind</td>
<td>1,138.7</td>
<td>1,061.5</td>
<td>-77.2</td>
<td>-6.78%</td>
</tr>
<tr>
<td>Tr_mc</td>
<td>661.0</td>
<td>610.8</td>
<td>-50.3</td>
<td>-7.61%</td>
</tr>
<tr>
<td>Oth_mfg</td>
<td>64.5</td>
<td>63.3</td>
<td>-1.2</td>
<td>-1.83%</td>
</tr>
<tr>
<td>Transport</td>
<td>670.4</td>
<td>639.7</td>
<td>-30.7</td>
<td>-4.58%</td>
</tr>
<tr>
<td>Utility</td>
<td>390.1</td>
<td>378.9</td>
<td>-11.2</td>
<td>-2.88%</td>
</tr>
<tr>
<td>Trade</td>
<td>2,455.5</td>
<td>2,398.2</td>
<td>-57.3</td>
<td>-2.33%</td>
</tr>
<tr>
<td>Fn_ins</td>
<td>1,482.4</td>
<td>1,457.8</td>
<td>-24.6</td>
<td>-1.66%</td>
</tr>
<tr>
<td>Bsn_srv</td>
<td>1,962.6</td>
<td>1,929.9</td>
<td>-32.6</td>
<td>-1.66%</td>
</tr>
<tr>
<td>Oth_pr_srv</td>
<td>1,823.7</td>
<td>1,785.5</td>
<td>-38.2</td>
<td>-2.09%</td>
</tr>
<tr>
<td>Gv_srv</td>
<td>2,450.5</td>
<td>2,462.1</td>
<td>11.6</td>
<td>0.47%</td>
</tr>
</tbody>
</table>

The change in the amount of expenditures for labor is best analyzed in nominal dollars because those are the dollars used by workers to purchase goods and services. Also, unlike EXP2 and EXP3, which employed a general equilibrium framework, the loss in productivity caused by reduced investment and R&D does result in lower wages on an economy-wide basis, not just a shift in wages between industries.
The nominal employment effects associated with \textbf{EXP4} appear in the table below expressed in terms of earnings. The results indicate that industry payments to labor contract in all but one industry due to the decline in productivity. The most significant losses occur in construction ($22.9 billion); electrical and industrial machinery ($20.7 billion); wholesale and retail trade ($18.8 billion); government services ($17.5 billion); and transportation machinery ($10.4 billion). The earnings reduction for the economy overall is $135.2 billion, $56.5 billion (41.8 percent) of which occurs in manufacturing industries. In percentage terms, the largest reductions occur in primary metals (9.04 percent); non-metallic minerals (8.61 percent); other mining (8.10 percent); transportation machinery (8.10 percent); and energy (7.48 percent). Construction; chemicals, plastic and rubber; fabricated metals; and electrical and industrial machinery also experience earnings reductions in excess of 5 percent.

\textbf{EXP4: Impact of Asbestos Costs on Industry Labor Demand}

<table>
<thead>
<tr>
<th>Item</th>
<th>Base Case</th>
<th>Simulation</th>
<th>Change</th>
<th>% Change</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Billions of Dollars</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ag_crp</td>
<td>25.1</td>
<td>24.8</td>
<td>-0.3</td>
<td>-1.04%</td>
</tr>
<tr>
<td>Livestock</td>
<td>7.8</td>
<td>7.6</td>
<td>-0.2</td>
<td>-2.81%</td>
</tr>
<tr>
<td>Oth_mn</td>
<td>8.6</td>
<td>7.9</td>
<td>-0.7</td>
<td>-8.10%</td>
</tr>
<tr>
<td>Energy</td>
<td>12.9</td>
<td>11.9</td>
<td>-1.0</td>
<td>-7.48%</td>
</tr>
<tr>
<td>Construction</td>
<td>418.9</td>
<td>396.0</td>
<td>-22.9</td>
<td>-5.47%</td>
</tr>
<tr>
<td>Fd_by_tb</td>
<td>104.2</td>
<td>103.2</td>
<td>-1.0</td>
<td>-0.99%</td>
</tr>
<tr>
<td>Tx_appLt</td>
<td>58.4</td>
<td>56.9</td>
<td>-1.5</td>
<td>-2.54%</td>
</tr>
<tr>
<td>Wd_ppr_oth</td>
<td>140.8</td>
<td>138.3</td>
<td>-2.5</td>
<td>-1.78%</td>
</tr>
<tr>
<td>Chemicals</td>
<td>128.3</td>
<td>120.3</td>
<td>-8.1</td>
<td>-6.28%</td>
</tr>
<tr>
<td>Nmm</td>
<td>32.9</td>
<td>30.0</td>
<td>-2.8</td>
<td>-8.61%</td>
</tr>
<tr>
<td>Pr_mt</td>
<td>52.1</td>
<td>47.4</td>
<td>-4.7</td>
<td>-9.04%</td>
</tr>
<tr>
<td>Fb_mt</td>
<td>79.3</td>
<td>74.8</td>
<td>-4.5</td>
<td>-5.71%</td>
</tr>
<tr>
<td>Eic_ind</td>
<td>309.1</td>
<td>288.5</td>
<td>-20.7</td>
<td>-6.69%</td>
</tr>
<tr>
<td>Tr_mc</td>
<td>128.8</td>
<td>118.4</td>
<td>-10.4</td>
<td>-8.10%</td>
</tr>
<tr>
<td>Oth_mfg</td>
<td>15.6</td>
<td>15.3</td>
<td>-0.3</td>
<td>-1.63%</td>
</tr>
<tr>
<td>Transport</td>
<td>184.7</td>
<td>177.3</td>
<td>-7.4</td>
<td>-3.99%</td>
</tr>
<tr>
<td>Utility</td>
<td>72.8</td>
<td>71.9</td>
<td>-0.9</td>
<td>-1.27%</td>
</tr>
<tr>
<td>Trade</td>
<td>945.3</td>
<td>926.5</td>
<td>-18.8</td>
<td>-1.99%</td>
</tr>
<tr>
<td>Fn_ins</td>
<td>515.3</td>
<td>506.1</td>
<td>-9.1</td>
<td>-1.77%</td>
</tr>
<tr>
<td>Bsn_srv</td>
<td>455.8</td>
<td>455.5</td>
<td>-0.3</td>
<td>-0.06%</td>
</tr>
<tr>
<td>Oth_pr_srv</td>
<td>287.6</td>
<td>287.9</td>
<td>0.3</td>
<td>0.12%</td>
</tr>
<tr>
<td>Gv_srv</td>
<td>1,402.7</td>
<td>1,385.2</td>
<td>-17.5</td>
<td>-1.25%</td>
</tr>
</tbody>
</table>
This simulation is meant to capture the impact of both lower capital stock and a reduction in the rate of technological change in the U.S. economy that may result from future asbestos litigation. The results indicate that slower technological progress along with a reduction in physical capital would have a significant long-run impact on the U.S. economy. All macroeconomic variables deteriorate, including consumption, and real GDP is 3.1 percent lower than in the base case scenario. Inflation adjusted industry output declines by $529 billion, while earnings experience a permanent reduction in nearly all industries. Workers in manufacturing industries bear a disproportionate share of the reductions in earnings.

**Alternative estimates**

There are many uncertainties involved in estimating the impact of asbestos litigation on the overall economy. On such uncertainty is the potential impact that the ongoing litigation and the threat of similar litigation might have on future product development and investments. In order to incorporate such effects into this analysis, additional investment effects are incorporated into each of the experiments, as discussed above. In **EXP1** and **EXP2**, physical capital amounting to 2 percent of U.S. capital is shifted from the United States to Rest of World. For **EXP3**, the risk premium for U.S. investment embodied in rates of return is increased to simulate the increased risk of investing in the United States, and the amount of lost capital is, in effect, transferred to Rest of World capital stock. The resulting database from **EXP3** is used to simulate lower productivity growth in the less capital-intensive U.S. economy depicted in **EXP4**. The results of these simulations are summarized in the table below.
Alternative Approach: Potential Impact of Asbestos Litigation on U.S. Macroeconomic Variables

<table>
<thead>
<tr>
<th></th>
<th>Real GDP</th>
<th>Nominal GDP</th>
<th>Consumption</th>
<th>Investment</th>
<th>Government</th>
<th>Exports</th>
<th>Imports</th>
</tr>
</thead>
<tbody>
<tr>
<td>EXP1</td>
<td>-291.6</td>
<td>-195.9</td>
<td>7.0</td>
<td>-109.5</td>
<td>0.0</td>
<td>-78.4</td>
<td>15.0</td>
</tr>
<tr>
<td>EXP2</td>
<td>-78.1</td>
<td>-94.3</td>
<td>6.0</td>
<td>-71.8</td>
<td>0.0</td>
<td>-20.4</td>
<td>8.1</td>
</tr>
<tr>
<td>EXP3</td>
<td>-262.5</td>
<td>-189.2</td>
<td>7.4</td>
<td>-114.3</td>
<td>0.0</td>
<td>-70.4</td>
<td>11.9</td>
</tr>
<tr>
<td>EXP4</td>
<td>-418.6</td>
<td>-364.9</td>
<td>-128.5</td>
<td>-158.5</td>
<td>-32.0</td>
<td>-45.9</td>
<td>0.0</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Percent Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>EXP1</td>
<td>-2.9%</td>
</tr>
<tr>
<td>EXP2</td>
<td>-0.8%</td>
</tr>
<tr>
<td>EXP3</td>
<td>-2.6%</td>
</tr>
<tr>
<td>EXP4</td>
<td>-4.2%</td>
</tr>
</tbody>
</table>

Note: Figures indicate change from base case scenario, which is denominated in 2001 dollars.

The results incorporating the shifting abroad of new product development indicate that the economic costs of the existing approach to asbestos litigation are potentially severe. In terms of real GDP, the declines fall in the range from 0.8 percent to 4.2 percent of real output. The largest losses occur with respect to investment, which declines an estimated 3.6 percent to 8.0 percent, and to exports, which shrink an estimated 2.2 percent to 8.6 percent from base case levels.

The alternative estimates underscore a major concern regarding the dynamic costs of asbestos litigation: that the negative externalities of litigation could ultimately cost more than the direct cost of litigation by reducing U.S. capital investment, product development, and productivity growth. If the current path of asbestos litigation and/or other similarly expensive, drawn out litigation episodes reduces capital accumulation, then productivity growth and output will also decline. The resulting U.S. economy will be less capital intensive, less productive, and smaller than otherwise. The extent to which the economy is affected thus depends on the extent to which domestic capital formation is reduced and the extent to which productivity growth is affected. The productivity effects incorporated here are relatively small. The shock imposed in the alternative EXP4 works out to -0.042 percent when imposed over 25 years. The reduction in capital stock imposed in these experiments is also not very large. However, the combined effects of less capital and lower productivity can have significant effects over time, and such costs will only be magnified if the estimated costs of asbestos litigation increase and the present model of that litigation spreads to other products or processes.
Conclusions

The simulations in this study provide different windows on the potential economic effects of anticipated asbestos litigation costs. **EXP1** demonstrates that the employment dislocation effects of the expected litigation costs are expected to be quite large, though these employment effects are likely to be spread out over time. In **EXP2**, the economy is at a new equilibrium with factors of production and pricing adjusting to the changes wrought by the extensive litigation costs. Even in this best case scenario, there are costs in terms of lost output, trade and investment. Employment losses, measured in terms of lost wages, are concentrated in manufacturing sectors. **EXP3** and **EXP4** offer a more dynamic analytical approach, which takes into account lost investment and subsequent reduction in productivity, respectively. These scenarios indicate that economic losses including lost investment amount to 1.8 percent of GDP and that incorporating lost productivity increases the losses to 3.1 percent of GDP.

**EXP3** and **EXP4** incorporate the investment and productivity effects that are directly attributable to the money businesses spend on litigation costs. However, as litigation has spread to affect businesses that did not manufacture asbestos, a second front of economic costs has become increasingly likely. Executives at such firms articulated that they are reluctant to invest in certain novel products and processes in the United States for fear of future litigation over problems that are now unforeseen. One way of avoiding litigation excesses is to invest in, and carry out product development in, countries other than the United States.

In order to capture this second level of economic losses, the four experiments were rerun to simulate the impact of shifting investments from the United States to other countries. Under these scenarios, the economic effects are even more significant. The declines in real GDP
range from 0.8 percent in EXP2 to 4.2 percent in EXP4, which also takes into account adverse effects of lost capital on U.S. productivity growth. Investment levels contract in all alternative simulations with declines ranging from 3.6 percent to 8 percent. In the U.S. international accounts, the largest effects are felt on the export side of the ledger, with declines ranging from 2.2 percent to 8.6 percent. Imports are flat or rise somewhat, even as the domestic economy shrinks.

Compared to their share of the economy, manufacturing firms and their workers bear a disproportionate share of the expected economic costs of asbestos claims litigation. Even in EXP2, the “best-case” simulation, net output in manufacturing industries contracts by $95.1 billion while wages decline by $20.8 billion. In the other scenarios, the anticipated losses are far more alarming. In EXP1, the partial equilibrium analysis, the short-run economic costs are severe, with manufacturing output contracting by $270 billion and labor earnings in manufacturing falling by $74 billion if the expected costs are imposed at once. While it is true that these results do not take into account the economy’s ability to absorb unemployed workers over time, one cannot dismiss the short-run employment and output effects that have resulted from the current asbestos claims process, and will continue to result if that process continues along its present course. The injury to manufacturers and their workers of expected asbestos claims is confirmed in EXP3 and EXP4, which assess the impacts of the anticipated costs on capital formation and productivity, respectively. Manufacturing output in EXP3, the long run simulation, drops by $250 billion, while earnings of manufacturing labor shrink by $40 billion. In EXP4, slower technical progress leads to real output contraction of $263 billion and earnings losses of $55 billion at manufacturers. The output and employment losses faced by manufacturers are even larger in the alternative scenarios.

The bottom line is simply this. Over the next 25 to 30 years, defendants in asbestos litigation may have to part with an estimated $141.2 billion to settle claims. The simulations in this study, as well as the results of other studies, suggest that the current path of asbestos claims resolution will have very real economic consequences, and that
these consequences are likely to fall heavily, though not exclusively, on manufacturers and their workers. Even if the flexible U.S. economy adjusts to these costs to remain at full employment after an adjustment period, the resulting economy will support hundreds of thousands fewer jobs in manufacturing industries than otherwise. A reduction in the level of capital accumulation would also produce slower productivity growth, with adverse consequences for wages and living standards for the United States as a whole. Given the increasingly competitive global economy, these are costs that US industry can ill afford.
Appendix 1:

Calculation of productivity shocks for EXP3

Inputs for 2001

<table>
<thead>
<tr>
<th>Input</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Combined labor and capital input</td>
<td>100.4</td>
</tr>
<tr>
<td>K</td>
<td>104.5</td>
</tr>
<tr>
<td>L</td>
<td>98.7</td>
</tr>
<tr>
<td>K%</td>
<td>29.31</td>
</tr>
<tr>
<td>L%</td>
<td>70.69</td>
</tr>
</tbody>
</table>

The shares K% and L% are estimated by using the following equations.

Equation 1: \(104.5 \times K% + 98.7 \times L% = 100.4\)

Equation 2: \(K% + L% = 1\)

Equation 2a: \(L% = 1 - K%\)

Equation 3: \(104.5 \times K% + 98.7 - 98.7 \times K% = 100.4\)

Equation 4: \(K = \frac{1.7}{5.8}\)

The new capital services index for 2001 reflects a 4.69% reduction from the actual figure:

| Actual | 104.5 |
| Revised | 99.60 |

The new combined input reflects the new capital services input and the original capital services share:

| (revised) | 99.60 |
| L        | 98.7  |
| K%       | 29.31 |
| L%       | 70.69 |

Revised combined labor and capital input 98.96

Real value added is reduced based on the decline in real GDP in the GTAP scenario:

| Real value-added output index | 100.5 |
| EXP3 decline in value added   | -1.795% |
| Revised real value added output index | 98.2 |

The new multifactor productivity index for 2001 is equal to 100* real value added index / combined input index:

| Real value-added output | 98.2 |
| Combined labor and capital input | 98.96 |
| Revised multifactor productivity index | 99.2 |

The shock is the percent change from the base 2001 period:

| Actual multifactor productivity index | 100.1 |
| Revised multifactor productivity index | 99.23 |
| Reduction                              | -0.87% |

Annual impact over a 25-year period: -0.035%
Calculation of productivity shocks for the alternative EXP3

Inputs for 2001

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Combined labor and capital input</td>
<td>100</td>
</tr>
<tr>
<td>K</td>
<td>104.5</td>
</tr>
<tr>
<td>L</td>
<td>98.7</td>
</tr>
<tr>
<td>K%</td>
<td>29.31</td>
</tr>
<tr>
<td>L%</td>
<td>70.69</td>
</tr>
</tbody>
</table>

The shares K% and L% are estimated by using the following equations.

Equation 1: \(104.5 \times K\% + 98.7 \times L\% = 100.4\)
Equation 2: \(K\% + L\% = 1\)
Equation 2a: \(L\% = 1 - K\%\)
Equation 3: \(104.5 \times K\% + 98.7 - 98.7K\% = 100.4\)
Equation 4: \(K = 1.7 / 5.8\)

The new capital services index for 2001 reflects a 6.79% reduction from the actual figure:

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Actual</td>
<td>104.5</td>
</tr>
<tr>
<td>Revised</td>
<td>97.40</td>
</tr>
</tbody>
</table>

The new combined input reflects the new capital services input and the original capital services share:

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>K (revised)</td>
<td>97.40</td>
</tr>
<tr>
<td>L</td>
<td>98.7</td>
</tr>
<tr>
<td>K%</td>
<td>29.31</td>
</tr>
<tr>
<td>L%</td>
<td>70.69</td>
</tr>
<tr>
<td>Revised combined labor and capital input</td>
<td>98.32</td>
</tr>
</tbody>
</table>

Real value added is reduced based on the decline in real GDP in the GTAP scenario:

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Real value-added output index</td>
<td>100.5</td>
</tr>
<tr>
<td>EXP3 decline in value added</td>
<td>-2.604%</td>
</tr>
<tr>
<td>Revised real value added output index</td>
<td>97.4</td>
</tr>
</tbody>
</table>

The new multifactor productivity index for 2001 is equal to \(100 \times \text{real value added index} / \text{combined input index}\):

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Real value-added output</td>
<td>97.4</td>
</tr>
<tr>
<td>Combined labor and capital input</td>
<td>98.32</td>
</tr>
<tr>
<td>Revised multifactor productivity index</td>
<td>99.1</td>
</tr>
</tbody>
</table>

The shock is the percent change from the base 2001 period:

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Actual multifactor productivity index</td>
<td>100.1</td>
</tr>
<tr>
<td>Revised multifactor productivity index</td>
<td>99.06</td>
</tr>
<tr>
<td>Reduction</td>
<td>-1.04%</td>
</tr>
</tbody>
</table>

Annual impact over a 25-year period: -0.042%
Bibliography


Angelina and Biggs, “Quantification and Forecasts,” Tillinghast – Towers Perrin, Claims Resolution Management Corporation, June 29, 2004


Carroll, Hensler, Gross, Sloss, Schonlau, Abrahamse and Ashwood, “Asbestos Litigation,” RAND Institute for Civil Justice, Santa Monica, CA, 2005


**Toxic Torts:** How the Asbestos Litigation is Undermining US Competitiveness, Destroying Jobs and Short-Changing Victims


Frankel, Allison, “Asbestos Removal: Thanks to State Tort Reform, Judicial Rulings, and Public Scrutiny, the Asbestos Docket has Dropped Dramatically,” *The American Lawyer*, July 1, 2006


Endnotes

1 The EPA instituted a total ban on asbestos in 1989, but the move was challenged in challenged in the courts and in 1991 the 5th Circuit Court of Appeals overturned many aspects of the ban. See Corrosion Proof Fittings v. EPA, 947 F.2d 1201


3 Milliman Global Insurance believes 1.1 million claims will eventually be filed, while the Manville Trust expects 2 million.

4 Carroll et al, “Asbestos Litigation,” RAND Institute for Civil Justice, Santa Monica, CA, 2005, p.16

5 Ibid. p.15


8 Ibid. p.184

9 Ibid. p.185

10 Borel v. Fibreboard 493 F.2d 1076 [5th Cir. 1973]


15 2nd Quarter 2006 Financial Statement and Report of the Manville Personal Injury Settlement Trust

16 Keene v. Insurance Company of North America 667 F.2d 1043, 1041 [DC Circuit 1981]


Toxic Torts: How the Asbestos Litigation is Undermining US Competitiveness, Destroying Jobs and Short-Changing Victims

20 Ibid. p.126
21 Ibid. p.74
22 Ibid. p. 86 and p.68
28 Ibid.
31 Ibid. p.1
32 See, for example, Joseph E. Stiglitz, Jonathan M. Orszag, and Peter R Orszag, “The Impact of Asbestos Liabilities on Workers in Bankrupt Firms,” (Sebago Associates, December 2002), which dealt with the experiences of bankrupt firms; and William O. Kerr, “Reducing the Asbestos Litigation Penalty: An Economic Benefit of Asbestos Reform Legislation,” (October 16, 2003), which studied a group of 30 publicly traded businesses facing significant asbestos claims.
33 See, for example, Kevin A. Hassert, Robert J. Shapiro, and Peter Wallison, “Assessing the Economic Impact of Proposed Asbestos Legislation: A Reconsideration of the Evidence,” (July 18, 2005), which criticized a number of aspects regarding a recent analysis by the consulting firm NERA.
34 https://www.gtap.agecon.purdue.edu/default.asp.
35 Model closure refers to the exogenous/endogenous split between variables in the model used to infer the time frame over which the effects of a policy shock are simulated. Closures can either be partial or general equilibrium in nature. When a partial equilibrium closure is specified, at least some of the various linkages between the sector (or productive factors) being examined and other sectors (and factors of production) are assumed to be fixed. When a general equilibrium closure is specified, these linkages are not fixed. The various market interactions in response to a policy shock occur within a consistent framework in which all factor and product markets clear and a multitude of accounting relationships are maintained.
36 GTAP is the acronym for the Global Trade Analysis Project, a global network of researchers and policy makers conducting quantitative analysis of international policy issues. The main center for GTAP is the University of Purdue, West Lafayette, Indiana.
37 The model used in this study assumes perfect competition, constant returns to scale, and a constant elasticity of substitution between imports and domestic products (the so-called Armington assumption).

39 RunGTAP was developed by Mark Horridge at the Centre for Policy Studies, Monash University, Australia. Version 3.4 was used for the simulations described below.

40 Dimaranan, Betina V., and Robert Mcdougall (Editors), 2005. Global Trade, Assistance, and Production: The GTAP 6 Data base, Center for Global Trade Analysis, Purdue, University, West Lafayette, Indiana.

41 The one exception to this practice is transportation services, where firms in the water transportation industry face more concentrated exposure than firms providing air, rail, and other forms of transportation services.

42 A dynamic version of GTAP has been developed, but a user friendly version of the program has not yet been released to the public.

43 This phenomenon is consistent with the process that Stiglitz et al. noted in their assessment of bankrupt firms. See Joseph E. Stiglitz, Jonathan M. Orszag, and Peter R Orszag, “The Impact of Asbestos Liabilities on Workers in Bankrupt Firms,” (Sebago Associates, December 2002) at 12 and 28. “(T)he structural and frictional unemployment associated with the bankruptcies represents a lost opportunity. That is, to the extent that the movement of the displaced workers to new jobs produces a temporary increase in the unemployment rate that would not have otherwise occurred, the production of goods and services lost during the transition represents a true economic cost.”


46 Angelina and Biggs at 26.

47 Bhagavatula, et al., at 1.


49 See RAND at 82-83. Due to rounding, the number of firms sums to 8,411 in Exhibit 40 above, compared to the RAND estimate (at 79) of 8,391 firms. However, the 8,411 figure is well within the range of 8,025 to 8,756 given by RAND, so no effort has been made to scale the number of firms to match the RAND total exactly.

50 This methodology assumes that each firm has an equal payroll. This exercise is not intended to estimate the actual payroll of the firms affected by asbestos litigation, but to use this information to distribute asbestos costs across industries in a rationale way.

51 The government is assumed to pay for settlement costs with tax revenue. Thus, its share of the implied payroll has been distributed proportionately to the other sectors.


53 Id.

54 The variable yg(“USA”), which represents the percent change in U.S. government expenditures, is set exogenously to zero, while dpsave(“USA”), the savings distribution parameter, is converted to an endogenous variable.

55 In addition to the fixed level of government expenditures, qo(“Labor”, “USA”), the percent change in the supply of U.S. labor, is converted to an endogenous variable and pm(“Labor”, “USA”), the percent change in the market price of U.S. labor, is exogenous and set to zero. Adding an exogenous variable requires that an exogenous variable in the standard closure be converted to an endogenous variable.
56 The adverse effects of asbestos litigation costs on employment have been discussed in the Stiglitz, et al.; RAND; Kerr; and NERA studies.


58 The capital input measures the service flows from the level of physical capital stock.

59 The necessary calculations are shown in Appendix 1.

60 U.S. multifactor productivity increased at an average compound rate of 1.05 percent per year from 1987 to 2004. Thus, the impact modeled in this experiment can be viewed as representing a reduction of less than a single year's growth in U.S. multifactor productivity. Over a 25-year period, this is equivalent to reducing the average multifactor productivity growth rate from 1.049 percent annually to 1.014 percent annually.

61 The closure requirements of the underlying experiments can limit options.


63 The expected rate of return is made up of two components, the risk free rate and the risk premium. As the risk free rate is assumed not to change, any increase in the expected rate of return must be due to a change in the risk premium. See Gerard Malcolm, Modeling Country Risk and Capital Flows in GTAP, GTAP Technical Paper No. 13 (September 1998) at 4-8. Rather than shock the risk premium directly, the approach taken here is to increase the value of RORFLEX from the default value of 10 to 25. The parameter RORFLEX represents the flexibility of the expected net rate of return on regional capital stock with respect to investment.

64 In this case, it is important to recognize that output reflects the value of production, not gross product. That is why the sum of changes in this table exceeds the change in GDP shown in the prior table.

65 See RAND at 81-84; and Stiglitz, et al., at 19-20.

66 Since the price of labor has been fixed, the entire reduction in earnings is, by definition accomplished by a reduction in hours worked.


68 Kerr at 12-13.


70 The math: [$176.7 bil. / ($78,000 per job)] / 25 yrs = 90,620 jobs / year.

71 In contrast, partial equilibrium approaches are criticized because they assume that no adjustments take place.

72 Whether this is a reasonable outcome is left for the reader to decide.

73 In EXP1, wages were fixed and employment levels declined by 3.28 percent.

74 This closure is implemented by swapping exogenous qo("capital", "USA") with endogenous EXPAND("capital", "USA") so that the former becomes endogenous and the latter becomes exogenous.
75 Kerr at 6 to 8.
76 Kerr at 11-12.
78 Bart van Ark and Marcel Timmer, Reader on Productivity Levels (Groningen Growth and Development Centre, University of Groningen, version October 2006) at 8, 10, and 12.
80 In other words, the EXP4 simulation results are compared to the same base case as EXP1, EXP2, and EXP3, not the new base case data set used for the EXP4 simulation.
81 RunGTAP calculates real GDP in EXP4 in relation to nominal GDP of EXP3. Real GDP in EXP4 was deflated by the GDP deflator of EXP3 to make real GDP of EXP4 comparable to the other simulations.
82 The inflation rates used are industry specific and based upon the difference between variable qo in EXP3 simulation and the variable qo in the EXP4 base case. Although the EXP3 database is used for EXP4, the RunGTAP outputs for qo in EXP4 include inflation generated in the EXP3 simulation and must be stripped of inflationary effects in order to compare with the original base case data.
83 This amount of capital stock is equivalent to approximately 3.7 percent of the base level of U.S. investment in the model.
84 For this experiment, only the incremental loss in U.S. physical capital (i.e. valent to the cost of capital, is 2.85 percent, which is smaller than the 4-to-14 percent increase estimated by Kerr.