Much Ado about Pigou

By Bruce Yandle
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Economists, policy analysts, and politicians often rattle the bones of brilliant economists long passed when making a case for a favorite policy or legislative action. John Maynard Keynes has again become a popular icon for justifying deficit spending in the face of severe recession. There are other days when Joseph Schumpeter's name and "creative destruction" surface to justify marketplace tough love. We hear references to Friedrich von Hayek and his notions about property rights, common law, and spontaneous order when the market process is being defended. And of course, Milton Friedman is brought forth when education and monetary policy are discussed.

The latest long-dead economist to enthrall bloggers, policy wonks, and entrepreneurial analysts is Arthur Cecil Pigou, whose authority is now being used to justify a blizzard of taxes and other actions proposed to serve the public interest. It is Pigou who suggested that a tax be placed on activities that generate negative externalities in order to make beneficiaries of the activity consider its full cost.

In November 2009, John Cassidy had this to say in a *Wall Street Journal* essay:

> Today Mr. Pigou's intellectual legacy is being rediscovered, and, unlike those of Messrs. Keynes and Friedman, it enjoys bipartisan appeal. Leading Republican-leaning economists such as Greg Mankiw and Gary Becker have joined Democrats such as Paul Krugman and Amartya Sen in recommending a Pigovian approach to policy. Much of President Barack Obama's agenda — financial regulation, cap and trade, health care reform — is an application of Mr. Pigou's principles. Whether the president knows it or not, he is a Pigovian.

Greg Mankiw, who was chairman of the Council of Economic Advisers during the George W. Bush administration, has become so dedicated to the idea of imposing a tax on gasoline for social purposes that he has organized a Pigou Society that scores of economists and others have joined. As Mankiw and others see it, a properly designed gasoline tax can compensate for social costs associated with driving automobiles. Those costs relate to traffic congestion, pollution, climate change, and secure delivery of crude oil and refined product.

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When adopted in its ideal form, a Pigouvian tax that brings beneficial adjustments to unaccounted-for harms can also bring a collateral benefit: in a perfect policy world, other burdensome taxes can be reduced. For example, properly calibrated taxes on carbon emissions can become a substitute for taxes on labor that yield a shortfall of gross domestic product. When taken together, the two actions happily make the world a better place — unwanted carbon emissions go down and GDP goes up.

Identifying a true social problem and designing an efficient Pigouvian tax to address it are challenging exercises. But it is even more challenging to get politicians to adopt such a tax and bureaucrats to implement it correctly. That is something Pigou understood, but the people who use his name today may not.

Bank Tax Consider President Obama's newly proposed tax on banks. Last January 14, the president announced that a Financial Crisis Responsibility Fee should be imposed on non-deposit liabilities held by U.S. banks with $50 billion or more in assets. The fee would take effect June 30, 2010, and operate for 12 years, during which time analysts calculate it would generate $117 billion in revenues, equal to the expected shortfall of payments from all TARP recipients.

In announcing the plan, Obama put populist red meat on the table when he said:

> My commitment is to recover every single dime the American people are owed. And my determination to

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> achieve this goal is only heightened when I see reports of massive profits and obscene bonuses at the very firms who owe their continued existence to the American people — who have not been made whole, and who continue to face real hardship in this recession. That's why I'm proposing a Financial Crisis Responsibility Fee to be imposed on major financial firms until the American people are fully compensated for the extraordinary assistance they provided to Wall Street.

In a radio address after the announcement, the president suggested another reason for the fee, a reason that should make modern-day Pigouvians very happy:

> Only the largest financial firms with more than $50 billion in assets will be affected, not community banks. And the bigger the firm — and the more debt it holds — the larger the fee. Because we are not only going to recover our money and help close our deficits; we are going to attack some of the banking practices that led to the crisis.

Taking in all this, the *Economist* magazine commented: "But politics is not the only motive. Hitting the giants addresses a genuine concern about banks whose size poses systemic dangers." Chiming in and hitting the nail on the head, *Seeking Alpha* writer Kindred Winecoff heard the rattle of Pigou's bones and said:

> This is essentially a tax on risk, because it targets leverage ratios. In terms of economic theory, or even social justice, this makes some sense. Think of it as a Pigouvian tax: moral hazard exists for firms with an explicit government guarantee, so this tax could help bring private and social costs in line. In other words, it could help banks internalize the social costs of their actions.

In a matter of a few days, the bank fee explanation transformed from a tax for generating revenue, to a tax for reducing sin, to a Pigouvian tax that would make the world better off.

Interestingly enough, the proposed bank tax arrived just a few weeks after shoppers in Washington, DC were hit with a new five-cent tax on paper and plastic bags provided by grocers and retailers. The bag tax was justified as an environmental tax, one that would reduce the careless use and disposal of bags and provide funding to clean up the Anacostia River. Patrick Gleason of Americans for Tax Reform described the matter thus: "Washingtonians heading out in search of VitaminWater and bacon to cure their New Year's morning hangovers will be greeted by a new Pigouvian tax at the checkout." In his extended comments, Gleason suggested that the revenue would just be used to form another slush fund for political purposes, that it was more about revenue than the environment.

The bank fee explanation transformed from a tax to raise revenue, to a tax on sin, to a Pigouvian tax.

Today, there is much ado about Pigou. To cite a few more instances of this, there are non-returnable bottle taxes to fight litter, snack and soda taxes to fight obesity, carbon and nitrogen oxide taxes in Scandinavia to fight global warming, and petrol taxes across Europe and the United Kingdom. All are justified in part as Pigouvian taxes that happily and harmlessly nudge human behavior in the right direction.

Pigouvian Solution Pigou was a Cambridge University don who had studied under the great economist Alfred Marshall, held the university's leading economics chair, and strongly supported John Maynard Keynes. Pigou was a prodigious writer and contributed to multiple strands of economic thought, but his reputation was earned for proposing the use of taxes to reduce activities that impose externalities — costs not taken into account by those who earn their profits from the cost-generating activities.

Writing in 1920, Pigou offered air pollution as an example of unaccounted-for costs and spoke in terms of divergences between private and social product: "Smoke in large cities imposes a heavy uncharged loss on the community, in injury to buildings, vegetation, expenses for washing clothes and cleaning rooms, expenses for the provision of artificial light, and in many other ways." Air pollution was just one example. Pigou saw social cost problems everywhere, or so it seems. There were too many cars forming traffic congestion, excessive alcohol consumption that damaged innocent people, too many vehicles wearing out highways, and too much work done by women in factories, which, in his view, imposed unrecognized costs on their children.

On the other side of the coin, Pigou called for subsidies, or what he called bounties, to expand activities that produced dispersed benefits that did not generate money in the till of the producer. These included planting forests that improved the environment, operating lighthouses that guided nonpaying shippers, and providing street lights that reduced crime. Based on strictly theoretical grounds, which is to say without the benefit of field work or data analysis, Pigou found a host of situations where markets simply led to faulty outcomes. He concluded:

> No "invisible hand" can be relied on to produce a good arrangement of the whole from a combination of separate treatments of the parts. It is therefore necessary that an authority of wider reach should intervene to tackle the collective problems of beauty, of air and light, as those other collective problems of gas and water have been tackled.

He then proposed:

> It is, however, possible for the State, if it so chooses, to remove the divergence in any field by "extraordinary encouragements" or "extraordinary restraints" upon investments in that field. The most obvious forms which these encouragements and restraints may assume are, of course, those of bounties and taxes.

In short, government taxes and subsidies are a required constraint on markets to bring balance between costs and benefits when there are spillovers not accounted for by private actors. But the taxes have to be carefully calibrated so that the tax paid at the margin is just equal to the cost imposed. A similar calculus is required for subsidies. What is

done with any resulting net revenues is another matter.

And there we have the Pigouvian solution. To correct problems of systemic risk generated by large banks, caloric drinks that lead to obesity, too much carbon emissions that may contribute to climate change, or too many grocery bags that ultimately foul the environment, a wise government can design just the right tax or subsidy and gently adjust the economic mechanism so that it runs more perfectly.

This proposal ultimately generated a massive academic debate. Chief among the debaters was Ronald H. Coase, who would later receive a Nobel prize in part for his contribution. Coase pointed out that markets failed to operate effectively only when property rights and rules of liability are not well defined, or when transaction costs restrict exchange. He noted that lighthouse operators long ago solved the problem of collecting fees from ships that benefited from their light. This response exemplified the institutional vacuum in which Pigou had conducted his analysis. Coase's classic 1960 article "The Problem of Social Cost," explaining all this, became the most cited academic paper in both law and economics. However, while Coase easily won the academic debate, at least as measured by citations, conferences, and books built around his ideas, Pigou seems to have won the policy debate.

Pigou's Warning As strange as it may seem, Pigou did not believe that government could improve human well being by fine-tuning behavior with taxes, subsidies, and regulation. His concern was grounded in what we today call Public Choice. He did not accept the notion that politicians, given constitutional constraints, would be capable of implementing an efficient and effective set of taxes and subsidies. Put simply, he did not believe the politicians could get the calculations right. Instead of making things better, the chances were just as good that things would be made worse. Instead of keeping faith with implementing a well-designed tax, the politicians' interest would be deflected to writing loopholes for favored interest groups and finding ways to generate ever more revenue.

In 1932, after describing the theoretically ideal outcome that could be achieved by his much-discussed mechanisms, Pigou confronted the politics of the problem and wrote:

> [W]e cannot expect that any public authority will attain, or will even wholeheartedly seek, that ideal. Such authorities are liable alike to ignorance, to sectional pressure and to personal corruption by private interest. A loud-voice part of their constituents, if organized for votes, may easily outweigh the whole.

Pigou did not believe that government could improve human well being by fine-tuning behavior with taxes.

It would seem that Pigou was not much of a Pigouvian.

Applied today, his warning suggests that instead of offsetting the cost of systemic risk, the purpose of the bank tax likely is to punish high-paid bankers (or at least make the public believe the bankers are being punished), or just simply to raise revenue for a deficit-plagued government.

But what about more traditional forms of Pigouvian taxes, such as those supposedly intended to reduce pollution and improve human well being? Are such taxes truly intended to reduce harms efficiently, or are they about something else, like raising government revenue? In an effort to answer this question for environmental taxes, in 2003 Elizabethtown College professor Cristina Ciocirlan and I analyzed tax revenues generated by all of the green taxes used by OECD countries, presumably to improve environmental quality. These include taxes on electricity and cement production, coal, petroleum, natural gas, waste, and packaging materials.

Ciocirlan's statistical estimates enabled us to test hypotheses about the underlying purpose of the tax system: was the purpose to protect human health or just to raise government revenue? To this end, we examined a statistically derived green tax revenue function and tested competing hypotheses regarding political behavior. For example, we included variables that adjusted for human health, reasoning that, all else equal, emission tax revenues would be higher where human health is lower. (We found that revenues were lower where human health suffered most.) We also examined the role played by green tax exemptions provided to special interest groups. Did revenues go up or down with exemptions? If up, we would infer that the politicians were taking action to maximize revenues. (It turned out that revenue went up with exemptions.) We then tested the shape of the revenue function, which enabled us to infer if the authorities set taxes to maximize revenue or maximize emission reductions. Our robust findings did not support the classic Pigouvian goal, but rather supported Pigou's later concern. The end result seemed to be more about generating money for government than about protecting human health.

Conclusion Today there is much ado about Arthur Cecil Pigou. But much of it is unjustified, at least in the view expressed by Pigou himself. Clearly, politicians and pundits need intellectual justification for their actions and opinions, but it is inappropriate to hang taxes and regulations that are claimed to make things better around the neck of Pigou. It is not that taxes, regulation, and subsidies are ineffective in changing behavior. Indeed, we all know that incentives matter. Nudges work. But the real question is, do those political instruments make things better? That remains an open question. R

Readings

- "Coase, Pigou and Environmental Rights," by Bruce Yandle. In *Who Owns the Environment?* edited by Peter J. Hill and Roger E. Meiners. Rowman and Littlefield, 1998.
- "The End of the Externality Revolution," by A. H. Barnett and Bruce Yandle. *Social Philosophy and Policy*, Vol. 26 (Summer 2009).
- "The Political Economy of Green Taxation in OECD Countries," by Cristina E. Ciocirlan and Bruce Yandle. *European Journal of Law and Economics*, Vol. 15 (2003).

Yuppie 911

By Shawn Regan
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Last September, four inexperienced hikers found themselves without water during a strenuous hike in Grand Canyon National Park. When they pressed "HELP" on their emergency satellite locator beacon, rangers were dispatched by helicopter to their location in a remote section of the park. But when rescuers arrived, the hikers had located a water source and declined help.

That evening, the hikers activated their beacon again. The Park Service called in another helicopter to locate the hikers in the middle of the night, only to discover that, again, no real emergency existed — the water they had found simply "tasted salty," the hikers said. The next morning, after the group sent a third dubious alert, a rescue team removed them from the canyon. When asked what they would have done without the emergency locator beacon, the leader stated, "We would have never attempted this hike."

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Since becoming available for public use in 2003, the price of personal locator beacons has fallen significantly and they are now standard fare for outdoor adventurers wanting the peace of mind that rescuers are just one button away. Accordingly, hikers and mountain climbers are increasingly relying upon the high tech gadgets for rescues in national parks and forests when circumstances go awry. When activated, the locator device, which is slightly larger than a cell phone, transmits GPS coordinates to a 24-hour emergency service, which then notifies the appropriate agency to send search and rescue personnel.

Moral Hazard The devices have often led to timely and heroic rescues of backcountry hikers in emergency situations. In 2008, a hiker with sudden abdominal pain was evacuated from the backcountry of Sequoia National Park and received emergency surgery. Last year, a hiker who sustained head and back injuries from a fall in a remote area of Olympic National Park was airlifted to a Seattle hospital for immediate treatment. In both instances, personal locator beacons alerted search and rescue officials of an emergency and likely saved lives.

However, some are beginning to ask if these devices are encouraging people to be more careless in the wilderness and causing them to take on more risk than they would otherwise. While data are sparse, anecdotal evidence and standard economic theory suggest that these devices do create moral hazard. Because individuals engage in more risky behavior when rescue is either explicitly or implicitly guaranteed, the head of California's search and rescue operations, Matt Scharper, has nicknamed the beacons "Yuppie 911."

Moral hazard does not only affect inexperienced yuppies. Seasoned mountain climbers are also known to take on extra risk when they are insulated from the full cost of having to self-rescue. Before the advent of helicopter rescues on Alaska's Mount McKinley in the 1970s, few people attempted to climb North America's highest peak, and those who did knew they were completely on their own. Prior to 1970 there were only 35 rescues on the mountain, but in the 1976 season alone there were 33 rescues.

This moral hazard effect on the decision calculus of climbers can be fatal. Last year, a beacon-bearing climber on McKinley attempted the mountain solo. He was last seen carrying minimal survival gear and no stove for melting snow, but he had his beacon. Whether he would have exercised more caution without the beacon — which was never activated — is unknown, but it is reasonable to assume he would have taken more survival gear with him.

The moral hazard problem that results as a consequence of guaranteed safety is well established in the economics literature. In the 1970s, Sam Peltzman's seminal research on the effects of automobile safety regulation found that seat belt laws induce people to drive less safely. In effect, seat belts lower the cost of riskier driving because the probability of harm to the driver in a crash is significantly reduced. Peltzman found that any benefits provided by the safety regulation were offset by risky driving behavior. Similarly, a recent study by economists Russell Sobel and Todd Nesbit found that NASCAR drivers drove more recklessly in response to increased safety measures in their automobiles. This offsetting response to safety regulation, now known as the "Peltzman effect," is crucial for understanding how hikers and climbers might respond to regulations mandating the use of personal locator beacons, which some states have proposed.

Externalities Making mountain climbing ostensibly less dangerous induces more offsetting behavior, which can dissipate any benefits received from

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the safety device, as seen in the case of seat belts. However, the costs and benefits of beacon use do not only fall on the hikers and climbers who use them, but also on search and rescue personnel. Just as Peltzman found that the safety effect of seat belts was partially offset by more fatalities to non-occupants such as pedestrians, bicyclists, and motorcyclists, the increase in rescues can result in more fatalities to rescue personnel.

Rescue efforts require the use of tremendous amounts of limited emergency resources. Most public land agencies contract with the U.S. Coast Guard and other agencies for emergency helicopters, which cost upwards of $4,000 per hour. But personal locator beacons often cause officials to over-respond with helicopters to minor or nonexistent emergencies. In September, a rescue helicopter responded to a beacon alert in the Grand Canyon that proved to be trivial. Rescuers arrived to find three people asleep in their tents and in no danger. One of the hikers had become alarmed during the night when she heard "odd noises emanating from the leader of the group as he slept," stated the park report. She activated the emergency locator and went back to sleep. Since the beacons only tell authorities that an emergency exists and provide no further information, it forces rescuers to always prepare for the worst.

Over the past 15 years, the Park Service has performed, on average, 11 search and rescue operations per day. The costs of those rescues add up. In 2008, the National Park Service spent nearly $5 million on search and rescues, mostly in Yosemite National Park, a haven for rock climbers. Denali National Park, home of Mount McKinley, averaged $18,000 per rescue in 2005.

"Free" Resources It is misleading, however, to view personal locator beacons as the sole culprit in many of these costly and dangerous rescues. Just as the innovation of seat belts came about as rising income levels increased the demand for safety, personal locator beacons are a high tech (and now affordable) electronic device that utilizes satellite technology to meet our modern-age demand for safety in the wilderness. It is at the intersection of helpful safety innovation and misplaced regulation where unintended consequences emerge.

The federal government's long-standing policy not to charge negligent hikers and climbers for rescues exacerbates the moral hazard problem. Outdoor adventurers, often taking undue risks, are rescued free of charge, enticing even more risk taking. Indeed, economists Dwight Lee and J. R. Clark's examination of rescue policy concludes that saving lives in the short run by offering free rescues encourages more rescue-creating activities, which result in more lives lost in the long run. With personal locator beacons becoming increasingly common, the problem has only worsened. It is simply too easy to get rescued for free.

> The costs of beacon use do not fall on the hikers and climbers who use them.

Because of escalating rescue costs, some states and counties are beginning to experiment with charging for rescues. Altogether, eight states have laws that enable them to charge for rescues, although they are seldom enforced and often weak. Oregon law permits the state to collect up to a paltry $500 when "reasonable care" is not exercised, but only one fine has been assessed in the 15 years the law has been in place. New Hampshire is perhaps the most aggressive, billing up to $10,000 for rescues where negligence is demonstrated. Since the law began in 1999, the state has recouped $47,000 to offset its expenses. To protect its taxpayers, Utah's Grand County began charging the extreme sport tourists that frequent the local deserts for rescues.

Many search and rescue groups find the notion of charging for rescues objectionable, contending that hikers will be wary to seek help out of fear of being charged a hefty rescue bill. But in areas where officials charge for rescues, the calls still come in. New Hampshire's Fish and Game Department conducts 150 rescues each year, 60 percent of which are for hikers. Charges are only applied in circumstances in which negligent or imprudent behavior is demonstrated, and those charges are capped at certain amounts. The fees defray a portion of the search and rescue costs, and more importantly, minimize the offsetting behavior that results in more overall rescues.

Despite the compounding moral hazard effect of both personal locator beacons and no-charge rescue policies, some are proposing to require the use of the devices. In the aftermath of the tragic deaths of three climbers on Mount Hood in Oregon this winter — the second such event in three years — officials are mulling whether to mandate that all climbers carry emergency beacons. However, not everyone is in favor of the requirement. Portland Mountain Rescue, a local volunteer rescue group, strongly opposes efforts to require beacons because of the unintended consequences, claiming that "mandating beacons actually increases risks for both climbers and rescuers."

Rescue Market Doing away with free rescues may do more to decrease fatalities and scale back excessive rescue costs than requiring beacons. Alternatively, requiring climbers on particularly dangerous mountains such as Mount Hood or McKinley to purchase climber rescue plans or to post a climbers' bond would force them to consider the financial costs of their decision to climb and alleviate the problem of moral hazard.

In the United States, free rescues have largely crowded out opportunities for markets to address this issue of risk in the wilderness setting. However, in areas where there are no free rescues, such as most international hiking destinations, such markets exist. Global Rescue, a crisis response company out of Boston, provides medical and security evacuations throughout the world and is a common provider of emergency services to adventurers who hike and climb internationally. Global Rescue coordinates emergency services for its members in almost all activities, including climbing,

skiing, kayaking, and mountain biking. Full membership, which is a little over $300 a year, covers any emergency from the point of injury or illness to a hospital of choice and covers $500,000 of rescue services. Less expensive short-term memberships are also available.

Recently, the American Alpine Club (AAC), a prominent rock climbing organization, partnered with Global Rescue to offer its members a limited, $5,000 coverage for rescues coordinated through Global Rescue. In 2008, the company handled 22 incidents from AAC members in locations ranging from the United States to Nepal and Bolivia, and in many cases the members' expenses were fully covered. In addition, climbers of Mount Everest are often required by their guides to purchase independent travel insurance plans that cover "extreme sports" or "hazardous risk" before attempting the world's highest peak.

But in the United States, why would hikers and climbers avail themselves of such coverage when they know that they will be rescued at taxpayer expense? Some recent efforts by the National Park Service have attempted to address the high cost of free rescues. Mount McKinley now charges a $200 climbing fee to those daring enough to attempt its summit. This extra cost funds wilderness ranger positions, which provide information and orientation to climbers to mitigate potential rescues. Similarly, climbers on Mount Rainier in Washington must purchase a $30 annual climber pass to travel on the mountain. Those small efforts represent only a fraction of the cost of rescues and likely deter only a few marginal climbers. Further, the fees fall equally on safety-conscious climbers, who seldom need assistance, and novice climbers, who are more likely to require rescue services. Regardless, fees are a step in the right direction toward striking a balance between risk taking and the cost of mishaps.

Conclusion If regulators truly want to reduce climbing deaths on mountains such as Mount Hood, charging for rescues, rather than requiring locator beacons, would be prudent. While detractors of charging for rescues argue that firefighters do not put out flames and then bill the homeowner, they ignore the fact that homeowners have fire insurance to cover such a disastrous event. Likewise, climber rescue programs such as Global Rescue act as adventure insurance and force hikers and climbers to face the costs of their actions. Adopting such measures would reduce moral hazard, Yuppie 911 calls, and save both taxpayer dollars and human lives. R

Readings

- "Automobile Safety Regulation and the Incentive to Drive Recklessly: Evidence from NASCAR," by Russell S. Sobel and Todd M. Nesbit. *Southern Economic Journal*, Vol. 74, No. 1 (2007).
- "The Effects of Automobile Safety Regulation," by Sam Peltzman. *Journal of Political Economy*, Vol. 83, No. 4 (1975).
- "Too Safe to be Safe: Some Implications of Short- and Long-run Rescue Laffer Curves," by Dwight Lee and J.R. Clark. *Eastern Economic Journal*, Vol. 23, No. 2 (1997).

Feds Freeze Out Frost Antidote

By Henry I. Miller
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In January, the American Southeast was hit with one of the worst killing frosts in recent decades. Blasts of arctic air brought prolonged record-breaking low temperatures. In Florida, tropical fish froze in their hatcheries and citrus, strawberries, tomatoes, beans, sweet corn, squash, and other crops were damaged. Food prices shot up immediately, in anticipation of compromised supplies.

Frost damage to crops is not unusual; losses to American farmers average in the billions of dollars annually. Peaches, plums, citrus, and other crops are regularly threatened by frost in the Southeast. California is also susceptible: a January 2007 freeze there cost farmers more than $1 billion in losses of citrus, avocados, and strawberries, and a 1990 freeze that caused about $800 million in damage to agriculture resulted in the layoff of 12,000 citrus industry workers, including pickers, packers, harvesters, and salespeople. In 2002, lettuce prices around the country went through the roof after an unseasonable frost struck growing regions in the Arizona and California deserts.

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High Tech Solutions Technology can mitigate much of the damage. Or, more accurately, it could have, had not government regulation placed obstacles in the way of innovative solutions. Those obstacles illustrate what innovators are up against, and how flawed, unscientific public policy prevents science and technology from spurring a robust recovery from the recession.

Currently, farmers attempt to prevent frost damage with pathetically low tech methods. These include burning smudge pots to produce warm smoke, running wind machines to move the frigid air, and spraying water on the plants to form an insulating coat of ice. The only high-tech solution, a clever application of biotechnology, has been frozen out by federal regulators.

In the early 1980s, scientists at the University of California and in industry devised an ingenious new approach to limiting frost damage. They knew that a harmless bacterium that normally lives on many plants contains an "ice nucleation" protein that promotes frost damage. They sought to produce a variant of the bacterium that lacked the ice-nucleation protein, reasoning that spraying this variant bacterium (dubbed "ice-minus") on plants might prevent frost damage by displacing the common, ice-promoting kind. Using very precise "gene splicing," or

genetic engineering, biotechnology techniques, the researchers removed the gene for the ice nucleation protein and planned field tests with ice-minus bacteria.

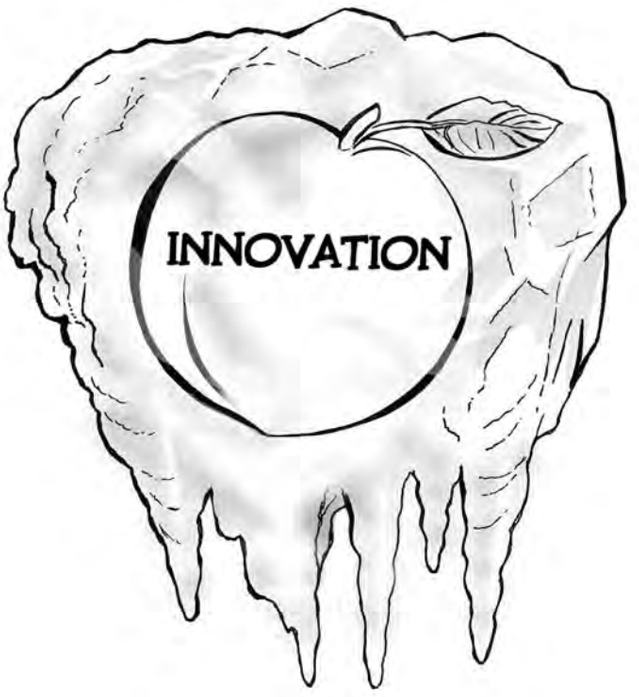
Then the government stepped in, and that was the beginning of the end.

The Environmental Protection Agency classified the innocuous ice-minus bacterium as a pesticide, reasoning that because the naturally occurring, ubiquitous "ice-plus" bacterium is a "pest," a bacterium intended to fight it must be a pesticide. This absurd, sophistic reasoning, which by extension would mean that outdoor trash can lids are also a pesticide because they deter or mitigate pesky raccoons, threw a wrench into plans to test ice-minus on small, fenced-off plots of potatoes and strawberries in northern California.

At the time, scientists inside and outside the EPA were unanimous that the test posed negligible risk. (I wrote the analysis submitted by the Food and Drug Administration.) No new genetic material had been added to the bacterium; only a single gene whose function was well known had been removed, and the organism was obviously harmless. Nonetheless, the field trial was subjected to an extraordinarily long and burdensome review — by both the National Institutes of Health and the EPA — only because the organism was genetically engineered.

It is noteworthy that experiments using bacteria with identical traits but constructed with older, cruder techniques require no governmental review of any kind. When tested on less than 10 acres, non-engineered bacteria and chemical pesticides are completely exempt from regulation. Moreover, there is no government regulation of the use of vast quantities of the ice-plus organisms (which contain the ice-nucleation protein) commonly blown into the air during snow-making at ski resorts.

Although the ice-minus bacteria proved safe and effective at preventing frost damage in field trials, further research and commercialization were discouraged by the combination of onerous government regulation, the inflated expense of doing the experiments, and the prospect of huge downstream costs of pesticide registration. As a result, the product was never commercialized, and plants cultivated for food and fiber throughout much of the nation remain vulnerable to frost damage. We have the EPA to thank for jeopardizing agricultural jobs and inflating produce prices.



KEVIN TUMA

We have the EPA to thank for jeopardizing agricultural jobs and inflating food prices.

Anti-Biotech That last point illustrates the ripple effect — in this case the public health impact — of such government actions. The demand for fresh fruits and vegetables is elastic, which means that higher prices result in reduced consumption. As a result, consumers get less of the anti-oxidant, vitamin, and high-fiber benefits that these products afford.

The EPA's flawed approaches to biotechnology regulation, which date from the 1980s, are ancient history, but there is a modern-day angle. Lynn Goldman, the EPA's chief pesticide regulator during the Clinton administration, defended and publicly misrepresented her agency's policies toward biotechnology. Responding to an article, she wrote in a letter to the journal *Science* that it was inaccurate to contend that the EPA "regulates or singles out for special treatment products because they are created using" genetic engineering; she remonstrated that the "EPA's activities reassure the public concerning biotechnology products."

Goldman was wrong on both counts. As noted above, the use of genetic engineering techniques for anything that falls within the regulatory definition of a "pesticide" — even when that definition is tortured to claim jurisdiction — triggers case-by-case review, which is not necessary for small-scale field trials for other pesticides, regardless of risk. As to reassuring the public, a more defensible view of biotechnology regulation was expressed by the president of the consumer-advocacy group Consumer Alert: "For obvious reasons, the consumer views the technologies that are *most* regulated to be the *least* safe ones. Heavy involvement by government, no matter how well intended, inevitably sends the wrong signals. Rather than ensuring confidence, it raises suspicion and doubt."

Well, Goldman is back in government as an Obama political appointee, this time as a senior science adviser at the FDA — yet another example of the Washington tradition that no bad deed goes unrewarded.

The EPA's discouragement of development of a product that can prevent or mitigate frost damage is yet another example of the actions of regulators creating a situation in which everyone loses. When will they re-think their policies and let their decisions be guided by science? Probably not before hell freezes over. R