

## ECONOMICS U\$A LESSON #21

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Stasio: Economics U\$A. One of a series of programs designed to explore Twentieth Century micro and macroeconomic principles. The subject of this edition is The Economics of Environmental Regulation. Our guest is Dr. Joel Schwartz with the Economic Analysis Division of the Environmental Protection Agency. I'm Frank Stasio.

Ruckelshaus: The American people put a very high premium on public health. I think that's justified, probably higher than anybody in the world but that does not mean that we, in my view, that we should pursue public health policies to the exclusion of everything else.

Stasio: Everybody wants to live in a clean and healthy environment. But as William Ruckelshaus suggested at his Senate confirmation hearings in Nineteen Eighty-three environmental regulation is part of a much broader agenda of social wants and needs. The fact is that keeping our air and water clean doesn't come cheap as long as we also demand the convenience and benefits of living in a technological country. Most people are willing to pay something to keep our air and water from becoming polluted. But how much should we pay? Is there a point where the cost is too high? And can we put a price

on good health and piece of mind? Can those qualities be compromised? Public policymakers and environmental experts grapple with these questions every day. The answers are never perfect but the ways they arrive at their conclusions can underscore social priorities and provide a rational basis to discuss the environmental cost of doing business. Dr. Joel Schwartz is with the Economic Analysis Division of the Environmental Protection Agency. He points out that the costs of keeping the atmosphere and waterways clean limit our control of pollution.

Schwartz: You can't just say control it absolutely because of two reasons. One, there may not be that much money in the world. And two, because if you look at tradeoffs between spending money on environment and on other things, um, it may be a bad deal. For example, it may be that putting more money into getting heart attack victims to the hospital sooner would lead to a much more important improvement in health for your dollar than on the margin tightening an environmental standard where it may not. And that's why you want to look and see what people are willing to avoid health risks in general in the economy and measure our environmental regulations against that.

Stasio: Schwartz tries to evaluate those tradeoffs and compare how much it will cost a certain pollutant to various levels against the benefits of those controls. That is how much the reductions in pollution will save society as a whole. This kind of study is called cost benefit analysis.

Schwartz: There are two basic difficulties, um, for doing a cost benefit study. One is that costs are pretty easy to measure and benefits are less easy. It's obvious how much it costs. They have to put this equipment on the plant. You find out how much they paid

for the equipment. The benefits, you need to know two things that we generally have a hard time finding out. And one is a dose response function between the pollutant and the damage it causes whether it's crop loss or disease or materials damages. At any given level of the pollutant, how many people are sick? And if you don't know that, then it's hard to estimate the change in the number of people who are sick when you go with the pollution level and therefore what you're getting at of a given level of control. And so it's hard to do a tradeoff. And then the second thing that's hard is to try to put a value on that illness. Um, and there again to the extent we can measure medical costs or workdays lost we can put a value on that. Putting value on, you know, the suffering and some of the thing—other things is...is more difficult. And the medical costs are...are sort of funny because if I have a disease whose treatment is pretty cheap but which is a serious disease and may have long-term consequences for you, unless I have good information on those long-term consequences I will value it at the cheap cost of treatment. If I have a disease that's relatively mild but the treatment is very extensive, I'm gonna wind up saying well that one's worth much more to avoid than the other one. Whereas the other one may lead to some chronic lung problem which is in fact much more serious. Um, and so the medical costs for the acute event are not necessarily good proxies for the long-term, um, medical costs that will be undergone. But usually it's a lot easier to find out about acute events than about chronic events as a result of exposure to air pollution because people move all throughout the country. You know you want to find out what twenty years of exposure to a given pollution level, you gotta follow someone for twenty years. And since people move, that's not easy.

Stasio: Dr. Schwartz is an author of one of the most comprehensive cost benefit studies ever conducted by the EPA. The survey was an attempt to predict the effect of proposed rules by the EPA to lower lead levels in gasoline. Lead emissions cause serious health problems especially in children. Lead also does crop and property damage. The study compared the benefits to society of reducing lead emissions to the cost of oil refiners and ultimately the public of producing gasoline with lower lead levels.

Schwartz: First we had to know how much blood lead levels change when you change the amount of lead in gasoline. And we gathered together four different epidemiological data sets where we could look at what the correlation was between lead in gasoline and lead in blood in different places. And we found a very consistent pattern from which we were able to then estimate how that would vary. Then the next component would be to say well there are lots of other sources of lead and so you have a broad distribution of blood lead levels. As you move that distribution to a lower level, how many fewer people are at the levels where certain effects occur? And the effects that we looked at were at higher levels in children who are very sensitive to lead. There are neurological effects. There are disturbances in cognitive functioning. At high blood lead levels children have been found to have lower IQs, to have shorter attention spans, to...to learn with greater difficulty, more likely to be left back in school. And so we looked at those things, and we tried to estimate the number of children. And that's the first thing. Because even if you can't always put dollar values on things, at least if you can enumerate them in some way, you can see how many of them are happening, that's important also because then you're not making a decision on where to set a standard in a vacuum; you have some idea.

Stasio: The first part of the study was relatively straightforward. Schwartz was able to get objective information and come to some fairly specific conclusions about the effect of leaded auto exhaust on human beings. The next step was to try to put a dollar value on the damage. Here it's a little tricky.

Schwartz: It's difficult to value loss of cognitive functioning. We spend some time looking at correlations between IQ and earnings as a way of valuing it but we decided that they were gonna be too controversial to use. And so what we used instead was studies indicating how much compensatory education for children costs that are mildly disturbed in cognitive functioning in some way. And there's data from the Department of Education at various different levels of that and we found one level that seemed to match the kinds of things that were happening to these lead exposed children best. And we used the costs estimates for that kind of, uh, level of intervention which is basically kids staying in a regular school, regular classroom but going couple of times a week to the reading teacher or school psychologist or something like that. And so we've used that value. For somewhat lower levels, we use the value of medical care to get rid of the lead. Um, and we based that on protocols that have been published in the Journal of Pediatrics on how to take care of kids with these blood lead levels.

Stasio: Schwartz also looked at non-medical benefits of controlling lead like improved crop yields and lower auto maintenance costs. Meanwhile, the studies showed the cost of lowering lead levels. Lead is added to gasoline to increase octane levels. There are other ways to get the same octane but those methods cost more, and the costs are passed on to consumers at the pump. When the EPA compared the additional cost of refining gasoline with the benefits of lower lead emissions, the study projected a net savings to society of

more than one point two billion dollars in the first year of the new regulations. Such analyses can be useful to measure the cost to society called social costs against the rewards called social benefits.

Mitchell: It is a rather easy task to place a value upon the cost of control but a rather difficult task to assign a dollar value to the benefits derived from that control. We know what it will cost to install a scrubber in a particular utility plant. But what is the value of human life?

Stasio: Maine Senator George Mitchell put that question to William Ruckelshaus at Ruckelshaus confirmation hearings in Nineteen Eighty-three. It is perhaps the most difficult question for environmental policymakers to answer. In fact, regulators don't really try to assign a dollar value to human life. Instead they try to measure how much people will pay to avoid varying degrees of risk.

Schwartz: Obviously, anyone would pay all the money in the world to save their life but that's not what you're really looking at. What you're really looking at is a small change in the risk of having a heart attack in a very large number of people. So for each individual the risk is small. And people make decisions all the time where they're trading something off against small risks. They decide to put seatbelts on in their car, or not.

Um, they decide to take a somewhat riskier job, or they don't. And you can look at those sorts of things and try to estimate how much money people are willing to pay for reductions in risk of dying. And when you look at some of the occupational, um, data where you can look at riskier occupations and...and what the wages are and try to control where, you know, unionization and region of the country and things like that. You see

that there are in fact risk premiums that people in riskier occupations do get paid more money. And if you look at data on how much money people are willing to spend to save time and you look at whether or not they wear seatbelts, you can come up with an estimate of how much they value risk at from that too. And all of those things are a little noisy in that you never know whether the person really knows what the risks are that they're trading off or not, and so it's difficult to...to be really confident in any one of those studies. But the range of those studies is between is if you translate from value of risk to value of statistical life, um, in the range a half a million dollars to seven million dollars per life saved. Um, and there are almost no studies below that and very few above that. So that's still a factor of ten range but at least you've narrowed it down. Um, we used a value of a million dollars per statistical life saved.

Stasio: Very often firms complain that the cost of controlling pollution is too high. In their fight to remain free from environmental controls they remind regulators that the cost of pollution control will be passed onto the consumer. Well that much is true. But the suggestion that by allowing pollution to go unabated there are no costs is simply wrong. The social costs of pollution are not immediately apparent because they're not added in to the cost of the product. These costs are called externalities of production.

Schwartz: If you have a very dirty factory that produces a tremendous amount of soot and people are dying of respiratory disease, you know the elderly are more likely to get pneumonia and die and stuff like that because of all the particulates in the air, that's a cost of making the product that you make. But you're not paying that cost – you don't pay their medical care, you don't pay money, um, as you know to their heirs, they can't sue you and collect damages because this person died – and therefore some of the cost of

making the product that you make is not being borne by you. And, therefore, similarly to the case of the subsidy you're going to make too much of that product because you're matching the revenue that you get to only the fraction of the cost that you bear. And pollution is a classic externality. You're laying the cost off on the people who are breathing the air and drinking the water and, therefore, you're not making the socially optimum decisions in terms of either how much of the product to make or what technology to use to make it. And if we internalize that cost, if we make the firm bear that cost, then it will make the right decision in terms of trading off which technology to use and in terms of how much to make given a given price on the outside.

Stasio: There are two ways that regulators can internalize the cost of pollution. One is to set an industry wide standard and to require each firm in that industry to meet the standard by a certain time. As an example, all oil refiners had to reduce lead levels in gasoline from a half a gram to a tenth of a gram per gallon by Nineteen Eighty-six. Now the other way to achieve that standard would be to impose a tax on pollution. Using the example of leaded gasoline, the government could charge refiners for the amount of lead they use.

Schwartz: If we had a tax, then every individual company could decide how much lead they were gonna put in their gasoline. Instead of everyone putting in a tenth of a gram, some would put in less and some would put in a little more and they would do it in a way that minimized the total cost to society for the same total number of grams of lead being used because we could adjust the tax rate so the amount of lead would be used but each individual person would use a slightly different amount in their gas. Also, some people you know who own Nineteen Sixty-seven GTOs that need high octane gas have a hard

time getting it. Premium unleaded isn't quite high octane enough and they tend to mix a little lead in with it to get a little extra boost out of the lead. They might be willing to pay a lot more money to get a little bit more lead in their gas, and there might be other people driving cars that can legally use leaded gas that, you know, as long as they can get eighty-nine octane gas for their car, they don't really care. They'll use unleaded. And when we fit in a regulation, there's sort of no way for that sort of trading on a micro level to work its way out. And so it's less efficient.

Stasio: Schwartz details how a tax would lead to more efficient decisions on the part of refiners.

Schwartz: If I say well all leaded gas has to be a tenth of a gram, then I have one refinery, let's say, that has lots of spare octane equipment that doesn't sell very much premium unleaded. It's got octane coming out of its ears. Um, it could easily run at a lower lead level. I have another refinery with relatively more leaded gasoline in there so taking lead out of it will cost them more, and they may have less octane generating capacity to begin with. Um, the industry as a whole is in surplus. But obviously everyone doesn't have the same amount of surplus. It's going to cost them more, therefore, because they're a little tighter. Now if those two refineries could get together, you could find an optimum combination of lead use at Refinery A and Refinery B where the total amount of lead being used is the same. But instead of each of them using the same amount of lead, Refinery A uses a little less and Refinery B uses a little more.

Automatically that's going to happen. A refiner who has higher than operating costs for taking lead out will pay the tax and use a little bit more lead because the tax is lower to him than the extra operating costs. A refiner's who got lower than average operating

costs can save money by paying less tax if he goes down below the standard. And so he'll do that, and they'll do it in a continuous way. Each one will have a slightly different level where their cost is exactly equal to the tax.

Stasio: The Environmental Protection Agency, however, doesn't have the authority to impose taxes so it regulates pollution by making rules. However, pollutant tax arrangements are common between local governments and firms that dump wastewater into public waterways. In those cases the tax is called an affluent fee. Another way to provide incentives for pollution control is to offer tax credits to install control systems. Of course taxing pollution is only possible when we can agree that a little bit of pollution is all right. And in most cases we do accept some pollution because as Schwartz explained earlier, the cost of controlling pollution makes it impractical to reduce the output of most pollutants to zero. Schwartz says that trying to find an acceptable level of pollution is a devilish process.

Schwartz: Most pollutants are harmful at some level. And while we sometimes pretend that there are thresholds below which no harm exists, that's certainly not true. Because (A) for many pollutants there are no thresholds. And even when there is a threshold level in a person, um, before some health harm occurs, generally that level is different for every person because different people are more or less susceptible. So if you take a broad distribution of two hundred and forty million people each with a different threshold and you look at you know the number of incidences of illness or harm or however you want to define it as a function of pollution level, there is on a population basis another threshold because there are always some people whose threshold is lower than the level you set.

Stasio: So, we compromise. Instead of eliminating pollution entirely, regulators try to reduce it to the point where the cost to society of any additional reductions in pollution are greater than the benefits. This point is called the optimal quantity of pollution. To arrive at this point, regulators take into account the fact that the marginal cost of controlling pollution increase as standards rise. And as former EPA Director William Ruckelshaus pointed out to a Senate Committee spending ever higher amounts on controlling pollution doesn't always bring greater benefits.

Ruckelshaus: I...I sighted a specific example, uh, in my testimony here two years ago, uh, from a plant that Weyerhaeuser had in the southern part of the state of Washington where we went from, uh, zero to about ninety percent removal of particulate matter, uh, in a...in a, uh, air quality region in the southeastern part of the state or southwestern part of the state. Uh, and then under a technological requirement called RACT, reasonably available control technology, on the statue, uh, we were forced, that was a four million dollar expenditure, we were forced in this particular facility to go, uh, to spend another six million dollars, fifty percent more than we spent the first time, to remove six percent more pollution, uh, more particulate matter. On all the monitoring stations that were around the plant, uh, there was not appreciable benefit...

Male: No significant change.

Ruckelshaus: ...no benefit associated with that expenditure. Now that is the question which I think the...the Committee ought to address.

Schwartz: For any given pollution control technology, it's generally the case that as you control tighter and tighter and tighter the marginal cost of that control goes up. Um, and

you have to use more and more equipment and fancier and fancier, um, techniques. And so it generally does get more and more extensive. And at the same time, even if there aren't thresholds in the general population, presumably as you go to lower and lower levels, the number of people who are sensitive at that level frequently, but not always, declines. And you may have lower and lower benefits that you're getting at lower and lower standards in term—never mind dollars just in terms of health, um, at the same time that you're having higher and higher costs. And that's one reason why most people believe that it probably is someplace, you know, before you get to zero for most pollutants where tho—those lines have to cross.

Stasio: Of course there are political considerations which can distort a pure cost benefit analysis.

Schwartz: We...we have regulations on how you burn coal. And those regulations basically require that not that you meet a certain standard in how much sulfur comes out of the stack when you burn the coal but that you use a particular technology to remove sulfur from the stack. And the reason is that the cheapest way to get very low sulfur emissions is to use very low sulfur coal and not put any technology on. And by requiring people to put on the technology whether they need it or not, we keep them from switching to low sulfur coal and that makes the high sulfur coal miners very happy. Now it's true that if we didn't do that, high sulfur coal miners would lose jobs. But it's also true that low sulfur coal miners would gain jobs. It's probably the case that there would be no net change in employment. But it's pretty hard to take a job away from someone who already has it in order to give it to somebody who doesn't have it yet. And therefore

politically that has been unacceptable and therefore we stand an awful lot more money on controlling sulfur dioxide than would otherwise be the case.

Stasio: The Environmental Protection Agency was created in Nineteen Seventy under President Richard Nixon. While there has been no comprehensive cost benefit study to show the overall economic effect of air and water pollution control since then, the impact of government regulation on the environment is clear.

Schwartz: Even in just absolute levels from Nineteen Seventy to now, there have been reductions in the particulate levels in the air, reductions in sulfur dioxide, reductions in ozone levels. There have been reductions in the amount of gunk in rivers, um, even reductions in...in some of the toxic chemicals that are in rivers. But those reductions underestimate the benefits that have really occurred because the gross national product has doubled since then. And we have much more industrial activity than we used to. So what you really want to measure is not Nineteen Seventy versus Nineteen Eighty-five but Nineteen Eighty-five versus Nineteen Eighty-five if we hadn't had any of those controls. And in that case for air pollution you're probably talking about half the level of pollution that we would have otherwise had, um, from many of the major pollutants. And for water pollution also, um, substantially lower levels of...of those ones that we've focused on. And...and so there...there's been a substantial cleaning up of the environment.

Stasio: But on the cost side is it possible that the gross national product may have tripled if it wasn't for the...the, uh, cost of, uh, cleaning up the environment?

Schwartz: No. That's...that's very unlikely. Uh, first of all you have to remember that you know producing pollution control equipment is also an industry and people work in

that. And so we may have you know diverted some of the gross national product from making widgets to making scrubbers, um, but if we have done that in an intelligent way, namely we have required the right number of scrubbers, then that's production also, and that has value. Also another way to look at it is if you look at capital investment by industry, in the Early Seventies when pollution control regulations first came in, it is true that a lot of capital was being spent on pollution control by industry. I mean it was still a very small percent of their total capital investment but it may have been upwards of five percent of their capital investment was going into pollution control. But that's because we had essentially no regulations and they came in all of a sudden everyone had to hurry up and do something. When you look at the Late Seventies and Eighties where we're in a more of a steady state environment, I mean new regulations keep coming out but we don't have this tremendous hurry up, the percent of capital investment that goes into pollution control equipment has fallen substantially and it's really down a very trivial level. So even if there was dollar for dollar replacement of investment in productive, um, equipment for pollution control equipment, um, it's a pretty trivial effect. And in fact there isn't dollar for dollar replacement. If you spend an extra dollar on pollution control, you may reduce the amount you stand on productive investment but you probably don't reduce it by a full dollar. You probably reduce it by less than that. Um, and so it's very unlikely that there's been a noticeable change in the gross national product as a result of this.

Stasio: Let's review the important elements in our study of the economics of environmental control. Not all costs are borne by the producers of a good. By-products of production which are costly to society but not the firm are called externalities of

production. Social costs include all costs of production, external as well as internal costs. The marginal cost of reducing pollution goes up as standards become more strict. In trying to decide on the degree to which pollution should be regulated, policymakers should weigh the value of the benefits of reducing each additional amount of pollution against the cost. But there are many problems in evaluating the cost and benefits of pollution. The difficulties in conducting environmental cost benefit analysis include predicting accurately the number of people who may become ill at a given level of pollution and second, placing a dollar value on illness or death. Environmental regulation seeks to change pollution control from an externality to an internal cost to make pollution control a more efficient process. There are two ways to control pollution. The government can impose industry wide regulation which means that every firm must meet the same standards or it can impose fees or taxes based on the amount of pollutant the producer releases into the environment. Most experts consider the latter more efficient since it allows individual firms to decide whether it would be cheaper to pay the fine and not meet the standard or whether it would be more economical to meet or exceed the standard. The tax would be levied at a rate that would ensure the environmental standards would be met on average nationally. While industry and government continue to debate the most efficient way to control pollution and protect public health and safety, there is almost no argument about the merits of some form of environmental regulation.

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Stasio: You've been listening to Economics USA, one of a series of programs on micro and macroeconomic principle. Our guest has been Dr. Joel Schwartz of the Economic

Analysis Division of the Environmental Protection Agency. Economics USA has been produced by the Educational Film Center in Annandale, Virginia. I'm Frank Stasio.

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