

157

Hughes, Marjorie

RECEIVED

From: Joakos1@aol.com
Sent: Thursday, November 04, 2004 4:26 PM
To: RegComments@state.pa.us
Subject: factory farms

2004 NOV 12 PM 3:43

INDUSTRIAL REGULATORY
REVIEW COMMISSION

Sirs: I oppose factory farms and the regulated feeding of mass amounts of animals bred for human consumption, especially when the use of antibiotics is involved. Sincerely, Joanne Kosloski

151

Original: 2412

Hughes, Marjorie

RECEIVED

From: Corj42@cs.com
Sent: Thursday, November 04, 2004 7:26 PM
To: RegComments@state.pa.us
Subject: I oppose factory farms and I oppose CAFO's

2004 NOV 12 PM 3:43

INDUSTRIAL & LABORATORY
REVIEW COMMISSION

I oppose factory farms and I oppose CAFO's (Concentrated Animal Feeding Operations).

Thank you for considering my comment.
Cynthia Jimenez
932 Franklin Street
Wyomissing PA 19610-3003

11/5/2004

Original: 2412

Hughes, Marjorie

RECEIVED

From: John Hoskyns-Abrahall [John@bullfrogfilms.com]
Sent: Thursday, November 04, 2004 3:44 PM
To: RegComments@state.pa.us
Subject: Comment on Proposed CAFO Rule Changes

2004 NOV 12 PM 3:42
 PENNSYLVANIA REGULATORY
 REVIEW COMMISSION

Dear Secretary McGinty,

I can't tell you how disappointed I am that the Rendell Administration, which I have supported wholeheartedly, should be proposing rule changes that would allow an increase in the number of factory farms.

Surely you have seen the footage, and read the reports, of the devastation that hog farms have caused in other parts of the country? Air so foul that people flying over in small planes get nauseated; ruined rivers; plunging real estate values; and most important of all...the removal of local control.

I understand that this is being done in the name of efficiency and lower food prices. However you, in your position, are well aware, that some things that appear to be efficient on the surface wind up costing much more in the long run in terms of public health and environmental degradation.

In a nutshell the only reason that a factory farm is economically viable is because we do not force them to clean up their waste. With that much waste each operation should have its own sewage treatment plant. After all in many cases they create as much sewage as a small city. The requirement to take care of their own waste in a responsible manner of course would make their operation unable to compete with smaller family farms.

Do you we really want the Pennsylvania countryside to be devoid of people? Do we want to concentrate the ownership of land in fewer and fewer hands? Revolutions have been fought over just this issue. Don't we want to encourage local control and local decision making?

Finally, politically speaking, and speaking as a friend of your administration, in my judgement you will be making a grave mistake to put yourself on the other side of the ever-growing environmental and economic justice movement.

With the end of fossil fuel production in sight, our society will have little choice but to grow and sell food locally. Don't destroy that infrastructure just when we're really going to need it again.

Sincerely,
 John Hoskyns-Abrahall, President

Bullfrog Films
 PO Box 149
 Oley, PA 19547
 Toll-Free: 800/543-3764
 Email: john@bullfrogfilms.com
<http://www.bullfrogfilms.com>
 Voice: 610/779-8226
 Fax: 610/370-1978

11/5/2004

Original: 2

Hughes, Marjorie

RECEIVED

From: Neal M Hoover [nealhoover@juno.com]
 Sent: Thursday, November 04, 2004 7:42 AM
 To: RegComments@state.pa.us
 Subject: Concentrated Animal Feeding Operations (CAFOs) Plea for Mercy / Farmers Turned Criminals

2004 NOV 12 PM 3:44
 REVIEW COMMISSION



~hpa0000.jpg



~hpa0001.jpg

To Whom it may concern,

October 30, 2004

My reason for writing is two fold. First to voice my concern about CAFO rule changes and second to give my experience with DEP enforcement officers.

I am not a letter writer but a farmer. But I need to plead to someone for mercy.

First, a little introduction of "us".

* My name is Neal M. Hoover the son of Amos B. Hoover of Denver, PA.. My address is Mt.Pleasant Mills.

* We farm as a partnership called Hickory Lane Farm with two of my brothers Amos Lynn, and Jay Paul

* Our Hickory Lane Farm is 568 acres situated 1 mile west of Blain PA. with crops and hogs being our mainstay.

* We are one of the few remaining independent hog producers in the state of PA.

* With no contracts or price guarantees of market price we have felt and were devastated by the severe effects of a

maturing industry and price effects of it, over the last 10 years.

* We have moved from concentrated Lancaster County to surrounding counties for more open farm ground of Pa. more than 20 years ago.

* We love our Church, community, country, and occupation. Our desire is to continue to be law abiding citizens and good stewards of the same.

* We are self sufficient farmers and have never accepted government payments of any kind in relation to our farming operation.

* Because we want to be good stewards of our soil we have had a conservation plan in place since 1992 with the help of SCS.

* We have never been arrested or even accused for creek contamination in the past, which flows through our property. We take water pollution serious.

* And because of past legislation we have developed a nutrient management plan and obtained a NPDES CAFO permit, with the help of SCS and a private consultant, George Hazard D/B/A Red Barn Consulting.

With all these permits and paperwork DEP is threatening us with a pending arrest. They mandated impossible deadlines and edicts that are continuously being changed as a "Moving Target". It seems they already have unlimited authority to dictate and threaten us.

I see the pending rule changes for CAFO will successfully force farmers out of business and could be called the "Farmer Export Law".

We don't know what to do to appease DEP. It's like being hit by a meteorite that came out of the blue. If DEP is bent on making it impossible and has singled you out, there is really nothing a person can do about it but to stand around and cry. They come on unannounced visits, walk around your whole farm, with cameras and record every thing they don't like to see, as evidence against you. And they leave the farm with an air of disgust and threats of an arrest.

After an 8 1/2 inches of rain from Hurricane Ivan in a single night, I think any farmer, regardless of their cropping program, will have more erosion than they wish to have. We have used minimum till and no-till programs for the last 20 years including 2004. However none of that matters. We are criminals and we will pay for it.

Now a little background on our pending case of this summer.

At Hickory Lane we had planted the previous two years of corn and decided to plant soybeans this year. (About 100 acres of pasture and 250 acres tillable ground are on this farm) So with a wet spring we finally finished planting the beans the beginning of June. Then DEP stopped in on one of their unannounced visits in the end of June 2004 and to our surprise, they were not happy. They proceeded to condemn our minimum till farming and blamed us for putting manure on a field that was first tilled to "secretly " put more manure on than our plan states, which was a total untruth and a fabricated accusation. They sent us a deadline to get grass started before August 15, 2004. Through Red Barn Consulting we negotiated with them for an October 15, 2004 deadline so we can first harvest the growing beans. The beans were slow in maturing because of the cool, wet summer. Then Hurricane Ivan came with it's 8 1/2 inch rains in September. But we still had full intentions of meeting the October 15 deadline. On the night of October 14, 2004 we moved the combine, the bean head, three gravity wagons and the no-till drill, all with tractors towing them about 50 miles from our farm in Snyder County to Hickory Lane Farm, Blain, Pa. Even if the beans were immature at 20% moisture, we were planning to do all the required areas to meet the deadline. But guess what. It started to rain again. And before the night was over it rained over an inch. And another inch the next day. Then it stayed damp and dreary for another 10 days. During this time DEP enforcement officers show up again and demanded answers to their demands. We said weather was the problem, not our unwillingness. But that didn't matter. They told Red Barn Consulting we may no longer try to sow rye or grass this fall without facing more fines for going in this late. What happened with the good reasoning and "working relationship" that DEP was supposed to have over the old DER? George Hazard from Red Barn says these people mean business, but what do we do now? Yesterday it rained another 8/10. We are farming under impossible conditions with DEP holding the law to our heads. We tried & yet we are being treated as criminals. Should we just give up and let Brazil do the agriculture? The U.S. has lost a lot of other industries to foreign countries and I can guarantee, if DEP will treat every farmer as they are treating us, PA and the U.S. will be very successful in exporting agriculture to other parts of the world too.

Yours very sincerely, Neal M. Hoover

R.D.#1 Box

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Mt.Pleasant Mills, PA. 17853

P.S. I am sending a copy of DEP's letter of June 30th as an attachment.

If you want a copy of the pending notice of

arrest I can send that too.



Pennsylvania Department of Environmental Protection

909 Elmerton Avenue
Harrisburg, PA 17110-8200

June 30, 2004

Southcentral Regional Office

717-705-4707
FAX - 717-705-4760

CERTIFIED MAIL NO. 7002 2030 0007 12 9705

Amos Hoover
RD #1, Box 80
Blain, PA 17006

Re: Concentrated Animal Feeding Operation (CAFO)
Hickory Lane Farm
NPDES Permit No. PA 0246859
Jackson Township, Perry County

Dear Mr. Hoover:

Department staff visited with you recently to discuss the implementation of your erosion and sedimentation (E&S) control plan included in the Conservation Plan for your farm. Review of your E&S plan reveals that grassed waterways are to be installed and maintained at your farm. A map submitted with the NPDES CAFO permit application, based on the E&S plan, specifies that waterways were to be installed within fields 51, 55, 56, 57, 58, 60, 70, and 71. We observed during our site visit that these waterways were either not installed or were not maintained. Significant erosion has occurred as a result (see attached photographs).

Sediment-laden runoff from a field entering a stream is pollution under the Pennsylvania Clean Streams Law. Failure to implement your E&S plan to prevent sediment pollution is contrary to the terms and conditions of your NPDES CAFO permit (Part C Section C) and the Department's E&S regulations at 25 Pa. Code § 102.4(a).

We are in receipt of correspondence from your consultant dated June 22, 2004, which indicates that you intend to cooperate with the Perry County Conservation District and the Perry County Office of the USDA Natural Resources Conservation Service (NRCS) in updating your E&S plan, and that you will be proposing a schedule to establish grassed waterways. We also recognize the technical services that are available locally and recommend that you contact the Conservation District and NRCS to assist you in this matter.

Based on the differences between your current cropping system and the conservation practices contained in your Conservation Plan on record, please identify additional practices that may be necessary this year to prevent additional sediment pollution. We request that you submit a plan and schedule by July 15, 2004. The waterways should be established as soon as possible but no later than August 15, 2004.

The Department's inspection also documented that you are not following the conservation tillage practices contained in your Conservation Plan. Specifically, the plan calls for crop residues of 40%

minimum at planting as a conservation practice. As a result of your manure injection practices, you are not maintaining a 40% minimum crop residue. In addition, your plan does not recommend the planting of soybeans on sloping field areas due to reduced crop residue concerns. The planting of soybeans in sloping areas was documented during our inspection. Consequently, prior to the next growing season, you will need to either revise your conservation plan and related best management practices or implement the conservation plan as written.

This notice is neither an order nor any other final action of the Department. It neither imposes nor waives any enforcement action available to the Department under any of its statutes. If the Department determines that an enforcement action is appropriate, you will be notified of the action.

If you have any questions, please contact Mr. Sean Furjanic at 717-705-4826.

Sincerely,



James S. Spontak, Chief
Monitoring & Compliance Section
Water Management Program

Enclosures

cc: Perry County Conservation District
Perry County Natural Resources Conservation Service
George Hazard, Red Barn Consulting, Inc.

Original: 2412

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Hughes, Marjorie

From: Peter Crownfield [PeterCrownfield@verizon.net]
Sent: Thursday, November 04, 2004 11:08 PM
To: RegComments@state.pa.us
Subject: factory farms

RECEIVED
2004 NOV 12 PM 3:43
REGULATORY
REVIEW COMMISSION

I oppose factory farms and "Concentrated Animal Feeding Operations".

I oppose these operations for several reasons:

- they are cruel to the animals,
- antibiotics used on the animals are a hazard to humans,
- these practices has proven disastrous in North Carolina,
- corporate farming puts small farmers out of business, and
- allowing state regulators to overrule stricter controls passed by municipalities is undemocratic.

Peter Crownfield
Bethlehem, PA

162

Original: 2412
Hughes, Marjorie

RECEIVED

From: Larry Fenner [fennjethawk@comcast.net]
Sent: Thursday, November 04, 2004 9:57 PM
To: regcomments@state.pa.us
Subject: Factory Farms

2004 NOV 12 PM 3:43

INDEPENDENT REGULATORY
REVIEW COMMISSION

I oppose factory farms and I oppose CAFO's. There bad for the environment, humans and they are really cruel to the animals. They only benefit the people with money, the big corporations. Please stop this.

158

Original: 2412

Hughes, Marjorie

RECEIVED

From: Deni Gross [cfpeace@hotmail.com]
Sent: Thursday, November 04, 2004 4:01 PM
To: RegComments@state.pa.us
Subject: factory farms

2004 NOV 12 PM 3:43

INDEPENDENT REGULATORY
REVIEW COMMISSION

I oppose factory farms and concentrated animal feeding operations. They are cruel to the animals and contribute to the overuse of antibiotics in animal feed, which eventually negatively affects human health. Additionally, they are environmentally devastating and put small farmers out of business. Thank you.

Mrs. Deni Gross, Birdsboro, PA 19508

Rock, jazz, country, soul & more. Find the music you love on MSN Music!

Original: 2412

Hughes, Marjorie

RECEIVED

From: THsidebar@aol.com

2004 NOV 12 PM 3:42

Sent: Thursday, November 04, 2004 3:24 PMINDUSTRIAL REGULATORY
REVIEW COMMISSION**To:** RegComments@state.pa.us**Cc:** governor@state.pa.us; srohrer@pahousegop.com; jrafferty@pasen.gov; opake@pasenate.gov**Subject:** Factory Farms

I oppose factory farms and I oppose CAFO's (Concentrated Animal Feeding Operations).

I oppose them because these operations are cruel to the animals, antibiotics used on the animals are a hazard to humans, environmentally the practice has proven disastrous as in fish kills and polluted water in North Carolina due to corporate hog farms, and that corporate farming puts small farmers out of business, thus establishing a monopoly for a few big corporations.

What are you trying to do, reward your big business friends with the ability to steam roll local farmer's, township's and citizen's?

The proposed new regulations are not democratic! Under these provision's, state regulators would be able to overrule local town and townships who pass ordinance's prohibiting factory farms. Local zoning boards would be restricted from exercising any real authority because of the threat of having to defend numerous law suits to enforce their decisions. Towns and township's would have to risk bankruptcy or raise local taxes in order to pay the potential costs of litigation.

These regulations are a backdoor attempt at destroying the very fabric of our local governmental systems. Under these regulations, local control would be trumped by state control!!!!!!!!!!!!!!

Pennsylvania's economy has and remains agriculture based. What's the matter with you, if it's not broke, why are you trying to fix it?

It appears pretty clear that the fix is in for big business corporate farming. Pennsylvania has pristine wild places with excellent rivers and streams. History has shown that corporations do not give a dam about people and places but, only care about their profit margin, at the expense of pollution of our streams, river's, water table's, air and lands.

Local citizen's, and local township's now have the authority to exercise permitting corporate farming! However, those same local authorities have recognized the potential destruction of their very town's and township's by large corporations. That's why these large corporations have lobbied so hard to eliminate local control. They (corporations) know they are bandits, raping the very land's they pillage with their farming practices.

11/5/2004

Local zoning boards are not reactionary tree huggers. They take very seriously their duties and also weigh the benefits of business when making their decisions.

Your agency does not have the ability to prevent large scale abuses by these companies. The best you can do is to react after the fact, and then it's to late. The fines imposed (if that even happens) are simply a business expense to these factory farm corporations. In many cases, it's easier to pay the fine than fix the problem. How many times has your agency actually "shut down and put out of operation," let alone forced, recovery or repair of any damage by these corporations? Huh, how many times?

Finally, local town's and township's zoning boards have good people to provide for competent decision making on behalf of the citizen's who live and work in those towns and townships. You need to let well enough alone, and let them do the job they were elected to do in the first place.

I would appreciate a reply to my concerns.

In closing, if you haven't "got it" by now, I insist that you say NO to the addition of these proposed regulations.

Sincerely,

**Tom Herman
Robeson Township**

**cc: Edward Rendell
Michael O'Pake
John Rafferty
Samuel Rohrer
file**

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Original: 2412
Hughes, Marjorie

From: Dennis Conti [hooter@epix.net]
Sent: Thursday, November 04, 2004 5:54 PM
To: regcomments@state.pa.us
Subject: Farm Regulations

RECEIVED
2004 NOV 12 PM 3:43
REGULATORY
REVIEW COMMISSION

Importance: High

I am writing to tell you that high nitrates of 22.7mg/l. and no farm animals here in Brandonville Schuylkill County Pa. My hotel business is closed since 1999 and we have been carrying bottled water for drinking and cooking since then but we are washing in farm chemicals daily. The coverup and the cause here in which babies have died, people have died of cancer all around my home and heart disease door to door. Politicians since then have refused to help or write laws for compulsory nitrate testing for the home buyer and rentee and the lives I have saved by putting signs around my home to protect the families from moving here. All this started in 1987 two years after a farm family moved here and the coverup by Dep. to protect this farm family has poisoned many families here. Videos of tractor trailer loads of pure nitrogen fertilizers being applied year after year and even this farm family is dealing with cancer. Overfertilizing with commercial fertilizers has destroyed the groundwater here in the Ringtown Valley and plays a large part of the pollution which enters the Chesapeake Bay. I have researched the world on this problem and the latest studies show that even low nitrates in water are causing cancer and when the fertilizer leaches through the soil into the groundwater it acts like a magnet and draws the radon into the water. Agriculture has to stop this environmental nightmare which is fed with taxdollars of 190 billion dollars in which pays for the above. I have wrote Schuylkill County Conservation for the paperwork so I could comment but as usual they cannot even come here or send me anything. Mr. Ressler of SchuylkillCounty Sanitation who came here said if he points one finger at Agriculture he would lose his job security and my brother-in-law told him that he lost four babies because of this water and Ressler put his chest up against his and pushed him back saying and what do you want to do about it. Tom Ridge then Governor never answered one of hundreds of letters and look where he is today. Rep. Argall lied and said he never heard of this problem while the person at the lab that test my water told me that people all around the area have this problem and never recieved any help and look where he is today. Senator Rhoads also left us for dead and I dont know how he can sleep at night. Congressman Holden also left us for dead while he visits the farms to sample the poisonous strawberries. Federal Epa came here years after all the above and blamed it on sewage like Mr. Ressler. Many home in which the wellwaters nitrate content was over 15mg/l went down after the farm family quit planting and now they are back in action fertilizing and spraying all fields and the hay has to be loaded with nitrates while the trucks take up to three loads daily to farm animals probably in Philly or New Jersey and God Bless the them because I know they are suffering. If every farm had so many animals there would be no problem but like anything else greed plays the role. If you need three acres for every cows manure how come farms are out of control. Please dont forget to include overfertilizing because this is 90% of the problem, Thank you.
Dennis Conti 143 Main Blvd Ringtown Pa. 17967

Original: 2412

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Hughes, Marjorie

RECEIVED

From: Elle C [ellec@ptd.net]

2004 NOV 12 PM 3:42

Sent: Thursday, November 04, 2004 2:45 PMINDEPENDENT REGULATORY
REVIEW COMMISSION**To:** RegComments@state.pa.us**Subject:** no factory farming

I had read an article in the Reading Eagle about the possibility of getting rid of the small individual farms and making a few big factory farms.

I am extremely opposed to this. Berks county is known for it's little farms. The quality of the meats, cheeses, produce and everything else surpasses that of the grocery stores.

Factory farming is bad for the animals, the environment and our health. Please see some of these facts I retrieved from a PETA website about factory farming....

"factory farms are putting the health of our families at risk. The use of antibiotics in food animals that are not sick causes an increase in antibiotic-resistant bacteria. This means that the medicines we rely on for human health may not be as effective when you or your family get sick.

The factory farming system of modern agriculture strives to produce the most meat, milk, and eggs as quickly and cheaply as possible, and in the smallest amount of space possible. Cows, calves, pigs, chickens, turkeys, ducks, geese, rabbits, and other animals are kept in small cages or stalls, often unable to turn around. They are deprived of exercise so that all their bodies' energy goes toward producing flesh, eggs, or milk for human consumption. They are fed drugs to fatten them faster and are genetically altered to grow faster or to produce much more milk or eggs than they would naturally.

Because crowding creates a prime atmosphere for disease, animals on factory farms are fed and sprayed with huge amounts of pesticides and antibiotics, which remain in their bodies and are passed on to the people who eat them, creating serious human health hazards.

The industry simply cannot raise the billions of animals per year that it does in such gruesome conditions without the drugs that allow their bodies to survive conditions that would otherwise kill them. Laying hens live in battery cages stacked tier upon tier in huge warehouses. Confined seven or eight to a cage, they don't have enough room to turn around or spread even one wing.

To prevent stress-induced behaviors caused by overcrowding, such as pecking their cagemates to death, hens are kept in semi-darkness, and the ends of their beaks are cut off with hot blades (without pain relief). The wire mesh of the cages rubs their feathers off, chafes their skin, and cripples their feet.

Cattle are fed an unnatural diet of high-bulk grains and other "fillers," which can include expired dog and cat food, poultry feces, and leftover restaurant food.

They are castrated, their horns are ripped out of their heads, and they have third-degree burns inflicted on them (branding), all without any pain relief. During transportation, cattle are crowded into metal trucks where they suffer from trampling, temperature extremes, and lack of food, water, and veterinary care. At the slaughterhouse, cattle may be hoisted upside down by their hind legs and dismembered while fully conscious.

Like chickens and turkeys, pigs are bred and pumped full of drugs, so that many become crippled under their own weight. Although pigs are naturally affable and social animals, the confinement of these crowded pens causes neurotic behaviors such as cannibalism and tailbiting, so farmers use pliers to break off the ends of the piglets' teeth and chop off their tails—with no pain relief."

These are the sorts of things you will be bringing into Berks county if you do this. It's appalling.

People are interested in buying fresh, free range healthy meat, that is not injected with

11/5/2004

hormones and kept in miserable conditions, because people are realizing that this is much healthier for our bodies. You also have the satisfaction of knowing where your meat comes from....you can't get that with factory farms. Not to mention that it is the "charm" of Berks County, all it's little farms right outside of the city. There are people from all around that come to get the farm fresh produce, eggs, meat, whatever. You take that away, and you are also taking some tourism away as well. You are driving residents that have been here forever (including Menonites and Amish) to move elsewhere, thus taking the culture with them. There has to be better ways to bring in more money to Berks County than this. Fix up and expand our existing malls (like king of prussia), fix up Penn Avenue and Penn Street, bring in more stores and tourist spots.....PLEASE, do not take away our source of good, local, fresh and healthy food by killing our farms.

Sincerely,
Ellen Crist
Reading, PA

11/5/2004

Hughes, Marjorie

From: JONATHAN L CLARK [jlc256@psu.edu]
Sent: Thursday, November 04, 2004 8:22 AM
To: RegComments@state.pa.us; ag-sccstate.pa.us@psu.edu
Cc: jlc256@psu.edu
Subject: Re: comment: CAFOs and Other Agricultural Operations

RECEIVED
 2004 NOV 12 PM 3:44
 REVIEW COMMISSION



vukina
2003-integrator.pdf



vukina 2004.pdf

Jonathan L. Clark
 104 Haffner Hall, White Course
 University Park, PA 16802-6831
 November 4, 2004

Dear EQB and SCC:

Many farmers who own and operate CAFOs sign production contracts obligating them to raise another party's hogs. In these production contracts, the CAFO owner and operator is the contractee and the other party is the contractor. The contractor typically supplies the hogs and the feed. Feed can be mixed in a way that reduces the amount of Phosphorus the hogs excrete in their waste, thereby reducing the risk of pollution (see Vukina 2003:78; see also Vukina 2004, attached to this email).

I have seven questions:

1. Why haven't you required contractors to supply contractees with environmentally friendly feed?
2. Under what circumstances would you hold a contractor liable for pollution that occurs on a contractee's CAFO?
3. Do you require either contractors or contractees to insure against manure spills, groundwater contamination, surface water pollution, or other types of pollution that a CAFO might cause?
4. If a CAFO causes pollution but breaks no laws, who pays the costs of the pollution?
5. Do you agree with Vukina (2003, 2004, attached) that making the contractee who owns and operates a CAFO solely liable for pollution is likely to externalize the environmental costs of production onto the public generally, rather than having consumers of pork pay?
6. If a contractee cannot afford to pay a fine for pollution that his or her CAFO causes, who pays?
7. Why haven't you made CAFO contractors liable for the costs of preventing pollution and for paying the costs (including fines) of any pollution that occurs on the contractee's land and on any land to which the contractee exports manure?

Sincerely,

Jonathan L. Clark

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2008 NOV 12 PM 3:44

LIBRARY
REVIEW COMMISSION

Optimal Regulation of Private Production Contracts with Environmental Externalities ¹

Philippe Bontems

Université de Toulouse, Institut d'Economie Industrielle,
and Institut National de la Recherche Agronomique
Manufacture des Tabacs, 31000 Toulouse
bontems@toulouse.inra.fr

Pierre Dubois

Université de Toulouse, Institut d'Economie Industrielle,
and Institut National de la Recherche Agronomique
Manufacture des Tabacs, 31000 Toulouse
dubois@toulouse.inra.fr

Tomislav Vukina

North Carolina State University
Department of Agricultural and Resource Economics
Raleigh, NC 27695-8109
tom_vukina@ncsu.edu

¹We thank Bob Chambers, Emma Hutchinson, David Martimort and Katleen Segerson as well as the participants of the 2nd World Congress of Environmental and Resource Economists, Monterey, 2002; the 2nd Annual Workshop on the Economics of Contracts in Agriculture, Annapolis, 2002; and the 1st CIRANO-IDEI-LEERNA conference on "Regulation, Liability and the Management of Major Industrial Environmental Risks" in Toulouse, 2003 for their comments on previous versions of the paper. Support from the French Ministry of Ecology and Sustainable Development is gratefully acknowledged.

Abstract

We address the problem of optimal regulation of an industry where the production of a polluting output is contracted with independent agents. The provision of inputs is divided between the principal and the agent such that the production externality results from their joint actions. The main result shows that in the three-tier hierarchy (regulator-firm-agent) involving a double-sided moral hazard, the equivalence across regulatory schemes generally obtains. The only task for the regulator is to determine the optimal total fiscal revenue in each state of nature because any sharing of the regulatory burden between the firm and the agent generates the same solution. The equivalence principle is upset only when the effects of regulation on the endogenous organizational choices are explicitly taken into account.

Keywords: Regulation, Pollution, Principal-Agent Relationship, Moral Hazard.

1 INTRODUCTION

A substantial increase in the number of environmental clean-up cases in the U.S. during the 1980's has been coupled by an increase in the entry rate of small judgment proof firms into hazardous sectors (Ringleb and Wiggins 1990). This phenomenon has been explained by the behavior of firms, which, trying to minimize their liability exposure, segregated their risky activities in small corporations. Such segregation was valuable because claimants were restricted to the assets of the small corporation typically unable to pay the associated liability damages. This result exposed the inefficiency of the tort liability as a primary institutional form for dealing with large-scale, long-term environmental hazards.

As a response to the above empirically identified problem, subsequent literature has largely moved towards the investigation of optimal schemes for lender's liability in the

case of judgment-proof firms (e.g., Pitchford 1995; Boyer and Laffont 1997; and Balkenborg 2001). There has been noticeably less interest in addressing these problems in a standard regulation framework. Similarly to the above literature on vicarious liability, papers examining environmental regulation too, focused only on cases where agents alone influence the level of pollution whereas the principal has little direct means for prevention or abatement. For example, Chambers and Quiggin (1996) modelled a non-point source pollution problem as a multi-task principal-agent problem where the agents are independent farmers producing corn and polluting the environment and the principal is the regulatory agency. Hiriart and Martimort (2004) analyze the impact of risk regulation and extended liability on private contracting between a buyer and a seller where the seller who is engaged in the environmentally hazardous production process can exert a level of safety care that reduces the probability of an accident.

In this paper we address the problem of optimal regulation of an industry in which environmentally polluting stages in the production chain are contracted with independent agents. A distinct feature of these contracts is the fact that the provision of production inputs is divided between the principal and the agents such that the resulting environmental pollution is the consequence of their joint actions. The particular sector that we have in mind is agriculture and especially the livestock production, although the results can be applied to other industries where environmentally hazardous activities are contracted or franchised to independent agents.

We model the trilateral relationship between the Environmental Protection Agency (*EPA*), a contractor (firm) and an agent (producer) with the technology characterized by a joint production of output (live animal weight) and pollution (waste). We assume that output is observable and verifiable and hence contractible, whereas pollution may or may not be verifiable depending on the analyzed scenario. The principal's input and the agent's effort are both unobservable, hence the two-sided moral hazard nature of the problem. From a theoretical point of view, this three-tier hierarchical model can be com-

pared to the recent modelling of supervisory problem in a hierarchy (Faure-Grimaud, Laffont and Martimort 2000; 2003; and Faure-Grimaud and Martimort 2001) where the principal (here the *EPA*) uses an intermediary agent (here the principal) to regulate a final agent (here the producer).

Our principal result shows that in the three-tier hierarchy involving double-sided moral hazard, the equivalence across regulatory schemes generally holds. For a given amount of tax revenue, the regulator can achieve the same outcome regardless of the tax legal incidence. The *EPA*'s only task is to determine the optimal total tax in each state of nature because any sharing of the tax burden between the principal and the agent results in the same optimal solution. In this regard our result provide an important extension of an earlier work by Segerson and Tietenberg (1992), who studied the structure of penalties in a three-tier hierarchy under the assumption of risk neutrality for all parties and the moral hazard on the agent's side, and showed that the efficient outcome can be reached by imposing a penalty on either party.

However, when the effects of regulation on the industry's endogenous organizational choices are explicitly taken into account, the equivalence principle breaks down and the design of the optimal regulatory scheme becomes more complicated. When the regulator wants to foster contracting as a dominant mode of organizing livestock production, the optimal taxation scheme prescribes the minimal and the maximal shares that the agent and the principal have to pay. In a situation where the *EPA* needs to simultaneously regulate independent producers and principal-agent contract organizations without being able to discriminate, the uniquely determined optimal division of the aggregate tax burden between the principal and the agent is necessary.

The rest of the paper is organized as follows. In the next section we present stylized facts about contracting in animal agriculture. The main part of the paper is contained in Section 3 where we present the three-tier hierarchical regulation model and derive the equivalence result. Section 4 investigates the consequences of endogenous industry

structures on the equivalence result. Concluding remarks are given in section 5.

2 CONTRACTING IN ANIMAL AGRICULTURE: INSTITUTIONS AND TECHNOLOGY

Contracting became an integral part of the production and marketing of selected livestock commodities such as broilers, turkeys and hogs. The potential impact of livestock production on environmental quality has become a major concern in areas with high density of concentrated animal feeding operations (CAFOs). It is increasingly common for environmental advocacy groups to argue that contracting is an important cause of adverse environmental quality effects in livestock production, largely because contracting increases the scale of livestock operations, simultaneously reducing opportunities for economics of scope in livestock utilization through reduced specialization.

Most of the livestock contracts are production contracts. A production contract is an agreement between a processing firm (also known as integrator) and a farmer (grower) that binds the farmer to specific production practices. Growers provide land, production facilities, utilities (electricity and water) and labor. Housing and waste handling units have to be constructed and equipped in strict compliance with the integrator's specifications. Growers are also fully responsible for compliance with federal, state and local environmental laws regarding disposal of dead animals and manure. An integrator company provides animals to be grown to processing weight, feed, medications and services of field men who supervise the adherence to the contract stipulations and provide production and management expertise. Typically, the company also owns and operates hatcheries, feed mills and processing plants, and provides transportation of feed and live animals. The integrator also decides on the volume of production both in terms of the rotations of batches on a given farm and the density of animals inside the house.

The most notable characteristic of modern livestock production systems based on contracts has been the shift to large-scale, intensive, specialized, confined animal operations. Opponents of such production systems cite many negative environmental impacts of increased geographic concentration of manure stocks. Among various externalities generated by the production and management of animal waste, nutrient runoff and leaching and air quality problems (ammonia emissions) are the most pervasive ones. For both of those, nutrient management plays a critical role. The nutrients of greatest concern are nitrogen and phosphorus. The amount of nutrients from animal waste that ends up deposited in the environment is directly related to the type of animals raised, the composition of animal feed, and the waste management technology that farmers use. Once feed composition and the waste handling and storing technology are fixed, the amount of pollution (nutrient content in manure) generated by a particular type of animal (e.g., a sow, a feeder pig, or a finished hog) is more or less deterministic.

The problems associated with the design and implementation of environmental regulation of CAFOs are different than those related to regulating traditional family farms. In the later case the standard economic prescription of taxing the externality such that the polluter pays the environmental cost of his action is not feasible due the non-point source nature of the pollution problem (see for example Innes 2000). On the contrary, CAFOs are more similar to point source industrial polluters, hence some of the traditional regulatory instruments may prove to be adequate. However, the fact that a significant portion of CAFOs are in fact contract operations makes the design of the regulatory policy regimes substantially different. Actually, the economic incidence of the regulatory compliance cost is difficult to predict because contracts between growers and integrators are likely to change in response to changes in regulatory environment.

An obvious solution to manure nutrient management problem is the source reduction. Pollution can be reduced by restricting the output or by reducing the amount of unusable

nutrients in feed.¹ The former regulatory scheme is easily implementable because the output is readily observable by all interested parties. The later scheme is considerably more complicated because the precise feed composition is known only to the integrator and could be discovered by the growers and the regulator only after bearing the costs of laboratory analyses. The regulatory objective can be however achieved by providing the integrator with the incentives to use environmentally friendly feed instead of the traditional environmentally unfriendly mix, even when this type of feed is less productive (more costly) in terms of feed efficiency. The main question becomes how to regulate an industry where production choices are affected by the signed contracts rather than by the independent producers' optimizations.

3 REGULATION OF THE THREE-TIER RELATIONSHIP

3.1 The basic model

We model the hierarchical structure by a game with three players: the regulator (*EPA*), the principal (*P*) and the agent (*A*). This structure corresponds to an integrator firm contracting the production of live animals with independent producers (growers). The production of output generates a negative externality that needs to be regulated by the *EPA*.

The production process is described as follows. An agent exerts effort e (possibly multidimensional) that the principal cannot observe and the principal supplies some production inputs x . In the case of livestock production, the production input of concern is animal

¹The amount of nitrogen in manure can be reduced by substituting synthetic amino-acids for crude proteins (corn, soybeans) in animal feed. The phosphorus pollution can be reduced by adding phytase to the diets. When the prices of corn and soybeans are high, it may be actually profitable to replace crude proteins with synthetic ones. On the other hand, rations based on phytase are always more expensive than the regular inorganic phosphorus diets (for details see Vukina 2003).

feed. This feed may have some impact on the environmental pollution. Actually the principal can choose a good feed which is less efficient in the production of output (live weight) but environmentally friendlier, or bad feed which is highly productive but more polluting. Thus, we assume that effort e and input x generate output q and pollution d according to the following conditional multidimensional distribution function

$$h(q, d | e, x)$$

for which the cumulative conditional distribution is denoted $H(q, d | e, x)$. Pollution is a production externality jointly determined with the production state of nature.

3.1.1 Observability and verifiability assumptions

The observability and verifiability of inputs, output and pollution is crucial for the regulation problem in this hierarchical model. Effort is assumed to be unobservable and thus generates a moral hazard problem between P and A . Inputs x provided by the principal are assumed unobservable which leads to a double sided moral hazard model. In addition, we assume that production is observable and verifiable which implies that it is contractible in the principal-agent relationship. The assumption of production contractibility is realistic given that payment mechanisms in contracts are always contingent on the production level.

Finally, the degree of observability and verifiability of pollution depends on the context. We first analyze the benchmark case where production and pollution are observable and verifiable by all parties. This corresponds to the point source pollution case. Other interesting situations cover the case where the pollution is non-contractible (non-point source pollution scenario), the case where pollution is verifiable only by the *EPA*, and the case where pollution is verifiable by the principal and the agent but not by the *EPA*.

3.1.2 Contracting and regulation

Because of the moral hazard problem, the principal faces an incentive problem in dealing with the agent that necessitates an optimal design of a production contract. According to the sufficient statistics theorem (Holmström 1979), the wage w received by an agent needs to be contingent on all verifiable informative signals about unobserved effort; in this case (potentially) production q and pollution d . The contract is then simply a functional form $\{w(q, d)\}$. Before contracting between P and A occurs, the *EPA* commits to some regulatory scheme to control pollution. When production and pollution are verifiable, P is required to pay $F(q, d)$ and A is required to pay $T(q, d)$ to the *EPA*. Total tax revenue is then $R(q, d) \equiv F(q, d) + T(q, d)$. Because both production and pollution are in this case observable and verifiable and there are no restrictions imposed on $F(q, d)$ and $T(q, d)$, this is the most general possible regulatory scheme that the *EPA* can implement.²

Finally, assuming that the *EPA* is the leader of the game, it chooses the regulatory scheme first, before contracting and production take place. The principal and agent have the opportunity to react after the regulatory scheme is proposed but the *EPA* cannot renegotiate the regulatory rules after observing their behavior.

3.1.3 Regulatory objective and preferences

The objective of the *EPA* is to maximize a social welfare function $S(q, d, R)$ that depends on production q and pollution d and possibly on the tax revenue R because collecting public funds may be costly.³ Further, the agent's utility function is $U(w - T, e)$ where

²Notice that in this setup, the standard Pigovian tax on pollution would be generally suboptimal because the regulator would forego the possibility to use production as an added informative signal about the input provisions made by the principal.

³The *EPA's* objective function implicitly takes into account both the principal's and the agent's utilities. As will be shown later, both the principal's and the agent's participation constraints are

U is increasing concave in its first argument (net income) and decreasing concave in its second argument (effort). The principal's utility function is $V(q - w - F, x)$ where V is also increasing concave in net income ($q - w - F$, where the price of output is normalized to one) and decreasing concave in the second argument (input x). Both P and A are therefore risk averse. The exogenous reservation utilities of the principal and the agent are respectively U_0 and V_0 .

3.2 Benchmark case

Throughout this section we assume that production and pollution are observable and verifiable for all parties. Given that the negative externality (pollution) is not internalized either by the agent or by the principal implies that the *EPA* has to design taxes in order to achieve a second best trade-off between production and pollution. At the same time, the regulation design requires that the individual rationality constraints of both P and A be satisfied. Of course, we implicitly assume that the *EPA* always finds some production socially desirable.

This hierarchical regulation problem can be solved in two stages. Reasoning backwards, we first examine the principal-agent relationship given some regulatory scheme defined by $F(q, d)$ and $T(q, d)$ and then, we consider the optimal choice of these functions by the *EPA* taking into account the actions of P and A .

For a given a tax system, the principal faces a moral hazard problem related to the agent's effort and thus proposes a wage contract $w(q, d)$. Knowing the stochastic law of production and pollution conditional on effort and input, the objective of P is to choose input x and wage w that maximize its expected utility, and at the same time, satisfy the incentive and rationality constraints of the agent. For a given choice of input x , the expected utility of the principal $V^*(x)$ is the solution of the following maximization binding at the optimum and consequently they both reach their constant reservation utility levels.

problem

$$\begin{aligned}
V^*(x) &= \max_{w(\cdot, \cdot)} E_{q,d} V(q - F(q, d) - w(q, d), x) \\
& s.t. \\
& E_{q,d} U(w(q, d) - T(q, d), e^*) \geq U_0 \\
& e^* \in \arg \max_e E_{q,d} U(w(q, d) - T(q, d), e).
\end{aligned} \tag{1}$$

Since the nature of this problem is rather general, the solution to (1) can be quite complex. Therefore, we will simply assume that this solution exists.

Next, given the solution to the principal's optimization problem (1), the *EPA* chooses a taxation scheme that maximizes expected social welfare and satisfies both the participation constraint and the incentive constraint of the principal, the latter corresponding to the optimal choice of input x . The *EPA*'s problem is thus

$$\begin{aligned}
\max_{F(\cdot, \cdot), T(\cdot, \cdot)} E_{q,d} S(q, d, R(q, d)) &= \int \int S(q, d, R) dH(q, d \mid e^*, x^*) \\
& s.t. \\
V^*(x^*) &\geq V_0 \\
x^* &\in \arg \max V^*(x)
\end{aligned} \tag{2}$$

where e^* is the solution to (1).

Once again, this optimization problem is a very difficult to solve. However, without solving it explicitly, an interesting proposition can be derived. To do this, let's write the agent's wage net of taxes as

$$\tilde{w}(q, d) \equiv w(q, d) - T(q, d)$$

from which it follows that

$$w(q, d) + F(q, d) = \tilde{w}(q, d) + R(q, d).$$

This implies that the principal's program rewritten as

$$\begin{aligned}
V^*(x) &= \max_{\tilde{w}(\cdot, \cdot)} E_{q,d} V(q - \tilde{w}(q, d) - R(q, d), x) \\
&s.t. \\
&E_{q,d} U(\tilde{w}(q, d), e^*) \geq U_0 \\
&e^* \in \arg \max_e E_{q,d} U(\tilde{w}(q, d), e^*)
\end{aligned}$$

is invariant to the partition of taxes between P and A because $V^*(x)$ depends only on total taxes $R(\cdot, \cdot)$. This invariance also implies that from the perspective of the *EPA* only total taxes matter. Therefore, the *EPA's* optimization program (2) simply becomes

$$\begin{aligned}
&\max_{R(\cdot, \cdot)} E_{q,d} S(q, d, R(q, d)) \\
&s.t. \\
&V^*(x^*) \geq V_0 \\
&x^* \in \arg \max V^*(x).
\end{aligned}$$

and the proposition can be stated as follows:

Proposition 1 (Equivalence Principle) *All partitions of total contingent taxes between P and A are welfare equivalent. The optimal regulation of the principal-agent relationship requires only that the total tax revenue be at the optimal level regardless of the allocation of these taxes between P and A .*

The derived equivalence principle is very general and says that, whatever the total tax R (optimal or not), all schemes implementing R are welfare equivalent. This happens because the wage contract w can offset the effect of taxes on the principal's and agent's shares of income. Intuitively, the affected parties care only about the net income and the distribution of total net income is not impacted by the partition of R proposed by the *EPA*. A direct consequence of this result is that when designing an optimal regulatory scheme the *EPA* has to worry only about total taxes R and not about partitioning of the regulatory burden between P and A .

This strong result is due to the fact that the principal and agent can always adjust their contract to the regulation proposed by the *EPA*. The optimal total tax $R^*(.,.)$ is a schedule contingent (in the general case) on production and pollution. This schedule may be complicated but it nevertheless depends only on the exogenous and fixed parameters and the information known to the regulator. More precisely, it depends on the technology (h), social welfare function (S), preferences U and V , and reservation utilities U_0 and V_0 . So, unless we add some adverse selection problems (hidden information about preferences or reservation utilities of the principal or the agent), the optimal total tax depends only on public information and exogenously fixed parameters.

3.3 Verifiability, regulation constraints and equivalence

A more realistic case is one where pollution is non verifiable in the sense that pollution may often be difficult to attribute to a particular agent. As is customary in the non-point source pollution cases, we now assume that pollution is observable but not verifiable implying that neither the *EPA* nor the principal can write contracts contingent on pollution.

Since d is not verifiable by the *EPA*, taxes cannot be contingent on pollution and need to be redefined as $T(q)$ and $F(q)$. Also, the wage contract $w(q)$ can only be contingent on q . The *EPA's* optimal regulation problem is now different (and the optimal total taxes R and consequently the total welfare are different) but the equivalence between all schemes imposing the same total tax still remains.

The principal's program now becomes

$$V^*(x) = \max_{w(.)} E_{q,d} V(q - F(q) - w(q), x)$$

s.t.

$$E_{q,d} U(w(q) - T(q), e^*) \geq U_0$$

$$e^* \in \arg \max_e E_{q,d} U(w(q) - T(q), e)$$

and can still be written as

$$\begin{aligned}
V^*(x) &= \max_{\tilde{w}(\cdot)} E_{q,d} V(q - \tilde{w}(q) - R(q), x) \\
& \text{s.t.} \\
& E_{q,d} U(\tilde{w}(q), e^*) \geq U_0 \\
& e^* \in \arg \max_e E_{q,d} U(\tilde{w}(q), e^*)
\end{aligned}$$

with

$$\tilde{w}(q) = w(q) - T(q) = w(q) - R(q) + F(q).$$

Same as before, the *EPA's* program amounts to choosing $R(q)$ to maximize the social welfare function under the corresponding participation and incentive constraints of the principal:

$$\begin{aligned}
& \max_{R(\cdot)} E_{q,d} S(q, d, R(q, d)) \\
& \text{s.t.} \\
& V^*(x^*) \geq V_0 \\
& x^* \in \arg \max V^*(x).
\end{aligned}$$

It is now easy to see that, like in the benchmark (point source pollution) case, the *Equivalence Principle* also holds in the non-point source pollution case.

Other interesting situations include information asymmetries regarding pollution. The first case is when pollution is non verifiable by the *EPA* but verifiable by the principal and the agent. In this situation the equivalence result holds. One simply needs to see that the net wage contract can be written as $\tilde{w}(q, d) = w(q, d) - T(q)$.⁴

In the second case, where pollution is not contractible between P and A but is verifiable by the *EPA*, the equivalence result may fail. In this case, the wage cannot depend on d while taxes may vary with pollution d . The agent's net wage $w(q) - T(q, d)$ cannot be written as a function \tilde{w} because the only verifiable outcome for the principal is q .

⁴Similarly, if the *EPA*, for whatever reason, cannot assess taxes on P and A contingent on the level of production but rather only on pollution d , the equivalence principle holds too because the net wage contract can still be written as $\tilde{w}(q, d) = w(q, d) - T(d)$.

Obviously in this case, the equivalence result does not survive. Notice that this result implicitly hinges on the assumption that taxes paid by the agent are not contractible. However, even if d is not contractible between P and A , it is sufficient for the principal to be able to propose a contract contingent on taxes to be paid by the agent. If taxes T are contractible, then any wage contract $w(q, T)$ can be replaced by a net wage contract $\tilde{w}(q, T)$ such that

$$\tilde{w}(q, T) = w(q, T) - T$$

and the equivalence result is maintained again.

The above discussion shows that the equivalence principle is rather robust and holds as long as the set of constraints restraining the feasible wage contracts is such that the corresponding net wage function belongs to the same feasibility set. This implies that if, for example, the wage contract is constrained to be linear, but taxes are non linear, the equivalence result will no longer hold. Similarly, like in the previous example, if taxes are contingent on some variable that is not contractible between P and A , then the equivalence result may no longer hold, unless the wage contract could be written contingent on taxes.

In all previously analyzed cases, the equivalence principle generally holds because it was implicitly assumed that the regulatory scheme does not alter the bargaining powers of the principal and the agent. However, if we allow the organizational structure of the industry to change in response to imposed regulation, then the equivalence result may no longer apply. For example, after observing the new regulatory scheme, the agents may decide to produce by themselves, which makes their reservation utility endogenous. This implicitly modifies their bargaining power in relationship to the principal compared to the case where they have no organizational alternative. The next section examines in details the question of endogenous industry structure.

4 REGULATION UNDER ENDOGENOUS INDUSTRY ORGANIZATION

In standard regulation problems, the regulator is the leader of the game in the sense of first proposing a regulatory scheme to which the principal and the agent optimally respond by signing a contract. The implicit assumption so far was that P and A would always sign a contract to jointly produce the output regardless of the regulation that the *EPA* imposed, provided they get at least their exogenous reservation utilities. The *EPA* takes this optimal response into account but cannot ex-post adjust the regulatory scheme it has committed to implement. Because of the endogenous nature of the contract signed between P and A , the equivalence principle turns out to be a robust property of the optimal taxation scheme.

However, so far in this paper we ignored the possibility that after observing the regulatory regime, the organization of production via contracts may not survive. Instead, the contracting parties may decide to go their separate ways and prefer to produce individually rather than jointly under contract.

If the regulatory agency could distinguish contract producers from independent producers, the optimal regulatory scheme would tax the parties contingently on whether they contract or independently produce. In this case, the previously obtained equivalence principle still holds. However, if the contract producers cannot be distinguished from the independents (or if the output produced under contract cannot be disentangled from the output produced outside the contract), or if the law does not allow taxing contract producers differently than independent producers, then it becomes important to take into account that agents, after observing the regulatory scheme, may prefer to exit the contract and start producing independently. In the rest of the section, we are looking at two interesting cases.

4.1 A regulation compatible with contract participation

One interesting possibility is the situation where the regulator may prefer contracts over independent production in the targeted industry. For example, it is conceivable that due to economies of scale in feed mixing, the marginal cost of supplying environmentally friendly feed for the integrator may be lower than for small independent producers. In this case the *EPA* would like to design a regulatory scheme such that it becomes incentive compatible with the endogenous choice to contract in the presence of the alternative opportunity to produce independently and pay only taxes T . The participation constraint of the agent becomes endogenous and depends on taxes T .

In the following, we assume that both q and d are contractible for the *EPA*. We say that the regulatory scheme is “contracting compatible” if, facing the regulation, agents always prefer to produce under a contract with an integrator rather than independently. If the agent produces independently, his expected utility $U_a(T(.,.))$ is equal to

$$U_a(T(.,.)) = \max_e E \{U(q - T(q, d), e)\}$$

which is clearly decreasing in $T(.,.)$.

This outside opportunity changes the agent’s reservation utility in the optimal wage contract between P and A which becomes $\hat{U}_0(T(.,.)) = \max(U_0, U_a(T(.,.)))$ but does not change the properties of the optimal contract. According to the equivalence principle, the optimal regulation under exogenous reservation utility is always implementable whatever the taxes $T(.,.)$ because only total taxes matter and increasing the tax on the agent can be compensated by reducing the tax on the principal. Since $U_a(T(.,.))$ is decreasing in $T(.,.)$, it is always possible to choose taxes $T(.,.)$ such that the agent’s endogenous contract participation constraint is satisfied ($U_0 \geq U_a(T(.,.))$). This means that necessarily $T(.,.) \geq T_{\min}^*(.,.)$ such that $U_0 = U_a(T_{\min}^*(.,.))$. Then, the *EPA* simply needs to choose taxes $F(.,.)$ such that the sum of taxes in each state is equal to the optimal taxes required by optimal regulation.

Proposition 2 (Non Equivalence Result - A) *The optimal taxation implies that for the optimal total tax revenue ($R^*(.,.)$), there exists a minimum state contingent tax $T_{\min}^*(.,.)$, such that any taxation scheme ($F(.,.), T(.,.)$) satisfying $T(.,.) \geq T_{\min}^*(.,.)$ and $F(.,.) = R^*(.,.) - T(.,.)$ is optimal.*

Contrary to the equivalence principle obtained previously, all shares of the total taxation scheme (R^*) between the principal and the agent are no longer optimal. Instead, the optimal scheme is described by the minimal share that the agent has to pay and consequently the maximal share that the principal has to pay.

4.2 Simultaneous regulation of contracts and independent producers

Another situation worth analyzing is the case where the *EPA* needs to simultaneously regulate independent producers and principal-agent contract organizations without being able to discriminate. Assume that after setting a regulatory scheme, the agent has the choice to contract with an integrator or to produce independently. If contracting is chosen, then both parties will have to pay the scheduled taxes. If the agent decides to produce independently, the principal leaves the game and gets his reservation utility and the agent pays taxes on pollution.

Consider the regulation of independent producers only. Given the optimal contract between the principal and the agent, the *EPA*'s problem is now to maximize the expected social welfare under the participation and incentive constraints of the agent:

$$\begin{aligned}
 \max_{F(.,.), T(.,.)} E_{q,d} S(q, d, R) &= \int \int S(q, d, R) dH(q, d | e, x) \\
 E \{U(q - T(q, d), e^*)\} &\geq U_0 \\
 e^* &\in \arg \max_e E \{U(q - T(q, d), e)\}
 \end{aligned} \tag{3}$$

The incentive and participation constraints are binding and therefore the optimal tax

T^* schedule is uniquely determined by:

$$U(w^*(.,.) - T^*(.,.)) = U_a(T^*(.,.)) = U_0 \quad (4)$$

where

$$U(w^*(.,.) - T^*(.,.)) = \max_e E \{U(w^*(q, d) - T^*(q, d), e)\}$$

and

$$U_a(T^*(.,.)) = \max_e E \{U(q - T^*(q, d), e)\}$$

and where $w^*(.,.)$ is the optimal wage offered by P , given the taxes T^* and F^* .

The previously obtained equivalence principle implies that optimal regulation can now be implemented without discrimination but in the *unique* fashion as follows:

Proposition 3 (Non Equivalence Result - B) *The optimal regulation is uniquely determined such that taxes imposed on contracting agents are also the optimal taxes to be imposed on independent producers: $T^*(.,.)$. The optimal tax imposed on the principal is the difference between the optimal total tax revenue $R^*(.,.)$ in each state and the optimal tax imposed on the agents, that is $F^*(.,.) = R^*(.,.) - T^*(.,.)$.*

Like in the previous case, all shares of the total taxation scheme between the principal and the agent are no longer optimal, causing the equivalence principle to break down. Instead, an optimal division of the aggregate tax burden $R^*(.,.)$ between the principal and the agent is necessary. Notice also that the optimal regulation scheme preserves the industry structure intact. As seen from (4), taxes imposed by the *EPA* are such that producers obtain the same expected utilities regardless of whether they are contract operators or independent producers, so there is no incentive for them to switch to a different mode of organization.

5 CONCLUSIONS

In this paper we studied the optimal regulation of a polluting industry characterized by the prevalence of private production contracts between firms and independent agents (producers). These kinds of contractual arrangements are typically found in animal agriculture, notably in poultry and swine industries. The main result shows that in a three-tier hierarchy (regulator-firm-agent) involving a double-sided moral hazard problem, a principle of equivalence across regulatory schemes generally obtains. The equivalence principle is upset only when the effects of regulation on the endogenous organizational choices of the industry are explicitly taken into account.

We analyze several cases of information asymmetries regarding the verifiability of pollution ranging from point source to non-point source pollution scenarios. In almost all these cases, for a given amount of tax revenue, the regulator can obtain the same provision of inputs and effort regardless of the tax legal incidence. Once the *EPA* commits to a regulatory scheme, the emerging private production contract between the firm (principal) and the producer (agent) is such that the ex-post utility levels of both parties are insensitive to the particular structure of the taxation scheme. Indeed, taxing only the principal or only the agent generates the same outcome from viewpoint of all parties. In this framework, the only task that *EPA* has is to determine the optimal total tax revenue in each state of nature, because any sharing of the tax burden between the principal and the agent would result in the same optimal solution. The way the optimal wage changes with respect to taxes is intimately related to the relative risk aversion of the principal and the agent. Neither double-sided moral hazard nor risk aversion impede this equivalence principle. This equivalence principle relies on the fact that the contract between the firm and the agent is optimal and endogenously determined after any change in the tax structure.

The policy implications of this equivalence principle are important. It means that the