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The use of tax-exempt securities to finance the cost of pollution control.

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THE USE OF TAX-EXEMPT SECURITIES
TO FINANCE THE COST OF POLLUTION CONTROL

BY

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A thesis

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ABSTRACT

Pollution is an economic externality resulting from competitive firms undervaluing the resources of air and water as factor inputs. Unfortunately, pollution will continue to be generated as long as cost-minimizing firms are allowed to shift the costs of environmental cleanup to society. As well, since firms are undervaluing their factor inputs the prices they set are not a true reflection of the total costs of doing business and, therefore, a misallocation of resources will result.

It is incumbent upon the government to coerce firms to internalize their costs by removing the zero price tag associated with the resources of air and water.

One method by which the government may do this would be through a policy of subsidization. The profit maximizing firm will view a subsidy as an opportunity cost in terms of foregone revenue and the more efficient it is in reducing pollution, the greater the opportunity for profit.

The use of tax-exempt securities to finance the cost of pollution control is one such subsidy and it appears to be an effective method to persuade firms to internalize the external costs they have been passing on to society.

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INTRODUCTION

While some form of environmental disruption has accompanied mankind's activities over the centuries, a combination of recent developments has caused what once was considered an annoyance to become a crisis. Increases in population, unparalleled affluence and technological progress in the United States (and other highly industrialized nations) has resulted in widespread pollution.

The world population doubled between 1650 and 1850. It doubled again by 1930 and this doubling now only takes thirty-five years.[1] It follows that this population is clustered in more compact areas. It is estimated that 40 percent of the world's population live in urban areas and 50 percent of urban dwellers live in cities of 100,000 or more. Naturally, the more people there are, the more wastes there are to recycle. The concentration of people and their accompanying wastes makes the task of recycling and disposal all the more difficult.

There has also been a great increase in per capita wealth and, as a result, production has risen to satisfy growing demands. This production increases consumption of resources for industrial purposes,

[1]Marshall I. Goldman, (ed), Ecology and Economics: Controlling Pollution in the 70's, (New Jersey: Prentice-Hall Inc., 1972) p. 144.

which in turn generates greater waste from the process of extraction and manufacturing.

In the April 1971 issue of *Environment*, Barry Commoner, Michael Corr, and Paul J. Stamler argue that the rapid increase in environmental disruption is due primarily to changes in technology. This technology has brought about a reliance on synthetic chemicals, the private automobile, cement, and domestic electrical appliances, and much greater power consumption. They argue that environmental conditions have deteriorated much more rapidly due to technological change than by increases in either population or affluence.

To determine the extent of environmental disruption, namely water pollution, the Environmental Protection Agency (EPA) ran a study of the major drainage basins in the United States. The details of this study appear in Table 1 of Appendix A. The explanation (in Appendix A) of the results of the survey leads one to conclude that the overall picture of water quality in the United States is appalling.

The extent of air quality deterioration in the United States is summarized in Table 2 of Appendix A. An estimated 263.9 million tons of discharges from motor vehicles, industrial plants, large and small power and generating plants, refuse disposals, individual heating systems, and from miscellaneous combustion and production activities entered the atmosphere in that year, again an appalling figure.

The net economic consequences of air and water pollution are extensive. The effect on human health results in a net decrease in productivity through

lost manhours worked and, increases the costs of health care; poor air quality results in damage to agricultural crops and livestock while poor water quality endangers the global food chain; air and water pollution can result in substantial property damage and thereby have a negative impact on residential property values; finally, there is a social cost associated with the foregone use of pollutant-damaged recreational facilities.

It was estimated that it would cost $42.6 billion to update and operate acceptable waste treatment facilities for American domestic and municipal water from 1971 to 1980.[2] The President's Council on Environmental Quality estimated that it would cost $23.7 billion to meet established air quality standards between 1970 and 1975.[3]

The preceding discussion raises two basic questions. First, recognizing that continued pollution of our environment must stop, who should take the initiative to stop further pollution from occuring? Second, who should pay the enormous cost of an environmental clean-up and the continued abatement of pollution?

The purpose of this thesis is to analyse the issues involved and to advance a partial answer to both of these questions.

Chapter I analizes pollution as an economic externality and lay's the foundation for governmental intervention to coerce firms to internalize

[2]Joseph J. Seneca, and Michael K. Taussig, Environmental Economics, (Englewood Cliffs, New Jersey: Prentice-Hall Inc., 1974), p.133.

[3]President's Council on Environmental Quality, Environmental Quality, 1971, (Washington, D.C.), p. III.

these external costs.   Chapter II outlines the various methods that

the government can use to accomplish this purpose and provides an

economic analysis of these methods.   Chapter III assesses the effectivess

of the government's efforts in pollution abatement.   Chapter IV examines

a relatively new method to finance the cost of pollution control *viz.* the

use of tax-exempt securities.   Finally, Chapter V provides the summary

and conclusion.

    The scope of this thesis is limited to air and water pollution

as the greatest environmental disruption has taken place in these media.

As well, this thesis is limited to the United States as the use of tax-

exempt securities has never been adopted in Canada.

CHAPTER 1

The Economics of Pollution

A. Introduction

Traditionally, we depend upon the price mechanism to allocate scarce resources among their alternative uses. The price system can not be expected to function properly, however, if factor inputs are priced improperly, or not priced at all. Abuse of water and air resources comes about largely because air and water are undervalued. In fact, they are regarded as free goods. Therefore, as the pricing system does not reflect all the costs of scarce resources, there will be a continued misallocation of resources in the economy.

As competetive firms do not view the use of the resources of air and water as a factor input, the competetive market system produces undesirable "spillover" effects on the environment.[4] A typical example would be the injection of waste products into our air and water resources, waste products that results from the production process of firms. Taking a closer look at the cost structure of a firm in a purely competetive market enables us to examine why pollution is commonly referred to as an externality.

[4]For the classic treatment of this problem, see: A.C. Pigou, Economics of Welfare, (4th. edition), (London: Macmillan & Co., Ltd., 1960).

(5)

B. Pollution as an Externality

The marginal cost schedule of a firm represents the additional

costs incurred to produce a given unit of output. The implicit assumption

is that all costs are borne by the firm and thus become private costs.

Given this assumption, then in figure I-I, the full incremental costs

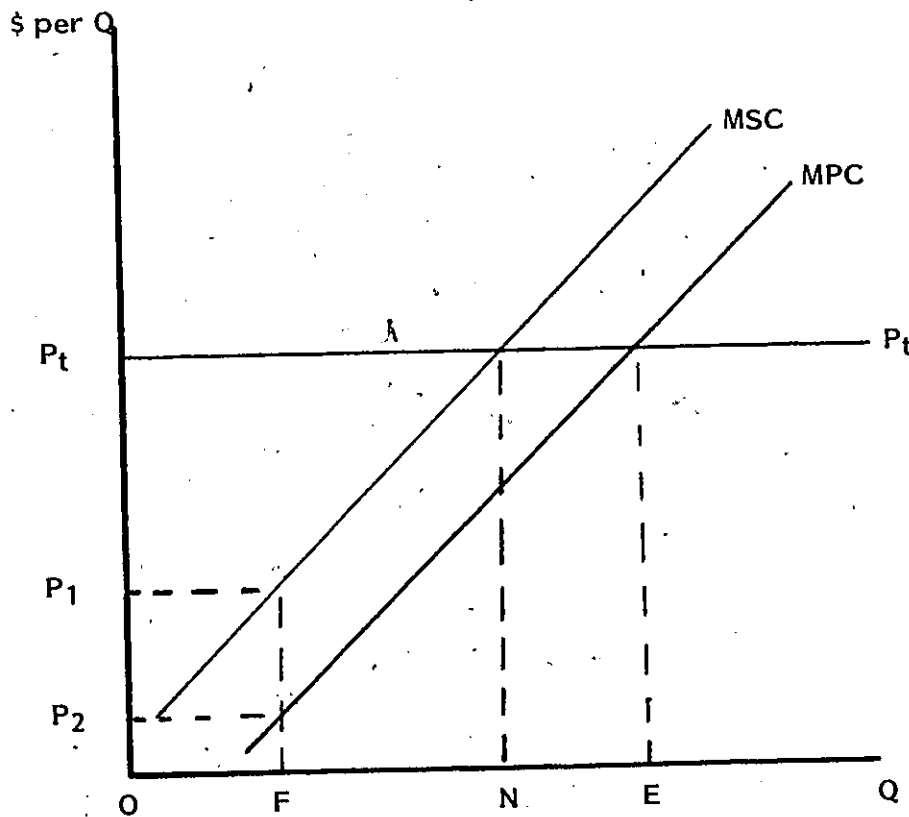of production could be shown as the marginal *private* cost schedule (MPC).[5]

Figure 1-1

[5] For the complete treatment of this topic, see: Joseph J. Seneca, and Michael K. Taussig, Environmental Economics, (Englewood Cliffs, New Jersey: Prentice-Hall Inc., 1974), pp. 48-65.

The firm will maximize profit at an output of OE. The MPC schedule includes the incremental costs to the firm of labour, materials, and capital. However, emphasizing the word private in the firms marginal cost schedule, indicates that other costs of production may exist. External costs are defined as any costs that are additional to the costs resulting from the production outlays of the firm. Total social costs are defined as the sum of the private costs of the firm and any external costs.

Thus, it is possible to conceive of another marginal cost schedule that includes both private and external costs. This is called the marginal social cost schedule (MSC). As drawn in figure I-I, it lies above the MPC schedule at every level of output. The vertical difference between the MPC and the MSC schedules at any given quantity measures the external costs per extra unit of output. Assuming a perfectly competitive market, and assuming that the firm takes account only of private costs, the firm maximizes profits by producing an output of OE units where Pt = MPC. However, if we are going to take into account all costs – private and external – then the price-marginal cost equality should occur at the output level where Pt = MSC or ON in figure I-I. This means that the excess of any units between the private optimal level of production OE and social optimum level ON represents over-production of goods. Society would be better off with ON units of this good rather than with OE units because the resources used to produce the last NE units have greater productive value in other employments. The same reasoning implies that some other good or goods in the economy are being underproduced,

or not produced at all. Thus, the first result of not taking into account external costs shows that an external diseconomy in an otherwise competitive market system distorts the optimum allocation of resources; the quantities produced of some goods are too great and the quantities produced of other goods are too small.

We can now extend the analysis one step further by assuming that all firms cause exactly the same social costs in their operations. Thus, we can shift our analysis from the firm to the industry level, and we can consequently represent the cost conditions of all firms in the industry by the MPC and MSC schedules in figure I-I. The aggregate of all firms with similar marginal cost conditions can be summarized in the industry supply schedule. The MPC schedule of each firm is its supply schedule at all price levels that exceed average variable costs. Figure I-2 shows the industry private supply schedule (PSS). The summation of the MSC schedules of all firms is labelled SSS or the Social Supply Schedule. The SSS curve lies above the PSS curve, reflecting the difference between marginal private and social costs for all firms in the industry. The vertical distance between these two industry schedules is the aggregate of the external costs imposed on society for any given level of output by the industry.

The PSS and the SSS schedules together with the industry demand schedule (D) in figure I-2 can be used to analyze the full effects of the external diseconomies of production on relative prices and resource allocation. The demand schedule intersects the private supply schedule

in figure I-2 at a price of Pt and a total quantity of OM. The equilibrium

industry price Pt is the going market price that faces each firm in the

industry, as shown in figure I-I. Total industry output of OM is just

equal to the sum of all the individual firms' outputs of OE in figure I-I.
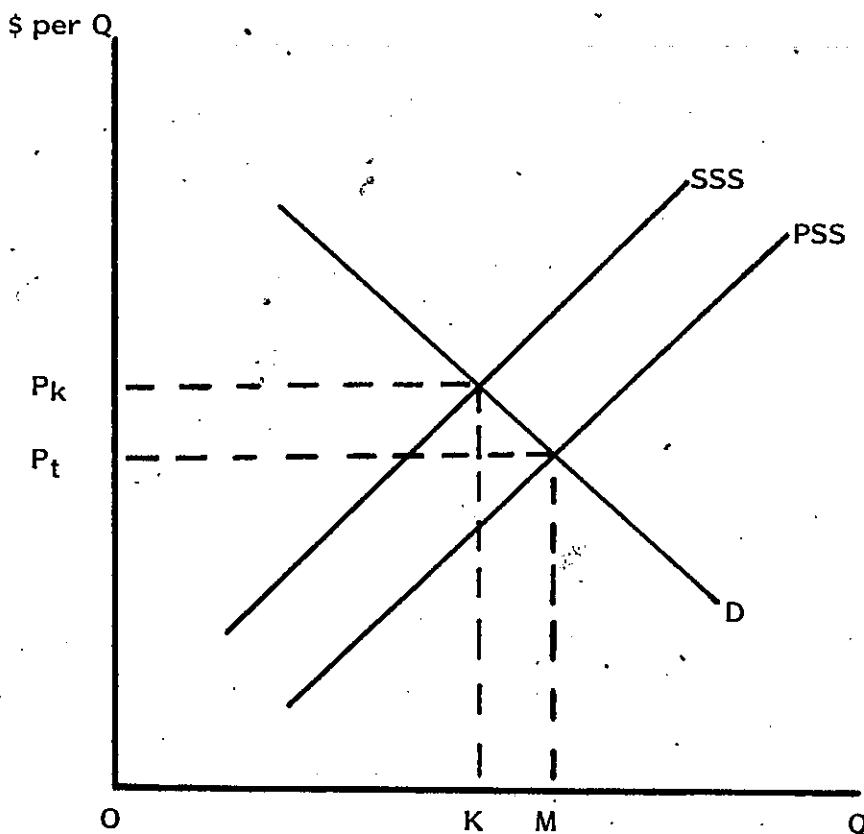
Figure 1-2

According to previous assumptions, the SSS schedule, not the PSS

schedule, reflects the social marginal costs of output. If SSS were the

industry supply schedule as shown in figure I-2, the level of industry

output would be OK units and the market price would be Pk. Comparing this

result with the actual industry price and output in equilibrium, we can

conclude that the private market for a good leads to too high a production

of that good. (by KM = OM - OK) units and too low a price (Pt instead

of Pk). Society, as a whole, would be better off if firms behaved as

if SSS, not PSS, were the industry supply schedule.

C. Externalities, Monopolies, and Imperfect Competition

The discussion of the externalities problem so far has assumed

perfect competition in all markets. The analysis can be extended to include

monopolies and markets characterised by imperfect competition. The

net effect of externalities on the allocation of resources will depend on

the extent of monopoly power exercised by the firm(s). A firm exercising

monopoly power will set its profit-maximising price above its marginal

cost. This results in a lower output relative to a perfectly competitive

industry and distorts the allocation of resources by producing too little

output compared to the level of output in competitive industries. Therefore,

the resource allocation distortions caused by monopoly power and externalities

may actually improve the overall allocation of resources in an economy.

However, if external costs are found mainly in competitive industries,

then both the competitive and externality effects reinforce each other

in distorting the allocation of resources.

D. A Market Solution for the Externalities Problem

If we recognize pollution to be an externality, it may be possible

to use the profit motive to lead to a solution to this problem by giving

the firm an incentive to internalize the external cost it was previously

imposing on other firms and households. Such a solution can be imposed

by having the government extend its traditional role in a market economy

by "assigning and enforcing property rights to environmental resources",[6]

and is discussed in the following chapter.

[6]Ibid, p. 77.

CHAPTER II

The Role of Government in Controlling Pollution

There are three possible means by which the government can intervene to coerce firms to internalize their costs: 1. direct regulation and prohibition; 2. fiscal disincentives or taxation; and, 3. fiscal incentives or subsidies.

A. Direct Regulation or Prohibition – Federal Legislation on Air Pollution

The Clean Air Act of 1970 (known as the "Muskie Clean Air Bill") is the central legislation upon which the American federal government's effort to improve air quality is based. It relies entirely on regulation to control air pollution and is directed at both mobile and stationary sources of air pollution.[7]

The law requires that carbon monoxide and hydrocarbon emissions be reduced by 90 percent from the uncontrolled levels of 1970. This limitation on discharges must be met by 1976.[8] In addition, the law requires that

[7]For a history of air pollution legislation, see: Frank P. Grad, George W. Rathjens, Albert J. Rosenthal, Environmental Control: Priorities, Policies, and the Law. (New York: Columbia University Press., 1971) pp. 51-57.

[8]Due to economic conditions, these standards have now been relaxed and their implementation deferred.

automobile manufacturers give customers a 50,000 mile or five year warranty that the vehicle will continue to meet the standards.

The 1970 law also applies to concentrations of various pollutants existing in the atmosphere. This feature empowers the Administrator of the Environmental Protection Agency (EPA) to establish maximum allowable rates of discharges for different classes of sources, for example, pulp mills and electric power generators, and to enforce them through the federal courts.

National emission standards have also been set for sulfur oxides, hydrocarbons, carbon monoxide, nitrogen oxide, oxidants and other particulate matter. Each standard has two levels – primary standards are to be achieved by 1975 and "reflect pollution levels that will result in no detrimental human health effects".[9] Secondary standards, much more severe, are an additional safety margin for preventing damage to vegetation and property. These standards are to be met in a reasonable time period after 1975.

B. Direct Regulation or Prohibition – Federal Legislation on Water Pollution

The Water Quality Act of 1965 represents the pivotal legislation asserting federal government leadership in anti-pollution efforts. The

[9]Joseph J. Seneca, Michael K. Taussig. Environmental Economics, (Englewood Cliffs, New Jersey: Prentice-Hall Inc., 1974), p. 163.

most important feature of this Act is that:

It requires states to establish water quality standards
for their waters and to develop a program for attaining
them. This program is to be regarded as a benchmark
for judging the progress of a state in attaining its water
quality-standards and for assisting federal officials in
determining the maximum amount of discharges consistent
with the water quality standards. Then they issue
licenses limiting discharges in aggregate to this maximum,
usually following some rule of thumb such as uniform
percentage removal. In enforcing these license provisions,
states must undertake surveillance of dischargers and
must initiate judicial or quasi-judicial proceedings
when violations occur. [10]

The Water Quality Act of 1965 was amended by the Clean Water

Restoration Act of 1966. The purpose of this law was to raise the quality

of interstate waters; however, the law did not provide for the estab-

lishment of a single set of national standards. Instead,

Congress provided for an elaborate procedure to insure
that the establishment of standards would be primarily
a state responsibility, subject to federal approval.
Under the 1967 (sic) Act, each state was given until
June 30, 1967 to adopt water quality standards applicable
to interstate waters within its borders. If a state failed
to meet this deadline, or if the standards submitted
to the Department of the Interior were rejected, the
department itself was authorized to establish water
quality standards for interstate waters within the
state. [11]

The efforts of the federal government in both air and water pollution

rely on "nationally protected quality standards to be achieved by more

[10]A. Myrick Freeman III, Robert H. Haveman, Allen V. Kneese,
The Economics of Environmental Policy, (New York: John Wiley and
Sons Inc., 1973), pp. 116-117.

[11]Grad (et al), op.cit., p. 62.

specific state regulations to control emissions and effluents. In both

instances there is an attempt to utilize federal regulatory power, relying

on state origination of standards in the first instance."[12]

C. An Economic Analysis of the Use of Prohibition/Regulation
   as a Means of Controlling Pollution

In figure 2-1, the marginal social benefit (MSB) and marginal

social cost (MSC) schedules are drawn in reference to the units of pollution

abatement for some hypothetical pollutant.[13]
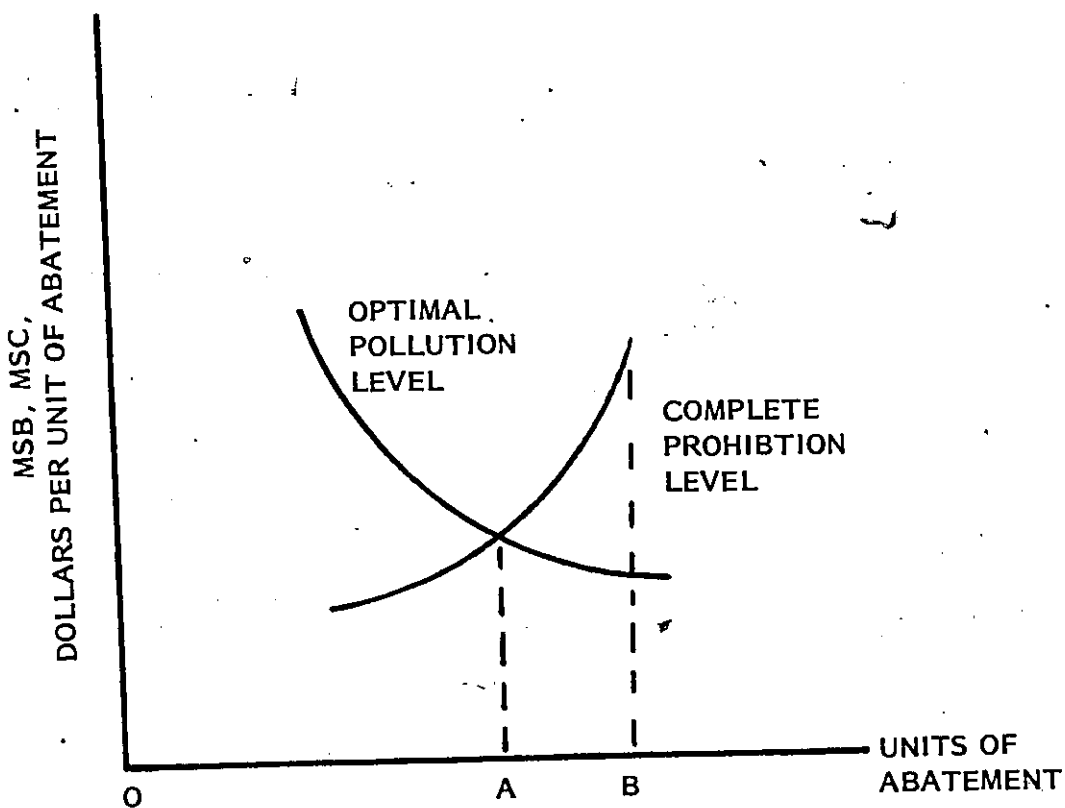
Figure 2-1

[12]Ibid., pp. 64-65

[13]Seneca, op.cit., p. 207.

The schedules represent the marginal social benefits and marginal social costs respectively, associated with each level of pollution abatement and the corresponding level of environmental quality. The optimal level of output of pollution abatement within the framework of benefit-cost analysis is at point OA. Rigidly enforced prohibitions may move society along the horizontal axis as far as OB; that is, to absolute purity, which people do not value and may not even be able to perceive. The marginal social cost of achieving perfect purity may be extremely large, as it could involve the complete shutdown of some industrial firms or public utilities. "The economist's benefit-cost analysis provides a strong argument against prohibition as a general environmental policy instrument"[14].

D. Fiscal Disincentives or Taxation

One of the problems with the present control system and standards for air pollution (in the Clean Air Act of 1970) for automobiles is " how to get the car owner to tune and maintain his engine periodically?" Economists at Rand Corporation proposed the answer – a Smog Tax.[15] In one version of this tax, cars would periodically be tested and

[14]Ibid., p. 208.

[15]D.M. Fort, et al., "Proposal for a Smog Tax," Reprinted in U.S. House of Representatives, Committee on Ways and Means, Hearings-Tax Recommendations of the President, 91st. Congress, 2nd. Session, September 1970, pp. 369-379.

assigned a smog rating. The rating could be indicated by a seal or coded device attached to the car. Then, when the driver purchases gasoline, he would pay a tax over and above the present gasoline taxes, and the amount of the tax would depend on his smog rating. Under the smog tax system, an individual can reduce his smog tax bill in several ways: first, tuning up or overhauling his engine to reduce emissions and obtain better gas mileage; second, he can buy a car with a better smog rating.

The smog tax is relevant for it answers the question of who should be responsible for the continued attainment of emission standards. It seems to be a practical means by which to reduce automobile emissions by placing the responsibility on owners and backing it up with appropriate economic incentives.

In 1972, The Nixon administration submitted the Pure Air Tax proposal to Congress.[16] This proposal was added to ensure that the standards of the Clean Air Act of 1970 would be met. The tax would be levied on electric power plants that burn coal and oil to generate electricity, refineries, smelters and perhaps other industrial processess. Among the primary pollutants, sulfur oxides are one of the most damaging to human health.

The Clean Air Act of 1970 requires air regions (as specified in the Act) to meet primary air quality standards by 1975. In regions not meeting these primary standards, the tax would be set at fifteen cents per pound of sulfur discharged from all sources within the

16Seneca, loc.cit., p. 235.

region. If the region meets the primary standard but not the more restrictive secondary standard, the tax would be ten cents per pound. If there is compliance with both standards, no tax would be levied.

. The Pure Air Tax represents the first seriously considered national emission charge. The immediate effects of the sulfur tax would be to encourage firms to install antipollutant technology and, at the same time, to move towards lower sulfur content fuels.

E. An Economic Analysis of the Use of Taxation as a Means
    of Controlling Pollution

In the category of tax weapons, "effluent charges are the particular form of taxation having the most direct application to the problems of environmental quality".[17] A per unit tax on effluent discharges removes the zero price tag associated with the use of air and water resources for waste disposal purposes, and thereby narrows the unrestricted property rights implicit in the free use of the environmental media. Firms and individuals are thereby forced to consider effluent charges as another cost of doing business.

In figure 2-2 with an effluent charge of OF dollars per unit of waste discharged, the firm takes action to not discharge its first OX waste units, saving AFB dollars relative to paying the effluent charge for discharging this amount of wastes. To the right of point B,

[17]Ibid., p. 220.

the firm will pay the effluent charge and discharge wastes rather than incur the higher costs of not discharging. Thus, the firm acts along a heavily shaded line ABC, taking internal actions to avoid waste discharges from A to B (that is, the first OX waste units) and if the waste load exceeds OX units, electing to pay the OF per unit effluent charge on the remainder.

Figure 2-2

* WASTE UNITS $\underset{OR}{}$ **WASTE UNITS
REDUCED   DISCHARGED

* SUBSIDY PER UNIT OF
WASTES REDUCED

** EFFLUENT CHARGE PER
UNIT OF WASTE
DISCHARGED

MSB of WASTE $\underset{OR}{}$ MSC of WASTE
REDUCTION   REDUCTION

19
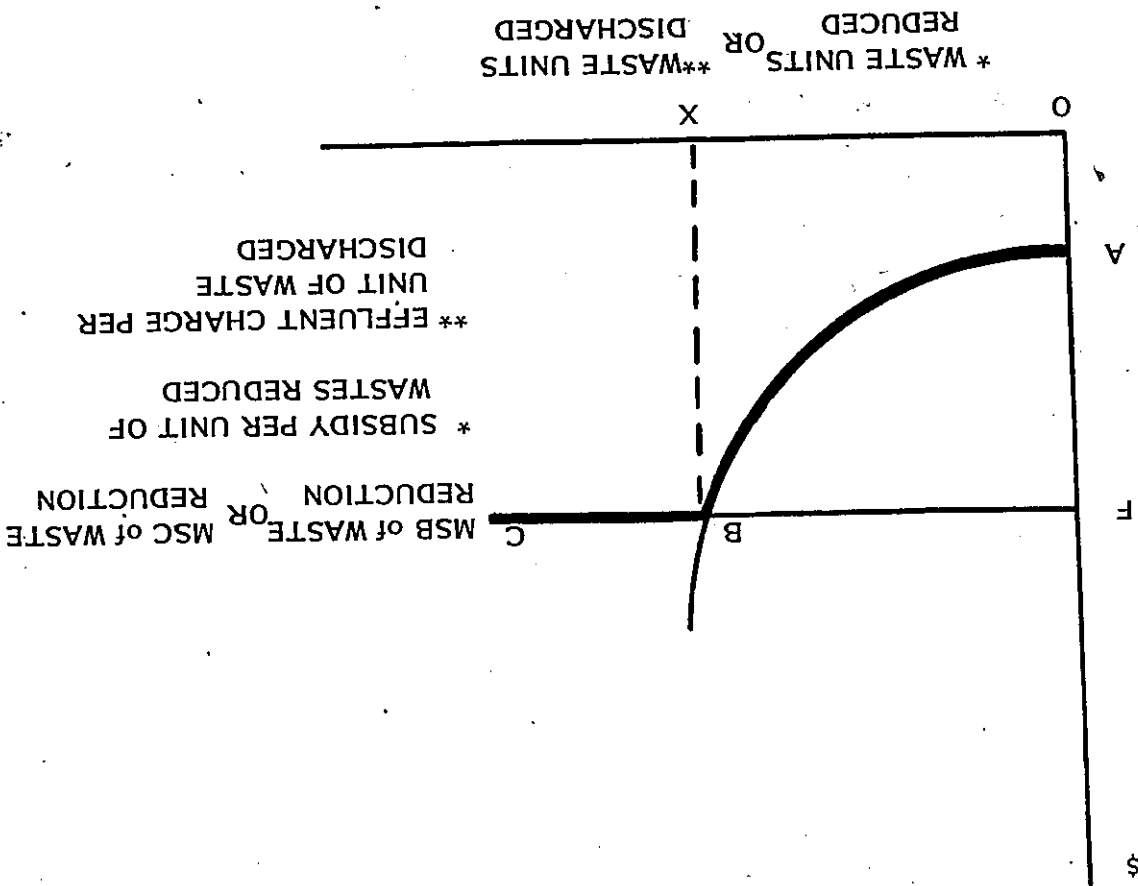
G. Fiscal Incentives or Subsidies

The Water Pollution Control Act of 1956 established the first federal subsidy for treatment plant construction.[18] This subsidy takes the form of federal grants to municipalities covering up to 55 percent of the cost of plant construction. In addition, some states augment the grants to the point where cities are responsible for only 15 percent of total construction costs. Since 1956 this program has grown so rapidly that by 1973 nearly $1 billion per year was being spent by the federal government to subsidize public waste treatment. To be eligible for these grants, a state must have adopted a plan for achieving water quality standards which are acceptable to the EPA. Present regulations stipulate that such plants must require a minimum secondary treatment of 85 percent removal of organic wastes or its equivalent.

This program encourages cities to provide at least secondary treatment of the wastes of all discharges connected to municipal sewer systems. While these discharges include the bulk of the nation's households and commercial enterprises, the majority of the nation's industrial wastes are discharged directly to rivers and streams. To encourage waste treatment activities by these dischargers, the Tax Reform Act of 1969 allows accelerated depreciation, for tax purposes,

[18]Freeman, loc.cit., p. 116.

of waste treatment plant investments.[19] The objective of this $120 million annual "tax expenditure" is to stimulate more spending on pollution control by reducing the aftertax cost of such investments.

In general, Federal government subsidies take the form of loans, guarantees and grants. The federal government makes available a variety of low interest loans for the purchase of pollution equipment. In some cases outright grants are made. Such grants may constitute up to 80 percent of the cost of new treatment facilities in economically depressed areas. Clearly, the government's objective is to provide jobs and economic security as well as to eliminate pollution. The federal government is also experimenting with what are called "Demonstration Projects." Washington will grant up to 50 percent of the cost of a water cleanup project if the program is related to a basin wide effort.[20] If there is no coordinated program the federal government will provide only 30 percent of the cost and then only on the condition that the state matches the contribution. Congress authorized an increase in federal grants from $150 million for fiscal 1967 to $1.25 billion for fiscal 1972.

H. An Economic Analysis of the Use of Subsidies as a
     Means to Control Pollution

The effects of a subsidy are equivalant to those of an effluent charge. The government could offer a subsidy of OF dollars (in figure 2-2)

[19]Ibid.

[20]Marshall I. Goldman (ed), Ecology and Economics: Controlling Pollution in the 70's. (New Jwrsey: Prentice-Hall Inc., 1972), p. 44.

per unit of waste not discharged. This policy would be symetrical to the effluent charge policy in terms of waste reduction. The firm would reduce wastes up to OX units because it is profitable to do so, earning a net profit of AFB dollars on the OX units of wastes treated.[21] However, a fundamental difference in economic incentives exists between the subsidy and the effluent charge methods.

G. A Comparison of Taxation and Subsidization

In the case of an effluent charge, the firm reacts to the potential economic penalty of a tax per unit of waste discharged into the environment. The firm takes action to minimize the net revenue effect of this tax by avoiding waste discharges if it can do so for less than the OF dollars per unit and paying the tax for all other waste units. An ultimate effect of the effluent charge is to increase the overall cost of operation and thereby reduce the quantity of final output offered at each price. If the effluent charge is applied throughout the industry, the final result is to increase the market price of its product and to reduce the quantity sold. Thus, the improvement in environmental quality is paid for by the consumer of the product via higher prices and by society, in general, through a decrease in output.

On the other hand, a government offer of a subsidy of OF dollars acts as a bribe not to discharge wastes. The subsidy is an opportunity

[21]Seneca, loc.cit., p. 222.

cost in terms of foregone revenue and also has the effect of internalizing

the social costs of waste discharges. . ."Normal profit incentives will

operate as in any other market, and the more efficient the firm is in

its waste reduction, the greater the profit opportunities." [22]

[22]Ibid., pp. 222-223.

CHAPTER III

Assessing the Effectiveness of Existing Pollution Control Programs

A. Direct Regulation and Enforcement

One of the conclusions of the previous chapter established that the cost-benefit analysis strongly argued against the use of prohibition as a general environmental policy instrument. Some recent findings support this conclusion.

In 1969, the General Accounting Office released the results of a detailed study of several rivers. The report concluded that even though $5.4 billion had been spent at all levels of government for waste treatment plant construction during the previous twelve years, the nation's rivers were in worse shape than before.[23] The Environmental Protection Agency (EPA) has also surveyed the extent of water quality deterioration in the United States. In 1970, "the EPA reported that 27 percent of the nation's water's were polluted. In 1971, the relevant figure was 29 percent".[24]

[23]Comptroller General of the United States, Examination into the Effectiveness of the Construction Program for Abating, Controlling, and Preventing Water Pollution, Washington D.C., November 3, 1969.

[24]Joseph J. Seneca, and Michael K. Taussig, Environmental Economics, (Englewood Cliffs, New Jersey: Prentice-Hall Inc., 1974), p.123.

While the existing laws seem adequate, the record shows that their enforcement is often quite lax, that in some cases enforcement has been hampered by intentional efforts to subvert the law, and that technology and industrial expansion simply moved too fast for control authorities to keep up with the latest developments.

For example, to ensure that the standards for auto emissions, as prescribed by the Clean Air Act of 1970, are met, cars are tested before they are sold. The shortcoming of this law is that there is no follow-up to assure that cars continue to meet the standards set for them after as little as 10,000 to 15,000 miles of use.[25] While the 1970 law requires manufacturesrs to guarantee that the cars will meet standards for 50,000 miles or five years, good maintenace and tuning by the owner are important factors in limiting emissions. At present there is no means to force an owner to tune and maintain his engine periodically.

In the area of water pollution, the Water Quality Act of 1965 authorizes federal enforcement actions whenever it is found that state-established water quality standards are being violated. Alternatively, a governor or state agency can request the EPA to initiate enforcement efforts to deal with an interstate pollution problem. The EPA can initiate court actions 180 days after notifying violators. This provision of federal law was not used at all until August 1969, and as of the end of 1971, the EPA had issued only twenty-seven notices.[26]

[25]A. Myrick Freeman III, Robert H. Haveman, Allen V. Kneese, The Economics of Environmental Policy, (New York: John Wiley and Sons Inc., 1973), p. 133.

[26]Ibid., p. 117.

Recent evidence in the attempts to make the 1899 Refuse Act work

causes one to conclude that there was an intentional effort to subvert

the law. This law prohibits the discharge of "any refuse matter of any

kind or any description whatever" into any waters unless the discharger

has obtained a permit from the U.S. Army Corps of Engineers.

> This all but forgotten law came to the forefront in
> 1969 as charges were brought against several firms
> as a consequence of individuals' initiatives. Some con-
> victions were obtained, fines levied, and rewards payed
> to vigilant citizens as the law provides. But in June
> 1970, as the number of cases began to increase, the
> Justice Department attorneys were issued guidelines
> that instructed them not to bring charges against firms
> holding a permit issued by a state or local government.
> With this action, the Justice Department, in effect,
> established a policy of selective non-enforcement of
> one of the nation's laws. This policy was re-enforced
> in December 1970, when the Administration announced
> that, while permits were required of all dischargers,
> including those "exempted" by the earlier Justice
> Department policy, no prosecutions would take place
> as long as an application had been filed by July 1, 1971
> and not subsequently rejected by the government.[27]

Some authorities feel that the net effect of this action ".. (repeals)

the one potentially effective federal law against pollution".[28]

B. Tax Incentives or Subsidies

The waste treatment grant program exemplifies how a poor government'

grant structure and its administration can result in a great deal of money

[27]Ibid., p. 138.

[28]Ibid.

being spent with little being achieved. The subsidy program in this case seems to be a failure. Freeman (et al) give the following reasons for this outcome:

First, states have failed to target federal funds to the municipalities, with the most harmfil discharges. More than one town situated downstream from major industrial locations has used federal funds to build treatment plants with the result that their treated effluent is of higher quality than the river into which it is discharged. Also, federal funds have been concentrated on smaller, largely suburban communities rather than on the larger cities with the most pollution. For example, nearly 40 percent of the federal grant money has gone to towns with populations of less than 10,000, and these communities contain less than 16 percent of the United States urban population. The largest cities, containing 25 percent of the total urban population, have received only 6 percent of the total federal grant money.

. . . .

(Second), the construction of treatment facilities does not guarantee their effective operation. In fact, the structure of the recent program creates incentives that work in the opposite direction. A second study by the General Accounting Office has confirmed the widely held belief that municipal plants are often operated inefficiently. Over one-half of the plants surveyed were providing inadequate treatment due to overzealous efforts to reduce plant operating costs, the difficulty and expense of hiring trained personnell to operate the plants, and the failure of cities to repair and maintain equipment. By subsidizing only one part of the costs of effective waste treatment - plant construction costs - the federal government has induced resources into construction activity but has provided no similar inducement for efficient plant operation.

(Third), federal grants for municipal waste treatment plant construction provide an indirect subsidy to industrial and commercial waste dischargers. By subsidizing the capital costs of municipal treatment

facilities, the existing policy tends to reduce the
sewer charges imposed on industrial, commercial,
and domestic waste dischargers connected to the
sewerage system. Because approxiamately 50 per
cent of the wastes handled by municipal treatment
plants is from industrial sources, the size of the
subsidy to business is substantial. The effect of
this subsidy is to weaken the incentives for waste
dischargers to seek alternatives to the public treatment
of their waste flows. Production process changes,
recycling, and materials recovery are all alternatives
to sending wastes to the municipal plant for treatment
at public expense. These alternatives are numerous
and are often less costly. Yet because these alternatives
are not eligible for federal subsidies, firms will
overlook them in favor of having the federal government
pick up the tab. The tax subsidies have a similar
distorting effect on the decisions made by firms as
to the techniques they choose to reduce their discharges.

Thus, through federal grants for municipal waste
treatment facilities as well as through tax subsidies
for industrial pollution control equipment, current
policy is, in effect, allowing polluters to generate
and dispose of large quantities of wastes without
bearing the full cost of their discharges and then
using the taxpayers' money (at a current annual
rate of about $1 billion) to clean up after them.[29]

To summarize, it appears that the failure of the present regulatory-enforcement

and subsidization effort is due to an over-reliance on a centralized adminis-

trative procedure. While it is important to have centralized (or national)

standards and goals, it is equally important to decentralize decision

making to the point of need to ensure that localities, in a coordinated

effort, might move closer to achieving national air and water standards.

[29]Ibid., pp. 118-119.

The following chapter analyses this decentralized decision making process by allowing localities to use tax-exempt securities as a means of inducing firms not only to internalize their costs but also meet national anti-pollution standards.

CHAPTER IV

The Use of Tax-Exempt Securities
To Finance the Cost of Pollution Control

A. A Brief History of the Exemption

The Federal Government does not tax the interest on State and

local securities through income tax, and State and local governments

cannot tax Federal securities. This anomaly rests upon the specific statutory

exclusion of such income by the U. S. Congress.[30]   The 16th Amendment

to the Constitution empowered the Federal Government to levy or tax

incomes "from whatever source derived." But when Congress passed

the individual income tax of 1913, Congress provided that interest on

State and local securities be excluded from income. This statutory exclusion

has been retained to the present in spite of continued opposition of Presidents

and secretaries of the Treasury and some members of Congress.

Efforts by the Federal Government to abolish the exemption have

gone on intermittently since the passing of the 16th Amendment. In 1923,

the Green resolution, authorizing reciprocal taxation of Federal and

State-local securities, was approved by the House of Representatives

[30]For a more extensive treatment of this topic see: James A. Maxwell, "Exclusion from Income of Interest on State and Local Government Obligations," U.S. Congress, Committee on Ways and Means, Tax Revision Compendium, 1959, pp. 701-704. See also: Vance N. Kirby, "State and Local Bond Interest," in the same publication, pp. 679-683. For the present tax status of these securities see: Olin S. Pugh, Industrial-Aid Bonds as a Source of Capital for Developing Regions, (Columbia, S.C.: Vogue Press Inc., 1971), pp. 10-11.

by a two-thirds vote. However, the effort to repeal the amendment

diminished until the depression of the 1930's.

In 1938, President Roosevelt asked Congress to repeal the exemption

by legislation rather than by a constitutional amendment, a step that

was violently opposed by State and local governments, and Congress

refused to accept the recommendation of the President.

In early 1942, the Treasury attempted to repeal the amendment

by asking Congress to remove the exemption with respect to State and

local issues then outstanding, rather than future issues. This proposal

was received critically not only by State and local governments, but

also by many persons who felt that it would be unfair to existing holders

of exempts. Such holders had bought in the reasonable expectation

that exemption would continue to be the law. The latter view prevailed

and the law remained unamended.

In 1949, in 1951, and in 1954, the exemption issue was raised

once more, and again proponents of its abolition made no headway. The

1949 and 1954 Treasury effort was concerned with local public housing

authority bonds and industrial development bonds; the 1951 effort concerned

the old issue of the general exemption.

Local public housing authorities have long had the right to issue

exempt bonds. In addition, the Federal Government makes an annual

contribution to authorities equal to the debt service on their borrowings,

reduced by the amount by which rents exceed current operating costs.

The Federal contribution, however, has a ceiling, since it cannot be

more than 2 percent of the then going interest rate on long-term Federal

borrowing. In 1949 the Public Housing Administration and the Treasury

recommended that future issues of local authority bonds be made subject

to Federal income tax.

Removal of the exemption was opposed principally by the American

Municipal Association and the Housing Act of 1949 continued the immunity.

In 1953-54 the Treasury again made an effort to have the

exemption on local public housing authority bonds removed. It also was

concerned about industrial development bonds issued, with exempt status,

by localities in a few States.

The Ways and Means Committee first agreed to remove the Federal

income tax exemption on interest received from future issues of industrial

development bonds. But represen tatives of the municipalities protested

that this was an opening wedge to the termination of the exemption and

the Committee did not press the issue.

On October 24, 1968, the American Congress altered the 16th.

Amendment and as of January 1, 1969, interest income on industrial-aid

bonds is still exempt, provided the issue is not above $1 million, or the

total of the issue plus capital expenditures of the leasing firm within the

issuing municipality does not exceed $5 million for three years before

and after the issue. The only exception to this 1968 ruling is that industrial

development bonds of any size may have the tax-exempt feature, if they

are for such facilities as housing, transportation, sports, industrial parks,

or air or water pollution. The significance of this alteration with regards to

air and water pollution is discussed in the remainder of this chapter.

B. Forms of Tax-Exempt Bonds

Tax-exempt bonds fall into two broad categories – general obligations and revenue bonds.[31] General obligations are indebtedness secured by the full faith, credit and taxing power of a political subdivision or governmental agency. Revenue bonds are used to identify bonds of a political subdivision or governmental agency which are payable solely from some specified source other than the general taxing power of the issuer. Classified according to the source of payment, revenue bonds fall into the following types:[32]

A. UTILITY

    1. Bridge, tunnel or toll highway

    2. Electric light and power

    3. Gas

    4. Public transportation

    5. Off-street parking facilities

    6. Water

    7. Multiple purpose, the more common combinations

       being electric and water, water and sewer

B. Quasi-Utility

    1. Airport

    2. Dock and terminal

[31]For a complete treatment of this subject see: Gordon L. Calvert, Fundamentals of Municipal Bonds, (Washington D.C.: French-Bray Printing Company, 1968).

[32]Moody's Investor's Service, Moody's Municipal and Government Manual, 1974, p. A-21.

    3. Hospital

    4. Public Market

    5. Public garage

C.   Non-Utility

    1. Gasoline tax, cigarette tax, beer tax, utility

        excise tax, etc.

    2. Rentals of public buildings

        a) To another governmental agency

        b) To the public generally

            1) Educational Facilities

            2) Recreational facilities

        c) To private persons or corporations

Revenue bonds have been further divided into industrial development

bonds. Industrial development bonds are used by certain municipalities

or governmental subdivisions to improve the economic status of their

communities by inducing new industry to locate there; for this purpose

they have extended their credit to acquire capital for the construction

of plants or facilities, which are in turn leased to private industry at

attractive prices.

C. The Nature of Pollution Control Bonds

    In a fashion similar to the Industrial Revenue Bonds, many municipalities

are now issuing environmental and pollution control industrial revenue

bonds to induce firms to reduce pollution. Municipalities have extended

their credit to these firms so that they may acquire capital for the construction

of facilities to help reduce or eliminate pollution that would otherwise

have been generated.

State and local entities will issue tax-exempt securities to purchase

property or to construct or equip facilities for lease or use by private

enterprises. The private enterprise is obliged to invest in pollution

control devices and these bonds are payable only from lease-rental

or other payments made by the company involved.

As an illustration of this type of arrangement, Baltimore County,

Maryland, offered $28,000,000. in bonds for the Bethlehem Steel Corporation

project. The purpose of the offering was to provide,

> proceeds for construction of the following pollution
> control facilities; air pollution facilities for the new
> Stinter plant, water pollution control plant from coke
> oven gas coolers, water pollution from blast furnace
> gas cleaning, water pollution control for sanitary sewage
> collecting and water pollution of zinc bearing waste
> paper.[33]

In an other example, Flat Rock, Michigan, in an agreement with

Ford Motor Company issued a $25,000,000 obligation for, "construction

at Ford Motor Company's Michigan casting centre for air and water pollution

control facilities to meet State and county standards".[34]

Many counties have industrial development boards that were created

by state legislature to act as the county authority for local industrial

[33]Moody's, Ibid., p. 1543.

[34]Ibid., p. 1721.

development. These same boards are now assuming authority to issue pollution control industrial revenue bonds. The Fairfield industrial development board issued $27,500,000 of debt to provide "Funds for construction, installation and equipping of air and water pollution control facilities for the Fairfield works of 'The United States Steel Corporation'."[35]

In an even more recent development many counties, under the aegis of the Industrial Development Authority law, are creating Industrial Development Authorities to deal only with the acquisition, construction, installation and equipping of air pollution control facilities. The Allegheny County Industrial Development Authority incorporated December 9, 1969, is such an authority. The Authority entered into a contract with the United States Steel Corporation in 1971 to issue $5,000,000 of obligations, proceed of which were to be used for "Construction of Air Pollution Control facilities for U.S. Steel's NationalDuquesne Works located in Duquesne, Pennsylvania."[36]

An important feature of this recent attempt at pollution control is that the counties have reciprocal arrangements with those industries that seem to contribute most to pollution: utilities, automobile manufacturing, steel plants, chemical and detergent manufacturing, oil processing, and finally paper manufacturing.[37]

Table 1 summarizes the total outstanding amount of municipal and environmental and pollution control industrial revenue bonds.

[35]Ibid., p. 179.

[36]Ibid., p. 2925.

[37]For a complete listing by company , see: Moody's, Ibid., p. A-28.

TABLE 1
STATE & MUNICIPAL
NEW ISSUE ACTIVITY (New Money Only)

LONG TERM ISSUES (MILLIONS)

YEAR	TOTAL	GENERAL OBLIGATION(a)	REVENUE ISSUES(a)	MUNICIPAL ENVIRONMENTAL & POLLUTION CONTROL INDUSTRIAL REVENUE BONDS(b)
1971	23,949.900	16,080	7,800	69.900
1972	20,210.220	12,538	7,228	444.220
1973	23,176.665	12,806	8,712	1,658.665

SOURCE: (a) Moody's Municipal and Government Manual, 1974, p. a14.

(b) Calculated from: Ibid., pp. a28-a30.

Table 2 shows that the percentage distribution of recent issues

is changing. (Tables 1 and 2, in Appendix B, enable us to put the pollution

control bonds into perspective. The percentage distribution between

revenue issues and general obligation issues has been relatively stable

except for 1954 and 1968 when there was a marked increase in new issue

activity on revenue issues.) Table 2 shows a decline in the percentage

distribution of general obligations in the years 1971, 1972, and 1973 indicating

that a downward trend may be taking place. However, it appears that

pollution control bonds are taking a place of greater prominence; these

bonds have increased from an insignificant .3 per cent of total new tax-

exempt issues in 1971 to 7.2 per cent in 1973. This marked increase

attests to the popularity of this method of financing pollution control.

YEAR	TOTAL	TABLE 2 PERCENTAGE DISTRIBUTION		
		GENERAL OBLIGATION	REVENUE ISSUES	MUNICIPAL ENVIRONMENTAL & POLLUTION CONTROL INDUSTRIAL REVENUE BONDS
1971	100	67.1	32.6	.3
1972	100	62.0	35.7	2.3
1973	100	55.3	37.5	7.2

Perhaps even more important than the percentage distribution,

Table 3 shows that pollution control bonds are steadily becoming a greater

proportion of industrial revenue bonds as a whole.

TABLE 3

MUNICIPAL ENVIRONMENTAL POLLUTION CONTROL INDUSTRIAL
REVENUE BONDS AS A PERCENTAGE OF INDUSTRIAL REVENUE BONDS

1971	.9%
1972	6.1%
1973	19.0%

D. The Nature of the Subsidy to State and Local Governments
   and the Loss of Federal Government Tax Revenues.

The tax exemption for State and local obligations constitutes a subsidy to the States and their political subdivisions. The subsidy is constituted by " the difference between the interest costs paid by the States and their subdivisions in carrying their indebtedness under the existing tax exemption and the costs which would be incurred if the interest were made taxable."[38] The amount actually involved is very difficult to estimate; and, the task becomes even more difficult due to changing market conditions and other factors. For example, the differential will be affected by changes in the basic interest rates, by current tax rates, by changing estimates as to future tax rates, by the supply of tax-exempt bonds, by the supply of investment funds, and by the quantity of other available securities.

As of any moment in time, the only practical method for estimating what this difference in interest costs may be would be to " compare the current yield (the interest factor) of state and local bonds with the yield of comparable taxable bonds".[39] (See Appendix D, Table 3). The cost of the exemption must be somewhere close to " the differential in yield between high-grade municipals and comparable corporate bonds ".[40]

[38]Kirby, op.cit., p. 686.

[39]Ibid.

[40]Ibid., p. 687.

Two such series are Moody's yields of Aaa Municipals and of Aaa corporates.

At the present time (1971), this differential is in the area of 2.17 percentage

points. Assuming that this is the differential favouring state and municipal

bonds, the subsidy to the states and local governments amounts to somewhat

over $3,446,545,900 a year based upon the present volume (1971) of

outstanding state and local bond issues. Yet the estimate of the cost

of this subsidy to the Federal Government in terms of income tax revenue

loss is around $3,942,378,685 (see Appendix C).

The calculations of Appendix D indicate that the subsidy to the

states and local governments for the pollution control bonds rose from

$1,737,330 in 1971, to $43,128,487 in 1973, and is currently (1974) valued

at $40,554,842. The loss of revenues to the Federal government rose

from $1,617,899 to $36,235,279 for the comparable period and is presently

valued at $37,388,311.

E. Nature of the Subsidy to State and Local Governments
    and the Loss of Federal Government Tax Revenues (continued)

The cost of the subsidy to the Federal Government in loss of

revenues from the income tax will depend on the following factors: the

rate of income tax of individuals and corporations; the distribution of

holdings of exempts not only between individuals and corporations but

also among corporations.

According to George E. Lent, the distribution of exempt holdings

between individuals and taxable corporations depends largely on "the

size of (individual) income above which the corporation and personal income tax rates were equalized."[41] A relative rise in the Federal corporation income tax rate will cause corporate holdings of exempts to rise, and vice versa. In the postwar period, the levels of the personal-income scale at which the rate for married persons was equal to the corporation income tax rates were as follows:

	Personal Income of married persons	Federal Corporation Tax rates	
		Normal & surtax	Excess profits tax
1946-47............	$11,000-13,000	38	....
1948-49..........	25,000	38	....
1950.............	25,000	42	15
1952.............	29,000	52	30
1954.............	45,000	52	....
1958.............	45,000	52	....
1969.............	52,000	52	....

The level of personal income which is in equilibrium with the rate of corporation income tax has therefore risen because the corporation tax rate has risen relative to individual rates. This would be expected to bring some relative decline in individual holdings and some relative increase in holdings of taxable corporations, and this has happened.

[41]George E. Lent, "The Ownership of Tax-Exempt Securities," Occasional Paper 47, National Bureau of Economic Research, Inc., 1955, p. 85.

Table 1 of Appendix E shows that, until 1964, individual holdings
of State and local debt comprised the largest category, followed by holdings
of commercial banks and insurance companies. Table 2 of Appendix
E shows that the relative holdings by individuals have fluctuated somewhat,
but have steadily declined from 50.4% in 1947 to 36.8% in 1967, while
those of insurance companies have grown. However, since 1965, Commercial
banks have comprised the largest category in both absolute and relative
holdings.

The rise in commercial bank holdings is due to a revision in the
Investment Securities Regulation statute:

> "The statute contains a general prohibition against
> a member bank (1) underwriting securities or (2) investing
> more than 10 per cent of its capital and surplus in the
> securities of any one obligor. ... The statute also
> provides, however, that 'The limitations and restrictions
> herein contained as to dealing in, underwriting and
> purchasing for (the Banks) own account, investment
> securities shall not apply to obligations of the United
> States, or certain other securities. In other words,
> national banks and member State banks are legally
> free (1) to underwrite such "exempt securities" and
> (2) to invest therein without regard to the 10 per cent
> limitation mentioned above.[42]

The distribution of holdings between individuals and corporations
(and among corporations in different tax brackets) is significant for
determining the loss in Federal Government income tax revenues. If
individual holdings increase, with the tax structure held constant, the
loss in Federal Government revenues will increase and the opposite
would be true if individual holdings decreased.

[42]Moody's Investor's Service, Moody's Municipal and Government
Manual, 1972, p. viii.

Finally, there will be a differential between the value of the subsidy to the state and local governments and the loss in revenues to the Federal Government caused by the progressive income tax rate. This is because the exemption is worth more to some taxpayers than others. Why this is the case is illustrated by supposing taxable income brackets and rates as follows:

> A taxpayer in the top (90 percent) bracket who buys
> a taxable bond yielding $40 annually, could keep only
> $4. The exemption is worth thirtysix fortieths of the
> yield. He would be as well off to purchase at par a
> tax exempt yielding 0.4 percent as a taxable one yielding
> 4 percent. A taxpayer in the 80-percent brac ket would
> keep $8 out of $40, and to him exemption is worth thirty-
> two fortieths of the yield. An equivalent exempt to him
> must yield 0.8 per cent. A taxpayer in the 60 percent
> bracket would keep $16, and to him the exemption is
> worth twenty-four fortieths of the yield. An equivalent
> exempt must yield him 2.4 percent. A taxpayer in the
> lowest (20 percent) bracket would keep $32 out of $40
> and to him exemption is worth eight-fortieths of the
> yield. An exempt yield of 3.2 percent is equivalent
> to 4 percent from a taxable bond.[43]

If it is assumed that the actual supply of exempts is relatively small, then all of them could profitably be bought by persons in the top bracket, and the yield would be 0.4 percent. But if and as the supply increased, the demand of buyers in the lower brackets has to be tapped, and if buyers in the lowest brackets are brought in--if they are the marginal buyers--the yield will be 3.2 percent. The marginal buyers are those whose income after tax is the same whether they buy exempts or taxables. Since this is an undifferentiated market, all buyers get

[43]James A. Maxwell, op.cit., p. 707.

the same yield as the marginal buyers and the high-income buyers

secure a sort of surplus or tax saving.

It is this surplus that causes the loss of revenues to the Federal

Government to be greater than the value of the subsidy to State and

Local governments.

To illustrate how the distribution of holdings and how the progressive

tax rate affects the differential between the subsidy and loss of Federal

Government revenues, assume that individuals, at a 60% tax bracket,

hold all the outstanding debt. Then the loss of Federal tax revenues

would be equal to [(5.52% x $150,885,650,000) - from Appendix C -

x (60%)] $4,997,332,600, a differential of $1,550,786,700. (See line B

of page 55). This differential is wholly attributable to the percentage

distribution of tax-exempt securities. Assuming the distribution of

Appendix C and a 90% tax bracket, the differential attributable to the

progressive tax structure is equal to [(5.52% x $55,525,919,000) x (90%)

- ($1,839,018,400) from line 1, p.56.] $919,509,200.

What are some of the important factors affecting the differential

between the subsidy to State and Local governments and the Federal

tax loss? The differential would increase if progression of the Federal

Income tax steepend, or if the level of rates increased , or if the level

of corporate taxes increased, or if the distribution between individual

holdings increased over those of corporate holdings; the differential

would decrease if progression lessened, if the level of rates decreased,

or if the level of corporate taxes decreased, or if corporate holdings

increased over individual holdings.

F. Economic Pros and Cons of the Exemption

One of the basic tax principles is that "equal incomes should bear

equal tax liabilities." Taxpayers in similar circummstances should bear

similar burdens. One of the arguments levelled against exemption is

that:

> the exemption for State and local bond interest is a
> violation of this principle. Any taxpayer who wishes
> to avoid the tax burden which he would otherwise have
> to carry may safely and legally pass such burden to
> others by buying State or municipal bonds.[44]

In fact, the exemption grants relief in an inverse ratio to ability

to pay. The investor with larger income will get greater relief from

the purchase of State and municipal bonds than one in the more modest

tax brackets.

Why the exemption is worth more (less) to some buyers was illustrated

in section E.

It is not possible to contend with this argument. Looking at the

total amount of revenue that is lost due to individual holdings of exempts,

Appendix C shows that the loss of tax revenue is $1,839,018,400, twice

that of the next highest figure (the loss of tax revenues from commercial

banks). However, it should be noted that, as pointed out in Section D

that individual holdings of exempts are decreasing and, ceteris paribus,

the amount lost in Federal tax revenues from individuals is consequently

decreasing too.

[44]Kirby, loc.cit., p. 684.

Some authors feel that the tax exemption of State and local bond interest interferes with the free flow of the market in the allocation of resources.[45] This objection, however, is overrated. The State-Local security holdings of top wealthholders (those with gross estates of $60,000 or more) accounted for only 3.5 per cent of their gross estates in 1953, according to Lampman's estimates.[46] At the end of 1960, state-local securities constituted about 3 per cent of the total financial assets of all individuals and nonprofit organizations.[47] Again, in 1966, state-local securities constituted 3 per cent of the total financial assets of all individuals[48] and all corporations.

In connection with the subsidy to the State and local governments in their borrowing functions, the proponents of the tax exemption make their strongest appeal for the status quo. Aside from the upsetting, but temporary, effect of the withdrawal of the exemption from State and local issues, the proponents point out that the additional cost of borrowing to the States and local governments, in the vicinity of some $3,446,545,000 annually when the new issues reach the level of outstanding issues,

[45]Ibid., p. 689.

[46]Robert J. Lampman, The Share of Top Wealth-Holders in National Wealth, 1922-1956, (Princeton, New Jersey: Princeton University Press, The National Bureau of Economic Research, 1962), p. 170.

[47]Richard Goode, The Individual Income Tax, (The Brookings Institution, 1964) p. 143.

[48]U.S. Treasury Department, Internal Revenue Service, (Statistics of Income - Fiduciary, Gift and Estate Tax Returns, 1965), p. 85.

[49]Department of the Treasury, (Internal Revenue Service, Statistics of Income - U.S. Business Tax Returns, 1966), p. 200.

would have to come from State and local revenues.[50] These revenues are principally derived from regressive taxes, the property and sales taxes. In illustration of that point, it should be noted that more than half of the revenues of the States come from sales taxes, and more than .85 percent of the revenues of the local governments come from property taxes.[51] The conclusion, which can then be drawn, is that the repeal of the exemption would increase the tax burdens of the State and local governments, which burdens can only be discharged through heavier levies under the more regressive taxes. In other words, as the argument goes, " the attempt to improve the fairness of the Federal income tax through the repeal of the exemption would result in a net loss in the overall fairness of the combined Federal, State, and local levies ".[52]

[50]Kirby, loc.cit., p. 688.

[51]Ibid., p. 689.

[52]Ibid.

CHAPTER V

Summary and Conclusion

Since pollution is an externality, it is encumbent upon the government to exercise it's role in the market economy to coerce firms to internalize their external costs. The three methods by which the government may do this were analysed in Chapter II.

The theoretical framework presented in Chapter II argues against the use of prohibition as a policy instrument; this is verified by recent experiences in the United States in trying to control air and water pollution. Subsidies attempting to control water pollution have generally failed as well. While tax proposals have been submitted, those that can have a direct impact on pollution curtailment have not been implemented.

The use of tax-exempt securities is a relatively new method to finance the cost of pollution control. Excluding State and local securities from the income tax has caused considerable polemics in the past and the extension of this tax-exempt feature to finance pollution control is also subject to criticism. The use of tax-exempt securities in general, and to finance pollution control in particular, violates the basic tax principle of horizontal equity and distorts the allocation of resources. Finally, the tax-exemption feature constitutes a subsidy to the States and their political subdivisions.

We are now faced with a choice - to implement a policy of regulatory taxation or a policy of subsidization.

While a subsidy (in the form of tax-exempt securities) may be objectionable in terms of equity, a regulatory tax is also objectionable in terms of horizontal equity. The regulatory use of taxation "involves a social cost in the form of lessened equity of the tax structure; and we must account for this cost when choosing between tax and other types of control." [53]

While economic theory shows that the effects of a subsidy and a tax are symmetrical, the incidence of the cost of obtaining the same level of environmental quality is "likely to be more diffuse throughout the economy with the subsidy policy than with..." the tax policy. [54]

As a general rule, it would appear that the policy of regulatory taxation would be preferable over a policy of subsidization. However, there is one exception - the case where taxation may force a firm out of business. The resulting unemployment of labour and capital and the loss of tax revenue may be too severe to be socially acceptable. This is even more true in areas where the labour force is immobile and areas that have only one industry or firm.

[53]Richard A. Musgrave, The Theory of Public Finance, (New York: McGraw-Hill, 1959), p. 179.

[54]Joseph J. Seneca, and Michael K. Taussig, Environmental Economics, (Englewood Cliffs, New Jersey: Prentice-Hall Inc., 1974), p. 223.

The use of tax-exempt securities can be used as an "adjustment

assistance" subsidy to reverse the adverse effects of pollution control

on labour and capital. Adjustment assistance policies are more "likely

to be consistent with achieving pollution control at least cost" and "...serves

to redistribute the costs of environmental improvement where these costs

are borne by few for the benefit of many." [55]

The purpose of this thesis was to provide a partial answer to two

questions. First, who should take the initiative to stop further pollution

from occuring and, second, who should pay the cost of environmental

clean-up and the continued abatement of pollution? I hope I have accom-

plished this purpose and I also hope I have contributed a little knowledge

to enable us to make rational choices by assessing the economic consequences

of environmental policy.

[55]A. Myrick Freeman III, Robert H. Haveman, Allen V. Kneese, The Economics of Environmental Policy, (New York: John Wiley and Sons Inc., 1973), p. 149.

Appendix A

TABLE 1   WATER POLLUTION SURVEY OF MAJOR
DRAINAGE BASINS

WATERSHED	STREAM MILES	Polluted Miles						1971 Duration Intensity Factor	P.D.I.
		1970	%	1971	%	Change	% Change		
Ohio	28,992	9,869	.34	24,031	.83	+13,746	+.49	.42	10,093
Southeast	11,726	3,109	.26	4,490	.38	+ 1,381	+.12	.74	3,322
Great Lakes	21,374	6,580	.31	8,771	.41	+ 2,191	+.10	.45	3,947
Northeast	32,431	11,895	.37	5,823	.18	− 6,072	−.19	.61	3,552
Middle Atlantic	31,914	4,620	.14	5,627	.18	+ 869	+.04	.47	2,645
California	28,277	5,359	.19	8,429	.30	+ 2,499	+.11	.27	2,276
Gulf	64,719	16,605	.26	11,604	.18	− 5,001	−.08	.35	4,061
Missouri	10,448	4,259	.41	1,839	.18	− 2,420	−.23	.31	570
Columbia	30,443	7,443	.24	5,685	.19	− 1,758	−.05	.12	682
U.S.	260,324	69,739	.27	76,299	.29	+ 5,435	+.02	.41	31,282
U.S. (less Ohio)	231,332	59,870	.26	52,268	.23	− 8,311	−.03	.40	20,907

Source: Joseph J. Seneca, Michael K. Taussig, ENVIRONMENTAL ECONOMICS, (Englewood Cliffs, New Jersey: Prentice-Hall Inc., 1974) P 125 quoting Environmental Protection Agency, The Cost of Clean Water, 1972.

Notes to Table 1 of Appendix A

Table 1 outlines the extent of water quality deterio-
ration in the United States. The first column lists the
total stream or shore miles in the basin. The next 6 columns
report the number and percent of polluted miles in 1970 and
1971 and the change between the 2 years.

The next to last column in Table 1 provides the EPA's
duration-intensity factor which measures the degree of the
existing water quality deterioration. The preceeding mileage
figures simply indicate whether or not the stream was polluted.
The duration factor relates the intensity of the pollution
to the designated Federal-State water quality standards for
the particular water body. This factor increases as the
pollution increases within any given stretch of stream
mileage. Multiplying the mileage of polluted waters in 1971
by this factor yields the Prevalence-Duration-Intensity
Index (PDI) which is a measure of how badly the water is
polluted. This PDI is reported in the final column of
Table 1.

Appendix A (continued)

TABLE 2. TOTAL AIR POLLUTANT EMISSIONS BY TYPE (1970)

Type	In Millions of Tons	Percent
Carbon Monoxide	147.2	55.77
Sulfur Oxides	33.9	12.85
Hydrocarbons	34.7	13.15
Particulates	25.4	9.62
Nitrogen Oxides	22.7	8.60
TOTAL	263.9	100.00

Source: Joseph J. Seneca, Michael K. Taussig; ENVIRONMENTAL ECONOMICS, (Englewood Cliffs, New Jersey: Prentice-Hall Inc., 1974). P 148 quoting Environmental Protection Agency

APPENDIX B

TABLE 1

STATE & MUNICIPAL NEW ISSUE ACTIVITY (1953-70)

LONG TERM ISSUES (MILLIONS)

YEAR	TOTAL	GENERAL OBLIGATION ISSUES	REVENUE ISSUES
1953	5,431	3,958	1,473
1954	6,811	3,693	3,118
1955	5,901	4,215	1,686
1956	5,371	3,750	1,621
1957	6,899	4,903	1,996
1958	7,306	5,651	1,655
1959	7,622	5,130	2,492
1960	7,176	4,999	2,177
1961	8,305	5,735	2,570
1962	8,298	5,803	2,495
1963	8,830	5,846	2,984
1964	9,888	6,727	3,161
1965	10,295	7,194	3,101
1966	10,869	6,970	3,899
1967	14,115	9,132	4,983
1968	16,236	9,536	6,700
1969	11,409	8,015	3,394
1970	17,706	11,774	5,932

SOURCE: Moody's Municipal and Government Manual, 1974, p. a14.

APPENDIX B (Continued)

TABLE 2

STATE & MUNICIPAL NEW ISSUE ACTIVITY (1953-70)

LONG TERM ISSUES (MILLIONS)

% DISTRIBUTION

YEAR	TOTAL	GENERAL OBLIGATION ISSUES	REVENUE ISSUES
1953	100	72.8	27.2
1954	100	54.3	45.7
1955	100	71.4	28.6
1956	100	69.8	30.2
1957	100	71.1	28.9
1958	100	77.3	22.7
1959	100	67.4	32.9
1960	100	69.6	30.4
1961	100	69.1	30.9
1962	100	69.9	30.1
1963	100	66.3	33.7
1964	100	68.1	31.9
1965	100	69.8	30.2
1966	100	64.2	35.8
1967	100	64.6	35.4
1968	100	58.7	41.3
1969	100	70.3	29.7
1970	100	66.4	33.6

APPENDIX C

A) Determining the value of the subsidy to State and Local
   governments (Data for 1971)

Formula: (Interest Rate Differential) X (Total Outstanding Debt)

Average Yield of Pollution Control Bonds (Aaa Rating): 5.22%[a]

Average Yield of Corporate Bonds (Aaa Rating)......... 7.39%[b]

Yield Differential 2.17%

Total Amount of Outstanding Debt ....$158,827,000,000[c]
(This amount includes $7,941,350,000 held in government
accounts and is not included in the Total* below.)

Therefore, the value of the subsidy to
State and Local governments is $3,446,545,900

B) Determining the cost of the subsidy to the Federal government
   in loss of revenues from the income tax (Data for 1971)

Formula: (Average Rate of Interest of Municipal Bonds x Total
          Outstanding Debt) X (Average Tax Bracket of Individuals
          and Average Tax Bracket of Corporations)

          Estimated Ownership of Outstanding State and
          Local Debt: Based on 1967 distribution and
          1971 Outstanding debt.

	Percentage Distribution**	Amount Held
Individuals:	36.8	$ 55,525,919,000
Commercial Banks	42.3	63,824,629,000
Insurance Companies	14.3	21,576,647,000
Corporations	4.4	6,638,968,000
Miscellaneous	2.2	3,319,484,000
Total*	100.0	$150,885,650,000

APPENDIX C (Continued)

Average Rate of Interest of Municipal Bonds: 5.52%

Total Outstanding Debt: $158,827,000,000.

Average Tax Bracket of Individuals: .... 60%^{d}

Average Tax Bracket of Commercial Banks ..... 27.895%^{e}

Average Tax Bracket of Insurance Companies .. 32.303%^{f}

Average Tax Bracket of Corporations .... 52%^{g}

Average Tax Bracket of Miscellaneous 52%

1) Cost of the Subsidy to the Federal Government
   due to Loss of revenues of Individual Income Tax
   (5.52% x $55,525,919,000) X (60%) $1,839,018,400

2) Cost of the Subsidy to the Federal Government
   due to Loss of Revenues of Commercial Bank
   Income Tax 982,774,180

3) Cost of the Subsidy to the Federal Government
   due to Loss of Insurance Company Income Tax 384,738,710

4) Cost of the Subsidy to the Federal Government
   due to Loss of Corporation Income Tax 190,564,930

5) Cost of the Subsidy to the Federal Government
   due to Loss of Miscellaneous Income Tax 95,282,465

Total $3,492,378,685

From the above figures, the average Income Tax rate is: 41.931%***

Sources for APPENDIX C

a. Moody's Municipal and Government Manual, 1974, p. A18.

b. Moody's Bond Record, 1974, 124.

c. Moody's Municipal and Government Manual, 1974, p. A11.

d. Moody's, Ibid., p. A18.

e. Richard Goode, The Individual Income Tax, (The Brookings Institution, 1964) p. 143.

f. Statistics of Income, Business Income Tax Returns, Department of the Treasury, Department of the Treasury, (U.S. Government Printing Office, Washington, D.C.) p. 178-179.

g. Ibid.

** These percentage distribution figures are from Appendix E, Table 2, for the year of 1967.

*** This agrees with Richard Goode's findings of an overall rate of 41%. See Richard Goode, op.cit., p. 141.

APPENDIX D

Municipal Environmental and Pollution Control Industrial Revenue Bonds

TABLE 1

Total volume by rating 1971-1974 (000's)

Year	Aaa	Aa	A	Baa	Unrated	Total
1971	--	10.5	41.1	18.3	--	69.90
1972	25.0	94.8	166.45	48.29	109.68	444.22
1973[a]	94.5	220.12	669.55	201.30	473.20	1,658.67
1974[b]	243.40	320.25	562.94	285.73	30.50	1,442.82

Source: a. Moody's Municipal and Government Manual, 1974, p. A28-30.
b. Moody's Bond Record, January, 1975, pp. 74-79.

TABLE 2

Yield: (State-Local).
Corporate

Year	Aaa		Aa		A		Baa		Unrated	
	(State-Local)	Corporate	(State-Local)	Corporate	(State-Local)	Corporate	(State-Local)	Corporate	(State-Local)	Corporate
1971	--		(5.36)	7.78	(5.61)	8.03	(5.89)	8.56	(5.52)	7.94
1972	(5.04)	7.21	(5.18)	7.47	(5.38)	7.66	(5.60)	8.16	(5.29)	7.62
1973	(4.99)	7.44	(5.10)	7.65	(5.28)	7.83	(5.49)	8.24	(5.21)	7.79
1974	(5.89)	8.57	(6.04)	8.67	(6.27)	9.16	(6.53)	9.50	(6.18)	8.98

Source: (State-Local) - Moody's Bond Record, 1974, p. 79.
Corporate - Ibid., p. 139

APPENDIX D (Continued)

TABLE 3

INTEREST RATE DIFFERENTIAL

Year	Aaa	Aa	A	Baa	Unrated
1971	--	2.42	2.42	2.67	2.42
1972	2.17	2.29	2.28	2.56	2.33
1973	2.45	2.55	2.55	2.75	2.58
1974	2.68	2.63	2.89	2.97	2.80

TABLE 4

VALUE OF THE SUBSIDY TO STATE & LOCAL GOVERNMENTS BY RATING

YEAR	Aaa	Aa	A	Baa	Unrated	Total
1971	--	254,100	994,620	488,610	--	1,737,330
1972	542,500	2,170,920	3,795,060	1,236,224	2,555,544	10,300,248
1973	2,315,250	5,612,932	17,073,525	5,918,220	12,208,560	43,128,487
1974	6,523,120	8,422,575	16,268,966	8,486,181	854,000	40,554,842

TABLE 5

LOSS OF FEDERAL GOVERNMENT TAX REVENUES

Using an overall rate of .41931% as established in Appendix C, the loss of Federal Government tax revenues is as follows:

1971	1,617,899
1972	9,853,465
1973	36,235,279
1974	37,388,311

APPENDIX E

TABLE 1

Estimated ownership of State and
Local Interest-Bearing Securities (1947-1967)

(Billions of Dollars)

	Total	Total Public	Total Private	Individuals	Commercl banks	Insurance Co.'s	Corporations	Misc.
1947..	16.6	2.9	13.7	6.9	5.0	.9	.4	.5
1948..	18.4	3.0	15.4	7.7	5.6	1.1	.4	.6
1949..	20.5	3.1	17.4	8.8	6.0	1.6	.5	.5
1950..	23.8	3.9	19.9	9.2	7.4	2.2	.5	.6
1951..	26.7	4.3	22.4	10.1	8.6	2.5	.6	.6
1952..	29.2	4.6	24.6	10.5	9.9	2.8	.6	.8
1953..	32.3	4.9	27.4	11.6	10.6	3.5	.7	1.0
1954..	37.4	4.8	32.5	13.8	12.0	4.6	.9	1.3
1955..	42.7	5.2	37.6	16.4	12.8	5.8	1.1	1.4
1956..	47.5	5.5	42.0	19.5	13.0	6.6	1.3	1.6
1957..	52.0	6.0	46.0	22.0	13.4	7.4	1.5	1.7
1958..[a]	56.7	6.6	50.1	22.7	15.8	8.2	1.5	1.9
1959..[b]	62.0	7.1	54.8	24.6	17.0	9.5	1.7	2.0
1960..	66.4	7.4	59.0	27.2	16.8	11.1	1.7	2.2
1961..	71.7	7.8	64.0	28.3	18.8	12.6	1.9	2.3
1962..	80.1	7.7	72.4	30.5	23.2	13.7	2.4	2.4
1963..	85.9	7.0	78.9	31.7	27.9	14.5	2.6	2.3
1964..	91.3	6.2	85.1	33.5	31.5	15.0	2.7	2.2
1965..	99.2	5.8	93.4	36.0	36.6	15.2	3.3	2.3
1966..	104.8	5.5	99.3	38.2	40.3	14.4	4.1	2.3
1967..	113.3	5.2	108.1	39.8	45.6	15.5	4.8	2.4

Source: For 1947-1958, see: James A. Maxwell, "Exclusion from
Income of Interest on State and Local Government Obligations
Tax Revision Compendium, 1959, p. 717.

For 1959-1967, see: Moody's Municipal and Government
Manual, 1967-1968, p. A 15.

APPENDIX E

TABLE 2

PERCENTAGE DISTRIBUTION OF STATE AND LOCAL SECURITIES

YEAR	INDIVID UALS	COM MERCL BANKS	INSUR ANCE CO.'S	CORP ORATIONS	MISC.	PUBLIC	PRIVATE
1947	50.4	36.5	6.6	2.9	3.6	18	82
1948	50.0	36.4	7.1	2.6	3.9	16	84
1949	50.5	34.5	9.2	2.9	2.9	15	85
1950	46.5	37.8	10.6	2.8	2.3	16	84
1951	45.1	38.4	11.1	2.7	2.7	16	84
1952	42.6	40.2	15.5	2.4	3.3	16	84
1953	44.0	38.8	12.7	2.6	1.9	15	85
1954	42.3	36.8	14.1	2.8	4.0	13	87
1955	43.7	34.1	15.5	2.9	3.7	12	88
1956	46.4	31.0	15.7	3.1	3.8	12	88
1957	47.7	29.2	16.0	3.3	3.8	12	88
1958	45.5	31.6	16.5	3.0	3.4	12	88
1959	44.9	31.0	17.3	3.1	3.6	12	88
1960	46.1	28.5	18.8	2.9	3.7	11	89
1961	44.2	29.4	19.7	3.0	3.6	11	89
1962	42.1	32.0	18.9	3.3	3.3	10	90
1963	40.2	35.4	18.4	3.3	2.9	8	92
1964	39.4	37.0	17.6	3.2	2.6	7	93
1965	38.5	39.2	16.3	3.5	2.5	6	94
1966	38.5	40.6	14.5	4.1	2.3	5	95
1967	36.8	42.3	14.3	4.4	2.2	5	95

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Vita Auctoris

June 3, 1944	Born in Hungary to Anthony and Katherina Amort
July, 1948	Emigrated from Hungary to Alsace, France.
October, 1951	Immigrated to Toronto, Canada, and attended St. David's and Holy Rosary grade schools.
September, 1959 to June, 1965	Attended Oakwood Collegiate Institute and graduated with Senior Matriculation.
September, 1965	Accepted at Waterloo University College and enrolled in the School of Business and Economics.
June 17, 1967	Married to Barbara Lynne (nee Chappell).
August, 1968	Received Bachelor of Arts Degree in Economics at Waterloo University College.
September, 1968 to May, 1969	Attended Waterloo University College for Master of Arts qualifying year.
September, 1969	Accepted and enrolled at the University of Windsor for Master of Arts candidate year.
April, 1970	Completed course work and oral comprehensives at the University of Windsor.
May, 1970	Joined Xerox of Canada Ltd., in Sarnia as an Associate Sales Representative.
May 22, 1972	A son, Joseph Scott, was born.
October, 1973	Joined IBM as a Sales Representative in Windsor.
February 19, 1975	A daughter, Leanne Heather, was born.