

**ΟΙΚΟΝΟΜΙΚΟ
ΠΑΝΕΠΙΣΤΗΜΙΟ
ΑΘΗΝΩΝ**



**ATHENS UNIVERSITY
OF ECONOMICS
AND BUSINESS**

SCHOOL OF ECONOMIC SCIENCES

DEPARTMENT OF ECONOMICS

STRATEGIC ENVIRONMENTAL POLICY WITH FINANCIAL INSTITUTIONS

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Dissertation submitted for partial fulfillment of the necessary conditions for obtaining
the Master of Science Degree

Athens

[March,2021]



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ACKNOWLEDGMENTS

In the end of this master's dissertation, the cycle of my postgraduate studies is completed. At this point I would like to thank my supervisor professor Antoniou Fabio for his guidance throughout the duration of the work but also for his valuable advice and remarks. Also, thank you to my examiner professors, Dendramis Ioannis and Dioikitopoulos Evangelos. Finally, I would like to thank my family and my close friends for their full support and assistance in completing my studies.



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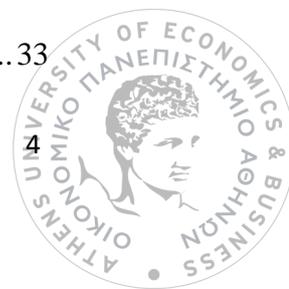
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ΠΕΡΙΛΗΨΗ

Το αντικείμενο της παρούσας εργασίας βασίζεται στην στρατηγική περιβαλλοντική πολιτική η οποία αποτυπώνεται μέσα από ένα παίγνιο. Γίνεται δηλαδή, μια εκτενής ανάλυση ενός θεωρητικού μοντέλου τριών σταδίου που διαδραματίζεται ανάμεσα σε δύο χώρες όπου κάθε χώρα αποτελείται από έναν παραγωγό, μια τράπεζα και μια κυβέρνηση, καθώς και η σύγκριση των περιπτώσεων όταν η κυβέρνηση θέτει φόρους ή πρότυπα. Παρουσιάζονται τα αποτελέσματα σε κάθε περίπτωση και γίνεται εκτίμηση αυτών. Τέλος, αναφέρεται ο τρόπος με τον οποίο επηρεάζονται οι αποφάσεις που λαμβάνει ο χρηματοδοτικός φορέας που είναι η τράπεζα.

Λέξεις κλειδιά: περιβαλλοντική πολιτική, φόροι εκπομπών, πρότυπα εκπομπών, περιβαλλοντικό παίγνιο, κυβερνητική ευημερία, τραπεζικά δάνεια

ABSTRACT

The subject of this paper is based on the strategic environmental policy which is reflected through a game. In other words, an extensive analysis of a three-stage theoretical model that takes place between two countries where each country consists of a producer, a bank and a government, as well as a comparison of cases where the government sets taxes or standards. The results are presented in each case and are evaluated. Finally, it mentions the way in which the decisions taken by the financial institution that is the bank are influenced.

Keywords: environmental policy, emission taxes, emission standards, environmental game, government welfare, bank loans



CHAPTER 1

INTRODUCTION

One of the most talked about and highly studied topics are climate change and its adverse effects on humanity. Climate change means an increase in the concentration of greenhouse gases in the atmosphere. Maybe our planet is so uneven in terms of temperatures and climate on every continent, scientists tend to use an average temperature to describe the temperature of the planet which seems to have risen in recent years. In the list of results Climate change is compounded by rising sea levels, melting ice and disruption of the planet's flora and fauna. In recent years, efforts have been made to find a solution to the problem of climate change. Man cannot control nature and its forces but can slow down through his actions the reckless use of carbon dioxide and methane as well as other fossil fuels used by industries to produce products.

At the same time, one means used to reduce pollution is the imposition of standards or taxes. In the case of standards, the government of each state sets an amount of pollutants that allow industries to emit. However, in case they exceed this amount, they are forced to pay in order to cover this difference. This motivates industries to either aim to reduce the amount of pollutants they emit into the environment or to use marketable licenses through which a country that has a surplus in polluting production can sell a pollutant to a polluting emitter which has reached its permissible limit. In the other case we have the taxes which are re-imposed by the government depending on the amount of pollutants emitted by each industry.

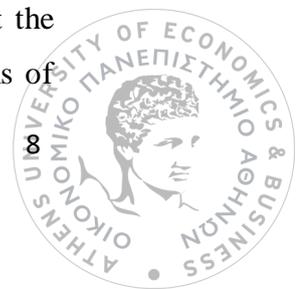
Banks do not remain uninvolved in the effort to reduce pollutants or may increase them. It seems that some banks are trying to give what are known as green loans to consumers in order to push them to use renewable energy sources such as air, water and sun. However, there are many times when they are the ones who finance polluting situations, thus proving that they are not always fundamental to the good of the environment. In recent years, the relationship between economies, human activities and climate change have developed strong links and are interdependent and has been the subject of research and study in recent years for many.



At the same time and through the Paris conference held in 2015, special interest was expressed for the strengthening and empowerment of the environment. They suggested that it would be beneficial to reduce greenhouse gas emissions and give more impetus to ecology and the actions around it. So they started in the markets green bonds that have energy efficiency and reduce environmental pollution. Also noteworthy is the creation of the British Green Investment Bank, which specializes in projects related to environmental protection, and the creation of a green credit division by the world's largest bank ICBC in China. Similar initiatives are being developed by many other industrialized and developing countries. At the same time there are no stocks left and central banks around the world have also begun to discuss the effects of climate change on monetary policy, with some such as the Bank of England increasing the Central Bank response to the fundamental (including environmental) change in key research priorities.

This discussion it usually focuses on the impact of climate change, as well as policies designed to address it. Both theorists and empiricists are increasingly analyzing the interdependent relationships between economic growth and global warming. As yet, many questions remain unanswered and economic research lags behind the proliferation of climate-related policies. In this study I set out a simple model which allows both governments and producers to act strategically and not strategically for convenience.

The purpose of this research is through the representation of a three-stage theoretical environmental game consisting of producers, banks and governments to reflect each other's interests and interpret the results according to emission taxes or emission standards. The structure is: In the first chapter there is an introduction where there is a smooth transition to the topic and it is discussed briefly but also in general a general context of the research topic which is studied. We proceed to the second chapter where through a bibliographic report that is made, everything that is identified as research objects is described, what other studies have shown, what research has been done as well as the results or otherwise conclusions of all of them. In the third chapter we have the central theme, i.e. the main body of the present work where the description of the environmental model is described and various cases are studied. Finally, we arrive at the last two chapters where there is the best solution. At the same time, in the last chapter there is the conclusion and my personal opinion about the study that took place. Through this environmental game depending on the forms of



environmental policy that the government decides to define and of course depending on whether the players want to play strategically or not we have different results. The question arises as to which of these forms is better, i.e. the case of tax imposition or standards and whether when they act strategically or not. Even in what case the best prosperity is achieved in a state. At the same time, the decisions of each bank are examined and what is affected by it. The results show what the interest rates of the loans granted to the producers to do with the taxes have imposed not only by the domestic government but also by the rival government. The same is true when the government applies the standards as an instrument of environmental policy. However, the decisions of the banks in the absence of the strategic form and the relations they have with the respective environmental policy that is applied to both the domestic government and the rival government are examined and interpreted.



CHAPTER 2

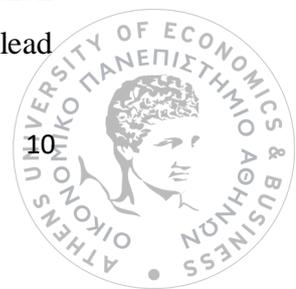
LITERATURE REVIEW

The term environmental policy consists of two words, environmental and policy. The first term describes the natural ecosystems that are in an environment but also the social and economic dimension. The second term, which is politics, describes the principle of action implemented by a government. In short, environmental policy reflects the pursuit of reducing pollution with the aim of prosperity, better quality of life but also to stop the negative effects of humans on natural ecosystems. The above action taken by a government as typical proposals to save the environment and stop human intervention are taxes and tax exemptions, market licenses and fees can be very effective in encouraging compliance with environmental policy. The need to enact laws that will be able to protect the environment soon came. Nevertheless, it would be useful to describe the story of the environmental policy from the past until today.

When the environmental revolution broke out in 1960, the world of economists was there waiting for him. They had already formed their views on this environmental disaster as well as its implications for public policy. The proposal was then made to use a price, i.e. a tax on polluting activities. Marshall and Pigou have been pioneers and have already proposed various means of controlling this environmental burden for the sake of prosperity and a better quality of life.

Experts in this case, in order not to stop the above effort, sought to find ways to reduce harmful gas emissions to heat. Taxes and standards were provided where in the first case there is a price for each carbon dioxide gas released into the atmosphere while in the other case there is a maximum emission limit for such gases. However, this means that the cost of a product will increase since now there is the mandatory tax and according to the law of demand and supply now the demand will decrease due to price and therefore the supply.

A number of studies such as Weitzman (1974) with Adar and Griffin (1976) have questioned how uncertainty about the cost of testing standards can affect their performance. Buchanan (1969) once argued that the taxation of Pigouvians could lead



to undesirable distributions when polluting companies have market power. Weitzman (1974), who formulated the policy rule, expressed the belief that it does not matter which instrument is chosen, that is, whether they are fair or standard, although polluting companies still have market power. At the same time, research (Jorgenson and Wilcoxon 1990) showed that the environmental standards and technologies used were a brake on economic growth as the cost was set as particularly high. Finally, analyzes by Markusen, et al. (1993), Motta and Thisse (1994) and Ulph (1994), have shown that the place where each industry is located is also important, since in this case, too, environmental policies have a significant impact.

To control environmental regulation, each state chooses an environmental policy such as the imposition of taxes or the imposition of standards. Research by Petrakis and Xepapadeas (2001) has shown that when a specific environmental policy instrument is not used by the regulator, there is greater prosperity but also that a strategic behavior can have a positive impact and create a greater environmental impact. At the same time, when a tax is used to control pollution and the subsequent tax reduction caused by strategic behavior also increases environmental innovation. This surplus resulting from higher production is not considered to offset the increase in costs and environmental damage. Finally, there was talk from the above research that the tax can have a positive effect when it is not capable of affecting and the policy specifications will depend on the marginal damage caused.

However, there are many times when environmental policy tends to be distorted instead of having a positive impact, it starts and creates difficult problems in the environment and many times irreparably. In a monopoly market it seems that there are incentives to distort environmental policy and depending on market behavior it is judged whether taxes or standards will be applied. According to research, an industry tends to reduce its behavior strategy when its marginal loss begins and becomes greater. When marginal losses reach a steadily increasing rate, the behavioral strategy adversely affects prosperity regardless of the measure used by the regulator. Research shows that it is best to apply a tax-free tax when marginal losses increase, but when they are stable, the best policy is to commit independently of the policy instrument, as a tax and a standard are socially equivalent. At the same time, other research presents a very interesting and not expected result which shows that strategic behavior not only does not have negative effects but also contributes positively to the prosperity of a government. This beneficial reaction can really influence environmental policy-

making and provoke environmental innovation. An example is when the domestic government has a standard to deviate and impose a weak environmental standard and thus seek to weaken the standards and thus improve competitiveness. However, in reality, environmental policy cannot strengthen competitiveness as much as industrial policy. The government, which intervenes in environmental policy, is often involved in this situation, but the belief that weak standards improve competitiveness is not strong. At the same time, it must be said that when the number of companies exceeds one, the incentive for weakening begins to decrease as much as it can and plays the opposite role. Finally, a distinction must be made when countries compete for price or quantity because it determines whether countries will impose strong standards. Last but not least, which accounts for all of the above is that the incentives for distorting environmental standards are not significant and may have the opposite effect. For a better quality of life and an environment that will not be violated is the responsibility of all of us.

The relationship between environmental practice and banking does not seem to be so foreign. Banks try to invent ways and solutions so as to motivate their customers to respect the environment. They use more lenient terms such as financing for young investors whose business is environmentally friendly and adapted to climate change. By bank we mean the medium or otherwise the business which has multiple roles of money and credit. It is used by consumers for a variety of reasons such as deposits, loans, transfers, payments and investment products. It is obvious that in recent years significant efforts have been made to strengthen last year's economy and the financing of such actions with the aim of reducing the greenhouse effect. This type of strategy turns producers to investments aimed at low levels of carbon dioxide. However, because it is a costly process it is natural to incur significant losses (Punzi M., 2018). However, according to studies, many did not see such an action in a positive way, i.e. to finance green businesses (Yoshino and Taghizadeh-Hesary 2018). There are risks from such actions as market distortion but also losses for financial institutions such as banks. In order to avoid the above, it would be useful to create alternative policies but also to give incentives to the banks to be willing to finance such actions. As mentioned the cost of setting up a green business has significant costs for each producer and this suggests that the savings of each industry are not enough to help him produce for this reason looking for a solution to an external financial institution such as the bank. In cases where the industry produces large quantities of carbon

dioxide, it is proposed to finance them with some form of loans or shares, thus creating a debt and capital strategy. Still, only an economic shock can save low-carbon industries. More specifically, the term financial shock means the ability to borrow in terms of tightening or relaxing the collateral while it is considered positive

by the creation of green bonds for example. The central banks did not remain uninvolved in supporting the green financing. In order for the transition to green entrepreneurship to become a reality, there must be policy coordination to ensure that the monetary and credit system is aligned with green entrepreneurship. But there are still central banks that believe in the potential risk of such an action.

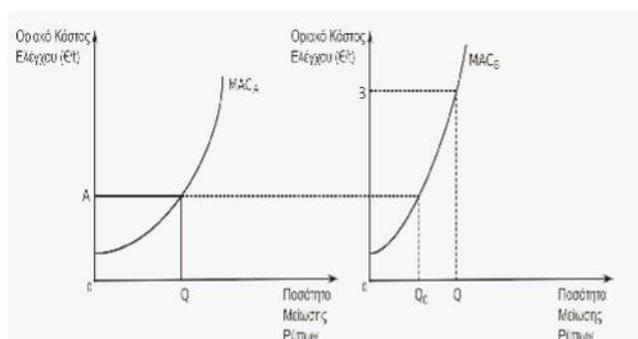
The government has great influence in the financial world and for example in the banks. Through the decisions they make and the laws they enact, they influence the various economic affairs. They also influence the decisions taken by the central banks, which aim to control the interest rate that they can lend money to the banks and in general to the amount of money in circulation. It has been observed that high interest rates slow down the economy while in contrast lower ones give incentives for lending. In short, our findings show that stock market-based financial systems are closely linked with better environmental quality. This suggests that countries with a

bank-based financial system targeting their green economy, such as through the promotion of green bonds or other green ones financial initiatives, could consider stimulating the growth of conventional stock markets as good.

The question is often asked, as has been done in some research on which environmental policy is better, i.e. standards or taxes. Tax policy is one of the most basic strategies that a state must develop with the goal of economic development. Within a state there are many and frequent tax changes because this ensures the fiscal course. In general, with the imposition of a tax, this implies the increase of the cost of a product, then the shift of the supply curve to the left and finally the reduction of the quantity produced. Taxes are considered to falsify economic activities and there are many times when they bring negative results, but this does not mean or even excludes the possibility of positive results. There are cases that show that taxes, in addition to raising revenue for the state (public), also lead to social prosperity. In order to answer to the answer which of the two is better, i.e. taxes or standards we compare both of them. Both have both positives and negatives. Initially, in the case of standards, we believe that direct control and enforcement of pollution control standards is usually inefficient, as they do not minimize costs for a given level of pollution reduction to

achieve efficiency. The overall level of pollution reduction units should be distributed among the companies in such a way that the marginal cost pollution reduction faced by different sources to be the same. However, quantitative standards may fail to equalize marginal costs of different sources of pollution leading to inefficiency, however require fewer resources to enforce and monitor them. At the same time some disadvantages of enforcing the standards are that some standards are not directly related to pollutant emissions and thus the effectiveness. In addition, a uniform treatment of all types of mechanical equipment does not allow taking advantage of specific advantages that each technology has, while no incentive to seek and find new methods of pollution control or improving efficiency, beyond the limits set by law. In addition, monitoring presents the expected relative difficulty. Next, in the case of taxes, determining the tax is difficult, as we need information to estimate the marginal cost of pollution control (MAC), but and the marginal damage caused by pollution. The problem is how to find the right amount of tax / subsidy. The first excellent solution is achieved equating the tax with the value of the marginal control cost. Due to difficulty in knowing the pollution control marginal cost curve (MAC) a second excellent solution is to set a high tax level.

In conclusion, we understand that the environmental policy imposed by each government, the financial institutions and the industries are inextricably linked and each change made by one term has a decisive effect on the other.



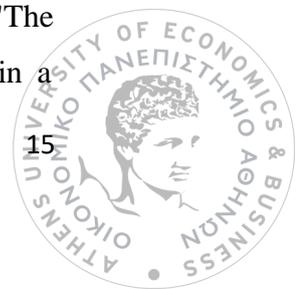
CHAPTER 3

GAME THEORY AND ENVIRONMENTAL GAMES

Game theory began its history as a branch of economics and its main concern is to analyze decisions in competitive interdependence strategies. After all, there are many times when even in our daily life we are called to make a decision on various important issues that concern us. So in order to be able to solve these problems we use games as a mathematical method of analysis. It tries through theoretical models such as the present work to represent a reality and to be a basic source of ideas regarding the use of strategies, the interaction of players and the consequences. Game Theory has been applied effectively in the past in both international relations and diplomacy (Stein, 1990), as well as in negotiations related to global environmental protection (Barrett, 2003). Game theory incorporates key elements of both the realist and liberal views of international politics (Stein, 1990). At the same time, environmental problems and, consequently, environmental policies are not easy and simple processes. Environmental problems know no boundaries and they cannot always control nature. This makes it difficult to decide on the right environmental policy. In this case, all scientific methods for the right kind of environmental policy should be investigated in order to mitigate or fail to avoid the risk of the consequences they may have.

The right choice and the best solution can on the one hand be considered the one that has the highest risk percentage and on the other hand it can be considered the one in which no one has the incentive to deviate, i.e. the Nash balance. Finally, we have the dominant strategies for each player where it seems how confident and strong a strategy is for each player and ultimately his desire to deviate from it or not. From the study of the environmental game, of course, some questions arise. A typical example is the factors that influence the environmental policies and solutions of the game but also what can be done to improve the results. The answer to the above questions can be considered as the earnings of each player since they are the ones that influence the decisions that he will make.

The American philosopher and ecologist Garrett Hardin in the classic article "The tragedy of the commons" describes a situation in economics in which users in a



society when they have access to the use of a good without being restricted by a higher power or by some rules act independently aiming only at their personal benefit and consequently the maximum profit for them. Garrett Hardin tried to give a solution, that is, an answer to the above situation. He suggested that we give up our freedoms and operate in a reciprocal way. The above sentence is even more important nowadays since the development of technology and the complex way of life have made it difficult for nature and our lives.

At the same time, the theory of Gregory Bateson, who speaks of double commitment, finds fertile ground in the present issue. The above theory describes a situation in which a user receives simultaneously conflicting messages where one is opposite to the other. Double commitment occurs when the individual cannot face the inherent dilemma and therefore can neither resolve it nor be excluded from the situation. Therefore, in our case, which has to do with the burden on the environment, the user is in a position with two messages. On the other hand, he states that the right thing is to follow the rules and avoid polluting the environment, but on the other hand, he seems to consider himself naive to follow the rules because others act with what is best for them, while he does not. After this it is understood that for the user not only the rules but also the reprimands that are done to him and that in fact the study of the problem must be done and methodical steps must be found in order to solve the environmental problem. We need the cooperation of all the competent bodies that are the legislation, the policy and others which should focus on the problem and make the users follow these policies since they themselves will see that the government does not make any distinction in its case non-enforcement punishes the offender.

CHAPTER 4

THE MODEL OF THE GAME

One of the most well-known environmental issues is the limitation of the increase of the temperature of the environment, which is addressed by the establishment of environmental policies, which try to be shaped and become an integral part of the negotiations that take place. Game theory provides the right tools to represent the relationships and interactions of the players involved in this game. More specifically, I use a model of a single industry where there are two producers who produce a homogeneous product. Below are presented in detail the equations for each producer from each country in case of strategic form as well as what each variable that makes up the equation expresses. The total revenue function for the first producer from the first country is:

$P(x, y) = (A - x - y) * x$ where, the x is the own output but the y is the output of the rival. Similar with the first producer is the second one whose total revenue function is: $P(x, y) = (A - x - y) * y$ where, the y is the own output but the x is the output of the rival.

Each producer to produce has some costs. This cost of production represents the means used by producers to produce such technology. Cost functions are represented below:

The total cost function for the first producer is: $C(x, \varphi) = \frac{\varphi * x^2}{4}$ where φ is a parameter which symbolizes the strategic form. Similar the cost function for the second producer is $C(y, \varphi) = \frac{\varphi * y^2}{4}$. Nevertheless, the producers may not choose to play strategy which will change the equations and in particular there will be the absence of the parameter φ . So, the equation of the cost function in case of no strategic form for the first producer is $K(x) = x$ and for the second producer is $K(y) = y$. When producers produce, they emit some pollutants into the air which are harmful to the environment. For this reason some filters are used which also have some cost for them. The emissions of the pollutant are $e = x - a$ and the abatement

cost is $\frac{a^2}{2}$. Finally, the environment does not remain unaffected by local production and ultimately these catastrophes caused to the local economy are represented as $\frac{de^2}{2}$.

The producer will need some form of financing in order to produce. The financial institution in this game is the bank. The type of finance in this study is a loan. However the bank except the profit which has expenses from the loan it has and cost from the central bank. So, the revenue function for the first bank is:

$B(r, x, c) = r * x - c * x$. The first term which is $r * x$ represents the profits from the loan where r is the rate and x is the amount of the loan. The second term which is $c * x$ represents the expenses which have to the central bank.

It is up to each government to decide what environmental policy it will have. There are two options available. On the one hand there is the imposition of taxes which is represented by the variable t and on the other hand there is the imposition of standards

i.e. a maximum set which is represented by the factor e . I believe that both governments will impose the same way of environmental policy. The government's welfare function will be total revenue minus total costs of production minus total costs of abatement minus total costs of pollution damage.

Last but not least, I must describe the moves of the structures. All players, i.e. producers, banks and governments, choose to act strategically or non-strategically. So, I have a three-stage game. In the first stage there is the government that chooses what kind of environmental policy to use taking into account the environmental policy of the adversary. In the second case there is the bank. The role of the bank is to finance producers in order to produce. Finally, in the third stage, the producers choose their

production levels as non-cooperative. We seek the perfect balance in any environmental policy, both in the case of the strategic form and in its absence.

However, the timing of the development of this game must also be mentioned. For the moment $t=1$ there is the government, for the moment $t=2$ there is the bank and at the last moment $t=3$ is the producer. For the moment $t=1$ government has two options to act strategically or not when decides what type of environmental policy will set, taxes or standards. In addition, for the moment $t=2$ bank has two options strategic form or

no strategic form and in this moment chose what rate will set to the producer according to the loan which gives to him. In the last moment, which is $t=3$ we have the producer, who has and him two options act strategically or not in order to achieve the best profit for his industry.

Taxes strategic form:

The profit equation for producer 1 from country 1 in case of taxes is:

$$P = (A - x - y) * x - \frac{\varphi * x^2}{2} - t * (x - a) - \frac{a^2}{2} - r * x \quad (1)$$

I mention in detail what each term describes in the above profit equation of the producer.

The first part which is $(A - x - y) * x$ is describing its revenue, mentioning its costs when operating strategically, the $\frac{\varphi * x^2}{2}$ describing the cost to the producer of the tax, the $\frac{a^2}{2}$ is a cost that reflects the filters and finally the $r * x$ showing the costs it incurs for to take the loan from the bank in order to produce.

The main concern of the producer is to maximize his profit and of course the quantity he produces. In the third-stage game the producer knows the emission tax, t , set by the government at stage 1 and the amount of loan which it takes from the bank set in stage 2, φ , takes as given the output of its rival, y , and chooses its output, x , and abatement, a , to maximize.

So I get first-order conditions for the equation (1) and finally I have:

$$a = t \quad (2)$$

$$x = \frac{A - r - t - y}{2 + \varphi} \quad (3)$$

The profit equation for producer 2 from country 2 in case of taxes is:

$$p = (A - x - y) * y - \frac{\varphi * y^2}{2} - T * (y - b) - \frac{b^2}{2} - R * y \quad (4)$$

I carry out a similar procedure for the producer from the other country. The profit equation is the same only that now instead of x I have y , I symbolize the taxes now with T , the filter cost with b and finally I have an interest rate R .

In the third-stage game the producer knows the emission tax, T , set by the government at stage 1 and the amount of loan which it takes from the bank set in stage 2, φ , takes as given the output of its rival, y , and chooses its output, y , and abatement, b , to

maximize.

So I get first-order conditions for the equation (2) and finally I have:

$$b = T \quad (5)$$

$$y = \frac{A-R-T-x}{2+\varphi} \quad (6)$$

Solving the system from (2), (3), (5) and (6) we find the optimal solution which satisfies the following combination:

$$x = \frac{-A+2r-R+2t-T-A\varphi+r\varphi+t\varphi}{3+4\varphi+\varphi^2} \quad (7)$$

$$y = \frac{-A-r+2R-t+2T-A\varphi+R\varphi+T\varphi}{3+4\varphi+\varphi^2} \quad (8)$$

We continue to the second stage where there is a bank. The profit equation for bank 1 from country 1 in case of taxes:

$$Q = r * x - c * x \quad (9)$$

The first member $r * x$ is declares the income he has from the loan it gives where it symbolizes the interest rate while the amount he will lend. The other member $c * x$ declares the expenses of the bank where he declares the interest rate set by the central bank and again he declares the amount that the bank lent.

I carry out a similar procedure for the bank from the other country. The profit equation is the same only that now instead of x I have y , I symbolize the rate now with R and the rate which set from the central bank is same both to the two countries.

So the profit equation for bank 2 from country 2 in case of taxes is:

$$q = R * y - c * y \quad (10)$$

The bank wants to maximize the interest rate it will lend and of course be much higher than what it will pay to the central bank so that it has a significant profit. Therefore at this stage for both banks I take first class conditions and maximize in terms of r and R . So the equation (9) and (10) become the following:

$$r = \frac{\frac{A}{3+4\varphi+\varphi^2} + \frac{R}{3+4\varphi+\varphi^2} + \frac{2t}{3+4\varphi+\varphi^2} + \frac{T}{3+4\varphi+\varphi^2} + \frac{A\varphi}{3+4\varphi+\varphi^2} + \frac{t\varphi}{3+4\varphi+\varphi^2} + \frac{c(2+\varphi)}{3+4\varphi+\varphi^2}}{\frac{2}{3+4\varphi+\varphi^2} + \frac{\varphi}{3+4\varphi+\varphi^2} + \frac{2+\varphi}{3+4\varphi+\varphi^2}} \quad (11)$$



$$R = \frac{\frac{A}{3+4\varphi+\varphi^2} - \frac{r}{3+4\varphi+\varphi^2} - \frac{t}{3+4\varphi+\varphi^2} + \frac{2T}{3+4\varphi+\varphi^2} - \frac{A\varphi}{3+4\varphi+\varphi^2} + \frac{T\varphi}{3+4\varphi+\varphi^2} - \frac{c(2+\varphi)}{3+4\varphi+\varphi^2}}{\frac{2}{3+4\varphi+\varphi^2} - \frac{\varphi}{3+4\varphi+\varphi^2} + \frac{2+\varphi}{3+4\varphi+\varphi^2}} \quad (12)$$

Solving the system from (11) and (12) I have:

$$r = \frac{1}{4}(2(A + c - t) + \frac{-2A + 2c + t + T}{3 + 2\varphi} + \frac{-t + T}{5 + 2\varphi}) \quad (13)$$

$$R = \frac{1}{4}(2(A + c - T) + \frac{-2A + 2c + t + T}{3 + 2\varphi} + \frac{t - T}{5 + 2\varphi}) \quad (14)$$

I continue with the first stage which is the government. The profit equations for governments are described above. The government has revenue from the business, from the bank and from the type of taxes it imposes. On the other hand, it also has costs and these are the damages caused by the infection. So the government's profit equation for the first country is:

$$W = (A - x - y) * x - \frac{\varphi * x^2}{2} - \frac{t^2}{2} + c * x - \frac{d * (x-t)^2}{2} \quad (15)$$

Similar with the first government, is and the profit equation for government from the second country:

$$w = (A - x - y) * y - \frac{\varphi * y^2}{2} - \frac{T^2}{2} + c * y - \frac{d * (y-T)^2}{2} \quad (16)$$

Governments want to have revenue and they will succeed from the tax policy they choose for this reason I get first class conditions in terms of t and T respectively. From (15) and (16) I have:

$$t = \frac{dx}{1+d} \quad (17)$$

$$T = \frac{dy}{1+d} \quad (18)$$

Solving the system from (17) and (18) I have:

$$t = \frac{dx}{1+d} \text{ and } T = \frac{dy}{1+d}$$

Standards strategic form

First, we describe the equations of both countries where each country consists of a producer, a bank and the government.

The profit equation for producer 1 from country 1 in case of standards

$$Z = (A - x - y) * x - \frac{\varphi * x^2}{4} - \frac{1}{2} * (x - e)^2 - r * x \quad (1')$$

I mention in detail what each term describes in the above profit equation of the producer.

The first part which is $(A - x - y) * x$ is describing its revenue, mentioning its costs when operating strategically is $\frac{\varphi * x^2}{2}$,

standard is

$\frac{1}{2} * (x - e)^2$, and finally the $r * x$ showing the costs it incurs for to take the loan from

the bank in order to produce. The main concern of the producer is to maximize his profit and of course the quantity he produces. In the third-stage game the producer knows the emission standard, e , set by the government at stage 1 and the amount of loan which it takes from the bank set in stage 2, φ , takes as given the output of its rival, y , and chooses its output, x , to maximize.

So I get first-order conditions for the equation (1') and finally I have:

$$x = \frac{2(A+e-r-y)}{6+\varphi} \quad (2')$$

I carry out a similar procedure for the producer from the other country. The profit equation is the same only that now instead of x I have y , I symbolize the taxes now with T , the filter cost with b and finally I have an interest rate R . So the profit equation for producer 2 from country 2 in case of standards is:

$$z = (A - x - y) * y - \frac{\varphi * y^2}{4} - \frac{1}{2} * (y - \varepsilon)^2 - R * y \quad (3')$$

In the third-stage game the producer knows the emission standard, ε , set by the government at stage 1 and the amount of loan which it takes from the bank set in stage 2, φ , takes as given the output of its rival, y , and chooses its output, y , to

maximize.

So I get first-order conditions for the equation (2) and finally I have:

$$y = \frac{2(A-R-x+s)}{6+\varphi} \quad (4')$$

Solving the system from (2') and (4') we find the optimal solution which satisfies the following combination:

$$x = \frac{2(4A+6e-6r+2R-2s+A\varphi+e\varphi-r\varphi)}{32+12\varphi+\varphi^2} \quad (5')$$

$$y = \frac{2(4A-2e+2r-6R+6s+A\varphi-R\varphi+s\varphi)}{32+12\varphi+\varphi^2} \quad (6')$$

We continue to the second stage where there is a bank. The profit equation for bank 1 from country 1 in case of standards is:

$$V = r * x - c * x \quad (7')$$

The first member $r * x$ is declares the income he has from the loan it gives where it symbolizes the interest rate while the amount he will lend. The other member $c * x$ declares the expenses of the bank where he declares the interest rate set by the central bank and again he declares the amount that the bank lent.

I carry out a similar procedure for the bank from the other country. The profit equation is the same only that now instead of x I have y , I symbolize the rate now with R and the rate which set from the central bank is same both to the two countries. So the profit equation for bank 2 from country 2 in case of standards is:

$$v = R * y - c * y \quad (8')$$

The bank wants to maximize the interest rate it will lend and of course be much higher than what it will pay to the central bank so that it has a significant profit. Therefore at this stage for both banks I take first class conditions and maximize in terms of r and R . So the equation (7') and (8') become the following:

$$r = \frac{\frac{8A}{32+12\varphi+\varphi^2} - \frac{12e}{32+12\varphi+\varphi^2} - \frac{4R}{32+12\varphi+\varphi^2} + \frac{4s}{32+12\varphi+\varphi^2} + \frac{2c(-6-\varphi)}{32+12\varphi+\varphi^2} - \frac{2A\varphi}{32+12\varphi+\varphi^2} - \frac{2e\varphi}{32+12\varphi+\varphi^2}}{-\frac{12}{32+12\varphi+\varphi^2} + \frac{2(-6-\varphi)}{32+12\varphi+\varphi^2} - \frac{2\varphi}{32+12\varphi+\varphi^2}} \quad (9')$$

$$R = \frac{\frac{8A}{32+12\varphi+\varphi^2} + \frac{4e}{32+12\varphi+\varphi^2} - \frac{4r}{32+12\varphi+\varphi^2} - \frac{12s}{32+12\varphi+\varphi^2} + \frac{2c(-6-\varphi)}{32+12\varphi+\varphi^2} - \frac{2A\varphi}{32+12\varphi+\varphi^2} - \frac{2s\varphi}{32+12\varphi+\varphi^2}}{\frac{12}{32+12\varphi+\varphi^2} + \frac{2(-6-\varphi)}{32+12\varphi+\varphi^2} - \frac{2\varphi}{32+12\varphi+\varphi^2}} \quad (10')$$

Solving the system from (9') and (10') I have:

$$r = \frac{1}{4}(2(A+c+e) - \frac{2A-2c+e+\varepsilon}{5+\varphi} + \frac{e-\varepsilon}{7+\varphi}) \quad (11')$$

$$R = \frac{1}{4}(2(A+c+\varepsilon) - \frac{2A-2c+e+\varepsilon}{5+\varphi} + \frac{-e+\varepsilon}{7+\varphi}) \quad (12')$$

Finally, in the third stage there is again the government whose profit equation for government 1 from country 1 in case of standards and for government 2 from country 2 in case of standards are above:

$$M = (A-x-y) * x - \frac{\varphi * x^2}{4} - \frac{1}{2} * (x-e)^2 + c * x - \frac{1}{2} * d * e^2 \quad (13')$$

$$m = (A-x-y) * y - \frac{\varphi * y^2}{4} - \frac{1}{2} * (y-\varepsilon)^2 + c * y - \frac{1}{2} * d * \varepsilon^2 \quad (14')$$

And in this case the aim of the government is to maximize its profits so depending on the equation I maximize by e and e and finally I have the two following equations:

$$e = \frac{x}{1+d} \quad (15')$$

$$\varepsilon = \frac{y}{1+d} \quad (16')$$

Solving the system from (15') and (16') I have the following two equations for e and ε:

$$e = \frac{x}{1+d} \text{ and } \varepsilon = \frac{y}{1+d}$$

Taxes no strategic form

However, there is also the case that the players do not act strategically in both cases, both in the case of taxes and in the case of standards. Since the players do not act strategically, the term ϕ is missing from the corresponding equations. Eventually the results differ compared to before and so do the excellent solutions of the game.

We now assume the case that no player will act strategically and this is inferred from the fact that the term ϕ which indicates the strategic behavior of the players will be absent from the equations. And in this case I still have 3 stages of producers, bank and government.

The profit equation for producer 1 from country 1 in case of taxes is:

$$H = (A - x - y) * x - x - t * (x - a) - \frac{a^2}{2} - r * x \quad (1'')$$

The equation is formulated for a producer who still wants to maximize his profit and then the equation of a and x is printed after the first order conditions

$$a = t \quad (2'')$$

$$x = \frac{1}{2}(-1 + A - r - t - y) \quad (3'')$$

Doing the same actions as before for the producer 2 where here we find 2 solutions from first class conditions

So, the profit equation for producer 2 from country 2 in case of taxes is:

$$h = (A - x - y) * y - y - T * (y - b) - \frac{b^2}{2} - R * y \quad (4'')$$

And the first order conditions for the equation (4'') are:

$$b = T \quad (5'')$$

$$y = \frac{1}{2}(-1 + A - R - T - x) \quad (6'')$$

Solving the system from equations (2''), (3''), (5'') and (6'') we have the next solution:

$$x = \frac{1}{3}(-1 + A - 2r + R - 2t + T) \quad (7'')$$

$$y = \frac{1}{3}(-1 + A + r - 2R + t - 2T) \quad (8'')$$

The profit equation for bank 1 from country 1 in case of taxes is:

$$N = r * x - c * x \quad (9'')$$

$$r = \frac{1}{4}(-1 + A + 2c + R - 2t + T) \quad (10'')$$

Bank's profit equation for the other country is the following and after this it is the solution after maximizing by R:

$$n = R * y - c * y \quad (11'')$$

$$R = \frac{1}{4}(-1 + A + 2c + r + t - 2T) \quad (12'')$$

Solving the system from (10'') and (12'') we have the next combination of r and R which is the solution for 2nd stage:

$$r = \frac{1}{15}(-5 + 5A + 10c - 7t + 2T) \quad (13'')$$

$$R = \frac{1}{15}(-5 + 5A + 10c + 2t - 7T) \quad (14'')$$

Finally, the profit equations for government 1 from country 1 in case of taxes and government 2 from country 2 in case of taxes there are:

$$F = (A - x - y) * x - x - \frac{t^2}{2} - \frac{d(x-t)^2}{2} - c * x \quad (15'')$$

$$f = (A - x - y) * y - y - \frac{T^2}{2} - \frac{d(y-T)^2}{2} - c * y \quad (16'')$$

Taking first order conditions for the (15'') and (16'') and maximizing for r and R, I have:

$$t = \frac{dx}{1+d} \quad (17'')$$

$$T = \frac{dy}{1+d} \quad (18'')$$

Solving the system (17'') and (18'') I have:

$$t = \frac{dx}{1+d} \text{ and } T = \frac{dy}{1+d}$$

Standards no strategic form

In the last stage the producer wants to maximize his profit and so I get first class conditions in terms of x ,

First the equation is formulated and then the first condition is expressed

So the profit equation for producer 1 from country 1 in case of standards is and the first order conditions are the following:

$$B = (A - x - y) * x - x - \frac{1}{2} * (x - e)^2 - r * x \quad (1'')$$

$$x = \frac{1}{3}(-1 + A + e - r - y) \quad (2'')$$

The equation for the other producer is also formulated and the first condition is also expressed, respectively which this time results after I maximized with respect to y .

So, the profit equation for producer 2 from country 2 in case of standards and the first order conditions are the following:

$$b = (A - x - y) * y - y - \frac{1}{2} * (y - \varepsilon)^2 - R * y \quad (3'')$$

$$y = \frac{1}{3}(-1 + A - R - x + \varepsilon) \quad (4'')$$

I solve (2'') and (4'') their system and find x and y :

$$x = \frac{1}{8}(-2 + 2A + 3e - 3r + R - \varepsilon) \quad (5'')$$

$$y = \frac{1}{8}(-2 + 2A - e + r - 3R + 3\varepsilon) \quad (6'')$$

I continue with the 2nd stage where the bank for each country is located. In both countries, however, as has been said again, the goal is the same and that is none other than maximizing the interest rate of the loan that will be granted to producers. Therefore, the equations and the best solutions for the 2 countries are as follows:

The profit equation for bank 1 from country 1 in case of standards is:

$$U = r * x - c * x \quad (7'')$$

Maximizing for r and taking first order conditions I have:



$$r = \frac{1}{6}(-2 + 2A + 3c + 3e + R - \varepsilon) \quad (8''')$$

Profit equation for bank 2 from country 2 in case of standards

$$u = R * y - c * y \quad (9''')$$

Maximizing for R and taking first order conditions I have:

$$R = \frac{1}{6}(-2 + 2A + 3c - e + r + 3\varepsilon) \quad (10''')$$

I solve (8''') and (10''') their system and find r and R:

$$r = \frac{1}{35}(-14 + 14A + 21c + 17e - 3\varepsilon) \quad (11''')$$

$$R = \frac{1}{35}(-14 + 14A + 21c - 3e + 17\varepsilon) \quad (12''')$$

Finally, the profit equation for government 1 from country 1 in case of standards is:

$$N = (A - x - y) * x - x - \frac{1}{2} * (x - e)^2 - c * x - \frac{1}{2} * d * e^2 \quad (13''')$$

And the profit equation for government 2 from country 2 in case of standards

$$n = (A - x - y) * y - y - \frac{1}{2} * (y - \varepsilon)^2 - c * y - \frac{1}{2} * d * \varepsilon^2 \quad (14''')$$

Similar with the other case, where government applies taxes and in this case we maximize the equations that describe the profit function of governments in terms of environmental policy. In the first case with respect to e while in the second case with respect to e. Taking first-order conditions for the two above equations, the following equations are obtained respectively:

$$e = \frac{x}{1+d} \quad (15''')$$

$$\varepsilon = \frac{y}{1+d} \quad (16''')$$

Solving the system from (15''') and (16''') I have:

$$t = \frac{dx}{1+d} \quad \text{and} \quad T = \frac{dy}{1+d}$$

Last but not least, $de = x - e$ and $d\varepsilon = x - \varepsilon$ which represents that marginal abatement cost equals marginal damage cost.

CHAPTER 5

RESULTS

The invisible hand of the government finds ground in every aspect of the financial sector and can through laws, regulations as well as the decisions of the banks influence the way in which each company operates and on the other hand how it invests and how it spends its portfolio. It is important after the end of the model and the appearance of the results to interpret how banks' decisions are affected and how interest rates move depending on whether we will have a strategic or non-strategic form but also depending on which environmental policy instrument the domestic as well as the rival government.

Observing the resulting equations we observe that both are affected by the value of taxes and by the value of standards. In the first case the rate of the bank affected not only by the t and by the T . In the first case we have r the equation depends negatively on t and positively on T . This means that an increase or decrease of the 2 above variables would affect r accordingly. For example, an increase in t will significantly reduce r since we observe that all terms containing the term t have a negative sign. Conversely, for the variable T an increase will also increase r since all terms have a positive sign. This is interpreted to mean that a country's interest rates are affected by taxes and therefore by the decision as to whether or not to lend. More specifically, this means that if the government imposes high taxes on domestic countries, interest rates will fall, which means that producers' costs will increase and they will not be able to produce as much as they want and will not seek a loan. On the contrary, the increase of T , i.e. the tax price of the other country, will not affect the bank of the other country. The reason is that the producer will choose to stay to produce in the country since another country will increase its cost and in the end it will not be in his interest but on the contrary it will bring him damage.

Nevertheless, the government may decide to set and choose standards as the best means of environmental policy. It is observed that the process develops in a similar way and it is obvious that the decision of the banks and the setting of interest rates are done in this case in a similar way. The lower the standards it sets in the domestic government, the smaller the loans, so in the end it will be in the interest of the

producers to stay in the country and eventually produce.

In the case of players who do not act strategically, however, there are some differences. In terms of taxes, of course, the same continues to apply to both the domestic and the rival government. More specifically, again the interest rate that the bank chooses to set depends in a negative way on the taxes set by the domestic and in a positive way on those set by the rival government. It is therefore more in its interest to increase the taxes of the rival country than of the country in which it is located. However, when the players decide to act non-strategically and the government sets environmental policy standards, we do not have a similar development to the above. The difference now is that interest rates are positively affected by the standards set by the domestic government and negatively by the standards set by the adversary. This can be interpreted as now that we have no strategy from the players the bank is not affected in a bad way and can cope with the imposition of environmental policy and set the optimal interest rate to increase its profits. This contradicts the case of the models in the strategic form because then the bank does not know the intentions of the government since the way in which it chooses to move is ambiguous and it is certain that it can influence it.

In the above game we noticed that we have two options for the players to move strategically and non-strategically. How much each producer will ask will affect the interest rate set by the bank. In other words, as the demand for a loan increases, the bank will take advantage of this situation and increase the price of the interest rate it will grant. When we have non-cooperation the bank acts as a price setter while when I have a strategic form the supply is affected, i.e. it either increases or decreases. The producer will have seen what interest rate will be set for him depending on the amount he will ask for and will decide whether he will be granted the loan or not.

Finally, the imposition of environmental policy will affect the well-being of the government as it will determine the decision of the banks on the interest rates that they will grant to the producers according to the amount they will ask and then this will affect the producers' decision on whether to produce and which country because it may be in their interest to transfer their production to another area. The latter also serves various political expediencies as it is not uncommon for governments to set lower taxes or standards in certain areas in a country thus pushing producers to move and relocate their production to that area.

CHAPTER 6

PLANNING THE FUTURE

Planning the future and dreaming of a better quality of life, more environmentally friendly and saving all its resources without being trampled on, raises the question of whether 2021 could be a focal point for the environment and climate change. Although last year in 2020 the issue that mainly concerned us was the pandemic that plagued all of humanity, we hope that 2021 will be what will be connected to the environment. The conference in Glasgow will take place in November 2021. It is the next day after the one in Paris where it was agreed to strengthen environmental protection and reduce global warming. There was a commitment to attend every 5 years and discuss developments to reduce the greenhouse effect. Developments with the pandemic, however, postponed the conference and thus will finally take place in 2021. An example to follow was China and the United Kingdom, which are now setting more and more targets and trying to fulfill all their ambitions. Furthermore, there must be a boost to renewable energy sources as it is also economically advantageous because the more it is produced the less it costs. Ultimately, it will make sense to replace fossil fuels with renewable, and governments know that by increasing renewable in their own economies, they are helping to accelerate the global energy transition, making renewable even more competitive and renewable.

The oxymoron is that the pandemic also caused something positive. It dealt a major economic shock and stimulated governments to come up with innovative ways to boost their economies. The ground for investments is also considered fertile since the interest rates are almost zero and sometimes maybe even negative, so this opens the way for investments. At the same time, the momentum behind the movement is growing to push businesses to integrate climate risk into financial decision-making. The goal is to make it mandatory for businesses and investors to show that their activities and investments are taking the necessary steps to move to a pure zero world. Seventy central banks are already working to make this happen, and integrating these requirements into the global financial architecture will be a key focus of the Glasgow conference.

CHAPTER 7

CONCLUSION

As the years went by, the effects of climate change were met with rapid pace. Science has spoken and states that the energies towards the salvation of this situation must be accelerated. No one should be left out and everyone's contribution is crucial. Local and state governments, businesses and private institutions have the power to reduce their own carbon footprint, as well as to influence consumer policy, public opinion and habits. And this force increases significantly when forces join. It would be unfair to forget that the greatest force is nature and it is she who has given us the solution. Nature-based solutions - natural systems or processes used to achieve social goals could make a significant contribution to minimizing climate change and its effects.

It has been shown that the problem of climate change and the reduction of pollution is a phenomenon that is difficult to deal with. The problem is identified because states think exactly the opposite. For this reason, strong motives and pressures must be given in order to reduce pollution. The environmental policies that are being designed should aim at the proper cooperation of all the involved bodies but also at the sanctions of the offenders without this affecting the cooperation of the involved bodies.

We also understand that governments are the ones who will give positive or negative incentives in order to encourage the whole green economy movement. However, incentives such as market distortion can also cause disadvantages. It is therefore recommended not to use them for an extended period of time because they are likely to be addictive but their accuracy is remarkable especially when the incentives take the form of subsidies.

Last but not least, the above study showed that the decisions taken by the governments for the environmental policy that they will set is an integral part of the way of action of both the banks and then consequently of the producers. It is obvious that the government-bank-producer relationship is interrelated and the decision that each of the above will make and the way in which it will choose to move in the

environmental game, i.e. whether it will be strategic or not, is of particular importance and is a consequence of the study and interpretation of the results.

CHAPTER 8

PERSONAL OPINION

Reaching the end of the work, it seems that strengthening the belief in the protection of the environment is an essential issue that should not only be discussed but also actions taken to prove its empowerment. Still, it seems that there are bodies that seek to distort and disobey the rules by serving some interests and acting on the basis of their personal gain. However, the impact of the results unequivocally proves the essence of the green economy. The right environmental governance must be subscribed by effectiveness and efficiency, responsiveness, coordination, integration and coherency, rule of law and impartiality, accountability, transparency, participation and integrity. The concepts of governance and government should not be confused since we are talking about two different things. The first serves many purposes and benefits since it acts in a strategic way, thus making the whole situation more and more complicated. Environmental governance is cross-cutting, relates to international, national, and sub-national levels, and involves many actors. Finally, it seems that the banks are the ones that, apart from the government, set the environmental policy instrument, are the ones that will determine the approval of the financing and the amount of interest rate that they will impose on each industry. However, they must not deviate from the original purpose which is the protection of the environment and defy expediencies and interests that lead them to finance polluting situations.

CHAPTER 8

REFERENCES

- Ulph A. (1994).” Environmental Policy and International Trade when Governments and Producers Act Strategically”. *Journal of Environmental Economics and Management* 30, 265-281
- Angelopoulos K. Economides G. and Philippopoulos A. (2010). “What is the best environmental policy? Taxes, permits and rules under economic and environmental uncertainty”. Working Paper.
- Finance Report 2020 Climate Change Available at:
https://www.ran.org/wp-content/uploads/2020/03/Banking_on_Climate_Change_2020_vF.pdf
- Coulson A. (2007). How Should Banks Govern the Environment? Challenging the Construction of Action versus Veto. *University of Strathclyde, Glasgow, UK*
- Punzi M. (2018). “Role of Bank Lending in financing Green Projects: A Dynamic Stochastic General Equilibrium Approach”. *ADB Working Paper Series 881*.
- Haas R., Popov A. (2019) “Finance and Carbon emissions”. *European Central Bank, Eurosystem. Working Paper Series*.
- Environmental governance. United Nations Environment Programme.
- Huse C., Koptug N. (2017). Taxes vs. Standards as Policy Instruments: Evidence from the Auto Market
- Arlinghaus J. and Dender K. Environmental Fiscal Reform PROGRESS, PROSPECTS AND PITFALLS *Working document May 2017*
- Pigato M. (2019). Fiscal Policies for Development and Climate Action. *International Development in Focus, World Bank Group*.
- Rowlatt J. (2021). Why 2021 could be turning point for tackling climate change? *BBC News*. Available at:



<https://www.bbc.com/news/science-environment-55498657>

- Bauren E. ENVIRONMENTAL POLICY. *Britannica*.

Available at:

<https://www.britannica.com/topic/environmental-policy/Guiding-concepts#ref314950>



- Osterloh S. (2020). The implications of fiscal measures to address climate change. *EUROPEAN CENTRAL BANK | EUROSYSTEM*. Available at:
https://www.ecb.europa.eu/pub/economic-bulletin/focus/2020/html/ecb.ebbox202002_04~a7d137cb35.en.html
- Γιάνναρου Μ. (2016). Παγκόσμιες Διασκέψεις για το Περιβάλλον. *ECO WHEATHER*. Available at:
<https://www.ecoweather.gr/blank>.
- (2012). Ο δρόμος προς την παγκόσμια βιωσιμότητα. Ευρωπαϊκός Οργανισμός Περιβάλλοντος. Available at:
<https://www.eea.europa.eu/el/simata-eop-2010/semata-2012/arthra/o-dromos-pros-ten-pagkosmia-biosimoteta>
- (2020). 2020: A CRITICAL YEAR FOR OUR FUTURE AND FOR THE CLIMATE. *WWF*. Available at:
<https://www.worldwildlife.org/stories/2020-a-critical-year-for-our-future-and-for-the-climate>
- ALLIANCES FOR CLIMATE ACTION. *WWF*. Available at:
<https://www.worldwildlife.org/initiatives/alliances-for-climate-action>
- WHAT ARE NATURE BASED-SOLUTIONS AND HOW CAN THEY HELP US ADDRESS THE CLIMATE CRISIS? *WWF*. Available at:
<https://www.worldwildlife.org/stories/what-are-nature-based-solutions-and-how-can-they-help-us-address-the-climate-crisis>
- Ορισμός και είδη φόρων. Available at:
https://europa.eu/taxedu/young_el
- Fan X., Li X., Yin J. (2019). Impact of environmental tax on green development: A nonlinear dynamical system analysis. *PLOS ONE*. Available at:
<https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0221264>
- Government, Central Banking, tax policies, oversight and regulatory functions. *CFI*. Available at:
<https://corporatefinanceinstitute.com/resources/knowledge/economics/government/>
- Haas R., Popov A. (2018). Finance and pollution. *VOX EU CEPR*. Available at:
<https://voxeu.org/article/finance-and-pollution>
- Δάνειο Πράσινης Επένδυσης. *ProCredit Bank*. Available at:
<http://www.procreditbank.gr/el/daneio-prasinhs-ependyshs/page/1349>

- Andreas. Environmental Dumping: Causes, Effects & Solutions. Available at: <https://environmental-conscience.com/environmental-dumping-causes-effects-solutions/>
- Our commitment to environmental sustainability. *BANK OF AMERICA*. Available at: <https://about.bankofamerica.com/en-us/what-guides-us/environmental-sustainability-governance-and-policies.html#fbid=VmQGwjZ3e-1>
- Environmental taxation and EU environmental policies. *EEA Report. No 17/2016*.
- Wingqvist G., Drakenberg O., Slunge D., Sjöstedt M., Ekblom A. (2012). The role of governance for improved environmental outcomes. *Swedish Environmental Protection Agency. Report 6514*.
- Rasmusen E. An Introduction to Game Theory
- Hardin G. (1968). The Tragedy of the Commons. *Science 162 (3859). 1243-1248*.
- Colonques R. and Rubio S. (2015). The Strategic Use of Innovation to Influence Environmental Policy: Taxes versus standards
- Berck P. and Helfand G. (2005). The Case of Markets versus Standards for Pollution Policy The Case of Markets versus Standards for Pollution Policy. *NATURAL RESOURCES JOURNAL. Volume 45. Issue 2. Spring 2005*
- Heuson C. (2008). Emission standards vs. taxes with uncertain control costs and market power of polluting firms. *Beitrag Nr. 299, (März 2008)*.
- Kuhn M. and Tivig T. (1996). Ecological dumping and environmental capital flight: The economics behind the propaganda. *Diskussionsbeiträge - Serie II, No. 324*
- Barrett S. (1994) Strategic environmental policy and international trade. *Journal of Public Economics 54 (1994) 325-338. North-Holland*.