Interest Groups, Biofuels Trade and Ecological Protectionism

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Public Choice Society Meeting
Miami 2012

First draft, please do not cite without permission

Abstract :

In this paper, we develop a common agency model of lobbying (Grossman and Helpman [1994]) that analyzes the impact of pressure groups on the formation of environmental policy in a context of trade liberalization. Apply this model to the issue of biofuel production and trade of biofuels and refer to the framework of Lai [2006]. We analyze the impact of the interaction between direct and indirect political influence on the stringency of the environmental standard, the pattern of trade and social welfare. This model provides a political economy explanation of the emergence of european environmental standards related to biofuels production. It also contends a predictive power concerning the design of future regulations in biofuels importing countries such as the United States.

Key words: production externalities, environmental regulation, interest groups, biofuels, trade liberalization

JEL Classification: D72; F18; Q28

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Introduction

The rise of oil prices, the battle against climate change and the willingness to advance economic development in rural areas have led policy makers to promote the production and use of biofuels around the world[1]. In this respect, the European Union and its member states give subsidies to production of biofuels within their jurisdictions. There are several forms of subsidies, ranging from support to research and development (R&D) to direct payments under the Energy Crop Scheme. Another form of subsidy, indirect, is the excise-tax exemption on biofuels. Secondly, EU biofuels producers benefit from the import tariffs imposed on biofuels originating from non E.U. countries. Nevertheless, several scientific studies have warned that promoting biofuels may result in negative ecological impacts, such as changing land use patterns and inducing additional greenhouse gas (GHG) emissions (EEA [2006]; JRC/IES/CONCAWE [2007]). Sustainability standards and certification schemes are possible strategies in order to support the sustainable production of biofuels (WWI [2006]). In this respect, the 2008 European Union's Renewable Energy Directive sets out sustainability criteria that must be met if biofuels are to benefit from support mechanisms. The criteria in the Renewable Energy Directive apply to both E.U. and non E.U. production. Officially, they have been set in order to avoid any de facto discrimination and definitions have been made based on available scientific evidences. But according to Erixon [2009], this directive is controversial and It has been intensively debated before and after its adoption. Some NGOs are questioning the GHG savings calculation methodology used by the European Commission, and that additional criteria such as human rights and the social effects of biofuels production in third-world

[1] In 2008, world fuel ethanol production amounted to 52.4 million tonnes, more than doubling the 23.7 million tonnes produced in 2004 (Martinot and Sawin, [2009]). The two leading ethanol producers were the United States and Brazil, representing 91% of the world production (FAPRI, [2009]). Regarding consumption, the US consumes more bioethanol as transportation fuel than any other country in the world. In 2008, total consumption was about 28.4 million tonnes, of which about 4.6% was imported. Brazilian fuel bioethanol consumption amounted to approximately 16.5 million tonnes. In the EU, total consumption for transportation was 2.6 million tonnes, the largest users being France, Germany, Sweden and The Netherlands (EurObserv'ER [2009]). Biodiesel refers to a vegetable oil or animal fat-based diesel fuel consisting of long-chain alkyl esters. Typical feedstocks for biodiesel are vegetable oils such as rapeseed oil, soybean oil, palm oil, etc. Biodiesel is used in standard diesel engines and is thus distinct from the vegetable and waste oils used to fuel converted diesel engines. World biodiesel production increased sixfold from about 1.8 million tonnes in 2004 to about 10.6 million tonnes in 2008 (Martinot and Sawin [2009]). The EU produces about two-thirds of this, with Germany, France, Italy and Spain being the top EU producers. European biodiesel production rose to 7.8 million tonnes in 2008, equivalent to a 35.7% increase compared to 2007 and 2008. However, EU production declined 7% in 2009 because of strong competition from abroad (FAPRI [2009]). Other main biodiesel producers include the United States, Argentina and Brazil. Biodiesel consumption in the EU amounted to about 9.2 million tones (EurObserv'ER [2009]), with Germany alone consuming 2.9 million tonnes.

countries are missing. In addition, this directive is likely to impose an excessive administrative burden on biofuels producers. Absent from the debate are the potential trade effect of this new standard. If a foreign exporter cannot document that it meets the established criteria, it will not be eligible for the tax exemption and the use of the imported biofuel cannot be part of the national obligations to increase the share of renewable energy in a country's energy mix. This is a clear and drastic cut-off point for effective access to the EU market which one can expect to have implications for exporters of particular crops and biofuels. Such environmental standards if they are technical barriers may harm free trade (Fontagne *et al.* [2005]). For this reason, they may be supported strategically by interest groups willing to get trade protection on their domestic market[2]. In addition, according to Vera [2008], the rules of WTO which are anterior to the emergence of the biofuels industry, create a favourable institutional context leading to such *ecological protectionism*[3]. Europe's biofuels policy seems to be an example of how strategic trade policy has moved away from tariffs towards subsidies and in the direction of standards. In order to investigate this issue we develop a common agency model of lobbying (Grossman and Helpman [1994]) that analyzes the impact of pressure groups on the formation of biofuels sustainability standards in a context of trade liberalization. Section 1 gives an overview of current bioenergy trade barriers and their policy implications. Section 2 survey the political economy literature related to the trade-environment debate with a special emphasis on studies that focus on environmental standards in a context of trade liberalization. Section 3 presents the economic model. Section 4 presents the political process. Section 5 analyzes the political equilibrium policy.

[2] Korber [1999] and Oates and Portney [2003] offer reviews of this literature.

[3] Also, Erixon [2009] points out that for the protectionist-leaning government, such measures are probably more appealing because there are fewer and weaker disciplines on subsidies and standards (especially in the agri-sector) than there are for tariffs. Hence, by taking such measures you are less likely to be ruled against in dispute settlement.

1. Bioenergy trade barriers: issues and policy implications

To mitigate the generally higher production costs of liquid biofuels, governments in many countries have supported domestic production and use through policy incentives, such as tax exemptions, subsidies and tariffs. In some cases, these support schemes may shield domestic producers from foreign producers that are more efficient and hindering international trade. For example, in France, tax exemptions are available only for biofuels that are both produced and sold in the French market. Producers from other EU countries are thus excluded, leaving them at a competitive disadvantage (Euractiv, [2009]). Similarly, Steenblik [2007] reports that several US states provide their own volumetric subsidies to support in-state production of bioethanol or biodiesel at rates equivalent to h0.04 per litre or more[4].
Biodiesel used to be subject to lower import tariffs than bioethanol, ranging from 0% in Switzerland to 6.5% in the EU and the USA. Tariffs applied by developing countries are generally between 14% and 50% (Steenblik, [2007]).

As far as Europe is concerned, Erixon [2009] pointed out that subsidies are necessary for European biofuels production to be competitive despite the rapid rise in demand for biofuels. Imports of ethanol from Brazil or biodiesel from Southeast Asia are cheaper than domestic produce. They are actually cheaper than biofuels produced in Europe even when the subsidies and border tariffs are accounted for. This is due to higher labour and input costs in Europe. Total transfers to ethanol in 2006 amounted to EUR 1.3 billion while transfers to the production of biodiesel were close to EUR 2.5 billion. Measured in terms of support per litre consumed, ethanol received bigger subsidies than biodiesel. The same result holds when measured in terms of petrol or diesel equivalents. In addition, for import of ethanol, the EU does not use a fixed tariff expressed in percentage. For import of undenatured alcohol, the bound tariff is 19.2 EUR/hl and for denatured alcohol it is 10.2 EUR/hl. The ad valorem equivalents of these tariffs are 63% and 39% respectively. Tariffs on biodiesel and vegetable oil are small in comparison. Palm oil is imported duty free, and other vegetable oils are subject to a tariff slightly higher than 3%.

In recent years, sustainability requirements have increasingly been imposed on either feedstocks (such as palm oil) or final products. Such requirements relate to non product-related processes or production methods (PPMs)[5]. They can take the form of regulations

[4] For a comprehensive description of these systems, see Junginger *et al.* [2010] and Oosterveer and Mol [2010].
[5] The different standards and regulations under consideration are discussed in more depth by van Dam *et al.* [2008, 2010].

linked to tax exemptions, subsidies or other policy instruments which make the eligibility of a biomass product dependent on certification at some stage of its production process or processing. Examples for liquid biofuels are the Renewable Transport Fuel Obligation (RTFO) in the UK, the German Biofuel Quota Law, the Energy Independence and Security Act (EISA) in the United States, and the European discussion on the draft fuel quality directive and the renewable energy directive (RED) (see van Dam *et al*. [2010] for an overview). In 2009, standardization organizations such as CEN and ISO have also announced to develop sustainability standards (CEN, [2010]; ISO, [2010]). In the past years, binding legislation on sustainability criteria did barely exist, and different parties have come up with voluntary standards. With the recent publication of sustainability criteria in the renewable energies directive (RED) (European Commission, [2009]) for liquid transport fuels, this situation has changed. The directive notably provides requirements for greenhouse gas emission reductions, the biofuels in question must not be produced from raw materials being derived from land of high value in terms of biological diversity or high carbon stocks[6]. With current developments by the European Commission as well as different European governments, several private sector initiatives Junginger *et al.* [2010] pointed at that there is a real risk that on the short term a multitude of different and partially incompatible systems will arise. Such a multitude of systems could potentially become a major barrier for international bioenergy trade instead of promoting the use of sustainable biofuels production. Besides, concerning the RED, Erixon [2009] emphasized that criteria, especially related to environmental and social issues, could be too stringent or inappropriate to local environmental and technological conditions in producing developing countries, and will only allow farmers from developed countries to meet the criteria. Indeed, studies by Smeets *et al.* [2008] and Smeets and Faaij [2010] indicate that production costs in Brazil for ethanol from sugarcane may increase to 36% (ethanol from sugarcane) or 42% (eucalyptus wood chips), especially due to strict environmental criteria. And this could thus lead to a restriction of bioenergy trade.

[6] Also in the USA, the Renewable Fuel Standard (RFS) – included in the EISA – provides provisions on the promotion of biofuels. EISA mandates minimum GHG reductions from renewable fuels, discourages use of food and feed crops as feedstock, permits use of cultivated land and discourages indirect land-use changes.

2. The political economy literature

The trade environment debate has given rise to a large number of publications[7]. Here we concentrate ourselves to the studies that focus on using environmental standards to control consumption and production externalities in open economies. Though Motta and Thisse [1999], Fischer and Serra [2000], Haupt [2000] and Essaji [2010] discuss various issues to do with minimum environmental standards, none of them considers political failure in the policy-making process. Bommer and Schulze [1999] and Fredriksson [1999] consider production-type externalities and investigate the effects of an exogenous trade liberalization on the environmental policy. Lai [2006] specifies externalities arising from consumption and analyze the same issue. Since the empirical evidence has suggested that foreign lobbying activity has a significant impact on both US tariffs and non-tariff barriers (Gawande *et al.*[2004]), Lai [2006] consider a foreign lobby whereas all lobbying groups are local in the two references mentioned. Also, Lai [2006] examines the political effects of a tariff reduction on the importing country's social welfare, which is not the focus of either Bommer and Schulze [1999] or Fredriksson [1999]. Lai [2006]'s paper adopts the common-agency model, which is developed by Grossman and Helpman [1994], to deal with the interactions between interest groups and the government. The government is assumed to care about a mixture of political contributions and social welfare. He obtains several results. First, trade liberalization tends to tighten the minimum standard, even though the environmental group's lobbying efficiency is insignificant. Second, trade liberalization reduces the imports of the polluting good. Third, the environmental disutility decreases as the economy becomes more open. Fourth, he finds that the weaker the environmental group's lobbying efficiency, or the stronger the foreign firm's lobbying efficiency, the more likely it is that trade liberalization will enhance the importing country's welfare. We extend Lai's analysis in two ways. First, we consider a country which imposes a minimal environmental standard on an imported good which generates negative production externalities. Second, the market for biofuels is a duopoly with a domestic producer and a foreign one. Both are represented by industry lobbies with opposed trade interests. In addition, there is an ecologist group in the home country that is concerned with environmental issues abroad as well as in the home country. In order to model the influence of interest groups on the political outcome, we refer to Yandle's "Bootleggers and

[7] See Ulph [1997], Jayadevappa and Chhatre [2000], and Schulze and Ursprung [2001] for general surveys.

Baptist" theory. Indeed, among public choice theory, the well known economic theory of regulation, asks us to consider the political arena as a marketplace where favors are bought and sold (Stigler [1971]). Stigler's theory helps to predict which interest group would do the capturing and which group would fail to capture. Interest groups that have the most to gain or to lose will bid the highest prices for favors (Dixit, Grossman and Helpman [1997]). Politicians dedicated to preserving their jobs, and needing large amounts of campaign funds, auction off the favors. Competing groups will attempt to outbid the winner. Generally, according to the contribution of Olson [1965] the smaller the group, the more each member can gain by crafting regulatory rules. The larger the group, the less likely each individual member will have a strong reward or heavy burden as a result of the rules. So, small special interest groups usually are the most actively involved in the negotiations. However, according Yandle [1999], this theory is incomplete. Being a small, well organized special interest group is not enough. According to Yandle, while powerful interest groups still matter, this theory tells us that there must be at least two different interest groups working in the same direction, "Bootleggers" and "Baptists." Bootlegger, then, is a term for those who benefit economically, and Baptist for those who provide moral cover for the regulations. In the bootlegger-and-Baptist story, the two groups come together to achieve a common policy goal[8]. In our model, the Baptists are the environmental group and the Bootleggers are the domestic industry. All groups exert political influence in the domestic country. The environmental group and the domestic producer both support high environmental standards. The former expects that this will be detrimental to production and pollution abroad as well as in the home country. The latter expects that this will favour domestic production of biofuels. The foreign producer is opposed to such standards and is willing to export more. Industry interest groups exert a direct political influence by providing political contributions to the government. The lobbying activity of the environmental group is based on the influence of public opinion through green public discourses. The "indirect" influence consists in exerting effort so as to persuade the public and thus, influence indirectly the government's policy. For instance, the traditional activity of environmental groups, is to "educate the public" and there is evidence of increasing of such effort (Mitchell, Mertig and Dunlap [1992]). These groups orient their appeals more to the public than to governments and their activities have greatly increased

[8] Such theory would explain more deeply a broad range of issues, including the Kyoto Protocol to the United Nations Framework Convention on Climate Change (Yandle [1999], [1999a]), the tobacco regulation (Yandle *et al.* [2007]), or the biofuel subsidy program in the U.S. (Yandle [1999a]).

public demand for environmental protection[9]. Public persuasion is a common real-life phenomenon. Interest groups and political parties often disseminate information to voters in order to shift their opinions. Releasing information and advertising through mass media are used by almost all interest groups. The purpose of all these activities is to get their political "messages" out to the public, and to change public perception about the environment and the environmental consequences of government policy. The importance of public communication and persuasion in a democratic society was recognized by Tullock [1967] and Berry [1989]. Congleton ([1986], [1991], [1966]) introduced this idea into the election models through political advertising. The issue that how interest groups influence government policy through persuading the general public is at his early stage. Following Congleton, Zhihao [2005] models indirect political influence where interest groups influence public perception about the consequence of a particular government policy. More recently, Jaeck and Bougi [2010] develop a political economy model which determines the conditions of cycles in environmental regulation. They analyze the impact of both interest groups and voters who have biased political beliefs on the environmental policy. Such biased beliefs are the result of the influence of activist interest groups who use strategically the beliefs formation process among ignorant voters (Kuran and Sunstein [1999]).[10] Following Zhihao, we model the "indirect political influence" where environmentalists are sending political "messages" to the public in order to manipulate the collective belief about the negative effects of the biofuels production on the state of the environment. Indeed, since 2006-2007, environmentalists have changed their view concerning the benefits of biofuels as an alternative energy, and have mainly focused on their detrimental effects on the environment. With this framework, we analyze the impact of the interaction between those types of political influence on the stringency of the environmental standard and the pattern of trade in a context of trade liberalization.

[9] As many studies conclude, environmental movements have proven to be exceptionally successful in the U.S. and many other developed countries (Dunlap and Mertig [1992]).

[10] Based on the work of related to informational cascades (Bickhchandani *et al.* [1998]) and that of kuran [1995] concerning preference falsification, Kuran and Sunstein offer an explanation of risk regulation. Their main insight is that activists belonging to the "latent group" (referring to Olson [1965]) might influence public policy by using biases in risk perception. Activists' behaviour consists in manipulating beliefs formation process in order to create a majority opinion on a risk issues. By creating pressure on public decision makers, they might direct the regulation process toward ends that satisfy the interest of the latent group which they pretend to represent. These new forms of collective action might be responsible for the implementation of regulations disconnected from real risks and therefore lead to a waste of resources.

3. The model

We consider a domestic country and a foreign country. The domestic country is populated by one type of consumers: green ordinary consumers. N^{go} denotes the size of the overall population. Each individual is endowed with one unit of labor. The utility function of representative green ordinary consumers is given by:

$$U^{go} = u[q_i] + Z^{go} - \mu\, d(\theta)$$

Where $q = x + y$, represents the aggregate production on the domestic market, x represents the aggregate production of the foreign firm, y represents the aggregate production of the domestic firm. Thus, we have $x + y = N^{go}x_i + N^{go}y_i$. Z^{go} is the consumption of the numeraire good with the world and domestic prices equal to one, q_i is the consumption of a polluting good with a domestic price equal to p, and $u[q_i]$ is a strictly concave function. The numeraire market is under free trade. The government taxes imports of x_i, and returns the tariff revenues to all citizens. The tariff revenues plus the labor income constitute the citizens' incomes. Thus, a representative consumer budget constraint is $p\, q_i + Z^{go} = w + \frac{tx}{N}$, where w is the labor income, t the tariff on each unit of the imported good. Utility maximization on the part of the consumers requires that:

$$U'[q_i] = p(q) = A - vq \quad \text{and } A > 0 \qquad (1)$$

Equation (1) determines the individual demand for the domestic and foreign polluting good. Domestic and foreign production of the polluting good imposes an environmental disutility on consumers. To protect the environment, the domestic country imposes a minimum environmental standard θ, on the domestic and foreign polluting good. Here θ is specified as a product sustainability standard. The polluting good that violates the minimum standard will not be allowed to be imported. The minimum standard is treated as a continuous variable; the higher θ is, the more stringent the environmental regulation will be. Following Lai [2006] we model a minimum standard that has no effect on the demand for the polluting good. We also assume following Zhihao [2005] that the environmental disutility function of a consumer is given by d, which is a function of the minimum standard θ, with the property

that $d_\theta < 0$. This captures the fact that when θ increases, the negative side effects of the production of the polluting good decrease, therefore d decreases. The environmental disutility is subject to a manipulation from environmental interest groups which seek to exaggerate the side effects of biofuel production. Therefore, consumers have a perceived environmental disutility, $\mu d(\theta)$, where μ represents the consumers' belief about the environmental disutility and $\mu \in [0, +\infty[$. It is assumed that green ordinary consumers consume the biofuel commodity (the polluting good) because they want to reduce the GHG emissions but they do not care about the negative side effects of the biofuels production on the state of the environment. This case correspond to case where $\mu = 0$. Nevertheless, when μ is positive, it means that they are sensitive of the environmental group's activism and thus they have a perceived environmental disutility when they consume the polluting good.

The model contains two firms, a domestic firm and a foreign firm. As in Fisher and Serra [2000] and Essaji [2010], the foreign firm is assumed to enjoy a cost advantage[11]. The foreign firm production for the domestic market does not affect its production for the foreign market. In equilibrium, the domestic firm produces output denoted by y. The foreign firm's output is x[12]. Total equilibrium output is thus q = x + y. The production of the good generates a negative externality. The domestic country regulates the externality with a production standard, θ, $\theta \in [0, \theta_m]$. A higher product standard induces higher costs only for the foreign firm, i.e $c_f'(\theta) > 0$, where c_d is the per unit production cost for the domestic firm and $c_f(\theta)$ is the foreign firm's per unit production cost. Moreover, $c_d \leq c_f(\theta)$ for all θ[13]. This assumption captures the fact that sustainability requirements are more detrimental to foreign producers and particularly to producers from developing countries than to E.U. producers (Smeets *et al.* [2008] and Smeets and Faaij [2010]). The model further assumes that costs are convex in the standard for simplicity, $c_f''(\theta) > 0$. The inverse demand function is given by $p(q) = A - v\,q$, and it is determined by equation (1). In addition to the standard, the domestic government has two trade policy instruments: a tariff that is modeled as a specific tariff (t) and a subsidy to the domestic firm (s). We further impose that[14]:

$$2c_d \leq c_f(\theta),\ s > 2t,\quad A > \left|c_d - 2c_f(\theta)\right| + 2\,t - s.$$

[11] This assumption is in accordance with the fact that without sustainability standards, producers from developing countries are more efficient than EU producers (See Lendle and Schaus [2010] p4).

[12] The assumption that the domestic production is not exported is in accordance with the EU reality where production of biofuels is oriented towards domestic consumption.

[13] This assumption captures the fact that sustainability requirements are more detrimental to foreign producers and particularly to producers from developing countries than EU producers.

[14] In a similar case, Essaji [2010] imposes such conditions (See Essaji [2010] p5 note7).

If the tariff or the subsidy is not high enough to bar the foreign firm from supplying the domestic market, the domestic firm solves the following problem:

$$\underset{y}{\text{Max}} \quad p(q)\, y - c_d\, y + s\, y \tag{2}$$

The foreign firm solves the following problem :

$$\underset{x}{\text{Max}} \quad p(q)\, x - c_f(\theta)\, x - t\, x \tag{3}$$

The first order conditions for the domestic and foreign firms, given the Cournot conjecture, are respectively:

$$P'(q)\, y + p(q) - c_d + s = 0 \tag{4}$$

And,

$$P'(q)\, x + p(q) - c_f(\theta) - t = 0 \tag{5}$$

Fully differentiating (4) and (5) yields[15] :

$$\frac{\partial x}{\partial \theta} = x_\theta = \frac{(p'+\alpha)\, c_f'(\theta)}{p'(p'+\alpha+\beta)} < 0 \tag{6}$$

$$\frac{\partial y}{\partial \theta} = y_\theta = -\frac{\alpha\, c_f'(\theta)}{p'(p'+\alpha+\beta)} > 0 \tag{7}$$

$$\frac{\partial x}{\partial T} = x_T = \frac{p'+\alpha}{p'(p'+\alpha+\beta)} < 0 \tag{8}$$

Equation (6) shows that an increase in the standard reduces the output of the foreign firm and equation (7) shows that an increase in the standards raises the output of the domestic firm. Equation (8) shows that an increase in the tariff reduces the output of the foreign firm.

[15] These results are obtained by applying the Cramer's rule.
With $\alpha = p' + p''y < 0, \beta = p' + p''x < 0$ *and* $p'(p' + \alpha + \beta) > 0$.

Moreover, with firms profits such as:

$$\pi_d = \text{p(q) y - } c_d \text{ y + s y}$$

$$\pi_f = \text{ p(q) x - } c_f(\theta) \text{ x -t x}$$

We get the following equilibrium quantity:

$$x^* = \frac{1}{3v}(A - 2c_f(\theta) + c_d - 2t - s)$$

$$y^* = \frac{1}{3v}(A - 2c_d(\theta) + c_f + 2s + t)$$

With $p(q) = \frac{1}{3}(A + c_f(\theta) + c_d + t - s)$, we get:

$$\frac{\partial \pi_d}{\partial \theta} = \pi d_\theta = \frac{1}{9v}\left[c_f'(\theta)(2(A - 2c_d(\theta) + c_f + 2s + t)\right] \quad (9)$$

$$\frac{\partial \pi_f}{\partial \theta} = \pi f_\theta = -\frac{4}{9v}\left[c_f'(\theta)(A - 2c_f(\theta) + c_d - 2t - s)\right] \quad (10)$$

Therefore, it is easy to show that $\pi d_\theta > 0$ and $\pi f_\theta < 0$, meaning that an increase in the standard raises (reduces) the profit of the domestic firm (foreign firm).

4. The political process

Following Lai [2006], we specify that the trade policies are exogenously determined throughout this paper, and that the formation of the environmental sustainability standard is subject to the influence of interest groups. The domestic firm and the foreign firm are assumed to organize themselves into separate groups that coordinate offers of political contribution to the government. We assume that consumers are too numerous to overcome the free-rider problem and that they do not organize themselves into a lobby group. The types of lobby groups are denoted by j, where j= d,f for the domestic (foreign) firm respectively. Such political influence corresponds to the classical "direct political influence" (Grossman and Helpman [1994]). In addition to this kind of influence, we model the "indirect

political influence" (Zhihao [2005]), from the environmental lobby. We assume that the general public does not have perfect knowledge and rationality about environmental issues and more specifically about the side effects of biofuel production. Following Zhihao [2005], we define $\mu = \mu(m_{sg}, \mu_0)$. Where μ_0 represents the initial belief of green ordinary consumers ($\mu_0 = 0$), namely when consumers are not sensitive to environmentalist's activism. m_{sg} represents the message released by the environmental interest group in the society, and $\mu'(m_{sg}) > 0$. When consumers are sensitive to the environmentalists' activism (m_{sg}), μ increases and $\mu \in [0, +\infty[$. To examine how political contributions provided by the lobbies impact the equilibrium environmental sustainability standard, we construct a political game. The timing of the game is as follows. In the first stage, each lobbying group presents to the government a contribution schedule, $m(\theta)$, which is contingent upon the environmental standard chosen by the government. In the subsequent stage, the government determines the environmental policy, and collects the political contributions. Before discussing the determination of the political equilibrium, we first define the aggregate welfare of each lobby group j. The domestic firm's gross welfare function is represented by equation (9). The foreign firm's gross welfare function is represented by equation (10). Each lobby tailors its contribution schedule to maximize its net welfare, which is defined as the gross welfare minus the contributions. For ease of exposition, we assume that the interest groups' contribution schedules are globally truthful; that is, the contribution schedule of a lobbying group everywhere reflects the group's true welfare. The global- truthfulness assumption implies that the political equilibrium is the solution of the following problem:

$$\underset{\theta}{\text{Max}}\ G = \varphi^{d}\pi_{d} + \varphi^{f}\pi_{f} + W \qquad (11)$$

The parameter $\varphi^{j} \in [0,1]$ can be interpreted as either the weight the government attaches to the contributions it gets from lobbying group j, or the lobbying efficiency of group j. The weight φ^{j} is subject to certain exogenously determined factors, such as political skills[16]. The domestic social welfare function, W, consist of two components: green ordinary consumer's welfare, and the contributions received by the government respectively:

$$W = W^{go} + m^{d} + m^{f} \qquad (12)$$

[16] Following Lai [2006], we refer to this assumption.

Where W^{go} is the green ordinary consumer's aggregate welfare, which is equal to:

$$W^{go} = N^{go}u[x_i + y_i\ ] - p(q)x - p(q)y + N^{go}w + N^{go}tx - \mu\, N^{go}\, d(\theta) \qquad (13)$$

Differentiating equation (11) with respect to θ, we obtain the first-order condition of government optimization:

$$G_\theta = \varphi^d \pi_{d\theta} + \varphi^f \pi_{f\theta} + W_\theta = 0 \qquad (14)$$

Here, G_θ measures the government's marginal benefit from tightening the standard. Furthermore, the second-order condition requires that the marginal benefit be decreasing, that is, $G_{\theta\theta} < 0$. Equation (14) is a key equation in this paper, and implies the political equilibrium standard. To deliberate over the meaning of equation (14), we need to discuss an important property of the contribution schedule implied by the global-truthfulness assumption. We recall that when the political contribution function is globally truthful, the contribution function for group j reward the government for every change in the action by exactly the amount of change in the group's welfare. Specifically, a marginal increase in θ will induce the foreign firm to contribute $\pi_{f\theta}$ and the domestic firms to contribute to $\pi_{d\theta}$. In what follows, we define, $\pi_{f\theta}$ and $\pi_{d\theta}$ as the foreign firm and the domestic firm marginal willingness to contribute (MWTC) respectively. Since $\pi d_\theta > 0$, this reveal that the domestic firm's contributions increase with the standard, and since $\pi f_\theta < 0$, this reveals that the foreign firm's contributions decrease with the standard. Equation (14) states that a political equilibrium standard should be chosen to balance the trade-off between the political contributions from the interest groups and social welfare.

5. Political Equilibrium Policy

First of all, we are interested in knowing the relationship between the equilibrium environmental standard (θ^O) and the socially optimal standard (θ^*). Realizing the relationship between θ^O and θ^* provides us with a better understanding of the policy distortion resulting from political failure. The socially optimal standard is the solution to the following first-order condition $W_\theta(\theta^*) = 0$. The second order condition requires that $W_{\theta\theta} < 0$. To compare θ^O and θ^*, we evaluate equation (14) at θ^* and we obtain :

$$G_\theta(\theta^*) = \varphi^d \pi_{d\theta}(\theta^*) + \varphi^f \pi_{f\theta}(\theta^*) \quad (15)$$

With the second order condition that $G_{\theta\theta} < 0$; if $G_\theta(\theta^*)$ is positive, the equilibrium standard is stricter than the optimal standard; if $G_\theta(\theta^*)$ is negative, then the equilibrium standard is less than the optimal level. The equilibrium standard happens to equal the optimal standard when $G_\theta(\theta^*) = 0$. The equilibrium standard can be either greater or less than the optimal policy. If $\varphi^f = 0$, $\varphi^d > 0$ then $G_\theta(\theta^*) = \varphi^d \pi_{d\theta}(\theta^*) > 0$. The equilibrium standard is superior than the optimal standard. This result is intuitive because the domestic firm is the only one to influence the policy. If $\varphi^d = 0$, $\varphi^f > 0$, $G_\theta(\theta^*) = \varphi^f \pi_{f\theta}(\theta^*) < 0$. The equilibrium standard is less than the optimal standard. This result is intuitive because the foreign firm is the only one to influence the policy. From equation (16), the following proposition reveals the relationship between θ^O and θ^* when $\varphi^f = \varphi^d$.

Proposition 1 : *When there is not indirect political influence and if the lobbying efficiency is such that* $\varphi^f = \varphi^d$, *the equilibrium standard is greater than the socially optimal standard if* $c_f(\theta) > \frac{2A - 8c_d - 8t - 2s}{10}$ *and it is lower than the socially optimal standard otherwise.*

Indeed, when $\varphi^f = \varphi^d$, we get from equation (15) $G_\theta(\theta^*) = \varphi^f [\pi_{d\theta}(\theta^*) + \pi_{f\theta}(\theta^*)]$. And, the sign of $G_\theta(\theta^*)$ depends on the sign of $\pi_{d\theta}(\theta^*) + \pi_{f\theta}(\theta^*)$, namely on the sign of $(-2A + 10c_f(\theta) - 8c_d + 2s + 8t)$. Therefore, $G_\theta(\theta^*) > 0$ if $c_f(\theta) > \frac{2A - 8c_d - 8t - 2s}{10}$. In this case, this means that the domestic firm MWTC is greater than the foreign firm MWTC in absolute term and as a result $\theta^O > \theta^*$. $G_\theta(\theta^*) < 0$ otherwise.

Also, with $W_\theta(\theta^*) = 0$ we get:

$$\pi_{d\theta}(\theta^*) = \frac{1}{3}\ c'_f(\theta)\ (x + y) + N^{go}(-tx_\theta) + \mu N^{go} d_\theta - \pi_{f\theta}(\theta^*) \quad (16)$$

Therefore, we may also evaluate equation (14) at θ^* and combining with (16) we obtain:

$$G_\theta(\theta^*) = \pi_{f\theta}(\theta^*)\ (\varphi^f - \varphi^d) + \varphi^d\left[\frac{1}{3}\ c'_f(\theta)\ (x + y) + N^{go}(-tx_\theta) + \mu N^{go} d_\theta\right] \quad (17)$$

From equation (17), the following proposition reveals the relationship between θ^O and θ^* when there is an indirect political influence and $\varphi^f = \varphi^d$.

Proposition 2 : *When there is an indirect political influence and if the lobbying efficiency is such that* $\varphi^f = \varphi^d$ *, the equilibrium standard is greater than the socially optimal standard if the indirect political influence is sufficiently low, namely if* $\mu < \frac{\frac{1}{3}\ c'_f(\theta)\ (x+y) + N^{go}(-tx_\theta)}{N^{go}|d_\theta|} = \mu_1$, *and it is lower than the socially optimal standard otherwise.*

Indeed, when there is an indirect political influence and $\varphi^f = \varphi^d$, we get from equation (17) $G_\theta(\theta^*) = \varphi^d\left[\frac{1}{3}\ c'_f(\theta)\ (x + y) + N^{go}(-tx_\theta) + \mu N^{go} d_\theta\right]$. And, the sign of $G_\theta(\theta^*)$ depends on the sign of $\frac{1}{3}\ c'_f(\theta)\ (x + y) + N^{go}(-tx_\theta) + \mu N^{go} d_\theta$. Therefore, $G_\theta\ (\theta^*) > 0$ if $\mu < \frac{\frac{1}{3}\ c'_f(\theta)\ (x+y) + N^{go}(-tx_\theta)}{N^{go}|d_\theta|}$ and as a result we have $\theta^O > \theta^*$. Indeed, we have the following relationship $W_\theta(\theta^*) = W_\theta^{go}(\theta^*) + \pi_{d\theta}(\theta^*) + \pi_{f\theta}(\theta^*) = 0$. Also, $W_\theta^{go} < 0$ when $\mu < \frac{\frac{1}{3}\ c'_f(\theta)\ (x+y) + N^{go}(-tx_\theta)}{N^{go}|d_\theta|} = \mu_1$. Therefore, when $\mu < \mu_1$ we get $\pi_{d\theta}(\theta^*) > \left|\pi_{f\theta}(\theta^*)\right|$. This means that when the indirect political influence is low (with $\mu < \mu_1$), the domestic firm MWTC is greater than the foreign firm MWTC in absolute term and as a result we get from equation (15) $\theta^O > \theta^*$. By the same reasoning, it is easy to show that when the indirect political influence is high, namely when $\mu > \mu_1$, the domestic firm MWTC is lower than the foreign firm MWTC in absolute term and as a result $\theta^O < \theta^*$. These results are in accordance with Yandle's Bootleggers and Baptists theory where the high indirect political influence from environmental groups (the Baptists) leads the domestic firm (the Bootleggers) to lobby less the regulator. Besides, what this proposition reveals is that when the lobbying efficiency of the domestic and the foreign firm is identical, the high indirect political influence from environmental groups leads to a lower environmental standard.

Also, From equation (17), the following proposition reveals the relationship between $\theta^O$and $\theta^*$when there is an indirect political influence and $2\varphi^f = \varphi^d$.

Proposition 3 : *When the indirect political influence increases, namely when* $\mu \in]\mu_1, \mu_2[$ *with* $\mu_2 = \frac{-\pi_{f\theta}(\theta^*)}{2N^{go}|d_\theta|} + \mu_1$ *,the lobbying efficiency must be such that* $2\varphi^f = \varphi^d$ *to get the equilibrium standard greater than the optimal standard. When* $\mu > \mu_2$ *the equilibrium standard is lower than the optimal standard when* $2\varphi^f = \varphi^d$.

Indeed, when there is an indirect political influence and $2\varphi^f = \varphi^d$, we get from equation (17) $G_\theta(\theta^*) = \varphi^f[-\pi_{f\theta}(\theta^*) + 2\ (\frac{1}{3}\ c_f'(\theta)\ (x + y)\ +\ N^{go}\ (-tx_\theta) + \mu\, N^{go} d_\theta)]$. Therefore, $G_\theta\ (\theta^*) > 0$ if $\mu < \frac{-\pi_{f\theta}(\theta^*)}{2N^{go}|d_\theta|} + \mu_1 = \mu_2$. If $\mu \in]\mu_1, \mu_2[$ we get $W_\theta^{go}(\theta^*) > 0$ and therefore $\pi_{d\theta}(\theta^*) < |\pi_{f\theta}(\theta^*)|$ due to the relation $W_\theta(\theta^*) = W_\theta^{go}(\theta^*) + \pi_{d\theta}(\theta^*) + \pi_{f\theta}(\theta^*) = 0$. Nevertheless, when $2\varphi^f = \varphi^d$ we get $2\pi_{d\theta}(\theta^*) > |\pi_{f\theta}(\theta^*)|$ and as a result we get from equation (15) $\theta^O > \theta^*$. By the same reasoning, it is easy to show that when $\mu > \mu_2$, the domestic firm MWTC is lower than the foreign firm MWTC in absolute term and as a result $\theta^O < \theta^*$. What this proposition reveals is that when the indirect political influence from environmentalists is high, the domestic firm will rationally reduce his MWTC, therefore the only way for a strict environmental standard to be implemented is when the domestic firm lobbying efficiency is twice as much greater than the foreign firm one. This result which is also in accordance with Yandle's Bootleggers and Baptists theory may explain why strict biofuel environmental sustainability standards are implemented in the E.U. Indeed, the intuition is that E.U. biofuel producers' interest groups are more efficient to influence E.U. policy than foreign one and that indirect political influence is high.

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