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POLITICAL ECONOMY OF AGRICULTURAL AND ENVIRONMENTAL WEIGHTS

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Political Economy of Agricultural Policies and Environmental Weights

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Abstract

In this paper, a theoretical model was constructed to endogenously determine environmental weights in the agricultural sector. The conventional Political Preference Function was extended to include environmental weights. The model was applied to the wheat sector in the EU for the years 1990 and 2006. The results imply that designing protection levels that have small disparities between domestic and world prices and avoiding excess production cause a positive environmental surplus which leads to higher environmental weights.

Key words: Environmental Weights, Political Preference Functions, EU, Agriculture

JEL: Q180, Q510, H230

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Introduction

The current path of globalization is creating environmental concerns because of increasing production and trade activities. Up to now, the impacts of agricultural policies were evaluated mostly on the welfare of producer and consumer groups, and on budgets. Despite the fact that the environmental impacts of agricultural policies have been examined by some studies, the environmental weights assigned by policymakers have not been scrutinized enough in the political economy models. Both agricultural and trade policies - such as subsidies, tariffs, or setting standards on export and import - have impacts on production, consumption, and trade, consequently changing the levels of polluting emissions. It is a known fact that these pollutants lead to health and environmental problems. On the other hand, there is room for further study regarding the weights associated with environmental concern in agricultural policymaking. Although endogenously formed weights and applications to agriculture were examined (Rausser and Freebairn, 1974; Oehmke and Yao, 1990; Johnson et al., 1993; Abler and Sukhatme, 1998; Ndayisenga and Kinsey, 1995; Kennedy et al., 1996; Atici and Kennedy 2005; Atici, 2005), environmental weights have not been examined in the literature. The originality of this study stems from its aim to explore the environmental weight perceived by policy makers in agricultural policy designs. It is expected that the result of this study will contribute to designing sustainable environmental, agricultural and trade policies. The main objective of the study is twofold; first to set up a model that determines the weight of environmental concern endogenously, and second to test the model for an agricultural commodity group, deriving policy implications for a sustainable policy design.

Policy-Environment Interaction

The domestic and international agricultural policies have various impacts on welfare and the environment. The neoclassical economic theory indicates that every intervention in markets leads to inefficiencies in welfare. Therefore, although some policies benefit producers, consumers, or budgets in general, a net loss occurs in the total welfare. However, if a policy's goal is to reduce environmental pollution, some policies can be preferred to others. For instance, price controls, production quota, export taxes, taxes (sales or pigovian), and direct income support policies can be used for this purpose. However, some policies - such as price controls and export taxes - are not optimal in today's globalized economies. In this case, tax policies and income support seem more flexible tools in reducing environmental degradation. The imposition of pigovian tax internalizes the environmental cost, forcing production to decrease to a socially optimum level. Agricultural trade flows can have positive or negative effects on the environment, depending on various indicators. For instance, the product composition of trade, availability of funds for environmental protection, location and intensity of production, choice of technology, and implementation of regulations are influenced by trade policy instruments (OECD, 1994). On the other hand, differences in environmental regulations may provide a comparative advantage in intensive pollution production among countries, leading to pollution havens (Cole, 2004).

If the pollutants are charged by the amount of environmental cost caused by externalities, an efficient level of production can be achieved. If we consider the supply curve as sum of all the marginal cost curves and S^1 as the marginal social cost curve after tax, then we can obtain Figure 1. Without trade, when only private costs are considered, production occurs at Q. In this case, social welfare is obtained by subtracting pollution costs (*ade*) from the sum of the producer and consumer surplus (*abe*). When firms are forced to pay pollution costs, they will produce at Q^1, which is the social optimum (van Beers, 2000). This social welfare (*abc*) is higher than pre tax welfare by (*cde*). This welfare represents a decrease in pollution and production.

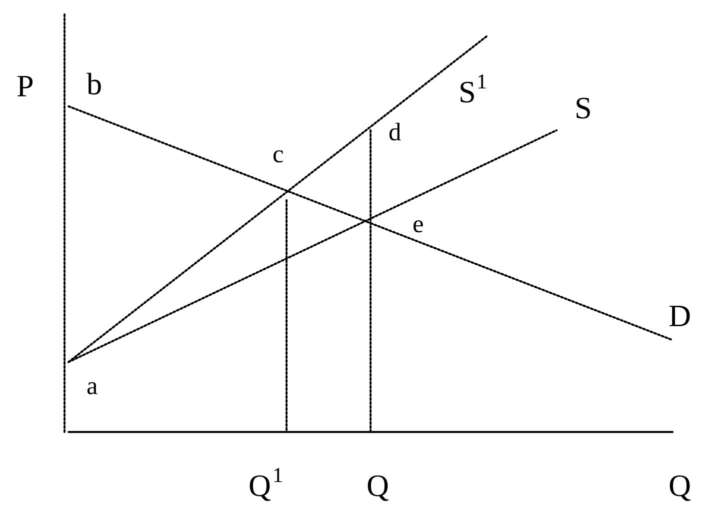

Figure 1. Social Optimum In Case of No Trade

When a small importing country opens to trade (Figure 2), the consumption increases from the level of balance and reaches C. Production decreases to Q^1. If the pollution cost is internalized, production occurs at Q^2. In this case, the importing country will gain whether it does or doesn't produce at social optimum. A gain from trade including the private cost is (*defgh*). The amount *degh* is due to the decrease in polluting production and (*efg)* is due to the consumer surplus. If that country produces considering the social cost, the gain from trade is *(cfq).* This gain is caused by the consumer surplus that compensates loss in the producer surplus. In this case, in a country where the social cost is internalized, the welfare gain is higher than without trade because of the higher consumer surplus.

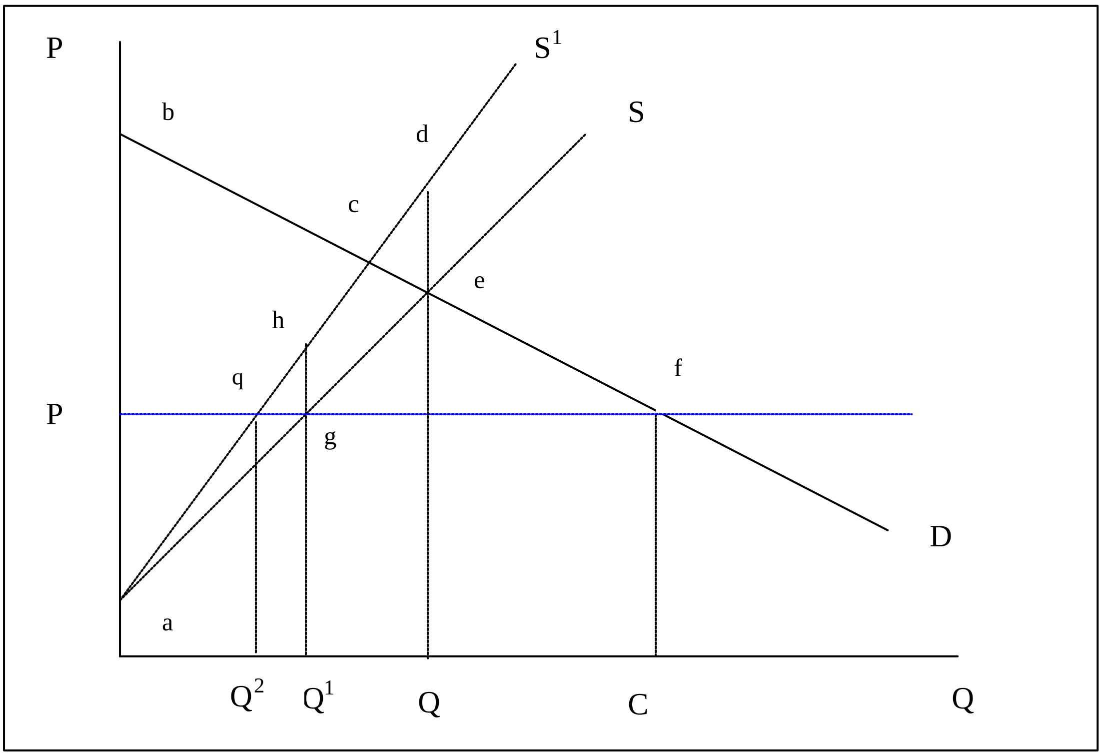

Figure 2. Social Optimum for Importer

If that country is an exporter (Figure 3), welfare gains are not clear. If pollution costs are not internalized, production occurs at Q^1 and consumption at C. In this case, gains from trade *(eik)* (compensation of producer surplus to consumer surplus because of high prices) minus *(edkm)* (loss because of not considering) social cost. The net welfare may be positive or negative because increasing production also brings pollution. If the pollution cost is internalized by taxes (S^1), that country gains from that. Consumption stays at C but production decreases to Q^2. Gains from trade are *(cij)* caused by higher producer surplus compensating loss in consumer surplus because of the higher prices.

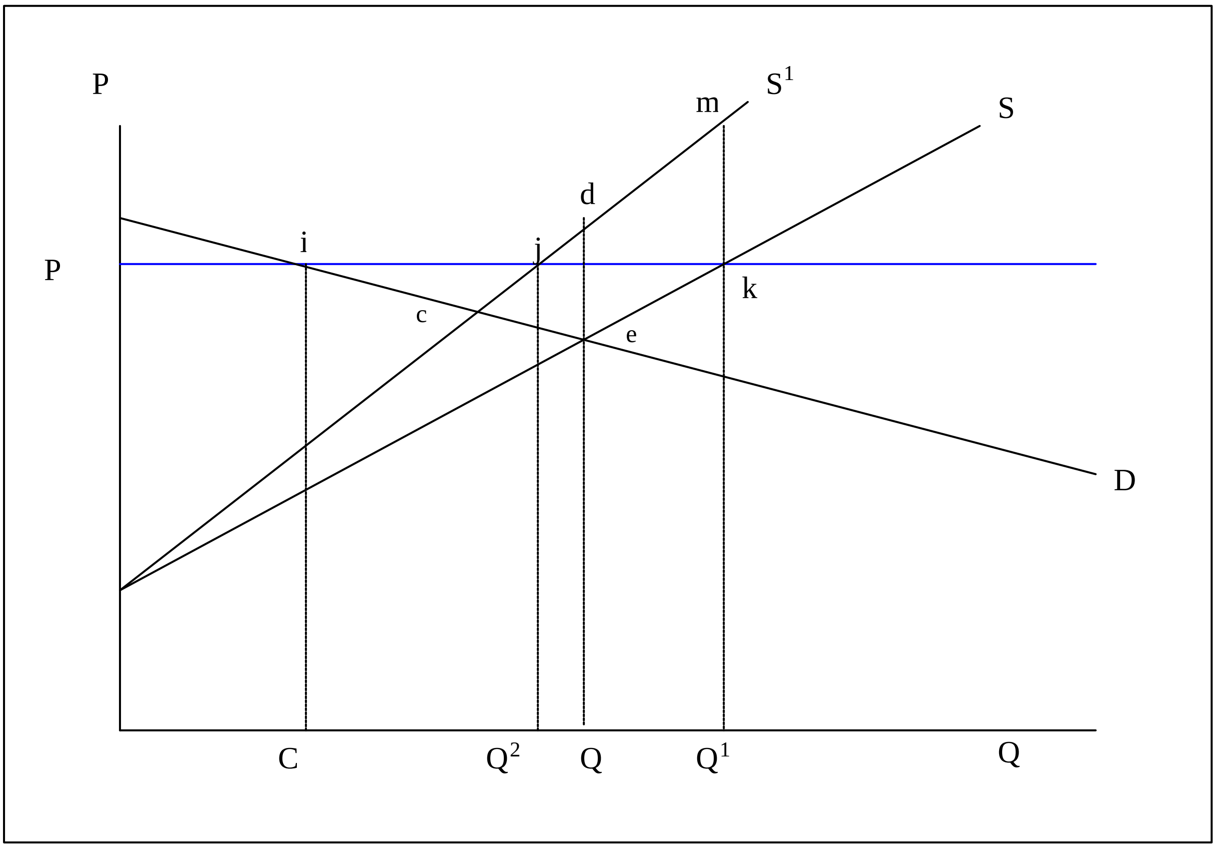

Figure 3. Social Optimum for Exporter

Model

In this study the conventional PPF will be employed and extended to include environmental weights. The PPF studies assume that governments behave as if they maximized a preference function consisting of various welfare groups (Bullock, 1994). Therefore, policymakers evaluate the welfare gains and losses of various groups in an economy. This relationship is represented by a PPF, which is a weighted additive function of producer and consumer surplus and budgetary savings (Johnson et al, 1993; Atici, 2005). In this framework, we assume that governments behave as if they maximized the PPF; thus it is shown as

$$Max. \quad PPF = PS_i(a_i)*w_{fi} + CS_i(a_i)*w_{ci} + B_i(a_i) \qquad (1)$$

where ? fi is a positive vector, in case there are many commodities, and ? ci is a positive scalar. The terms PS, CS, and B denote producer surplus, consumer surplus, and budget savings respectively for each commodity examined. The terms ? fi and ? ci are the political weights of the respective producer groups and the aggregate consumer, respectively, in country *i*. After differentiating this equation with respect to the actions (a_i), the weights can be calculated (Johnson et al., 1993; Kennedy et al., 1996). This study aims at integrating the environmental weight (? ei) in the model by using quasi environmental rents (ES_i) through pigovain tax, environmental budgetary expenditures, and sector specific protection activities such as subsidies, income support, tariff etc. related to the environment, and it can be shown as,

$$Max. \quad PPF = PS_i(a_i)*w_{fi} + CS_i(a_i)*w_{ci} + ES_i(a_i)*w_{ei} + B_i(a_i) \qquad (2)$$

In order to integrate environmental weights in the PPF framework we need to define a quasi environmental rent caused by various policies such as taxes or subsidies. If governments internalize the cost with a fixed charge, say (?), then that level can be assumed as the environmental protection that varies according to the product and country. This can be an environmental tax imposed on production or sales tax imposed on inputs. In any case, such a policy causes a shift to the left in the supply curve, changing producer and consumer welfare and the socially optimum level of production. This level of production can be a proxy for environmental surplus caused by various policies. Therefore ES can be defined as the change

$$ES \cong [\int_{qso}^{qe} (S^{e} - S^{so}) dq] \tag{3}$$

where S^e : Initial supply curve, S^{so}: Socially optimal level of supply after pigovian tax, and with subsidy

$$ES \cong [\int_{qso}^{qe} (S^{e} - S^{so}) dq + \int_{qso}^{qsub} S^{sub} dq] \tag{4}$$

Therefore if a country has no pigovian tax, its ES will be minus while it will be positive for a country which has the tax. If a country has a subsidy, the ES will be negatively higher than in a country which has no subsidy and no tax. In this case, weights can be determined endogenously using equation (2) and evaluating the impact of policy changes, so that

$$\begin{bmatrix} w_{pi} \\ w_{ci} \\ w_{ei} \end{bmatrix} = -\begin{bmatrix} \partial PS/\partial P_i & \partial CS/\partial P_i & \partial ES/\partial P_i \\ \partial PS/\partial C_i & \partial CS/\partial C_i & \partial ES/\partial C_i \\ \partial PS/\partial E_i & \partial CS/\partial E_i & \partial ES/\partial E_i \end{bmatrix}^{-1} \begin{bmatrix} \partial B/\partial P_i \\ \partial B/\partial C_i \\ \partial B/\partial E_i \end{bmatrix} \tag{5}$$

where P, C, E represent actions (a) for government related to producers, consumers, and environment respectively for a commodity in a country i.

Application of the Model and Results

The procedure described above was applied to the EU wheat policy for the years 1990 and 2006 based on the production, consumption, protections, and world prices obtained from OECD (2008). As can be seen in Table 1, in 1990 producers had the highest weights (1.4), followed by consumers. The environment had the lowest weight (0.02) given the conventional support policies. Considering the fact that most agricultural policies have not valued the environmental quality for a long period of time, the results are not surprising. On the other hand, in 2006 the producer weights decreased to 0.84 and consumer weights increased to 1.16, which reflects the lower producer prices due to the EU's changing policy towards income support. Because of the smaller disparity between world prices and domestic prices in 2006, producer weights decreased and consumer weights increased, almost equaling each other. On the other hand, fewer domestic distortions caused environmental weights to increase to 0.14, much higher than in 1990. A similar procedure can be applied to obtain environmental weights for various commodities and various countries for the purpose of comparison. In this way we can obtain an endogenously determined environmental weight index.

Table 1. Estimated Weights for Wheat in the EU, 1990-2006

	Weights	
Groups	**1990**	**2006**
Producers	1.40	0.84
Consumers	0.60	1.16
Environment	0.02	0.14
Budget	1	1

Source: Calculated.

Table 2 presents the calculated PPF values for different weights assigned by policy makers. As can be seen, when weights are one for all groups the PPF value is higher than when the weights are estimated. In addition, the PPF values were higher in 2006 when environmental weights gained importance. Therefore, a policy towards environmental protection in the wheat sector in the EU would improve PPF values and also environmental quality. The welfare generated by such a policy can be considered as an income effect that can be utilized to further improve environmental quality.

Table 2. Pigovian Tax (10 %) and Changes in PPF Values with Equal and Estimated Weights, Million Euros

	1990	**2006**
PPF(Weights=1)	1728	2506
PPF (Estimated Weights)	926	1914

Source: Calculated.

Conclusions

In this paper, a theoretical base was constructed to determine environmental weights endogenously and it was tested by using the data for wheat in the EU for 1990 and 2006. The concept of quasi environmental rent through a pigovian tax was utilized to determine environmental weights. These weights reflect the political economy of agricultural protection displaying the lobbying powers of various groups. The results showed that environmental weights increased significantly from 1990 to 2006 as a result of the EU's changing policy from payments to output to direct income support. Since price supports are rather more distortive than other types of protection because of their link to production and pollution, a decrease in price support has positive impacts on the environment. Therefore, a lesser disparity between world prices and less production create a positive environmental surplus leading to higher environmental weights. The importance of these weights is that they can be calculated for groups of products to determine average agriculture related weights and an index can be constructed for countries over the years. Future studies can explore these potentials.

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