INTERNATIONAL CENTRE FOR ECONOMIC RESEARCH
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WORKING PAPER SERIES

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AGRICULTURAL POLICIES AND ENVIRONMENTAL INTERACTION IN OECD COUNTRIES

Working Paper No.26/2008

Agricultural Policies and Environmental Interaction in OECD Countries

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ICER, 2008

Abstract

Agriculture is heavily subsidized in most of the OECD countries. On the other hand, environmental externalities occur because of protection related pollution. In this study the structure of agricultural protection in the OECD countries was examined in a chronological and comparative perspective. In addition, the policy-environment interaction was scrutinized in order to better understand environmental implications of agricultural policies in the era of globalization. Evidence was found for international trade and environmental interaction in some of the OECD countries such that production and technological impact appear to be a prominent factor in environmental pollution.

Key Words: OECD, Agricultural Policy, Environment, EPI

JEL: Q180, Q560, F530

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Introduction

OECD countries in general have high levels of agricultural protections and their agricultural policies impact the world of agriculture as well. On the other hand, many industrialized countries are reforming their policies to be more competitive in the era of globalization and as an obligation of the WTO. Agricultural policies impact not only producer and consumer welfare but also environmental quality, which has been disregarded for a long time. Agricultural subsidies encourage the use of polluting inputs that harm the environment. In addition, international trade policies have an impact on the environment as well. There are five main categories of trade-related environmental effects: scale effect, structural effect, product effect, technical effect, and regulatory effect (OECD, 1994). Increasing trade flow can have positive or negative effects on the environment by changing the product composition of trade (product effect), by increasing economic growth and generating the funds available for environmental protection (scale effect), by altering the location, product-mix and intensity of production by the removal of trade distortive and environmentally harmful subsidies (structural effect), by using more efficient technologies (technical effect), and by creating greater consciousness and higher standards for the environment because of the higher income generated by trade related flows (regulatory effect). On the other hand, with the process of globalization, differences in environmental regulations may provide a comparative advantage in intensive pollution production among countries, and this is called Pollution Haven Hypothesis (Cole, 2004). Trade openness also increases the flow of FDI that may affect the economy, and hence the environment in similar such as scale, income and technical effects (Liang, 2006). The trade-environment interaction has been studied empirically in some previous papers. For instance, in terms of general equilibrium studies Beghin et al. (1996) examined the link between economic activity and environment for various countries. Their results indicate that trade policy reforms do not have uniform outcomes across sectors and

that technical adjustments - in substituting non-polluting factors for polluting factors - are essential. In terms of environmental impact of trade and tax policies, it was found that when tariff removal is combined with a cost-effective tax policy, welfare enhancement can be achieved with environmental quality (Lee and Roland-Host, 1997). Dessus and Bussolo (1998) indicated that environmental taxes reduce growth but also decrease emissions. Strutt and Anderson (1999) estimated the environmental effects of trade agreements and found that trade policy reforms would improve the environment and reduce the depletion of natural resources. Yang (2001) researched the environmental effects of Taiwan's WTO membership and found that total carbon dioxide emissions increase as a result of trade liberalization and there is a structural effect shifting production to more carbon intensive sectors. Kumbaroglu (2003) examined the environmental impacts of taxation in Turkey and found that sustainable development is possible through environmental taxation. In terms of partial equilibrium studies, Leetmaa et al. (1996) found that export subsidies in the US and EU have small contributions on nitrate pollution. Saunders et al. (2006) analyzed the impact of trade liberalization on greenhouse emissions in regards to the EU and New Zealand dairy sector, and found that although producer returns in New Zealand have increased, greenhouse gas emissions have also increased significantly, while EU producer returns and emissions have decreased. In terms of econometric studies, Frankel and Rose (2002) examined the impact of trade on environment using determinants of trade and found that trade may have beneficial impact on the environment largely because of the income effect; the results also support the environmental Kuznets curve indicating that growth harms the environment at low levels of income but helps at high levels. In a recent study, Atici and Kurt (2007) determined that Turkey's trade openness leads to increases in carbon emission levels, confirming the Pollution Haven Hypothesis, while agricultural openness has a slight negative impact on the level of emissions. In another study, Atici (2008) examined the impact of various factors on carbon

emissions in Central and Eastern European Countries utilizing the panel data. The results confirm the existence of an EKC for the region, and findings also indicate that globalization did not facilitate the emission level in the region.

This study attempts to examine the agricultural policy-environment interaction in OECD countries. Although there are data on agricultural protection and to a lesser extent on environmental indication, there is quite an essential need to outline the interaction between policy design, economic performance, and environmental change in the agricultural sector. An OECD (2000) study indicates that, given the diversity of agricultural systems, environmental impact will vary between countries and regions. Thus, this study aims at contributing to our understanding of policy-environment interaction in the agricultural sector in order to evaluate the impacts of policy-environment interaction and design policies for a sustainable development.

Agricultural Policies and the Environment

The impact of various agricultural policies on welfare and environment can be seen in Table 1. As we know from the economic theory, every intervention leads to inefficiencies in welfare. Therefore, although some policies benefit producers, consumers, or budgets, in general there is a loss in the total welfare. However, if the policy 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. Given the fact that some policies - such as price controls and export taxes - are not optimal in today's globalized economies, pollution tax policies and income support seem more flexible tools in reducing environmental degradation. The imposition of pigovian taxes internalizes the environmental cost, thereby forcing the production to decrease to a socially optimum level.

Table 1. Agricultural Policies and Their Impact on the Environment

	Producer Surplus	Consumer Surplus	Budget	Environment
Price Control	–	+	N	+
Price Support	+	–	–	–
Production Quota	+	–	–	+
Input Subsidy	+	N	–	–
Import Tariff	+	–	+	–
Import Quota	+	–	N	–
Export Subsidy	+	–	–	–
Export Tax	–	+	+	+
Tax	–	–	+	+
Direct Income Support	+	N	–	+

Environmental Performances

Environmental performances can be measured in various ways. The Environmental Performance Index (EPI) constructed by Yale University (2008) ranks countries according to criteria such as environmental health and ecosystem vitality. The agricultural index is part of the ecosystem vitality and is composed in terms of irrigation stress, agricultural subsidies, intensive cropland, burned land area, and pesticide regulation. These rankings can be seen in Tables 2 and 3.

Table 2. Environmental Performance Index for OECD Countries, 2008

Rank	Country	EPI
1	Switzerland	95.5
2	Norway	93.1
3	Sweden	93.1
4	Finland	91.4
5	Austria	89.4
6	New Zealand	88.9
7	France	87.8
8	Iceland	87.6
9	Canada	86.6
10	UK	86.3
11	Germany	86.3
12	Slovakia	86.0
13	Portugal	85.8
14	Japan	84.5
15	Hungary	84.2
16	Italy	84.2
17	Denmark	84.0
18	Luxembourg	83.1
19	Spain	83.1
20	Ireland	82.7
21	US	81.0
22	Poland	80.5
23	Greece	80.2
24	Australia	79.8
25	Mexico	79.8
26	South Korea	79.4
27	Netherlands	78.7
28	Belgium	78.4
29	Czech Republic	76.8
30	Turkey	75.9

Source: http://epi.yale.edu, 2008.

Table 3. Agricultural Score in EPI

Rank	Country	Agricultural Score	Irrigation Stress	Agricultural Subsidies	Intensive Cropland	Burned Land Area	Pesticide Regulation
1	New Zealand	*97.5*	100	93.6	97.4	96.5	100
2	Poland	*84.4*	100	89.8	40.7	95.9	95.5
3	Ireland	*82.6*	100	22.8	95.4	99.5	99.5
4	Luxembourg	*82.1*	100	22.8	100	92.4	95.5
5	Czech Republic	*81.9*	100	61.4	54.7	93.3	100
6	Belgium	*80.8*	100	22.8	87.1	98.6	95.5
7	Canada	*80.4*	98.4	55.0	59.6	89.0	100
8	Finland	*79.4*	100	22.8	75.8	98.3	100
9	Netherlands	*79.3*	100	22.8	85.1	92.9	95.5
10	Sweden	*79.3*	100	22.8	75.0	98.9	100
11	Australia	*78.7*	50.7	99.9	79.6	63.3	100
12	Japan	*78.7*	100	0.0	97.4	96.2	100
13	Germany	*78.5*	100	22.8	72.8	96.7	100
14	Slovakia	*78.5*	100	56.7	51.9	83.9	100
15	Switzerland	*78.3*	100	0.0	93.2	98.1	100
16	Turkey	*78.1*	96.8	42.1	77.6	87.5	86.4
17	US	*77.9*	77.5	65.7	73.4	86.6	86.4
18	Mexico	*77.6*	78.4	63.6	84.7	79.7	81.8
19	Norway	*77.1*	100	0.0	86.2	99.2	100
20	UK	*76.9*	100	22.8	67.7	98.4	95.5
21	Austria	*76.4*	100	22.8	63.2	96.0	100
22	Greece	*76.4*	98.2	22.8	85.1	80.5	95.5
23	Portugal	*74.1*	100	23.0	69.2	82.5	95.5
24	France	*73.9*	100	22.8	54.2	97.1	95.5
25	Italy	*73.9*	100	22.8	65.3	85.7	95.5
26	Spain	*68.5*	81.2	22.8	50.1	93.0	95.5
27	South Korea	*66.5*	100	0.0	93.3	70.8	68.2
28	Hungary	*65.1*	100	54.8	35.7	39.4	95.5
29	Denmark	*64.5*	100	22	0.0	99.6	100

Source: http://epi.yale.edu, 2008.

Agricultural Protection in OECD Countries

The structure of agricultural protection in OECD countries is presented in Table 4. As can be seen, this table provides us very detailed and crucial information about the agricultural policies of the OECD countries. The Producer Subsidy Equivalents (PSE), which measure the direct protection for farmers, are good indications for agricultural subsidies in general. Iceland, Korea, Norway and Switzerland had high PSE values in the early 1990s and in 2006. Australia and New Zealand had the lowest PSE values in the1990s and 2006. These two countries therefore have had liberal agricultural policies throughout the last 15 years. Consumer subsidy equivalents (CSE), on the other hand, measure the consumer protection, or more precisely taxation. It is negative when PSE values are positive. Total subsidy equivalents include direct as well as indirect protections such as infrastructure, services, extension etc. The highest TSE values belong to the EU, US, and Japan in the 1990s. However, the ratios of TSE to GDP were highest in Korea, Turkey and Iceland by 8.3, 4.7 and 4.5 respectively. In 2006 these three countries also had the highest rankings despite the ratio decrease. If we look at how these agricultural policies are financed, we can make some observations about these countries. In the EU, 64% of protection is financed by consumers through high domestic prices, as compared with world prices, and 35 % by taxpayers through taxes. In the US, on the other hand, we observe a different pattern: only 22% of protection comes from consumers while 78% comes from taxpayers. This indicates that US consumers consume food products that are relatively cheaper than other countries. The highest consumer burden belongs to Korea and Japan with 84% and 79 % respectively. The lowest consumer burden is observed in New Zealand with 21 % in 1990. In 2006 the share of consumers decreased to 37 % and in the US to 6 % , which is a result of the trade liberalization movement of the WTO and agricultural reforms towards competitiveness. Japan and Korea

still keep their high share for consumers while the share of consumer transfers decreased to less than 1 % in Australia. The General Service Expenses (GSE) is an important factor in indirect agricultural protection and it is favored by the WTO as well because it does not disturb production. Also these policies are environmentally friendly, since they provide information for more efficient and clean technologies. The share of GSE to the TSE was highest in New Zealand and the US by 46% and 30 % respectively in the 1990s. Norway, Switzerland and Turkey had the lowest share in that period with 4-7 %. In 2006, New Zealand had the highest again with 66% followed by the US, Australia and Canada.

Table 5 presents the composition of PSE in OECD countries over years. In the EU, support on output was highest in 1990 forming 85 % of PSE. In the US support on output through high support prices formed 47 % of PSE while payment based on area was 30 %. Korea, Japan, Iceland, and Turkey also had high levels of output support in the 1990s. In that period, payments based on inputs were highest in Mexico by 58 %. In 2006, output support decreased to 46 %, almost half compared to the 1990s, and share of payments based on area increased to 44 % in the EU. These values show that problems caused by overproduction were aimed at being eliminated by direct income payments to farmers. In the US payments based on area also reached 47 % of the PSE. The striking point is that the share of input payments which have the highest share in environmental pollution increased to 63 % in Australia and 43 % in New Zealand. The implication is that these two highly competitive countries benefited from trade liberalization and globalization and even if they have the lowest overall support, input subsidies have gained importance depending on the changing demand conditions of world markets (grains and beef). Also the recent climate change impact may have had a negative influence on productivity, causing use of additional inputs such as fertilizers.

Table 4. Structure of Agricultural Support in OECD Countries, 1990-2006

Years	Support	Australia	Canada	EU	Iceland	Japan	Korea	Mexico	N. Zealand	Norway	Switzerland	Turkey	USA
1990	PSE (%)	11	34	33	75	52	74	16	2	72	73	21	17
	CSE (%)	-14	-17	-27	-60	-50	-70	-16	-3	-57	-69	-23	0
	TSE (Mil. $)	2.176	9.103	125.228	288	52.438	21.875	5.659	174	3.807	7.416	7.133	65.794
	TSE/GDP	0.7	1.6	2.1	4.5	1.7	8.3	2.1	0.4	3.3	3.1	4.7	1.1
	Transfer from consumers %	28	36	64	56	79	84	62	21	50	74	77	22
	Transfer from tax payers %	72	64	36	44	21	16	38	79	50	36	23	78
	GSE/TSE	17	20	12	8	18	12	22	46	4	7	7	30
1995	PSE	7	20	37	59	62	72	-5.0	2	65	65	13	10
	CSE	-8	-12	-23	-39	-57	-71	12	-3	-47	-58	-8	7
	TSE	1.758	5.728	143.471	154	97.645	28.750	-143	192	3.157	7.446	6.238	68.026
	TSE/GDP	0.5	1.0	1.6	2.2	1.9	5.5	0.0	0.3	2.1	2.4	3.7	0.9
	Transfer from consumers %	13	33	53	42	74	86	19	20	47	66	34	15
	Transfer from tax payers %	87	67	47	58	26	14	81	80	53	34	66	85
	GSE/TSE	22	27	5	9	25	11	20	51	5	7	32	38
2000	PSE	5	20	34	67	60	66	20	2	67	70	21	24
	CSE	-2	-16	-20	-53	-50	-63	-19	0	-51	-61	-21	1
	TSE	1.125	5.80	100.652	169	67.907	22.114	6.974	118	2.422	4.873	10.523	95.944
	TSE/GDP	0.3	0.80	1.3	2.0	1.5	4.3	1.2	0.2	1.5	2.0	5.3	1.0
	Transfer from consumers %	0.2	41	46	49	76	83	70	11	42	62	54	19
	Transfer from tax payers %	99.80	60	54	51	24	17	30	89	58	38	46	81
	GSE/TSE	26	24	9	10	20	12	9	73	9	6	36	23
2006	PSE	6	23	32	66	53	63	17	1	65	63	20	11
	CSE	-2	-17	-16	-46	-46	-61	-11	-2	-50	-47	-13	13
	TSE	1.677	10.1	156.452	238	48.872	29.073	7.937	258	3.219	5.486	11.794	96.854
	TSE/GDP	0.2	0.8	1.1	1.5	1.1	3.3	0.9	0.3	1.0	1.5	2.9	0.7
	Transfer from consumers %	0.5	37	37	37	79	83	49	13	46	51	50	6
	Transfer from tax payers %	99.5	63	63	63	21	17	51	87	54	49	50	94
	GSE/TSE	27	26	10	9	17	12	11	66	8	7	14	37

Source: OECD, 2008 and Calculations.

Table 5. Composition of PSE over Years in OECD Countries, 1990-2006, %

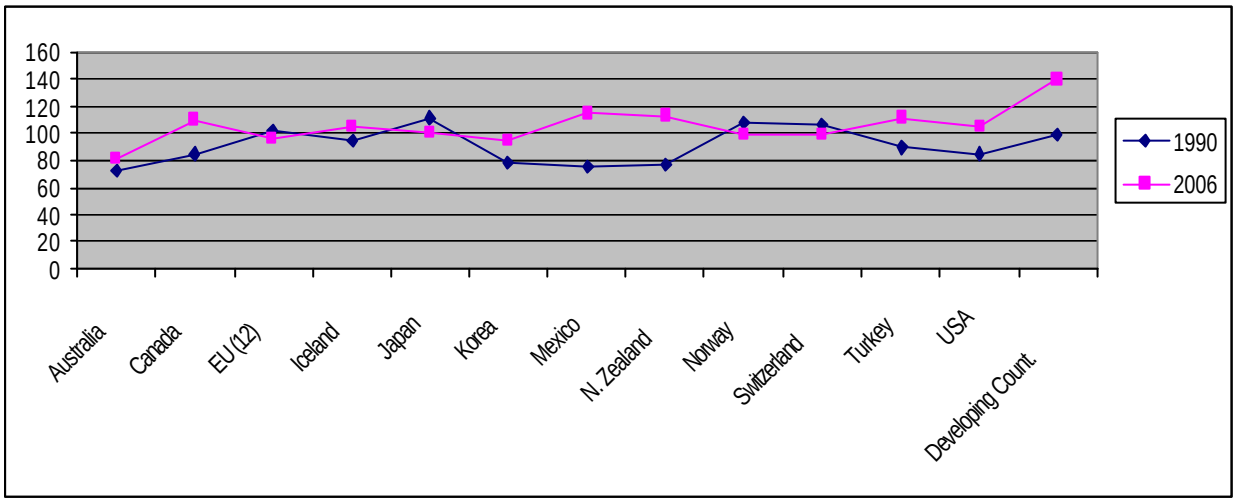
Year	Support	Australia	Canada	EU	Iceland	Japan	Korea	Mexico	N. Zealand	Norway	Switzerland	Turkey	USA
1990	*Support on Output*	77	67	85	91	93	96	42	40	75	84	82	47
	Payments Based on Inputs	23	16	7	8	4	2	58	42	5	4	18	23
	Payments based on area	0	12	8	1	3	0	0	17	20	8	0	30
	Other	0	5	0	0	0	0	0	1	0	0	0	0
1995	*Support on Output*	41	45	63	96	94	95	-43	59	63	70	51	45
	Payments Based on Inputs	44	13	5	4	5	1	74	41	4	6	50	32
	Payments based on area	15	38	31	0	1	0	69	0	33	22	0	23
	Other	0	3	1	0	0	4	0	0	0	2	0	0
2000	*Support on Output*	1	53	60	81	93	96	88	11	56	64	87	52
	Payments Based on Inputs	73	8	7	4	4	2	11	81	6	3	12	15
	Payments based on area	26	37	34	14	3	0	2	7	39	29	0	33
	Other	0	2	-1	0	0	2	0	0	0	4	1	0
2006	*Support on Output*	0	50	46	77	93	90	55	51	52	53	73	20
	Payments Based on Inputs	63	7	10	7	3	2	25	43	5	4	9	33
	Payments based on area	37	43	44	16	4	7	20	6	43	40	18	47
	Other	0	0	0	0	0	3	0	0	0	3	0	0

Source: OECD, 2008 and Calculations.

Input Use, Trade, and Environment

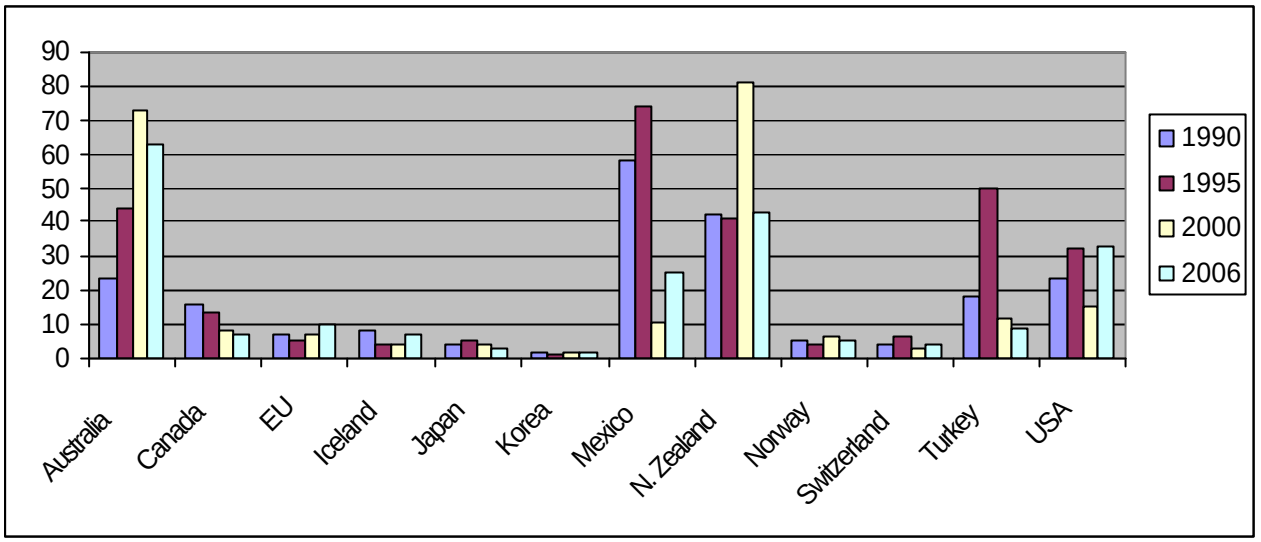
Input use is quite crucial for production. However, it is also contributing to environmental pollution. Figure 1 presents the production index for the OECD countries and the developing world. As we can see, the production index has a tendency to increase except for Japan, Norway, and Switzerland. The EU production index values decreased very little over the period. On the other hand Mexico, New Zealand, Turkey, and the USA index values increased significantly. Developing countries also performed well in terms of agricultural production. Figure 2 presents the PSE shares of inputs over time. As we can see the use of input payments has jumped significantly in Australia and New Zealand.

Figure 1. Production Index for OECD and Developing Countries, 1990-2006 (Base:1999-2001)



Source: FAO, 2008.

Figure 2. PSE Shares of Payments Based on Inputs in OECD Countries, 1990-2006



Source: OECD, 2008.

If we look at Table 6, we can understand the rationale for such input use policy. Both Australia and New Zealand increased their food export and their share in world markets significantly. Australia's share increased to 3.7 in 2006 from 2.57 in 1990, while that of New Zealand increased to 2.21 in 2006 from 0.41 in 1990. The shares of Iceland, Japan, and Korea on the other hand decreased during that time. The highest increase in terms of value occurred in Mexico by 310 %, followed by Turkey, New Zealand and Norway.

Table 6. Food Export Values and Shares in OECD Countries, 1990-2005.

	1990		2005		
Country	**Value Billion $.**	**Share in World Export**	**Value**	**Share in World Export**	**% Change Value (1990-2005)**
Australia	7.571	2.57	14.257	3.07	88,31
Canada	9.219	3.13	20.618	4.3	123,64
EU (12)	92.727	31.0	180.016	38.79	94,13
Iceland	1.244	0.40	1.761	0.37	41,55
Japan	1.442	0.68	2.450	0.52	69,90
Korea	2.014	0.71	2.467	0.53	22,49
Mexico	2.170	0.73	8.911	1.92	310,64
N. Zealand	4.157	0.40	10.264	2.21	146,90
Norway	2.286	0.77	5.240	1.12	129,22
Switzerland	1.378	0.46	2.784	0.6	102,03
Turkey	2.301	0.78	6.494	1.39	182,22
USA	30.090	10.20	48.239	10.38	60,315
World	294	52.56	464	61.57	

Source: Comtrade, 2008; FAO, 2008.

The carbon emissions and fertilizer consumption of OECD countries can be seen in Table 6. The highest CO2 emission and per capita emission increases have occurred in Norway, followed by Korea and Canada. On the other hand, in terms of agriculture, the highest increase in fertilizer consumption occurred in Australia and New Zealand, between 1990 and 2005.

Table 6. Carbon Emissions and Fertilizer Consumption in OECD Countries, 1990-2004.

Country	CO2 Emission (Mil. Ton)			CO2 Emission Per Capita, (Metric Ton)			Fertilizer Consumption (Metric Ton)		
	1990	2004	% Change	1990	2004	%Change	1990	2005	%Change
Australia	273	321	17.58	16	16	0	1163700	2215296	90.36
Canada	416	638	53.36	15	20	33.3	2073852	2798401	34.93
EU (12)	2883	3595	24,69	9.6	10	4.1	18586281	12692152	-31.71
Iceland	2	2.3	15.0	8	8	0	23163	17674	-23.69
Japan	1112	1270	14.20	9	10	11.1	1838000	1692782	-7.90
Korea	252	480	90.47	6	10	66.7	770000	722407	-6.18
Mexico	415	408	-1.68	5	4	-20	1798400	1730759	-3.76
N. Zealand	23	32	39.13	7	8	14.28	650000	1053926	62.14
Norway	33	86	160.60	8	19	137.5	209590	165468	-21.05
Switzerland	40	37	-7.5	6	5	-16.67	167900	91420	-45.55
Turkey	168	213	26.785	3	3	0	1887520	2031210	7.61
USA	4731	6153	30.05	19	21	10.52	18586940	19273700	3.69

Source: Carbon Emissions: World Bank, 2008; Fertilizer Statistics: World Bank, 2005, FAO, 2008.

The impact of liberalization on agriculture can be summarized in Table 7. In terms of scale effect, GNI based on PPP indicates that Japan almost doubled its GNI during that period, followed by Norway and Turkey. The product effect can be proxied by the first three items traded. Most countries have similar products exported and imported during the period observed, but there are some noticeable differences. For instance, in Australia beef and veal ranked first in 2006 as compared to 1990, indicating the need for feed grains and increasing use for inputs such as fertilizers. In New Zealand dairy export also became important, just as in Australia, and may have negative impacts on environment due to higher emissions of methane and increase in coarse grain use. On the other hand, while cotton was an important export item in Turkey in the early 1990s, a developing textile industry and low self sufficiency led to a higher import demand for that product. Since cotton is an input intensive commodity, import of that product may have positive impact on environment in Turkey despite loss of export earnings. When we analyze the structural effect, we realize that production index has increased in many countries except EU, Japan, Norway, and Switzerland. The highest increase occurred in Mexico, New Zealand, and Canada. The technological effect can be proxied by input use, and it is clear that input use has almost doubled in Australia and New Zealand while it has decreased in most of the other OECD countries. In terms of regulatory effect, I used the mycotoxin limit applied on food imports. Since there are no consistent comparable limits over time, I used the latest levels to test whether the higher income induced by trade leads to more sensitive limits. The data indicate that there is no consistent outcome for this effect. The reason is that while the EU, a high income member, has quite restrictive (low) limits, other high income countries - such as the US, Australia, and Canada - have less restrictive (high) limits. On the other hand, some low income countries such as Turkey have more restrictive limits.

Table 7. Summary of Agricultural Trade Liberalization-Environment Interaction in OECD Countries.

	1990					2006					
	Scale Effect	**Product Effect**		**Structural Effect**	**Technology Effect**	**Scale Effect**	**Product Effect**		**Structural Effect**	**Technology Effect**	**Regulatory Effect**
Countries	**GNI, PPP**	**First Three Items Exported**	**First Three Items Imported**	**Production Index, (1999-2001)**	**Input Use (Fertilizer Cons., Ton)**	**GNI, PPP**	**First Three Items Exported**	**First Three Items Imported**	**Production Index (1999-2001)**	**Input Use (Fertilizer Cons., Ton)**	**Mycotoxin limits ug/kg Afla B1**
Australia	16850	Wool, Wheat, Beef&Veal	Beverages, Horses, Cheese	72.8	1163700	33940	Beef&Veal, Wheat, Wine	Food Prep, Beverages, Pork	81.91	2215296	15
Canada	18750	Wheat, Cattle, Rapeseed	Beef, Wine, Sugar	85.4	2073852	36280	Wheat, Beef, Pork	Food Prep, Wine, Chocolate	109.67	2798401	15
EU (12)	15855	Wine, Beverages, Poultry	Animal Feeds, fruits, tobacco	102.01	18586281	31525	Wine, poultry, cereals	Animal Feeds, fruits, wine	95.41	12692152	2
Iceland	18260	Fish Meal, Fish Oils, Food Wastes	Food Prep, Cigarettes, Sugar	93.38	23163	33740	Fish Meal, Fish Oils, Horses	Food Prep, Pastry, Wine	104.65	17674	2
Japan	18820	Food Prep, Cigarettes, Fish Meal	Maize, Beef, Pork	111.2	1838000	32480	Food Prep, Cigarettes, Fruit Seeds	Pork, Maize, Cigarettes	100.96	1692782	10
Korea	7690	Sugar, Chestnuts, Tobacco	Hides, Maize, Cotton	78.85	770000	22990	Food Prep, Cigarettes, Beverages	Maize, Wheat, Soybeans	94.38	722407	10
Mexico	6420	Tomatoes, Cattle, Coffee	Maize, Sugar, Sorghum	75.44	1798400	11990	Beer, Tomato, Beverages	Soybeans, Maize, Beef	114.74	1730759	20
N. Zealand	13100	Mutton&Lamb, Beef&Veal, Wool	Sugar, Wheat, Beverages	77.08	650000	25750	Mutton& Lamb, Milk, Beef&Veal	Food Prep, Wine, Beverages	112.78	1053926	15
Norway	22530	Cheese, Fur, Cake Soybean	Soybeans, Coffee, Sugar	107.67	209590	50070	Cheese, Fish Meal, Fish Oils	Wine, Food Prep, Fish Oils	99.23	165468	2
Switzerland	24900	Cheese, Food Prep, Cigarettes	Wine, Coffee, Cheese	106.39	167900	40840	Food Prep, Chocolate, Cheese	Wine, Food Prep, Cheese	99.09	91420	10
Turkey	4160	Hazelnuts, Tobacco, Sheep	Wheat, Cigarettes, Sugar	88.67	1887520	8410	Hazelnuts, Tobacco, Prep nuts	Cotton, Skin, Soybeans	110.74	2031210	5
USA	22940	Maize, Cigarettes, Wheat	Coffee, Beverages, Beef	84.27	18586940	44070	Soybeans, Maize, Wheat	Beverages, Wine, Beef	105.11	19273700	20

Source: World Bank, WDI, 2008 (GNI); FAO, 2008, Eurostat, 2008 (Export&Import Data); World Bank, 2005, FAO, 2008 (Fertilizer Data); FAO, 2004 (Food Standards).

Conclusions

This paper examined the interaction between agricultural policies and the environment from the chronological and comparative perspective in the OECD countries. It can be observed that the policies of the EU, the US and some other countries have evolved over the years from payments to output to payments to area, given the fact that direct income supports, which do not depend on production, have positive impacts on environment. In addition, the trade liberalization rules the WTO have had an impact on such a policy change. However, trade liberalization may also cause environmental related problems even without a high level of support. For instance, the recent trade liberalization and the globalization movement benefited some countries, such as Australia and New Zealand, with comparative advantage in agriculture. Both of these countries have increased their total agricultural export and their share in world markets significantly. Therefore, they have greatly increased the use of inputs such as fertilizers, which cause environmental pollution. In addition, while many other countries decreased the share of input based payments in agricultural support, these countries increased the share of input based inputs, in order to meet the demand coming from the rest of the world. In that sense, the EPI may have some deficiencies in terms of agriculture related pollution. That index covers some of the parameters such as agricultural subsidies, irrigation stress etc., but does not include change in input use such as fertilizers. Therefore, some countries such as Australia and New Zealand, although providing lower support compared to other OECD countries, misleadingly have higher rankings. The future EPI therefore should consider these factors. In the era of globalization and environmental concerns, the trade off between higher trade, income, and environmental quality will be the main issue. Therefore, governments and international agencies should consider the socially optimal level of production and trade, in addition to achieving the highest level of income in their policy goals. This can be achieved by policies designed to alleviate emission levels, such as

sustainable tax policies, technological improvements that enable the use of less polluting factors, and use of the higher income generated by trade activities in eliminating the harmful impacts of pollution.

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