International Journal of Ecological Economics & Statistics (IJEES)
Year 2011, Vol. 21, No. P11; Int. J. Ecol. Econ. Stat.;
ISSN 0973-1385 (Print), ISSN 0973-7537 (Online)

The Relationship between Skill Content of Trade and Carbon Dioxide Emissions

Wei Geng[1] and **Yaoqi Zhang**[2]

Dept. of International Trade and Economics, School of Economics
Tianjin University of Finance and Economics
Tianjin, 300222, China
gengwei@tjufe.edu.cn

[2]School of Forestry and Wildlife Sciences, Auburn University, AL 36849, USA
Yaoqi.Zhang@auburn.edu

ABSTRACT

This study examines the relationship between the trade pattern and the environment. Although it is widely thought that industries with higher labor skill content are cleaner, no clear evidence is provided. It is hypothesized that various types of trading activities influence the environment differently. The present sample includes 35 countries at different stages of development and 56 industries divided into three groups according to skill intensity in the panel data over 1991-2006. The results reveal a positive effect on CO2 emission arising from trade specialization in low skill industries and an insignificant effect from trade specialization in medium-high-skill industries. There are also distinctions between the skill content of exports and imports and their respective impacts on emissions, as well as between OECD and non-OECD countries.

Keywords: Trade pattern, panel data, CO2 emission, skill content

JELClassification: F18, Q56

Mathematics subject Classification: 62H12

1. INTRODUCTION

One of the most contentious issues revolving around globalization is the environmental effects of trade liberalization. Grossman and Krueger (1991) propose a paradigm for thinking about the link between economic growth and the environment breaking down the aggregate economic effects of trade or growth on the environment into scale, composition, and technique effects. The scale effect implies that expansion of economic activity results in greater environmental damage, holding other things constant. More output leads to more pollution emissions and degradation of natural resources. The composition effect refers to the change in the environmental pollution as a result of altering the sectoral composition, other things equal. Because the pollution intensity varies across sectors, aggregate pollution can shift. The technique effect indicates that there is a variety of different production techniques for given goods. If trade or economic growth increases to a certain level, production will become cleaner. As a result, trade will reduce emissions.

Empirically, previous studies of trade and the environment overwhelmingly focus on the effects of trade on the environment (Lucas et al., 1992; Low and Yeates, 1992; Mani and Wheeler, 1998; Antweiler et al., 2001; Cole and Elliott, 2001; Frankel and Rose, 2002; Copeland and Taylor, 2001, 2003). For a comprehensive survey of literature, see Dean (2001), Copeland and Taylor (2004). What seems clear from numerous studies is that the overall effect is beneficial. Empirical studies have extensively explored the relationship between various macroeconomic aspects of trade and the environment (Zhang, 2010). However, researchers seldom investigate the relationship from a multi-sectoral framework. Although it is widely thought that more specialized industries with higher skill content are cleaner, no good evidence is provided.

The aim of the present empirical study is to examine the relationship between skill content of trade and the environment. In other words, we focus on the environmental impacts of the trade pattern. We hypothesize that various types of trading activities influence the environment differently. The sample includes 35 countries at different stages of development with 56 manufacturing industries. The sample industries are divided into three groups according to skill intensity, with the panel structure of our data set covering 1991-2006.

Carbon dioxide emission is a purely international externality unlikely to be addressed by national environmental regulation; its analysis has a political and environmental implication. At this moment, climate change is the most popular environmental policy issue. There is now a new set of policy concerns on the issue of trade and carbon dioxide emission. Policy makers are proposing complex "border adjustments" to reflect the expected carbon content of imports and exports (Orzag, 2008; Fischer, 2009).

The remainder of the paper is organized as follows: Section 2 provides empirical model and data. Section 3 presents the estimation results. The final section provides the conclusions.

2. EMPIRICAL MODEL AND DATA

Grossman and Krueger (1991) decomposed pollution emissions into scale, composition and technique effects. Its main implication is the familiar Environmental Kuznets Curve (EKC). EKC measures an inverted U-shaped relationship. Countries with low levels of income per capita will generate more pollution. When income increases to a certain level, pollution tends to fall. Many EKC studies have pointed out how beneficial economic growth is for environmental performance of countries (Anamika, 2008; Cancelo, 2010).

As the prime concern of this paper is to investigate the environmental consequences of trade skill content, we should include trade openness (the ratio of aggregate imports and exports to GDP) and high skill trade share (the trade share of a sector over GDP), medium skill trade share, low skill trade share as well.

Our empirical estimates of the effects of the export skill content and import skill content on carbon dioxide emission is obtained by estimating the following two equations:

$$LnCO2it = \beta 0 + \beta 1\ LnY\ it + \beta 2\ Lny\ it + \beta 3\ Lnk\ it + \beta 4OPEN\ it + \beta 5EX\_H\ it + \beta 6\ EX\_M\ it + \beta 7\ EX\_L\ it + \mu it \quad (2.1)$$

$$LnCO2\ it = \beta 0 + \beta 1\ LnY\ it + \beta 2\ Lny\ it + \beta 3\ Lnk\ it + \beta 4OPEN\ it + \beta 5\ IM\_H\ it + \beta 6\ IM\ \_M\ it + \beta 7\ IM\_L\ it + \mu it \quad (2.2)$$

where CO2 is a measure of pollution level for country i and year t. Empirical studies employ gross domestic product (Y) as a proxy for the scale effect and use per capita GDP (y) as a proxy for income to measure the technique effect. The composition effect is represented by a country's capital–labor ratio (k). We follow the previous studies in variables selection. Openness variable (OPEN) measures the trade intensity.

Trade share refers to the share of exports (imports respectively) over GDP in the respective industry segment (low to high skill) of country i at time t (EX_H, EX_M, EX_L). Except for trade openness and trade share, all the other variables are in terms of natural logarithms.

The sample is split into two groups of countries: OECD refers to a set of OECD member countries up to 1971. They are Australia, Austria, Canada, Denmark, Finland, France, Germany, Greece, Italy, Japan, Netherlands, Norway, Portugal, Sweden, Turkey, the UK and the USA. In addition, a group of catching-up countries is included, consisting of selected Asian, and Latin American countries. They are China, Indonesia, South Korea, Malaysia, Philippines, Singapore, Thailand, India, Argentina, Brazil, Chile, Mexico, Nicaragua, Peru, Uruguay, Venezuela and Hong Kong, China.

We will take a more general look at the relationship between skill content of trade structure and environment. It is widely recognized that industries with higher skill content are cleaner. Moreover, pollution heaven hypothesis holds that comparative advantage could be deliberately created by differences in environmental regulatory strengths itself. Countries with stringent environmental policy – that generally tend to be rich countries will shift more of environmentally hazardous industries to poorer countries. Some empirical evidence support this view, e.g. see Suri and Chapman (1998), Muradian et al. (2001), Wilson et al. (2002), Ederington et al. (2005), Akbostanci et al. (2007) . Porter and Linde (1995) assert that a tightening of environmental regulation stimulates technological innovation and thereby exerts positive influence on both the economy and the environment. Based on the above, it is hypothesized that there is no universally valid model which would describe the link between trade pattern and environment. Rather, this link is a different one for countries at different stages of development due to differences in environmental regulations across countries. As a result, this study will stratify the sample into OECD and non-OECD countries, the result may reveal an interesting distinction between the two groups.

To test for pollution effects of the disaggregated trade, we need a clearly - defined set of "dirty" industries. Mani and Wheeler (1998) gave the ranking of pollution - intensive industries on actual emissions intensity (emissions per unit of output). This study selects these high-ranking sectors as the sample industries. As to industries category by skill content, the OECD (1994) suggests a detailed classification based on technological activity within each category, 166 manufacturing sectors is divided into 4: high skill, medium high skill, medium low skill and low skill. We use this kind of classification, but we only investigate 56 manufacturing industries, most of them are high-ranking "dirty" industries (Mani and Wheeler, 1998).

Data on sectoral exports and imports (in US $) from 1991 to 2006 has been obtained from United Nations' Commodity Trade Statistics Database (COMTRADE). This data is grouped according to the United Nations Standard International Trade Classification (SITC) system. The disaggregated data set comprises exports and imports for 56 manufacturing industries at the 3-digit level of the SITC classification which are grouped into 3 classifications. The sample industries and grouping are presented in Table 1.

Table 1: List of industries and grouping according to skill content

	SITC Code	Definition
Low skill	111	Non-alcoholic beverages, nes.
	112	Alcoholic beverages
	251	Pulp and waste paper
	282	Iron and steel scrap
	288	Non-fer metal scrap
	522	Inorganic chemical element, oxides, etc
	611	Leather
	612	Leather, etc, manufactures
	621	Materials of rubber
	625	Rubber tyres, tubes, etc
	628	Rubber articles nes
	633	Cork manufactures
	634	Veneers, plywood, etc
	635	Wood manufactures nes
	661	Lime, cement and building products
	665	Glassware
	666	Pottery
	673	Iron, steel shapes, etc
	674	Iron, steel univ, plate, sheet
	676	Railway rails etc, iron, steel
	677	Iron, steel wire, exc w rod
	679	Iron, steel castings unworked
	689	Non-ferrous base metals nes
	695	Tools
	821	Furniture and parts thereof
	895	Office supplies nes
	899	Other miscellaneous manufactured articles, nes
Medium skill	333	Crude petroleum
	334	Petroleum products, refined
	335	Residual petroleum products nes
	512	Alcohols, phenols, etc

	533 Pigments, paints, varnishes etc
	562 Fertilizers, manufactured
	572 Explosives, pyrotechnic products
	582 Products of condensation, etc
	583 Polymerization, etc, products
	584 Cellulose, derivatives, etc
	585 Plastic materials nes
	591 Pesticides, disinfectants
	598 Miscellaneous chemical products nes
	641 Paper and paperboard
	642 Paper and paperboard, cut
	714 Engines and motors nes
	745 Non-electrical machinery, tools nes
	749 Non-electrical machinery parts, accessories
	775 Household type equipment nes
	812 Plumbing, heatingg, lighting equipment
High skill	716 Rotating electric plants
	718 Other power generating machinery
	751 Office machines
	761 Television receivers
	764 Telecommucation equipment, parts and accessories
	771 Electric power machinery nes
	774 Electro-medical, x-ray equipment
	778 Electrical machinery nes
	792 Aircraft and related products

More detailed description of the variables and data sources are reported in Table 2. Statistics describing the variables of the sample were summarized in Table 3. Methodologically, panel data in econometrics will be used in the testing and analysis. For the purpose of comparison, the equations are estimated using two techniques: fixed effects model and random effects model. The parameters are estimated for the total sample and separately for the subsample of OECD countries and the subsample of Non-OECD countries.

Table 2: Variable description and data sources

Variable	Description	Data Sources
CO2	Total CO2 emissions (in Kiloton)	WDI*, 2007
Y	Gross domestic products (in 2000 US Dollars)	WDI*, 2007
y	GDP per capita (in 2000 US Dollars)	WDI*, 2007
k	Capital abundance	WDI*, 2007
OPEN	Trade-to-GDP ratio	WDI*, 2007
EX_{H}	High Skill Export (% of GDP)	UN COMTRADE, WDI*, 2007
EX_{M}	Medium Skill Export (% of GDP)	UN COMTRADE, WDI*, 2007
EX_{L}	Low Skill Export (% of GDP)	UN COMTRADE, WDI*, 2007
IM_{H}	High Skill Import (% of GDP)	UN COMTRADE, WDI*, 2007
IM_{M}	Medium Skill Export (% of GDP)	UN COMTRADE, WDI*, 2007
IM_{L}	High Skill Export (% of GDP)	UN COMTRADE, WDI*, 2007

*WDI: World Development Indicators.

Table 3: Descriptive statistics

	CO2	Y	y	k	OPEN	$EX_{\_H}$	$EX_{\_M}$	$EX_{\_L}$	$IM_{\_H}$	$IM_{\_M}$	$IM_{\_L}$
	Million ton	Billion $	Thousand $		(% of GDP)						
Total Sample											
Mean	490.2	755.1	17.9	8605.6	0.6	5.5	4.9	2.2	2.9	5.8	2.3
Std Dev	1062.6	1672.3	15.7	12164.1	0.6	16.7	5.99	1.6	3.9	5.2	1.6
Minimum	2.2	2.8	0.4	10	0.1	0.0003	0.1	0.1	0.2	0.7	0.2
Maximum	5911.1	11265.2	65.6	113942.3	3.7	100	42.4	0.1	23.7	47.6	9.8
Non-OECD Sample											
Mean	381.2	248.3	5.8	6684.4	0.8	3.3	5	2.1	3.9	6.98	2.3
Std Dev	840.8	313.2	6.5	16233.2	0.8	5.2	7.1	1.8	5.2	6.7	1.99
Minimum	2.1	2.8	0.4	10	0.1	0.0003	0.1	0.2	0.2	0.7	0.2
Maximum	5547.8	2113	28.6	113942.3	3.7	25	42.4	0.1	23.7	47.6	9.8
OECD Sample											
Mean	605.5	1291.8	30.8	10639.8	0.5	7.7	4.8	2.4	1.98	4.5	2.2
Std Dev	1246.8	2258.9	11.8	4249.9	0.2	23.2	4.6	1.5	0.9	2.3	1.1
Minimum	27.9	87.6	3.3	1225.5	0.1	0.1	0.3	0.3	0.2	0.89	0.3
Maximum	5911.1	11265.2	65.6	29378.4	1.3	100	31	7.3	5.5	17.3	5.97

3. Estimation Results

Table 4: Effect of export skill content on carbon dioxide emissions (1991-2006)

Variable	**icient (Std. err)**	**Coefficient (Std. err)**	**Coefficient (Std. err)**
	Total sample	OECD countries	Non-OECD countries
Intercept	-5.25	-4.18	-5.58
	(0.30)***	(0.49)***	(0.37)***
LnY	1.11	1.09	1.14
	(0.04)***	(0.06)***	(0.04)***
Lny	-0.57	-0.69	-0.597
	(0.05)***	(0.13)***	(0.07)***
Lnk	-0.01	-0.05	0.018
	(0.02)	(0.04)	(0.02)
OPEN	-0.05	-0.16	0.004
	(0.02)***	(0.05)***	(0.03)
$EX_{\_H}$	0.04	0.05	-0.16
	(0.13)	(0.14)	(0.25)
$EX_{\_M}$	0.07	0.38	-0.07
	(0.09)	(0.13)***	(0.14)
$EX_{\_L}$	0.53	0.51	1.87
	(0.37) *	(0.53)	(0.63)***
Observations	560	272	288
Degree of freedom	552	264	280
R-Square	0.70	0.59	0.75

Note: ***, ** and *denote significance at the 1%, 5% and 10% levels, respectively.
Dependent variable is the log of Carbon Dioxide Emission.

Tables 4 and 5 report our main findings for exports and imports respectively. For the purpose of comparison of estimation results between total sample and the subsamples, using the same

methodology is needed. For aggregate sample and the subsamples, Both the Hausman test and Lagrange multiplier test suggest that random effects model is preferred to fixed effects model. As a result, the random effects model results with the correction of autocorrelation and heteroscedasticity are presented in Tables 4 and 5.

Table 5: Effect of import skill content on carbon dioxide emissions (1991-2006)

	Total sample	**OECD countries**	**Non-OECD countries**
Variable	Coefficient (Std. err)	Coefficient (Std. err)	Coefficient (Std. err)
Intercept	-5.18 (0.31)***	-4.33 (0.47)***	-5.78 (0.40)***
LnY	1.11 (0.04)***	1.06 (0.06)***	1.16 (0.05)***
Lny	-0.56 (0.05)***	-0.65 (0.11)***	-0.58 (0.07)***
Lnk	-0.01 (0.02)	0.01 (0.05)	-0.01 (0.02)
OPEN	-0.05 (0.02)***	0.02 (0.05)	-0.03 (0.03)
IM_{H}	-0.16 (0.23)	-3.69 (0.65)***	-0.02 (0.27)
IM_{M}	0.27 (0.13) **	-0.06 (0.31)	0.19 (0.16)
IM_{L}	0.11 (0.44)	2.398 (0.95)***	1.06 (0.59) *
Observations	560	272	288
Degree of freedom	552	264	280
R-Square	0.70	0.63	0.74

Note: ***, ** and *denote significance at the 1%, 5% and 10% levels, respectively.
Dependent variable is the log of Carbon Dioxide Emission.

In general, we have statistically significant results of scale effect and technique effect. These results imply that total amount of CO2 emission increase after the economy was scaled up. These also imply that the rise in per capita income will increase the demand for higher environmental quality or technique change. Consequently, total amount of pollution decreases. These results are in favor of the aforesaid growth-environment theory and in consistent with the previous studies. But composition effect as measured by capital - labor ratio is never found to be significant, composition effect as such does not turn out to play an important role in this framework. For the total sample, trade openness is found to exert a highly significant negative influence on pollution emissions over the observation period. The negative sign reveals that freer trade is good for the environment, which is in line with the previous studies. However, the coefficient of openness is not significant for the group of developing countries. This finding implies that developing countries specialize in the dirty manufactured goods due to low environmental cost.

Tables 4 reports the estimation results of the link between export pattern and CO2 emission. For aggregate sample, in line with our expectation, export shares in low skill categories are significantly positively correlated with pollution emission because the sampled industries with low skill content are high-ranking dirty ones. The effect of rising medium skill exports turns out to be insignificant for CO2 emission. High tech exports show an insignificant correlation to CO2 emission arising from cleaner environmental production. When the sample is split into highly industrialized and catching-up countries, an interesting distinction between the two subsamples is revealed. For the subsample of highly industrialized countries, only growing shares of medium skill exports are highly significant and positive to emission. High tech exports show no significant environmental effect resulting from clean environmental production. The fact that low skill export has no significant impact on the environment may reflect tighter standard for higher pollution intensive production in place. Whereas only growing share of low skill exports is highly significant and positive to emission for the group of less developed countries. These are the industries where developing countries usually hold their comparative advantages. This distinction might be explained by different regulatory stringency and comparative advantages across countries. Comparative advantage is based on factor endowment differentials as well as pollution policy differentials (Copeland and Taylor, 2004). There is no significant environmental consequence for growing medium high skill exports in non-OECD subsample. This might be explained by their comparative disadvantages in these industries leading to more imports from developed countries.

Tables 5 presents the results obtained using imports instead of exports. For total sample, both low skill and high skill imports are found to be insignificant to CO2 emission. In contrast to this, growing medium skill imports show a highly significant positive sign. This might be explained by imports of pollution-intensive good as an intermediate input for dirty manufacturing resulting in environmental pollution. For example, China has imported goods with pollution potential from other countries every year, such as ozone-depleting substances, fertilizers and plastic materials (Chen et al., 2006). As Table 1 shows that most sample industries are intermediate products. In addition, no significant pollution consequences for growing low skill imports are found in the total group. This might be explained by their relatively low share over GDP comparable with medium high skill shares due to their own low value.

Again, the results are changed when stratifying the sample according to income levels. For rich countries, a highly significant positive influence of low skill imports could be observed. It is probable that most low skill imports are used as an intermediate input for dirty manufacturing resulting in pollution. We also find the significant negative relationship between high skill industries and pollution. It reflects clean production. In line with the neoclassical trade models, rich countries hold comparative advantages in high skill goods, whereas developing countries specialize in low skill goods. As a result, the developing countries import more high tech goods (with even less pollution potential) from rich countries and export more low medium skill goods to them which is consistent with the previous studies. As noted earlier, different environmental cost for different income-level countries also matters.

That might be the reason that an insignificant correlation to CO2 emission are shown for the group of developing countries' rising imports over the observation period

4. CONCLUSIONS

Previous empirical studies have extensively explored the relationship between various macroeconomic aspects of trade and the environment. However, researchers seldom investigate the relationship in a multi-sectoral framework. Although it is widely recognized that industries with higher skill content are cleaner, evidence is scarce.

The present results reveal that both the scale effect and technique effect are consistent with the theoretical prediction. No composition effect is found in this framework. The findings seem to suggest that free trade benefits the environment. Furthermore, the results show a positive effect on CO2 emissions arising from trade specialization in low skill industries and an insignificant effect from trade specialization in medium-high-skill industries.

Moreover, on the export side, the distinction between subsamples is that growing shares of medium skill exports is highly significant and positively related to emissions for OECD subsample, whereas low skill exports is highly significant and positive related to emissions for non-OECD subsample.

On the import side, a highly significant positive influence of low skill imports is observed for rich countries. There is also a negative relationship between high skill industries and pollution. In contrast, there is an insignificant relationship between CO2 emissions for the group of developing countries with rising imports.

5. REFERENCES

Akbostanci, E., Tunc, G. I., and Asik, S. T., 2007, *Pollution haven hypothesis and the role of dirty industries in Turkey's exports*, Environment and Development Economics, **12**, 297-322.

Anamika, B.,and Klaus H., 2008, *Water Pollution and Economic Growth: An Environmental Kuznets Curve Analysis at the Watershed and State Level,* International Journal of Ecological Economics & Statistics, **10**, 63-78.

Antweiler, W., Copeland, B. R., and Taylor, M. S., 2001, *Is Free Trade Good for the Environment?* , American Economic Review, **91**, 877–908.

Cancelo, M. Teresa, 2010, *The Relationship Between Co2 And Sulphur Emissions And Income: An Alternative Explanation To The Environmental Kuznets Curve Hypothesis***,** Applied Econometrics and International Development, Vol. 10-1.

Chen, J., Liu, W., and Hu, Y., 2006, *Foreign Trade, Environmental protection and sustainable economic growth in China*, Frontiers of Economics in China, **4**, 521–536.

Cole, A.M. and Elliott, R.J., 2001, *Factor Endowments or Environmental Regulations? Determining the Trade-Environment Composition Effect*, UB Department of Economics Discussion Paper No: 01/06, University of Birmingham, Birmingham.

Copeland, B.R. and Taylor, M.S.,2001, *International Trade and the Environment: A Framework for Analysis,* NBER Working Paper No. 8540, National Bureau of Economic Research, Cambridge, Massachusetts.

Copeland, B.R. and Taylor, M.S., 2003, *Trade and the Environment*, Princeton: Princeton University Press.

Copeland, B.R. and Taylor, M.S., 2004, *Trade, growth and the environment*, Journal of Economic Literature, **42**, 7–71.

Dean, J. 2001, *International Trade and the Environment* (editor), UK: Ashgate Publishers, International Library of Environmental Economics and Policy Series.

Ederington, J., Levinson, A., and Minier, J., 2005, *Footloose and pollution-free*, Review of Economics and Statistics, **87**, 92–100.

Fischer, C. and A. Fox, 2009, *Comparing Policies to Combat Emissions Leakage: Border Tax Adjustments Versus Rebates*, RFF Discussion Paper DP 09-02, Resources for the Future,Washington, D.C

Frankel, J., and Rose A., 2002, *Is Trade Good or Bad for the Environment? Sorting out the Causality,* NBER Working Paper No. 9021, National Bureau of Economic Research, Cambridge, Massachusetts.

Grossman, G.M. and Krueger, A.B.,1991, *Environmental impacts of a North American Free Trade Agreement*, NBER Working Paper No. 3914, National Bureau of Economic Research, Cambridge, Massachusetts.

Lucas, R., Wheeler, D., and Hettige H., 1992, *Economic development, environmental regulation and the international migration of toxic industrial pollution: 1960–88*, in P. Low (ed.), International Trade and the Environment. World Bank Working Paper No. 159, World Bank, Washington DC.

Low, P. and Yeates, A., 1992, *Do 'dirty' Industries Migrate*, in P. Low (ed.), International Trade and the Environment. World Bank Working Paper No. 159: 89-104, World Bank, Washington DC.

Mani, M. and Wheeler, D., 1998, *In search of pollution havens? Dirty industry in the world economy, 1960–1995*, Journal of Environment and Development, **7**, 215–247.

Muradian, R., Connor, M. O., and Alier, J. M., 2001, *Embodied Pollution in Trade: Estimating the 'Environmental Load Displacement' of Industrialised Countries,* FEEM Working Paper No. 57, Milan.

Orszag, P., 2008 , *Issues in Designing a Cap-and-Trade Program for Carbon Dioxide Emissions,* before the Committee on Ways and Means U.S. House of Representatives, September 18.

Porter, M., and Linde, C., 1995, *Toward a New Conception of the Environment – Competitiveness Relationship*, Journal of Economic Perspectives, **9**, 4.

Suri, V., and Chapman, D., 1998, *Economic Growth, Trade and Energy: Implications for the Environmental Kuznets Curve*, Ecological Economics, **25**, 147-160.

Wilson, J.S., Otsuki, T., and Sewadeh, M., 2002, *Dirty exports and environmental regulation: do standards matter to trade?*, The World Bank Policy Research Working Paper No. 2806, World Bank, Washington DC.

Zhang, Zhongxiang, 2010, *Climate Change Meets Trade in Promoting Green Growth: Potential Conflicts and Synergies,* FEEM Working Paper, 18.2010.