

Economic Globalization and the Environment

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- Economic globalization involves liberalization
 1. of international trade in goods
 2. of international movements of capital

- The levels of both trade and FDI are much higher at the present time than, e.g., 25 years ago.

Figure 1: The Development of Globalization – FDI Inflows and FDI Outflows, 1970-2000

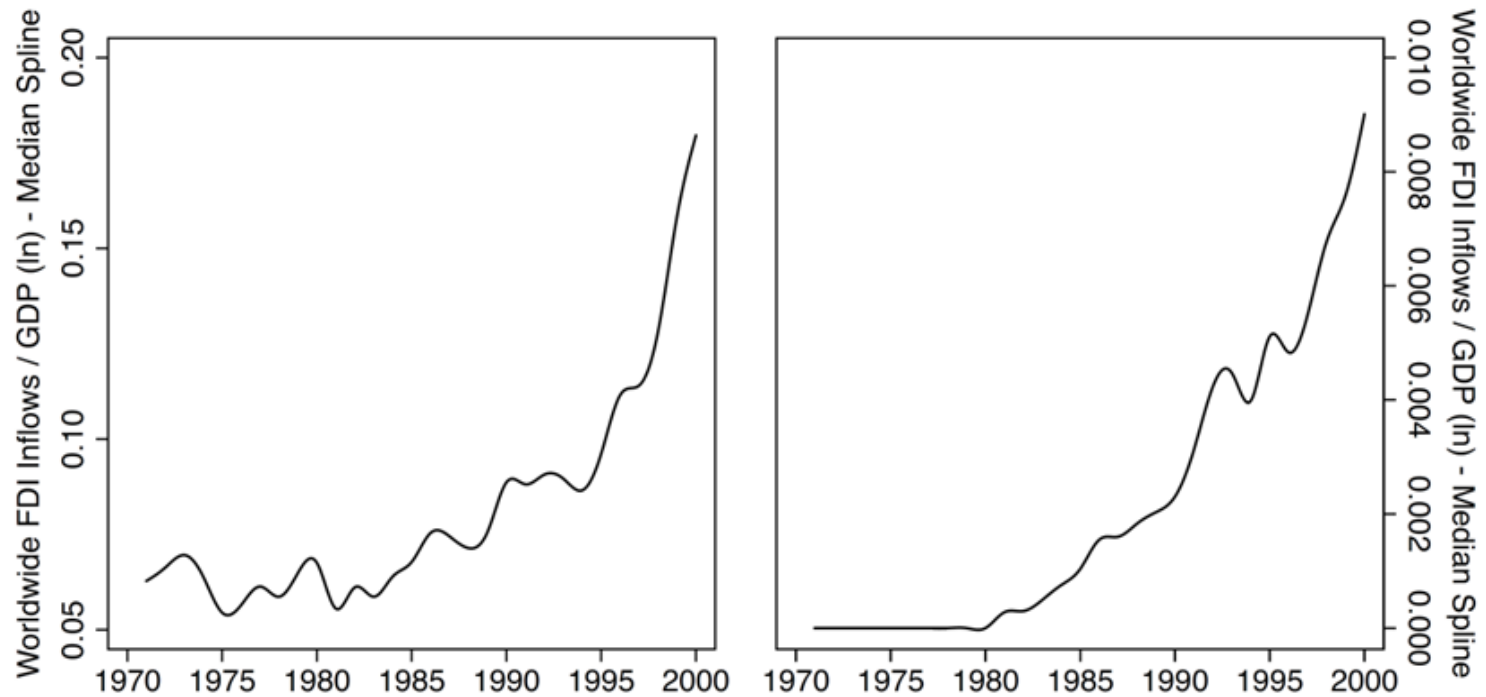
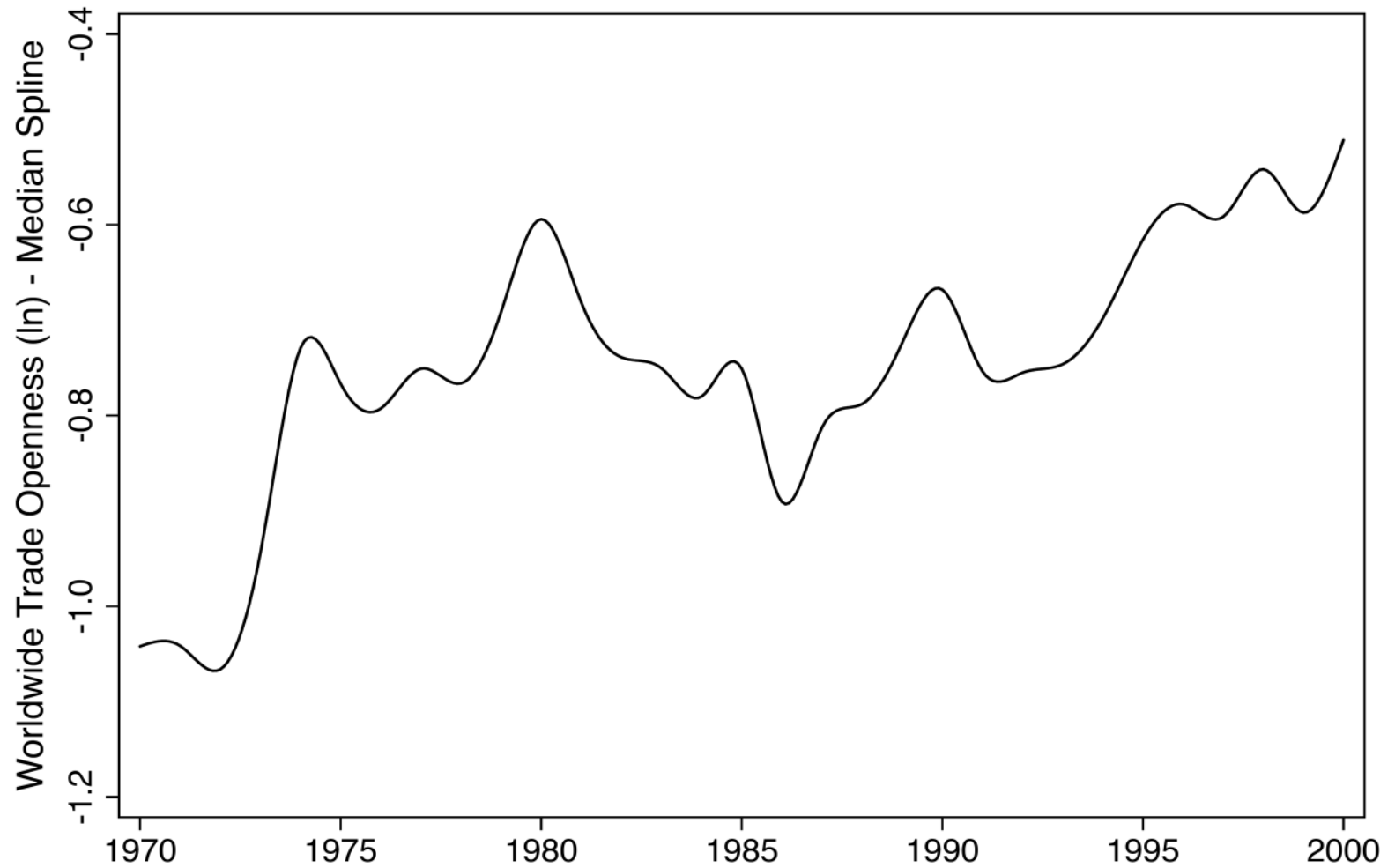


Figure 2: The Development of Globalization – Trade Openness, 1970-2000



- **Subject of the paper:**

How does economic globalization affect the quality of the environment across countries?

What do we know: Theoretical arguments

- Effects of economic globalization via income.
- Effects of economic globalization for a given level of income:
 - System wide adverse effects: *Race to the bottom* in countries' environmental standards
 - System wide beneficial effects: *Race to the top* in countries' environmental standards
 - *Comparative advantage*:
 - *Factor endowment theory (FET)*: developed countries become dirtier due to their capital abundance.
 - *Pollution haven hypothesis (PHH)*: LDCs become dirtier due to the laxity of environmental regulations and polluting firms will find it profitable to relocate to these countries

What do we know: Empirical evidence

- *Trade*: empirical evidence is rather mixed but positive via its effect on income
- *FDI*: empirical evidence is rather mixed

Our argument

- *Join impact* of free trade and FDI on environment, while encompassing the PHH and standard-trade theory effects.

Trade and the environment

- Trade in goods worsens environmental quality in those countries that have a comparative advantage in the production of “polluting” goods
 - *FET: developed countries* become dirtier with free trade due to capital abundance
 - *PHH: less developed countries* become dirtier with free trade due to the laxity of environmental regulations
- *Hypothesis 1*: Environmental quality decreases with higher levels of trade openness.

Income and the environment

- Developed and developing countries differ with regard to the levels of income which also affects environmental quality.
- Environmental Kuznets curve (EKC): environmental quality deteriorates at low levels of income (scale effect) and then improves at higher income levels (composition and technique effects)
 - Environmental quality is now a normal public good
 - Governments enact and enforce stricter environmental regulations
- Developed countries are likely to have stricter environmental regulations
- Developing states are expected to have laxer environmental regulations

FDI and the environment

- *FET*: stricter environmental regulations increase the costs of production and multinationals shift some or all of their “dirty” production to other countries with weaker environmental regulations
- *PHH*: laxer environmental regulations in a developing (host) country attract FDI from pollution-intensive sectors that want to avoid costly environmental compliance in their developed home country
- Both the FET and PHH argue that “dirty” FDI will flow from developed to developing countries
- *Hypothesis 2*: Environmental quality in developing countries decreases with FDI inflows.

Trade, FDI and the environment

- *FET*: the negative effect of trade will be mitigated by FDI (dirty) outflows (i.e., expand production and export clean good) and hence their joint effect should lead to improved environmental quality in developed countries.
- *PHH*: the negative effect of trade will be amplified by FDI inflows (i.e., expand production and exports of dirty goods) and hence their combined effect should be detrimental to the environment of less developed countries.
- *Hypothesis 3*: There is a joint effect of FDI inflows and trade on environment:
 - FET, it improves environmental quality
 - PHH, it deteriorates environmental quality

Empirical analysis

- Data: 188 countries, 1970-2003 period (annual data)
- Dependent variable: *SO2 Emissions per capita* (ln)
- Independent variables:
 - *Trade Openness*: imports plus exports to GDP
 - *FDI*: inflows to GDP and outflows to GDP
 - *Interactive terms*: FDI inflows * GDP per capita
FDI inflows * Trade openness
- Control variables: GDP per capita and its square term; GDP growth; Population density; Democracy; Membership in IO; Environmental treaties ratified
- Estimation procedure: OLS, country fixed effects, year dummies, and lagged dependent variable

Table 2: Economic Globalization and the Environment – Baseline Models

	Model 1	Model 2	Model 3
Lagged Dependent Variable	0.819*** (0.041)	0.739*** (0.078)	0.771*** (0.063)
Trade Openness (ln)	0.036* (0.021)	0.048* (0.026)	0.036** (0.018)
FDI Inflows / GDP (ln)	-0.641** (0.258)	-0.429** (0.167)	-0.508*** (0.164)
FDI Outflows / GDP (ln)	-0.034 (0.045)	0.095 (0.083)	0.145** (0.073)
GDP (ln)		0.026 (0.029)	
Democracy		0.002 (0.001)	0.000 (0.001)
GDP per capita (ln)		0.335* (0.174)	0.312** (0.144)
GDP per capita square (ln)		-0.011 (0.011)	-0.012 (0.009)
Ratification of Environmental Treaties		-0.002* (0.001)	
IGO Membership		-0.000 (0.001)	-0.002 (0.001)
Population Density (ln)		0.611*** (0.224)	0.523*** (0.153)
GDP Growth in %		0.001 (0.001)	
Constant	2.034** (0.812)	-0.852 (0.640)	-0.920* (0.496)
Observations	3,497	2,892	3,191
RMSE	0.26	0.20	0.20
R-Squared	0.98	0.99	0.99
Country FEs	Yes	Yes	Yes
Year FEs	Yes	Yes	Yes

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Robust standard errors in parentheses

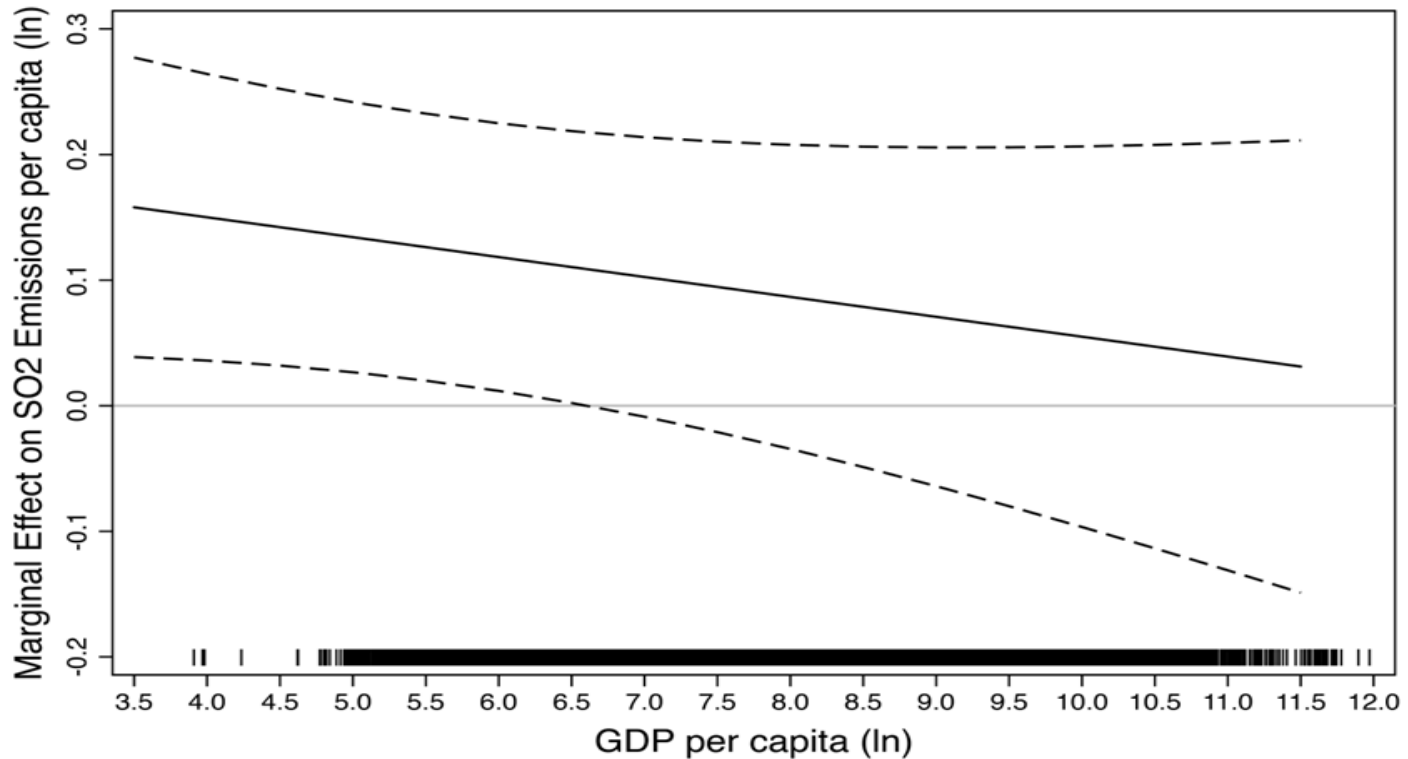
Table 3: Economic Globalization and the Environment – Interaction Models

	Model 4	Model 5
Lagged Dependent Variable	0.772*** (0.063)	0.769*** (0.063)
Trade Openness (ln)	0.034* (0.017)	0.030* (0.016)
FDI Inflows / GDP (ln)	-0.515*** (0.169)	-0.488*** (0.160)
FDI Outflows / GDP (ln)	0.213** (0.107)	0.112 (0.083)
Democracy	0.000 (0.001)	0.000 (0.001)
GDP per capita (ln)	0.149*** (0.052)	0.379** (0.163)
GDP per capita square (ln)		-0.016* (0.010)
IGO Membership	-0.001 (0.001)	-0.002 (0.001)
Population Density (ln)	0.560*** (0.162)	0.517*** (0.152)
FDI Inflows * GDP per capita	-0.016 (0.015)	
FDI Inflows * Trade Openness		0.021 (0.018)
Constant	-0.694** (0.338)	-1.178** (0.560)
Observations	3,191	3,191
RMSE	0.20	0.20
R-Squared	0.99	0.99
Country FEs	Yes	Yes
Year FEs	Yes	Yes

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

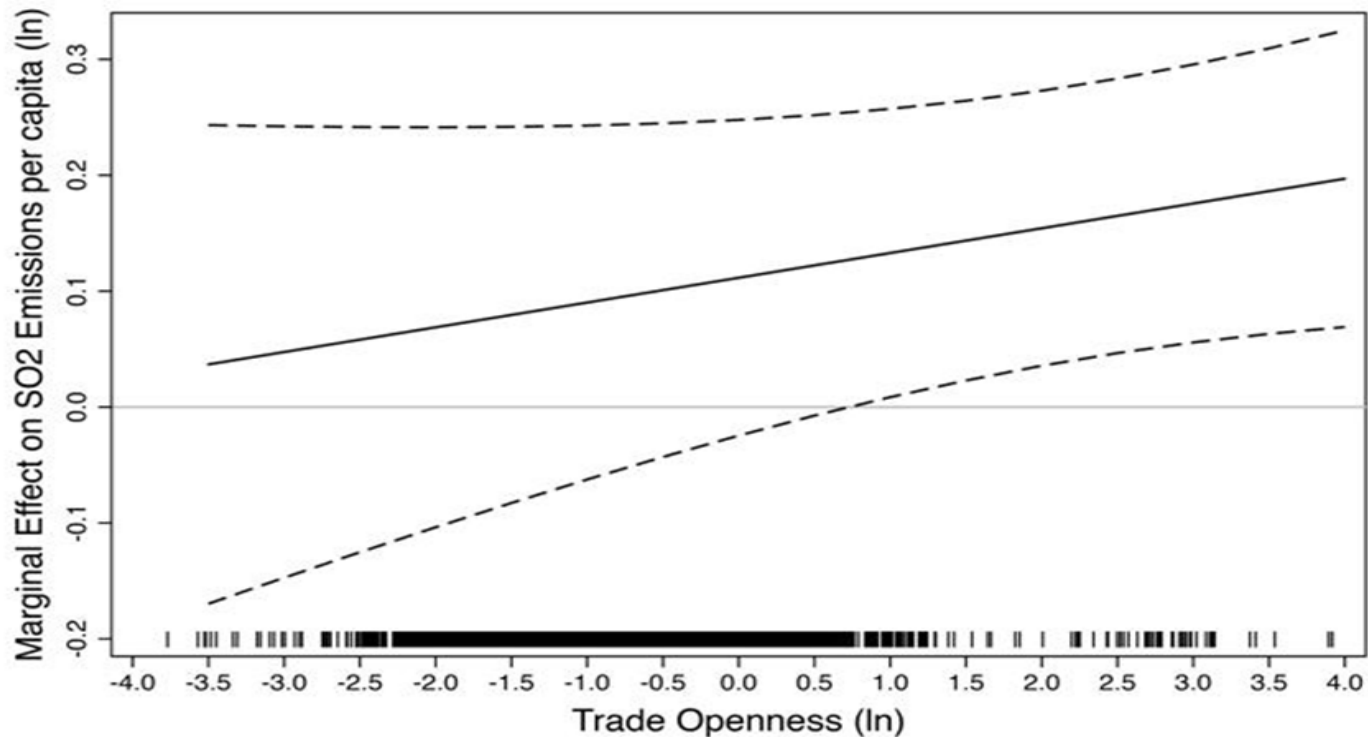
Robust standard errors in parentheses

Figure 3: Marginal Effects of *FDI Inflows / GDP (ln)* on *SO2 Emissions per capita (ln)*



Note: Dashed lines pertain to 90 percent confidence intervals; graph based on Model 4; solid horizontal line marks average marginal effect of 0; rug plot along horizontal axis signifies distribution of *GDP per capita (ln)*

Figure 4: Marginal Effects of *FDI Inflows / GDP (ln)* on *SO2 Emissions per capita (ln)*



Note: Dashed lines pertain to 90 percent confidence intervals; graph based on Model 5; solid horizontal line marks average marginal effect of 0; rug plot along horizontal axis signifies distribution of *Trade Openness*

■ **Conclusion**

- Uncover conditional relationships
- Discriminate between two competing theories, the FET and the PHH: the interaction between trade with inward FDI is expected to damage the environment under the PHH, but improve it under the FET.

■ **Policy Implication**

The globalization of environmental standards (*international harmonization*) has the potential to reverse the increase in pollution in less developed countries that derives from the globalization of trade and FDI.