International Waste Trade:

unwrapping the impact of the environmental regulation on the new EU member states

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Outlines

- **Literature Review** => Trade and Environment, Empirical and Theoretical. From pollution haven effect to waste haven effect
- **Contribution** => Dataset, Different proxy of environmental regulation (corruption inclusion) and Difference-in-differences approach
- **Important features** => Some important facts to know about this trade

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- **Trade and environment => Theoretical**
- Grossman and Kruger (1991)
- Copeland and Taylor (2003)
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- Antweiler et al (2001), Dean (2002), Cole and Elliott (2003), Frankel and Rose (2005) and Ben Kheder (2012)
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Contribution

- Different datasets used and not used in the literature
- Different and complementary proxies of environmental regulation
- Difference-in-differences approach
- Inclusion of corruption as a determinant factor of international waste trade
- Use of waste considered hazardous

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How hazardous waste was defined:
industrial, municipal, oils, pharmaceuticals, organic solvents, hydraulic fluids, brake fluids and anti freeze fluids, chemical products, primary cells, metal scrap, primary batteries and electric articles

Important Features

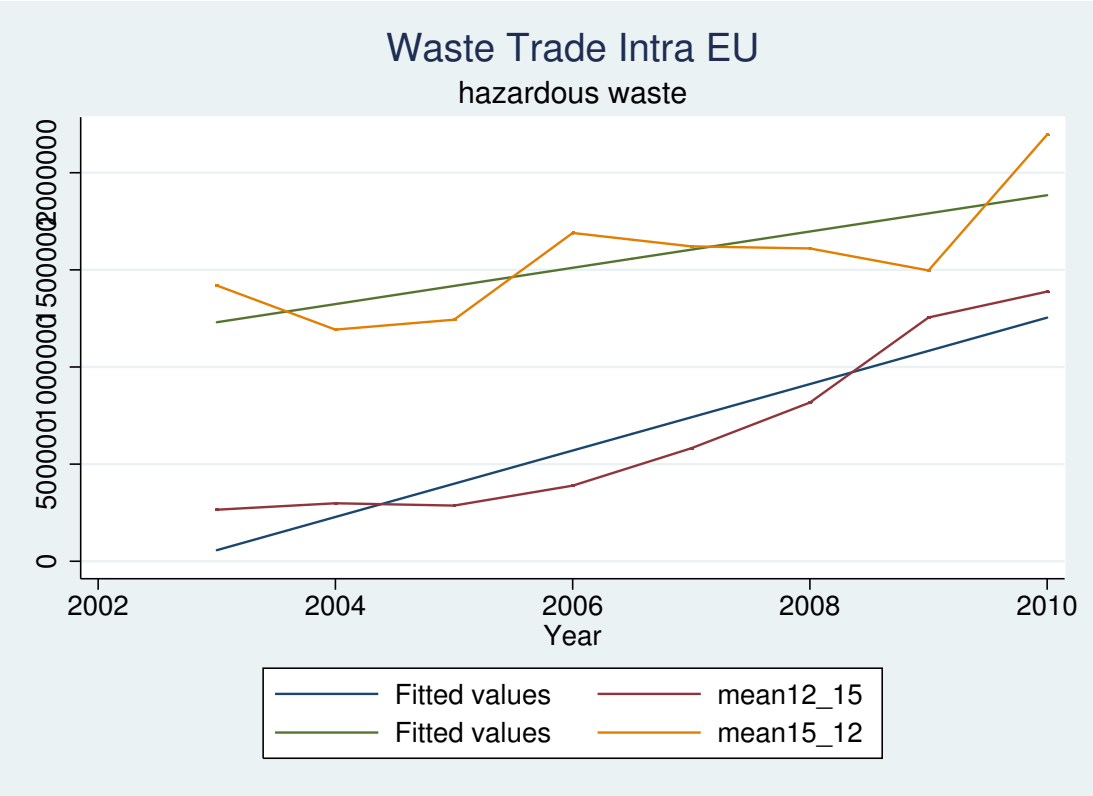

Figure : Waste Trade Flows inside the EU

Important Features

The REGULATION (EC) No 1013/2006 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 14 June 2006, on shipments of waste

- By that amendment, all exports of hazardous waste destined for disposal from countries members of OECD, EC, Liechtenstein were prohibited, [...]. to other countries.
- It is also important to bear in mind the requirement [...] of the Basel Convention that shipments of hazardous waste are to be reduced to a minimum, consistent with environmentally sound and efficient management of such waste.

Important Features

Figure : Ratio to total trade of waste trade EU

Important Features

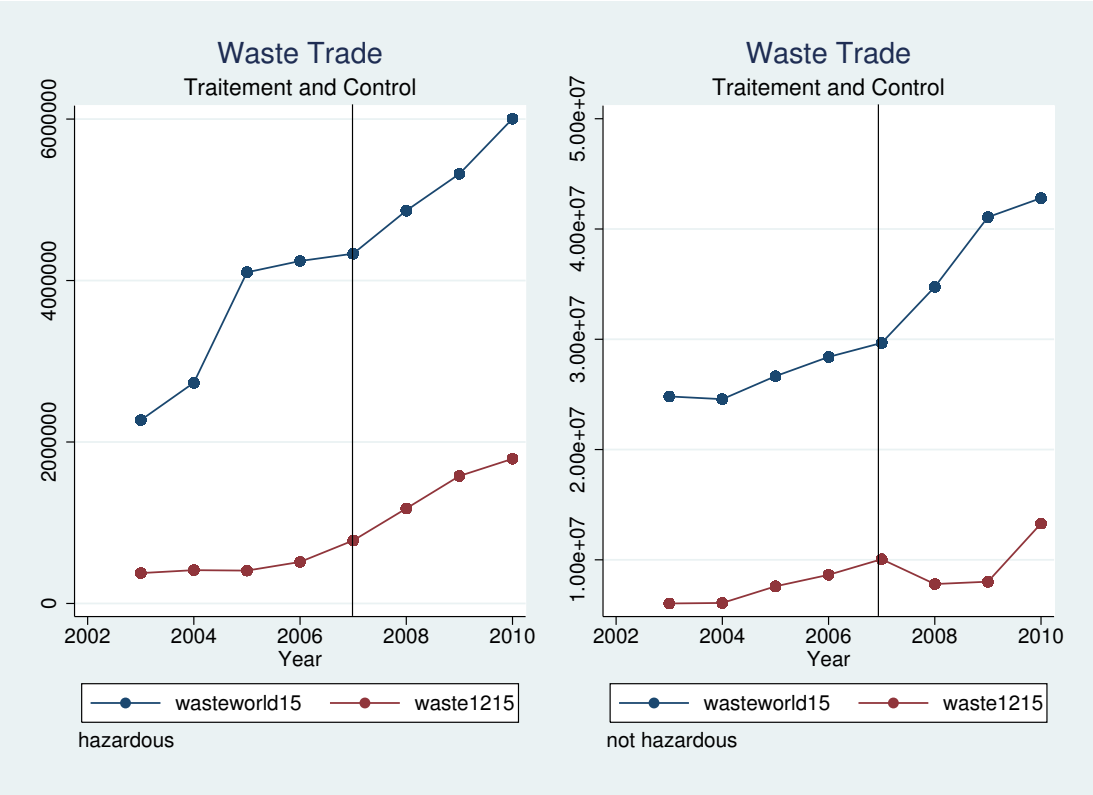

Figure : Waste Trade EU

Important Features

Country	ER_imp	ER_exp
Denmark	3.75	3.09
Finland	3.65	3.06
Suede	3.61	3.08
Netherlands	3.52	3.05
Austria	3.49	3.11
Luxembourg	3.43	3.00
UK	3.32	3.05
Germany	3.31	3.05
France	3.02	3.07
Belgium	2.93	3.08
Ireland	2.82	3.11
Spain	2.68	3.05
Cyprus	**2.52**	**3.02**
Portugal	2.51	3.07
Slovenia	**2.50**	**3.18**
Latvia	**2.26**	**3.17**
Lithuania	**2.24**	**3.20**
Slovakia	**2.19**	**3.11**
Hungary	**2.18**	**3.13**
Estonia	**2.17**	**3.10**
Greece	2.09	3.07
Malta	**2.00**	**3.06**
Italy	1.91	3.15
Poland	**1.88**	**3.13**
Czech Republic	**2.46**	**3.11**
Bulgaria	**1.63**	**3.07**

The multi-dimensional panel data in period 2003-2010 has three components:

1. The Waste Trade
   - matching process of the two principal sources of waste trade that are the Basel Convention data and the United Nation Comtrade and BACI for robustness
2. The data of gravity variables
   - resistance terms
3. Environmental Regulation proxy
   - Environmental Trade Barriers, Institution Efficiency and Environmental Quality

1.- **Environmental Trade Barriers:** MEA's InforMEA => Chemicals and Waste Management

- Basel => Wastes including hazardous wastes
- Rotterdam => Hazardous chemicals
- Stockholm => Persistent Organic Pollutants

2.- **Institution Efficiency:** Corruption Index => Governance

- Government Effectiveness
- Regulatory Quality
- Rule of Law
- Control of Corruption

3.- **Environmental Quality:** Environmental Performance Index => Health and Environment

- Environmental burden of disease, Air pollution and Water
- Biodiversity, Habitat, Agriculture, Forestry, Fisheries, Climate Change

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From **Wooldridge (2001)**

Proxy of Environmental Regulation

$$Yit = Mea_{1i} + Mea_{2i} + Mea_{3i} + Cor_{1i} + Cor_{2i} + Cor_{3i} + Cor_{4i} + Epi_{1i}$$

$$Yhat_{it} = E_{it}$$

$$Yhat_{jt} = E_{jt}$$

An orthogonal projection Yhatijt recuperates all the explanatory power of these environmental regulation components on Y (imports of hazardous waste)

From **Kellenberg (2012)**

Environmental Gradient

$$X_{ijt} = E_{ijt} = (E_{jt} - E_{it})/[(E_{jt} + E_{it})/2]$$

Basic regression

$$Y_{ijtps} = \beta_0 + \beta_1 X_{ijt} + \beta_2 X_p + \beta_3 X_s + \beta_4 X_{ps} + \beta_5 X_{ijtp} + \beta_6 X_{ijts} + \beta_7 X_{ijtps} + \beta_8 C_{ijt} + u_{ijtps}$$

where X_{ijt}: environmental gradient, X_{ijtps}: the diff-in-diff estimate, C_{ijt} costs controlling

	OLS TRUNCATED				POISSON			
	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
VARIABLES	lnsumnet	lnsumnet	lnsumnet	lnsumnet	sumnetweight	sumnetweight	sumnetweight	sumnetweight
ER_grad	-0.00813	-0.00592	-0.00749	-0.00857	-0.00588**	-0.00660***	-0.00540**	-0.00385*
	(0.00908)	(0.00831)	(0.00850)	(0.00902)	(0.00232)	(0.00221)	(0.00226)	(0.00199)
post	0.535***	1.102***	0.569***	0.735**	0.362	0.917***	0.596**	-0.674
	(0.178)	(0.181)	(0.157)	(0.293)	(0.242)	(0.242)	(0.244)	(0.473)
UE12_15	-0.236	-0.888***	-1.632***	-0.251	-1.500***	-3.184***	-1.800***	-1.758***
	(0.277)	(0.311)	(0.287)	(0.261)	(0.269)	(0.530)	(0.369)	(0.249)
ER_grad_1215	0.108	0.342*	0.135	0.0208	-0.0968*	0.0494	-0.0205	-0.0814
	(0.199)	(0.183)	(0.172)	(0.183)	(0.0508)	(0.0799)	(0.0778)	(0.0598)
ER_grad_post	-0.580***	-0.426***	-0.659***	-0.728***	-0.469***	-0.328***	-0.563***	-0.592***
	(0.149)	(0.138)	(0.133)	(0.140)	(0.0884)	(0.0713)	(0.0792)	(0.0944)
ER_grad_1215post	0.474	0.363	0.617**	0.672**	0.250***	0.178***	0.258***	0.291***
	(0.317)	(0.291)	(0.288)	(0.306)	(0.0503)	(0.0555)	(0.0509)	(0.0498)
cost	-0.638***	-2.828***	0.337***	-0.489***	0.173	0.256	0.756***	0.108
	(0.106)	(0.315)	(0.104)	(0.0989)	(0.202)	(0.582)	(0.130)	(0.161)
RT	no	yes	yes	yes	no	yes	yes	yes
it jt	no	no	yes	yes	no	no	yes	yes
it,jt,ij	no	no	no	yes	no	no	no	yes
Total effect	**-0.58**	**-0.426**	**-0.659**	**-0.728**	**-0.322**	**-0.157**	**-0.310**	**-0.305**
Constant	8.985***	49.01***	23.92***	10.14***	11.17***	37.30***	18.97***	15.84***
	(0.696)	(4.232)	(1.255)	(0.267)	(0.884)	(4.259)	(1.260)	(0.305)
Observations	2,904	2,904	3,221	3,221	3,162	3,162	3,521	3,521
R-squared	0.037	0.195	0.128	0.018	0.284	0.580	0.472	0.252

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

ENVIRONMENTAL REGULATION DETERMINANTS

VARIABLES	(1) sumnetweight	(2) sumnetweight	(3) sumnetweight	(4) sumnetweight
post	0.240	0.704*	0.411	-0.769
	(0.491)	(0.390)	(0.406)	(0.707)
UE12_15	-1.058***	-1.389**	1.408***	-1.214***
	(0.380)	(0.676)	(0.342)	(0.328)
reglrelkell	2.158**	6.564***	6.740***	1.610**
	(0.948)	(0.903)	(0.933)	(0.804)
RRK1215	-0.117***	-0.508***	-0.442***	-0.101***
	(0.0313)	(0.0734)	(0.0453)	(0.0274)
RRKpost	0.0958	0.0550	0.0267	0.0850
	(0.120)	(0.0744)	(0.0979)	(0.107)
RRK1215post	**0.0305**	**0.0587**	**0.0265**	**-0.00116**
	(0.0215)	(0.0467)	(0.0278)	(0.0211)
meas_int	-0.663***	-0.405*	-1.017***	-0.726***
	(0.164)	(0.238)	(0.178)	(0.164)
meas_int_1215	0.0331***	0.0706***	0.0772***	0.0241***
	(0.00941)	(0.0204)	(0.0108)	(0.00815)
meas_int_post	-0.0834***	-0.0228	-0.0795***	-0.0693***
	(0.0219)	(0.0197)	(0.0238)	(0.0203)
meas_int_1215post	**-0.0108**	**-0.0136**	**-0.00285**	**-0.00505**
	(0.00796)	(0.0297)	(0.0159)	(0.00915)
corrupt_grad	0.00838	0.0237	-0.00568*	0.00314
	(0.00817)	(0.0147)	(0.00319)	(0.00327)
corrupt_grad_1215	-0.121	-0.155	-0.266***	-0.0879
	(0.0870)	(0.149)	(0.0645)	(0.0574)
corrupt_grad_post	-0.00532	-0.0221**	0.00295	-0.00189
	(0.00601)	(0.0106)	(0.00289)	(0.00232)
corrupt_grad_1215post	**0.0782**	**0.106***	**0.0613***	**0.0660***
	(0.0499)	(0.0547)	(0.0366)	(0.0341)
cost	-0.125	1.479**	0.178	-0.0664
	(0.175)	(0.711)	(0.187)	(0.156)
RT	no	yes	yes	yes
it jt	no	no	yes	yes
it,jt,ij	no	no	no	yes
Constant	10.52***	35.30***	22.40***	15.76***
	(1.002)	(4.597)	(2.175)	(0.362)
Observations	3,162	3,162	3,570	3,570
r2_p	0.262	0.623	0.525	0.183

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

IMPORTS OF THE WORLD FROM THE 15				
VARIABLES	(1) sumnetweight	(2) sumnetweight	(3) sumnetweight	(4) sumnetweight
ER_grad	-0.00746***	-0.00933***	-0.00753***	-0.00333**
	(0.00197)	(0.00192)	(0.00203)	(0.00159)
post	0.114	-0.0745	0.0908	-0.362
	(0.232)	(0.231)	(0.222)	(0.467)
UEW_15	-1.021***	-1.341***	-1.213***	-0.873***
	(0.245)	(0.278)	(0.307)	(0.223)
ER_grad_W15	-0.000261	0.00139	-4.51e-05	-0.000611
	(0.00353)	(0.00360)	(0.00362)	(0.00314)
ER_grad_post	-0.00320	-0.00704	-0.00464	-0.0142***
	(0.00518)	(0.00501)	(0.00602)	(0.00496)
ER_gradW15post	-2.019***	-2.316***	-2.052***	-2.023***
	(0.425)	(0.443)	(0.425)	(0.406)
cost	0.840***	0.118	0.946***	0.812***
	(0.127)	(0.215)	(0.112)	(0.116)
RT	no	yes	yes	yes
it jt	no	no	yes	yes
it,jt,ij	no	no	no	yes
TOTAL EFFECT	**-2.026**	**-2.325**	**-2.060**	**-2.041**
Constant	12.90***	14.19***	22.11***	16.46***
	(0.355)	(2.032)	(1.455)	(0.238)
Observations	7,639	7,639	7,639	8,409
r2_p	0.244	0.315	0.385	0.213

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

- **Bad news**: **1% increase** in environmental regulation gap between EU15 and UE10 will imply **0.3% increase** in dangerous waste imports after the law was passed.
- **1% increase** in corruption gap particularly between EU15 and UE10 will imply **0.1% increase** in dangerous waste imports after the law was passed.
- **Good news**: For **1% of increase** in environmental regulation from the rich countries of the european union versus the poor countries of the world, the poor countries of the world will **decrease** their imports of dangerous waste in **2%**.

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- The European Regulation on shipments of waste, was effective preventing the damages in health or environment for the developing countries.
- One of the objectives of this law was well achieved.
- The waste imports of the UE10 countries are increasing, which could be very unsettling, if the differences in environmental regulation, are still increasing between UE15 and UE10.
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Thank you!

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