Slow Violence of Waste: Evidence from Chinese Environmental Policy in Waste Trade

SongYi Paik
University of Minnesota, Applied Economics

Abstract

Since the 1990s, China has been the largest importer of waste in the world. However, China changed its environmental policy in 2018 not to import plastic, paper, and textile. **This 2018 Chinese policy left the questions regarding where the waste is exported to and which groups of countries are more affected by importing more waste. Using a difference-in-difference approach, this study analyzes the effects of the Chinese import ban on the extensive and intensive margins of waste exports and re-exports by country income level and region.** The evidence is found that the effect of the Chinese waste import ban on waste exports is valid at both extensive and intensive margins, especially having substantial effects on the intensive margin of trade for **middle-income countries**. Similarly, re-exported waste, which is low-quality and more contaminated, arrived more in middle-income countries. This research also find that **East Asian and Pacific countries** considerably increased waste imports by about 91 percent after the waste import ban.

Motivation and Research Question

Motivation

- Comparative advantages give good economic reasoning to export waste from rich countries to poor countries because poor countries have a lower opportunity cost of importing waste.
- China was the largest importer of waste in the world, but Chinese living standards have improved and they demand clean environment and care more about their health. The Chinese government has banned the importation of plastic, paper, textile, and vanadium since 2018, and this policy has been very effective.
- This 2018 Chinese policy left the questions regarding where the waste is exported to and which groups of countries are more affected by importing more waste.

Research Questions

How does the change in China's waste policy in 2018 affect waste exports and re-exports?

- among high-, upper-middle-, lower-middle-, and low-income countries
- among regions.

Empirical Specification

Extensive Margin Effects by DiD Methods

$$I(Export_{ijt,k} > 0) = \alpha_0 + \beta_1 Treat_k + \beta_2 Post_t + \beta_3 (Treat_k * Post_t) + X_{ijt}\gamma + \alpha_i + \alpha_j + \varepsilon_{ijt,k}$$

Intensive Margin Effects by DiD Methods

$$arcsinh(Export_{ijt,k} > 0) = \alpha_0 + \beta_1 Treat_k + \beta_2 Post_t + \beta_3 (Treat_k * Post_t) + X_{ijt}\gamma + \alpha_i + \alpha_j + \varepsilon_{ijt,k}$$

i = exporter, j = importer, t = time, and k = treatment or control group;
$I(\,) = 1$ if export weights($Export_{ijt,k} > 0$);
$Treat_k = 1$ if wastes have been banned since 2018;
$Post_t = 1$ if year ≥ 2018;
X_{ijt} = control variables determined by the gravity model;
α_i = exporter fixed effects;
α_j = importer fixed effects; and
$\varepsilon_{ijt,k}$ = an error term with mean zero.
$arcsinh$ means the inverse hyperbolic sine, and standard errors are clustered by country pairs.

- **Treatment group** is wastes banned in 2018 (18 HS codes including plastic, paper, textile, and vanadium)
- **Control group** is wastes that have never been banned (31 HS codes including clinical wastes, waste oils, batteries)

Data

- Weight of waste exports and re-exports: UN-Comtrade database for 88 countries over 16 years (2005-2020)
- Country classification by income and region: World Bank
- GDP: International Monetary Fund (IMF)
- Border, Language, Colonial, Distance, RTA, and WTO: Institute for Research on the International Economy (CEPII)
- Basel Convention Ban Amendment : UNEP Basel Convention

Results

- After China banned the importation of waste in 2018, more countries started importing waste and increased the amount of imports on average.
- Especially, upper-middle-income countries increased their waste imports significantly (36%) but there is no statistically significant change in waste imports in low-income countries (Table 1). This result may imply that low-income countries lack the proper waste infrastructure or that their recycling technology is not good enough to import waste.
- The Chinese 2018 policy led to a 2.3-7% (2.8-8.8%) increase in waste re-exports to lower-middle (upper-middle)-income countries (Table 2). More hazardous waste arrives in more economically disadvantaged countries.
- The Chinese 2018 policy led to an increase in waste exports to East Asian & Pacific countries by 91% and to Latin American & Caribbean countries by 36% (Table 3).

Table 1. Intensive Margin Effects: Waste **Exports** to Countries By **Income Level** (excl. China and Hong Kong), 2005-2020.

	All countries (1)	High income countries (2)	Upper Middle income countries (3)	Lower Middle income countries (4)	Low income countries (5)
Treat ° Post	0.212***	0.212***	0.306***	0.155**	0.034
	(0.037)	(0.063)	(0.068)	(0.073)	(0.049)
R^2	0.398	0.451	0.347	0.355	0.322
Covariates	Yes	Yes	Yes	Yes	Yes
Observations	244,992	108,576	64,032	55,680	16,704
Calculated (semi-)elasticities:					
$\tilde{P}(\cdot)/100$	0.236***	0.236***	0.358***	0.168**	0.035
	(0.046)	(0.078)	(0.092)	(0.085)	(0.051)

Table 2. Intensive Margin Effects: Waste **Re-exports** to Countries By **Income Level** (excl. China and Hong Kong), 2005-2020.

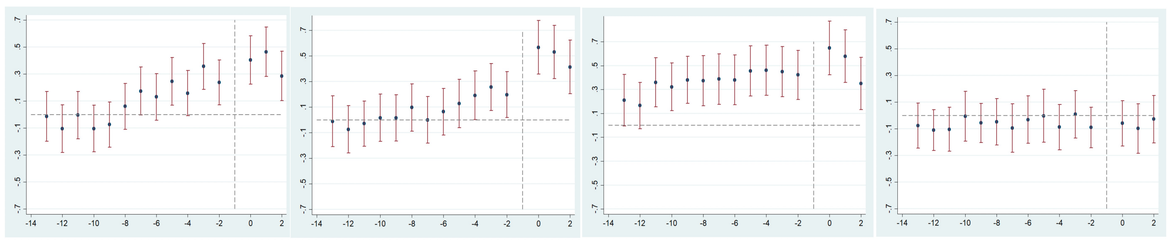
	All countries		High income countries		Upper Middle income countries		Lower Middle income countries		Low income countries	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Treat ° Post	0.019***	0.058***	0.014	0.043	0.028**	0.085**	0.022*	0.068*	0.007	0.020
	(0.007)	(0.022)	(0.013)	(0.039)	(0.013)	(0.040)	(0.013)	(0.040)	(0.009)	(0.027)
R^2	0.075	0.102	0.102	0.152	0.104	0.124	0.041	0.055	0.036	0.046
Covariates	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	244,992	80,736	108,576	35,872	64,032	21,088	55,680	18,368	16,704	5,408
Calculated (semi-)elasticities:										
$\tilde{P}(\cdot)/100$	0.019***	0.060**	0.014	0.044	0.028**	0.088**	0.023*	0.070	0.007	0.021
	(0.007)	(0.024)	(0.013)	(0.041)	(0.014)	(0.044)	(0.014)	(0.043)	(0.009)	(0.027)

Table 3. Intensive Margin Effects: Waste **Exports** to Countries By **Region** (excl. China and Hong Kong), 2005-2020.

	East Asia & Pacific (1)	Europe & Central Asia (2)	Latin America & Caribbean (3)	Middle East & North Africa (4)	North America (5)	South Asia (6)	Sub-Saharan Africa (7)
Treat ° Post	0.647***	-0.173	0.308***	0.047	0.051	0.078	0.091
	(0.136)	(0.217)	(0.071)	(0.129)	(0.049)	(0.308)	(0.058)
R^2	0.282	0.282	0.411	0.196	0.171	0.436	0.261
Covariates	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	27,840	11,136	89,088	16,704	38,976	5,568	55,680
Calculated (semi-)elasticities:							
$\tilde{P}(\cdot)/100$	0.909***	-0.159	0.361***	0.049	0.053	0.082	0.095
	(0.260)	(0.183)	(0.097)	(0.135)	(0.052)	(0.333)	(0.064)

Parallel Trends Assumption

Intensive Margin Effects: Waste **Exports** to Countries By **Income level** (excl. China and Hong Kong), 2005-2020.
(99% confidence intervals shown)



High-income ctry | Upper-middle-income ctry | Lower-middle-income ctry | Low-income ctry

Conclusions

- I investigate how the 2018 China's waste import ban affected the waste trade among countries by their income level and region.
- Using the DiD method, I find that the ban has both a positive effect on the probability to import waste (extensive margin) and the quantity of waste imports (intensive margin), especially for upper-middle-income countries and East Asian & Pacific regions.
- I also find that lower-middle-income countries, which are likely to have relatively weaker environmental regulations than high-income countries, re-imported more waste, especially more contaminated wastes.

Contact

<SongYi Paik> University of Minnesota, Applied Economics
Email: songyi@umn.edu Phone: 612-354-9128 Website: songyipaik.com