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Waste Not, Want Not: Tariffs as Environmental Protection in the Global Waste Trade

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Abstract

In the global waste trade, importers buy foreign-origin waste and scrap. After recycling waste products into raw materials destined for new goods, the leftovers are just trash—imported negative externalities that can overwhelm low-capacity developing states. Yet there is power in piles of foreign garbage, especially as modern waste management systems are designed around trade. When a waste product's imports concentrate in fewer states, those states gain market power to raise tariffs while still accommodating domestic demand. To support the theory, I introduce a list of 179 internationally traded waste products (HS 6-digit), as well as novel data on product-level tariffs and the international distribution of waste imports (1995–2020). I show the theory in action following China's shocking 2017 ban on imports of 26 waste products, where states on the receiving end of diverted imports have exercised their newfound power to use tariffs in service of environmental protection.

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1. Garbage Introduction

In the global waste trade, exporters collect post-consumer materials and post-industrial byproducts and offer them for sale on international markets. Importers buy containers and trucks of waste products, because they can process the waste and scrap to recover valuable raw materials. According to the recycling and waste management industry, 40 percent of raw materials worldwide are sourced from waste products.[1] While the waste trade goes both ways, developing states in the so-called "Global South" are especially hungry for raw materials.2[2] Based on data introduced in this article, the waste trade has netted out to at least 995 million tons of waste products exported from developed states and imported into developing states since 1995.

What sets waste products apart from other traded goods is that a waste product by definition requires processing to recover primary good(s), so every waste product carries a leftover component known as end-of-life (EOL) waste with no further reuse value.[3] The upshot of the waste trade is that voluntary transactions between exporters and importers in commercial markets redistribute EOL waste from one national jurisdiction to another. So, developing states have ended up as net importers of negative externalities in the form of physical, even smelly, foreign-origin garbage.

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1 As of 2023. Bureau of International Recycling, https://www.bir.org/the-industry.

2 Civil society groups representing the interests of actors from the "Global South" use this terminology. In this article, "Global North" is defined as developed (or high-income) states that are, as of the beginning of the study period (1995), (1) in the OECD and (2) classified as High Income by the World Bank (Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Iceland, Ireland, Italy, Japan, Luxembourg, Netherlands, New Zealand, Norway, Portugal, Spain, Sweden, Switzerland, United Kingdom, United States). All other developing (or middle- and low-income) states are in the "Global South." Appendix B.

3 While primary goods may also contain EOL waste, the incidence of EOL waste is predictable, visible, and salient for the subset of waste products.

Low-capacity developing states struggle to implement regulations to mitigate domestically generated negative externalities and further those that result from economic integration (Dolak and Prakash, 2022; Rudra, Alkon, and Joshi, 2018; Ward and Cao, 2012). While commercial markets for waste products help meet demand for raw materials especially in developing states, waste products' imported leftovers can manifest a race to the bottom (Rudra, 2008).

Outright import bans have been of considerable interest in policy circles as a means of abating the race to the bottom, especially since 2017 when China shocked global markets by banning imports of 26 specific waste products in its "Operation National Sword"— also known as "No More Foreign Garbage." But import bans carry the political costs of decimating domestic importers, not to mention disrupting supplies of recovered inputs to downstream domestic consumers. Usefully, governments have another trade policy lever at hand that can balance imported externalities against domestic demand—the product-level tariff (Kim, Liao, and Imai, 2020). A higher tariff makes it more expensive to import a waste product, which can improve environmental protection in two ways: first, by collecting more compensation from those commercial market actors responsible for importing negative externalities, and second, by discouraging imports by those who now find it too expensive. At the same time, the government can set the tariff low enough to accommodate domestic demand for waste products and their constituent raw materials. Conceptually, the tariff can serve as an environmental Pigouvian "sin" tax that just happens to be levied at the border (Wiseman and Ellig, 2007). Product-level import tariffs are targeted, easy to implement, and adjustable as the government's preferences over environmental- economic tradeoffs change. What is more, tariffs regulate foreign-origin negative externalities at the border rather than behind it, a particular boon to low-capacity developing states. Although overlooked in the environmental policy repertoire, I argue that states can and do use tariffs as leverage in shaping the distribution of the physically big, environmentally overwhelming, costly leftovers of the global waste trade.

Moreover, bigger piles of imported garbage make it easier to accommodate economic interests at a higher tariff. If and when not all national jurisdictions see the benefit of racing to the bottom in maximizing openness to, say, spent batteries (HS 854810), then the tradeable sector has less leverage over government policy. Importers concentrate in fewer territories, as do the EOL leftovers after the waste product is processed. Governments of these territories gain monopsony power as the dominant "buyers" in a so-called "market" for the waste product's negative externalities. With monopsony power comes the flexibility to raise the tariff higher, as a way to extract more compensation for imported negative externalities without decimating importers' competitiveness.

In providing evidence, I introduce a novel list of 179 internationally traded (HS 6-digit) waste products, nearly triple previously best-available catalogs of waste products. I use newly assembled data on product-level import tariffs for 170 developing states from 1995–2020. Additionally, I demonstrate the continued usefulness of the product-level tariff alongside national-level waste import non-tariff barriers (NTBs), based on a new dataset of over 1200 NTBs. Further, I leverage China's 2017 import ban on 26 waste products in a differences-in-differences research design, as China's selection out of those import markets shocked monopsony power in markets for their negative externalities. Developing states awash in imports of those 26 waste products raised tariffs higher on those products (and not others) in the wake of the "China garbage shock."[4]

A theory about the usefulness of tariffs in pursuit of environmental protection is far from esoteric. One takeaway is that trade protection can be repurposed as a tool to mitigate foreign-origin negative externalities, so long as the negative externalities respect national borders. Another is that developing states can use decisions over economic openness to alleviate consequences of low state capacity. There may be more opportunities for trade policy to be repurposed in service of outcomes other than protection of import-competing interests (Holtmaat, Adolph, and Prakash, 2020). Furthermore, with developing state demand for raw materials in mind, contemporary waste management systems in developed states have been designed around export.[5] As a result, developed states are using capitalist markets as a byway to mitigate their domestically produced negative externalities. If and when the structure and operation of markets confers power on developing states in the "Global South," it is the "Global North" that needs to adjust. As one example, Mesa, Arizona, contracts with waste management service providers-cum-exporters to collect the contents of households' blue recycling bins. In a January 2022 mailer, Mesa introduced a new recycling program tagline: "When in Doubt, Keep it Out."[6] In the fine print, Mesa explains that recyclability is endogenous: Service providers "ultimately determine what items can and cannot be accepted," they are only "willing to accept and recycle items with a strong market value," and finding markets in recent years "has been difficult." When developing states' trade policies squeeze exporters' profit margins too far, Mesa can no longer rely on commercial markets to do its dirty work. Although, having my parents drop their empty glass pickle jar in the trash instead does not seem a sustainable solution, in any sense of the word.

The next section uses novel data to illuminate the commercial waste trade and its concomitant redistribution of negative externalities. Section 3 draws insights from a variety of literatures on the political-economic consequences of the waste trade. Section 4 presents the theory. Section 5 describes the empirical approach and reports results from regression analyses and a differences-in-differences research design leveraging China's 2017 import ban on 26 waste products. I end with rubbish conclusions.

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4 The enormous "China shock" literature has looked at the political-economic consequences of China's entry to globalmarkets (Autor, Dorn, and Hanson, 2016). The "China garbage shock" affords the opportunity to see consequences when China exits.

5 The major waste and recycling trade association in the United States "aggressively advocates initiatives that promote free and fair trade of recycled commodities," and its European counterpart calls for "open and fair competition" to ensure "a genuine international recycling market." Sources: "ISRI: International Trade," https://www.isri.org/advocacy-compliance/ international-trade and "EuRIC: Position Papers." https://www.euric-aisbl.eu/position-papers. As of 2023.

6 Appendix A.

2. Garbage Data

Exporting firms accumulate waste products from municipalities' household recycling and waste management systems, industrial producers of primary products, secondary scrapyards that collect post- industrial and post-consumer waste, and other direct and indirect sources. The non-zero EOL waste component of these products needs to be processed out before the recyclable component can be used as an input in downstream production processes. Unfortunately, especially in light of its normative salience, the global waste trade is poorly measured (O'Neill, 2019). A growing literature makes clear the shortcomings in tracking waste shipments and ensuing opportunities for evasion and illegality (Favarin and Aziani, 2020; Liddick, 2009). Advocates are innovating methodological solutions to the tracking problem; for example, Biotto et al. (2009) develop remote sensing to identify illegal landfills, and the Basel Action Network uses GPS trackers to follow electronic waste (e-waste) to incorrect and often illegal destinations.[7] Yet, a scalable technological solution is difficult to imagine in an issue area that is rife with incentives for political actors to obfuscate.

The most successful global governance effort in this space is the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal (Basel Convention), with the core function of providing repositories for various member state self-reporting on waste shipments (Yang, 2020). However, the Basel Convention's limitations mean it has not resolved the measurement problem in documenting the international distribution of EOL waste, much less the problem of setting or enforcing harmonized regulations (Puckett et al., 2005; Clapp, 1994; Kummer, 1992). First, while the Basel Convention was signed in 1989 and quickly reached near-universal coverage, the United States is not a member.[8] Second, the Basel Convention facilitates a program of technical work with regard to "toxic, poisonous, explosive, corrosive, flammable, ecotoxic, and infectious wastes," but radioactive waste is excluded.[9] Third, the Basel Convention is designed around member state autonomy in defining hazardous waste and even waste itself (Pongracz and Pohjola, 2004). Given that the Basel Convention delegates definitions to member states, it does not link its technical advice to specific traded products.[10] The problem extends even to identifying what counts as a waste product.

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7 "E-Trash Transparency Project," with the MIT Senseable City Lab. https://www.ban.org/trash-transparency.

8 Fiji, Haiti, and several small island nations are the only other non-members. Membership in the subsequent 1998 Rotterdam Convention on pesticides and industrial chemicals and the 2001 Stockholm Convention on persistent organic pollutants is in the dozens.

9 A set of African nations formed the 1998 Bamako Convention that prohibits hazardous—including radioactive—waste imports into member states; however, there are serious concerns over compliance (Okafor-Yarwood and Adewumi, 2020).

10 Neither does the European Union, which has built on the Basel Convention in providing technical guidance.

Since 1988, the statistical infrastructure of the World Customs Organization's (WCO) Harmonized Commodity Description and Coding System has been the world's means of defining traded goods. Harmonized System (HS) codes are hierarchical and move from categories (2- and 4-digit) to a specific product with a 6-digit HS code.[11] To use the core metaphor from James Scott's Seeing Like a State, HS codes are the means by which states "see" traded products (Scott, 1998). This article introduces a list of 179 traded waste products at the HS 6-digit level (Appendix E). To be classified as a waste product, the definition includes the term waste or scrap; it is a residual or byproduct from primary production processes; and/or the product is a one-time primary good intended to be processed into inputs for further use. Waste products vary in the types of raw materials they contain, in the downstream applications of their constituent raw materials, and the potential for harm from their EOL components, reinforcing that tradeoffs around market openness operate at the product-level (Kim, Liao, and Imai, 2020). For example, consider their eight different sources: animal, chemical, metal, mineral, paper, plastic, textile, and vegetable. What the 179 waste products on the list have in common is that states use HS codes in tracking their international movement via exports and imports—and, as a consequence, the redistribution of their EOL waste components.

Whether an international regulatory body like the WCO "sees" and measures something is endogenous to politics (Buthe and Mattli, 2014). E- waste is notoriously under-measured (Lepawsky, 2018; Ilankoon et al., 2018). The WCO acknowledges that e-waste has not been captured in dedicated HS codes, despite it being an "example of a product class which presents significant policy concerns as well as a high value of trade."[12] While there are HS codes for plastic waste, it is also known to be poorly measured (Lebreton et al., 2018).[13] Further, HS codes do not "see" trade in services, which means the list of waste products does not include waste exported at a negative price (in which the service of foreign waste disposal is imported). In terms of research design, the population of interest is the set of legally traded products that, by definition, include an EOL component and thus, by definition, redistribute physical negative externalities across international borders. This means the products of interest are waste products with HS codes—including any additional waste products coded in the future, if and when political will brings about measurement. For now, this list of 179 nearly triples the previously best-available list hosted by the OECD Trade in Waste and Scrap database.[14]

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[11] Product codes beyond 6-digits are not globally harmonized.

[12] Its first guidance on e-waste appeared in 2022. https://www.wcoomd.org/-/media/wco/public/global/pdf/topics/nomenclature/instruments-and-tools/hs-nomenclature-2022

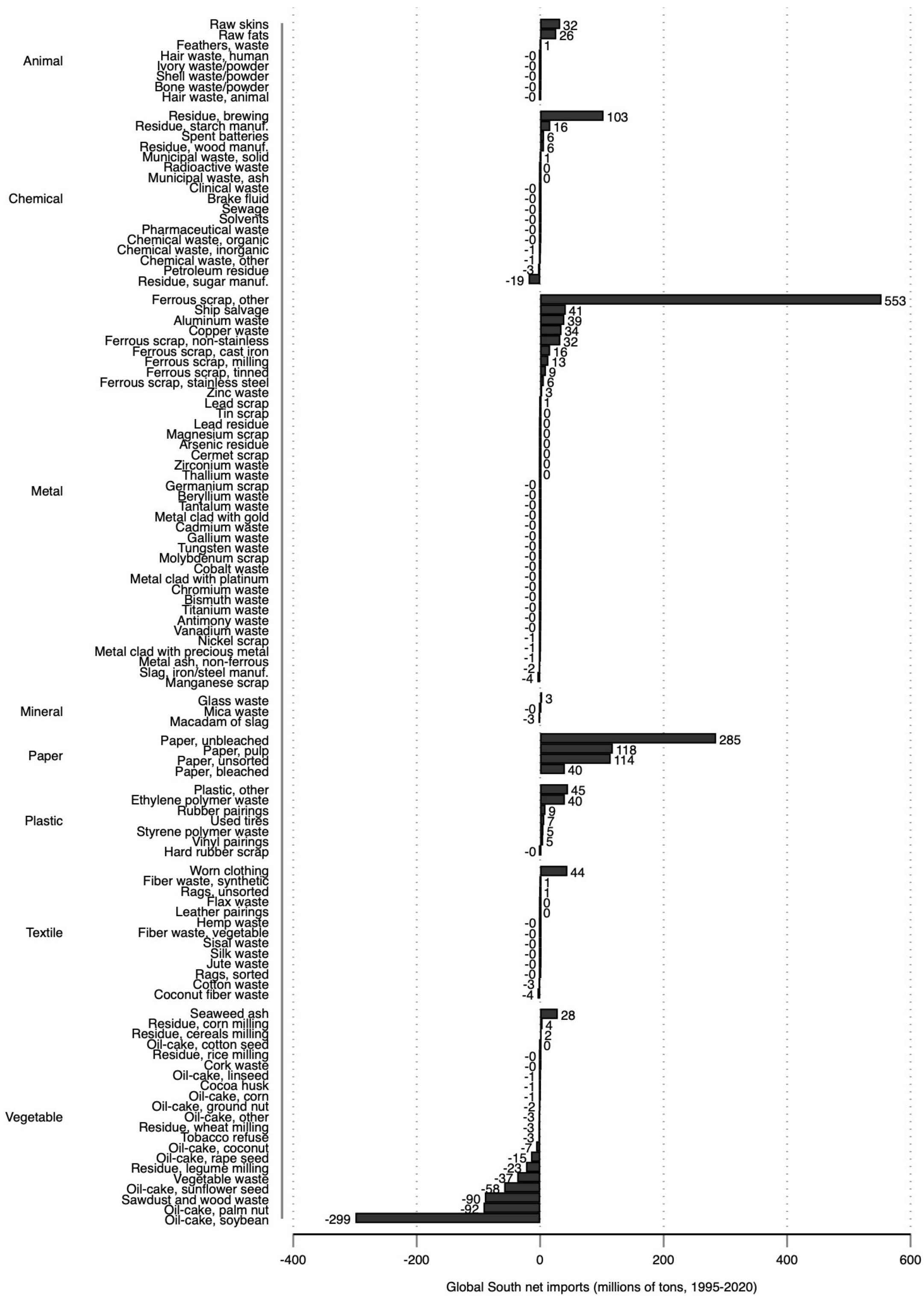
[13] The Basel Convention succeeded in adopting amendments on hazardous plastics in 2019, and the United Nations agreed in 2022 to negotiate a legally binding agreement on plastic waste pollution.

[14] That list of 63 misses, among other things, two-thirds of the waste products China banned in 2017 (Kellenberg, 2012).

To provide insight into the list, Figure 1 summarizes net product-level trade between developed states and developing states. Waste products are categorized by type, and similar products are combined for presentation. Trade is measured in millions of (metric) tons, because the physicality of waste products is the means by which their EOL waste components are delivered. It is clear from Figure 1 that trade in waste products goes both ways, consistent with the fact that deriving inputs from waste products is not inferior or exploitative in itself (Gregson et al., 2015). Developing states are net importers of a number of metals and other industrial scrap and byproducts, consistent with the waste trade accommodating unmet demand for raw materials important for industrialization. They are also net importers of all post- consumer paper and plastic waste products, which reflects the structure of global recycling systems and the importance of these materials to manufacturing processes concentrated in developing states. Several of the waste products net imported into developing states are eyebrow-raising; still, they are traded at positive prices (which are observable given their HS codes).

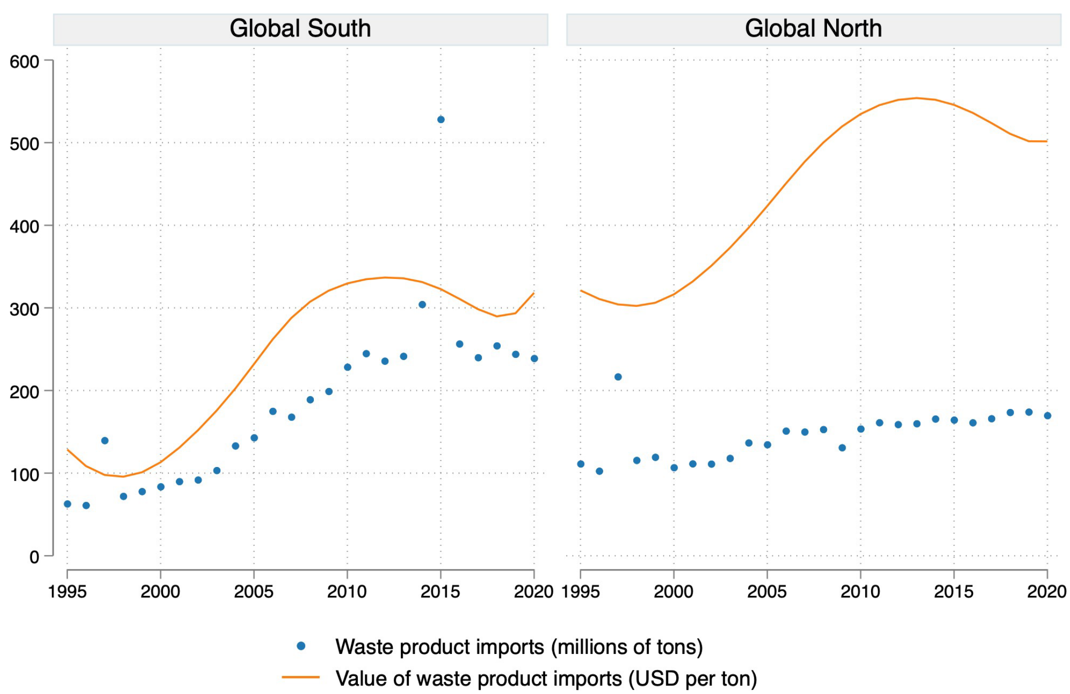
What Figure 1 alone cannot speak to is the normative concern that the global waste trade facilitates net transfers of serious negative externalities from the territories of developed to developing states. This is because waste products vary in the quantity and quality of their EOL content, over time and space. The physical material in question is but one factor. What portion of a waste product is or is not recycled is endogenous to technology, to the price of alternative virgin materials, to costs incurred in processing, to other standard supply and demand dynamics, and broadly to the political-economic determinants of the extent to which capitalist, commercial markets are accepted as a mechanism to redistribute negative externalities for that waste product at that time.

Figure 1: Net waste product imports into developing "Global South" states, in millions of tons (1995–2020). Similar products collapsed for presentation.



Only in combination with price trends can we infer that developing states receive net flows of waste imports' more serious negative externalities. If we assume that market actors internalize at least some costs associated with negative externalities, it should be the case that baskets of goods containing more consequential negative externalities should sell at a lower price. Figure 2 plots data on the volumes and values of baskets of imported waste products in the developing "Global South" (left panel) and the developed "Global North" (right panel).[15] On volume, the annual amount imported is consistently higher in South than North states, and it has more than doubled in the South while growing more slowly in the North.[16] On value, baskets of South imports have cleared at lower prices across the period, and the price gap between North and South import baskets has grown over time. This is against a backdrop of increasing demand for waste products overall, suggested by rapid price growth for baskets imported into the North despite little change in volume. Taken together, the data establish that waste imports into the developing "Global South" have characteristics consistent with more, and more consequential, negative externalities, compared to those imported into the developed "Global North."

Figure 2: Empirical support for the concern that developing "Global South" states import higher negative externality waste products than developed "Global North" states.



[15] For definitions, see footnote 2 and Appendix B. Trade data from CEPII/COMPUSTAT, 202201 (Gaulier and Zignago, 2010).

[16] An unprecedented amount of trade in ship salvage (HS 890800) accounts for the very high developing "Global South" import surplus in 2015.

3. Garbage Literature

The political upshot of net Global North-to-South transfers of negative externalities through the waste trade is that commercial markets provide outs for developed states to relocate "not in my backyard" (NIMBY) problems to developing states' "backyards" (Foster and Warren, 2022). Although international relations scholars have overlooked the global waste trade and its theoretical implications, fellow travelers in social sciences have made inroads into understanding its material and non-material dimensions.[17] On the material dimension, a variety of studies link waste imports to worsened environmental quality and human health (e.g., Heacock et al., 2016; Kellenberg, 2012; Ederington, Levinson, and Minier, 2005; Cole, 2004), although well-identified tests of causal effects are scarce (Jayachandran, 2022). On the non-material dimension, scholars engage critically with the power relations embedded in global recycling markets (e.g., Theis, 2020; Cotta, 2020; Schmidt, 2006; Sanchez, 1994). Liboiron (2021) argues that imports of foreign-origin pollution are "an enactment of ongoing colonial relations," particularly when one nation's waste management transforms indigenous land "into a Resource for waste disposal."[18] Okafor- Yarwood and Adewumi (2020) argue that imported pollution is best thought of as a form of environmental racism. Waste imports carry multifaceted harms for social justice (Rathore, 2020); rural and urban communities (Mihai et al., 2022; Grant and Oteng-Ababio, 2012); municipalities (Kaza et al., 2018); and more. Evidence from a variety of national settings establishes agency on the part of communities exposed to harms. Of note, 20 million "waste pickers" sort mixed waste worldwide, and they have been powerful organizers in a variety of contexts (Amuzu, 2018; Gutberlet et al., 2017; Amankwaa, 2013).[19] Still, the myriad harms of EOL waste in developing states illustrate a weakness in the "circular economy" model that sees the waste trade as a means of closing the loop from responsible resource usage, to recycling, to reuse (Yamaguchi, 2021).

In regulating waste product imports, governments choose whether and to what extent to sacrifice domestic economic gains in favor of protecting against concomitant negative externalities. The Environmental Kuznets Curve (EKC) implies that making such an economic-environmental tradeoff is hardest for governments in developing states. The EKC posits an inverse U-shaped relationship between pollution and development level. At lower levels of GDP per capita, pollution is accepted as a correlate of industrialization and low state capacity; that changes after some inflection point, beyond which pollution decreases as GDP per capita rises. While there is limited empirical support for the implied mechanisms, the EKC pattern has been observed in a variety of settings (Aklin,

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[17] On lacunae in international relations, see Colgan (2019).

[18] p. 6, 40. See also Liboiron (2021) on the ethics of capitalizing land and resource.

[19] International Alliance of Waste Pickers, https://globalrec.org/.

2016; Stern, 2004). Waste trade data also suggest an inverse U-shaped relationship between surplus waste imports (as a proxy for pollution) and GDP per capita (Appendix D.3). In terms of theory development, this pattern locates the starkest political-economic consequences of waste trade openness in developing states—exactly those where foreign-origin garbage is disproportionally piling up.

How might developing states balance mitigating environmental harm and accommodating domestic demand for the goods responsible? In international environmental politics, the primary struggle has been for states to find ways to combine domestic institutions and global governance to limit exposure to negative externalities produced outside of the state's jurisdiction (e.g., Gulotty, 2020; Perlman, 2020; Spilker, 2013; Ward and Cao, 2012; Cao, 2009). In stark contrast, waste products are physical, and they arrive packed inside containers and trucks. This physicality allows states to regulate externalities unilaterally and at the border, in ways not possible with gaseous or effluent transboundary pollution. The regulator's starting point has more in common with other forms of negative externalities that arrive in a physical form, such as trade in illicit substances (Kim and Tajima, 2022), although that analogy is strained given non-harmonized definitions of which waste is illicit (Higashida, 2020). What if we instead reconceptualize the politics of trade protection to include protection from imported negative externalities? Through the setting of the waste trade, I propose that the old-fashioned protectionist trade policy instrument of the tariff is well-suited to be repurposed for environmental protection, too.

4. Garbage Tariffs

A Pigouvian tax, or a "sin tax," is a form of taxation used to reduce the negative externalities caused by socially and thus politically undesirable activities (Pigou and Aslanbeigui, 1920). A higher tax on the activity increases the cost of engaging in it, which has the dual effects of reducing the production of negative externalities and extracting more compensation from those that still engage in the activity. A sin tax can be applied domestically or at a border (Wiseman and Ellig, 2007). Think of a Pigouvian "sin tariff" as an import tariff that increases the costs to bringing a negative externality-laden good across the border. A higher sin tariff can reduce negative externalities by making the offending product too costly to import. A higher sin tariff also extracts more revenue for government coffers from those commercial actors that continue to import the offending product.[20] For the concept of a sin tariff to be useful, a state must be constrained by an environmental-economic tradeoff in making its decision over openness to a given

[20] Increased tariff revenue can indirectly mitigate negative externalities, for example by improving state capacity.

product. The government does not want to default to free trade—the environmental costs of abdicating responsibility for negative externalities to the commercial market are too great. But neither does the government want to ban imports—the economic costs would be too great.

For developing states making choices over openness to waste product imports, a sin tariff is a fantastic tool. The humble product-level tariff is incremental, so the government need not make the kind of all-or-nothing decision required by an import ban or its free trade opposite. It is targeted, so governments can make economic-environmental tradeoffs on a product-by-product basis, and not over the waste trade per se. It is adjustable, so the government can change its policy in response to changing political and economic conditions. It takes little state capacity to implement, a particular boon for states at the lowest levels of development. In contrast to a behind-the-border regulation, a tariff makes it possible for foreign actors to shoulder at least some of the costs, because how much of a tariff is passed through to domestic actors is an empirical question.[21] For a myriad of reasons, product-level import tariffs can help a developing state government pursue environmental goals without quashing its domestic tradeable sector in the process.

Conventionally, protectionist trade policy traces back to import-competing interests pitted against the interests of those that engage in and benefit from the tradeable sector. However, a theory of tariffs as a means of protection from import competition is out of place in the waste trade. Waste products are byproducts, so import competition is reasonably a second-order worry for domestic producers of waste products. Import competition might matter for domestic producers of virgin raw materials; still, international markets for waste products have arisen as raw material needs outstrip domestic supplies of raw materials, from whatever source (O'Neill, 2019). Instead, "sin" tariffs on waste products provide a different sort of protection—from the environmental and social harms of a waste product's negative externalities. In what follows, I further conceptualize the environmental-economic tradeoff behind waste product import tariffs and attendant testable implications, before theorizing the conditions under which economic constraints weaken.

On the environmental dimension, it is easiest for the importer to put a waste product's EOL waste in the bin and leave it at the curb. Should it do so, its private transaction creates a new burden for the local waste management system that is increasingly overstretched when bins are filled with foreigners' garbage, too (Kaza et al., 2018). From a social welfare point of view, actors participating in voluntary transactions would ideally internalize the costs of negative externalities resulting from EOL waste.

[21] Measuring pass-through is left to future research.

How- ever, low-capacity developing states struggle to set and enforce domestic environmental regulations in general (Prakash and Potoski, 2014), including regulations that would shift the waste management burden to importers and/or have the effect of passing through its costs to exporters (Boudier and Bensebaa, 2011; Helm, 2008). Moreover, even if market actors were to internalize the costs of best-practices EOL waste management, the garbage remains in a political jurisdiction different from the one in which it was generated. That physical presence, and its associated sights, smells, and exploitative overtones, have “public bad” qualities of non-rivalry and non-excludability without a behind-the-border technological solution. But with a higher sin tariff, developing states can pursue their goals on the environmental dimension by distorting prices in the marketplace in which the responsible voluntary transactions occur. All else equal, the greater the expected harms of a waste import’s negative externalities, the higher the import tariff on the waste product.

It is methodologically fraught and perhaps counterproductive to judge which harm to whom or what is worse. Instead, to operationalize this hypothesis I take advantage of a feature of HS codes. A number of waste products can be sold in a mixed form, meaning that a different HS code applies when the exporter offshores the sorting process. Examples of mixed waste products include mixed metal ashes and unsorted rags.[22] Some HS codes indicate mixtures by way of imprecision, as they are defined based on exclusion from other categories; examples include a variety of chemical residues. I maintain that waste products traded under mixed HS codes carry higher average negative externalities than other waste products.[23] Why? First, I assume that such waste products contain more EOL content mixed in with raw materials of interest to the importer and that negative externalities are increasing in the volume of EOL waste.[24] Second, sorting can generate negative externalities beyond those embedded in pre-sorted waste products. Sorting can generate significant direct harms for waste pickers. For example, ship salvage (HS 890800) contains hazardous materials mixed with recyclables in a physically dangerous form, and the International Labour Organization identifies ship-breaking as “among the most dangerous of occupations.”[25] At a societal level, harms to waste pickers increase production of “public bads” through social and moral negative externalities. Additionally, among waste products, mixed products have proven particularly important in facilitating “home style” politics (Fenno, 1977). When in 2019 the Philippines sent back to Canada 69 containers of what was discovered to be

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22 Exporters accept lower prices for mixed waste; for example, the average price per ton paid by importers of “Ferrous, other” (HS 720449) is one-third that of the 14 pre-sorted ferrous metal waste products.

23 See Appendix E.2 for full list.

24 As empirical support, the bulk of these waste products are net imported into the developing “Global South” (Figure 1).

25 “Ship-breaking: A Hazardous Work.” March 23, 2015. ILO.

mixed illicit and licit waste, then-president Rodrigo Duterte told Canada, “Your garbage is on the way. Prepare a grand reception. Eat it if you want to” (Liebman, 2021). In 2021, the Malaysian Minister of Environment stood in front of bales of imported waste products, promising that Malaysia will not “become the garbage dump of the world.”[26] Bloomberg reporters described the wafting “stench of curdled milk” and the sight of “maggot-infested rubbish” as the minister spoke—newsworthy EOL waste mixed in with what I’m guessing was imported municipal solid waste (HS 382510).[27] For these reasons, I hypothesize that tariffs should be higher on mixed waste products, if indeed waste product tariffs are Pigouvian in nature.

Hypothesis 1: All else equal, developing state governments set higher import tariffs on waste products sold in mixed form than other waste products.

On the economic dimension of the environmental-economic tradeoff, a developing state needs to avoid setting a Pigouvian sin tariff too high, lest would-be importers become uncompetitive and too few waste products be imported into the domestic market. Too-few imports would have knock-on costs throughout the economy for the health of the tradeable sector, downstream customers of recovered raw materials, and opportunities for developmental spillovers. If recycled materials are used as inputs in exports, too few waste product imports would have further consequences for accruing foreign exchange. These dynamics are not unique to traded waste products. Rather, the more that openness to a waste product generates the same economic benefits possible of any traded good, the more downward pressure on the tariff.

This proposition is both intuitive and difficult to support empirically, as observed prices and trade flows are deeply endogenous to the tariff. One observable implication is that meaningful variation in product-level tariffs should be unaccounted for by controls for national-level factors such as membership in the Basel Convention, policies that serve as national-level NTBs, or aggregate development level indicators (e.g., Nooruddin and Simmons, 2009). To provide more direct support, I devise two differently flawed product-level indicators for domestic demand, presuming that they are substantially (though not fully) driven by decisions taken outside of the developing state in question. First, I create an indicator variable for the 82 HS 6-digit waste products that are net imported into developing states in the study period, expecting that they should be in relatively higher demand in a given developing state-year (summarized in Figure 1).

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[26] Malaysia sends back over 300 containers of illicit plastic waste.” April 6, 2021: Reuters, https://www.reuters.com/article/us-malaysia-environment-plastic-.

[27] Koh, Ann and Anuradha Raghu. “The World’s 2-Billion-Ton Trash Problem Just Got More Alarming.” July 11, 2019. Bloomberg.

Hypothesis 2a: All else equal, developing state governments set lower import tariffs on waste products that are net imported into developing states, compared to waste products that are not.

Second, when a global product market is not USD 100 but USD 1 billion, it entices new entrants, motivates current firms to remain competitive, and hints at longer-term opportunities for economic growth and strategic investments attractive to political actors. For a waste product, a larger market signals deep downstream interest in the product's constituent raw materials and possibilities for importers to integrate into thriving global value chains. Overall, domestic economic and political interests around ensuring market access are more likely to align when the global product market is large.

Hypothesis 2b: All else equal, developing state governments set lower import tariffs on waste products with larger global markets, compared to other waste products.

Given support for conceptualizing waste product tariffs as Pigouvian "sin" tariffs, the following question emerges: (When) can a developing state accommodate the economic dimension of the environmental-economic tradeoff at a higher tariff level? I argue that the structure of international markets, in combination with the physicality of waste products' negative externalities, create conditions under which developing state governments can raise the sin tariff higher at lower economic cost. These conditions have to do with a developing state's power in what I call the market for a waste product's negative externalities, or its "market for sin."

Waste product importers and exporters engage in voluntary transactions in commercial markets. Because waste products are physical goods, and negative externalities are embedded in the physical form of the waste product's EOL component, transferring the waste product across national borders also transfers its negative externalities. Think of this as creating a second marketplace around the international distribution of the waste product's negative externalities. An importer's voluntary transaction simultaneously makes its state a "buyer" of the waste product's negative externalities, in a marketplace where its state "competes" with other national jurisdictions to hold EOL waste in its territory. In setting a sin tariff on a waste product, the state trades off the harm generated by its "competitiveness" in the waste product's market for negative externalities against the benefits generated by its importers' competitiveness in the waste product's commercial market.

When there is only one buyer in a market it is a monopsonist, and the seller must meet the monopsonist's demands or else the transaction fails. If all importers of a waste product are located in very few states, those are the only national jurisdictions available as a geographic destination for a waste import's EOL component, so those states have monopsony power in the waste product's market for negative externalities. Monopsony power allows a state to achieve its intended goal on the environmental side of the environmental-economic tradeoff with a higher sin tariff than otherwise. Monopsony power is a continuous concept, resulting from the interaction of two factors: the concentration in the market for negative externalities across national jurisdictions and a state's share of that market. It can only operate if the market is concentrated enough to allow for outsized price-setting power. Therefore, the theoretical prediction is that beyond some threshold of market concentration, tariffs increase with import market share. The testable hypothesis is as follows:

Hypothesis 3: A developing state government sets a higher import tariff on a waste product when it has a higher share of the waste product's global imports, conditional on global imports being highly geographically concentrated.

The key scope condition behind H3 is that the developing state is constrained by a Pigouvian environmental-economic tradeoff in making its decision over openness to a waste import. As such, the government does not intend to raise the tariff so high as to select out of the market for negative externalities altogether. It is therefore useful in observing the tariff hikes predicted by H3 that the supply of Global North waste and, in turn, waste product exports are extremely inelastic. Global North politicians have yawning incentives to subsidize their exporters enough to get international commercial markets to clear. Otherwise, if a would-be exporter cannot agree to a low-enough price to make the transaction worthwhile, the waste product remains a NIMBY problem, and politicians have to devise a different solution.[28] Additionally, H3 can be adapted to speak to change over time. If and when a developing state finds itself no longer constrained by Pigouvian dynamics, it can set the sin tariff higher—even to the level that it rejects imports of a waste product altogether. China did exactly that when it banned imports of 26 (HS 6-digit) waste products in its market-roiling 2017 "Operation National Sword." This article does not offer a theory of why China, or any developing state, would select out of the import market for a given waste product at a given time. Instead, H3 carries implications for what a reduction in the number of "competitors" in the market for negative externalities means for the developing states that remain. Specifically, one or more remaining "competitors" can find themselves with very high shares of global imports after trade is diverted. All else equal, these "competitors" have an increased ability to exercise monopsony power and should set higher tariffs than they would have otherwise. Contained in "all else equal" is that market concentration remains high enough for monopsony power to operate (H3).

Hypothesis 4: Should a developing state government ban the import of a waste product, governments in developing states receiving high shares of diverted imports are likely to raise the import tariff higher, all else equal.

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28 Inter alia, the European Union's ban on single-use plastics took effect on July 2, 2021. Theorizing the politics of adjustment in the Global North is left to future research.

5. Garbage Empirics

To provide support for H1–H3, I conduct regression analyses on novel panel data. To provide support for H4, I leverage the shock to the concentration of markets for negative externalities for 26 waste products that followed China's unexpected 2017 ban on imports of those (but not other) waste products. The dependent variable throughout is the product-state-year applied most favored nation import tariff for each waste product on the list of 179 (HS 6-digit level).[29] Figure 3 summarizes trends in the dependent variable, aggregated by the waste product's type, with the smoothed developing "Global South" average tariff for comparison.[30] Like the average tariff, waste product tariffs have generally followed a downward trend in recent decades. Considerable heterogeneity across waste type makes it an important fixed effect in empirical analyses.[31]

Variables of interest include *Mixed*, which equals 1 if the HS code definition indicates that the waste product HS code is sold in a mixed form or defined based on exclusion from other categories (H1; Appendix E.2). *Global South net import* equals 1 if the waste product is net imported into developing states in the study period (H2a; Figure 1). *Product market size* is the (logged USD) value of the worldwide trade in that waste product-year (H2b).

A given state's monopsony power builds from the distribution of a waste product's import surplus across all states, interacted with its share of that import surplus. *Herfindahl-Hirschman Indices (HHIs)* capture the distribution of the import surplus across states. Each waste product-year HHI is the sum of squared national shares of the worldwide import surplus (in tons).[32]

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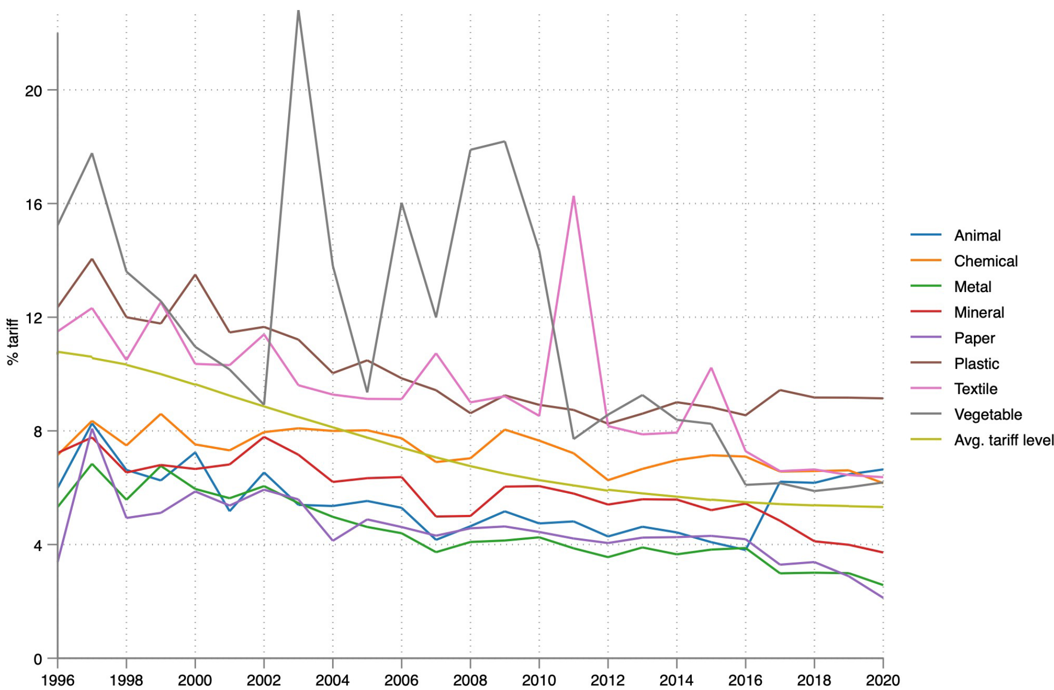
[29] Appendix E. Average WITS (TRAINS) ad valorem (or equivalent) duties expressed in percentage terms across all directed dyads for a given product-country-year. Enormous thanks to In Song Kim and collaborators for organizing these data in the TradeLab platform (Barari and Kim, 2022).

[30] Weighted mean applied tariff across all products (World Bank Open Data).

[31] See Appendix D.1 and D.2 for tariff heterogeneity by state and time.

[32] Data from CEPII/COMPUSTAT (footnote 15). HHIs necessarily include developed "Global North" state import surpluses where present, whereas the theoretically relevant sets of states making decisions over tariffs are in the developing "Global South."

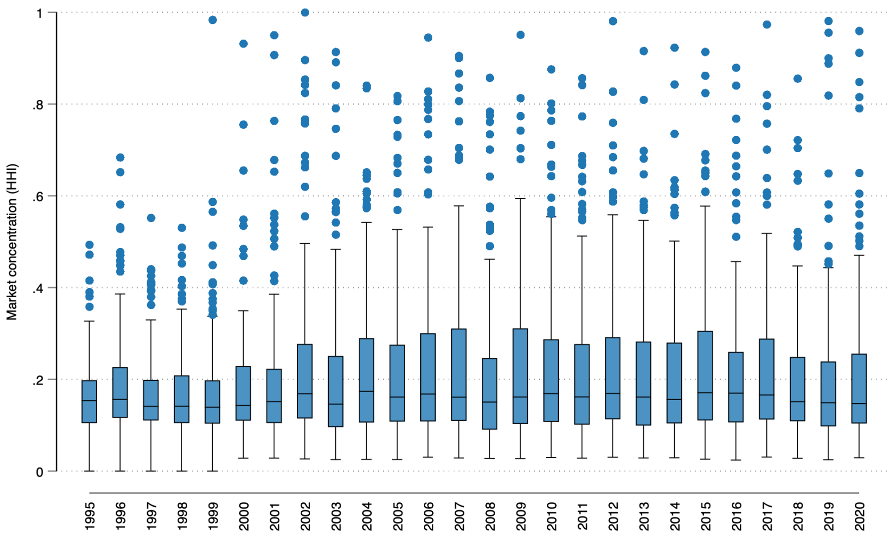
Figure 3: This figure summarizes heterogeneity in "Global South" developing state waste import tariff levels over time.



Notes: Observations report the average across all Global South states. Lines are the mean tariff for waste products by category. Smoothed line is the weighted mean applied tariff for all products.

Figure 4 shows that while the mean HHI across waste product import market-years is relatively stable, there is considerable variation across distributions. Importantly, Figure 4 reports a number of outliers at very high HHIs, providing descriptive evidence that a theory built around monopsony power can be of practical use in understanding real-world outcomes. The second component of monopsony power is the Import surplus share by waste product-state-year. Figure 5 provides descriptive evidence of heterogeneity in *Import surplus share* across developing states. For presentation purposes, Figure 5 summarizes average product-level import shares across the study period and reports only values greater than 0.1. Notably, China has high import surplus shares for many waste products, but so do many other developing states. Further, the waste trade is indeed heterogeneous, as shares of different waste products vary considerably within developing states (including China). Monopsony power is the interaction of Import surplus share and HHI, with the expectation being that when HHI is sufficiently high, the product-level tariff increases withthe state's Import surplus share (H3).

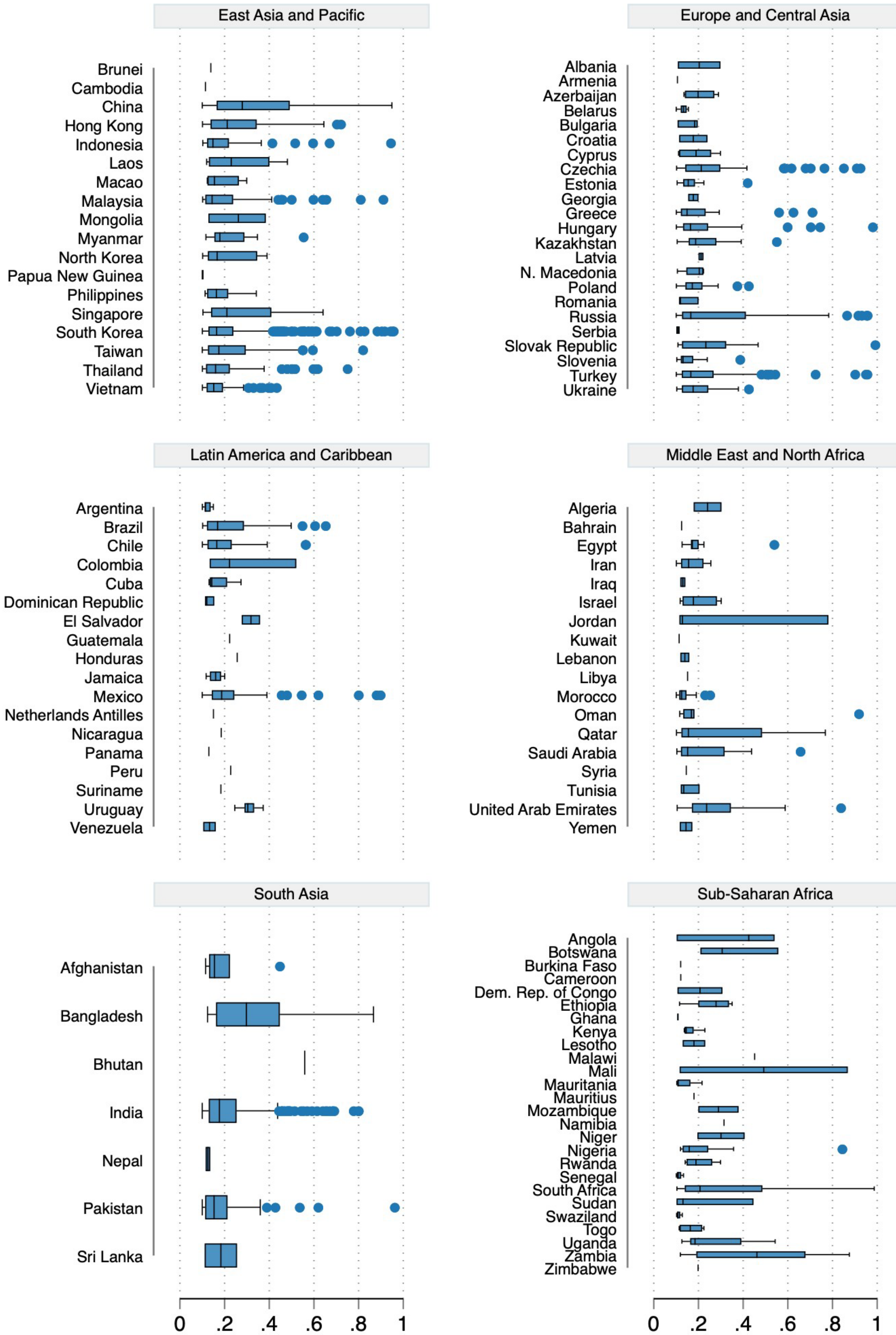
Figure 4: This figure summarizes heterogeneity in the concentration of markets for negative externalities for each of the 179 waste products, by year.



Notes: Observations are the Hirschman-Herfindahl Index (HHI) for the market for surplus imports (in tons) for each of 179 waste products.
Box plots summarize the distribution of HHIs by year.

While this article's focus is on explaining variation in trade protection at the product level as captured by the tariff, states also set national-level non-tariff barriers (NTBs) around waste imports. A state's holistic waste trade policy is surely more interrelated than is captured by an additive linear model, and further research is needed on endogenous and potentially post-treatment choices over product-level tariffs in light of choices over NTBs (Brandi, Blu¨mer, and Morin, 2019). The theory's observable implication is simply that results on product-level tariffs should be robust to controlling for national-level NTBs; coefficients should not be interpreted. I introduce an indicator for Basel Convention member, but the limitations of the Basel Convention suggest incentives for states to set their own NTBs as well (Yang, 2020). I therefore introduce a novel dataset of national-level NTBs that have the effect of restricting waste imports, coded from the Food and Agriculture Organization of the United Nations FAOLEX database (see Appendix D.4). In the study period (1995–2020), 156 states in the sample adopted around 1200 national laws and regulations that restrict waste imports in some way. These appear on the whole to apply to targets or levels of aggregation other than the product level. For example, 1997 legislation in Bulgaria established licensing protocols for importing waste and its transit through the country, and 2003 legislation in Ethiopia established a framework to implement Basel Convention reporting requirements. The empirical suggestion of complementarity between product-level tariffs and aggregated NTBs is consistent with states' increasing delegation of the operationalization of environmental laws to environmental ministries (Aklin and Urpelainen, 2014). As 80 percent of observations are of one or two NTBs introduced in a state-year, National-level NTB is an indicator variable

Figure 5: This figure illustrates cross-national heterogeneity in waste product import shares.



Notes: Observations are the national share of the world import surplus (in tons), for each of 179 products (avg. 1995-2020). Shares > 0.1 reported and summarized in box plots.

Other control variables address state-level economic and political factors. The Environmental Kuznets Curve literature suggests that *GDP per capita* is correlated with a lower tariff and its squared term with a higher tariff.[33] Unemployment makes the state less interested in increasing costs to business, so it should also have a negative relationship with the tariff. Industrial output per GDP (ln) is the value added by industry and construction as a percentage of GDP and is expected to be positively correlated with demand for waste products as a source of raw materials and thus negatively related to the tariff. Although, as demand for raw materials can be satiated by virgin materials, states with more valuable natural resource endowments likely face less domestic pressure to supplement raw materials through imported waste products (Natural resources rents per GDP (ln)). Trade per GDP (ln), electoral democracy (Polyarchy, Lindberg et al. (2014)), and WTO member are all known to have negative relationships with tariff levels.

All models include waste type, state, and year fixed effects. Waste type fixed effects ensure like comparisons by accounting for systematic differences in recycling technology, externalities, demand, and supply tied to a waste product's origin—animal, chemical, metal, mineral, paper, plastic, textile, or vegetable. State fixed effects account for non-time-varying factors such as land area, or the domestic "backyard" alternatives available for EOL waste storage. Year fixed effects soak up shocks such as the post-2008 turmoil in commodity markets for scrap (Minter, 2015). For all estimations, the unit of analysis is at the product-state-year level, and the sample covers the list of 179 waste products for up to 170 developing "Global South" states (Appendix B). The dependent variable and all other transformed variables containing 0 or negative values are the natural log of the inverse hyperbolic sine transformation of the unscaled underlying value (Aihounton and Henningsen, 2021). All time-varying independent variables are lagged, and standard errors are clustered by product-state.

5.1 Garbage Regressions

Table 1 presents the main results from OLS panel regression models. Across models, the coefficient on the high-negative externality indicator *Mixed* is positive, significant, and of stable magnitude, consistent with H1. Regarding domestic demand and the tariff, coefficients on *Global South net import* (H2a) and *Product market size* (H2b) are negative, significant, and of stable magnitude. Together, these results provide strong support for the Pigouvian "sin" tariff conceptualization. They also reinforce the importance of product-level theory: Governments are not setting tariffs on waste products in general, but on specific waste products, accounting for their particular tradeoffs (Kim, Liao, and Imai, 2020).

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33 Appendix D.3. All variables are from the World Bank Open Databases unless otherwise specified.

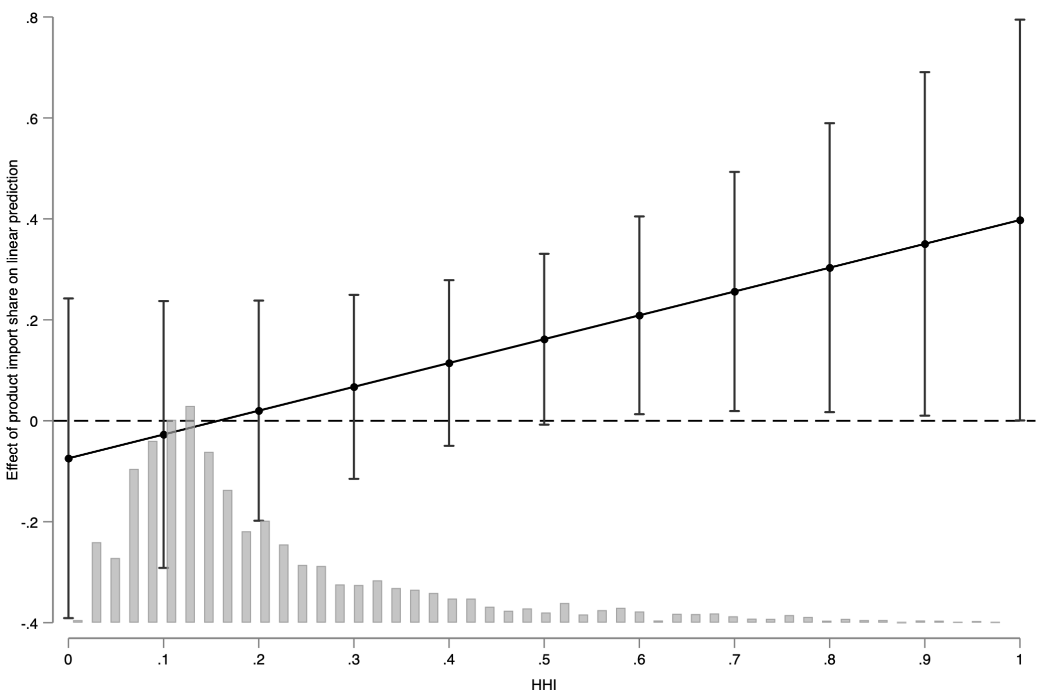
Table 1: Garbage tariffs: Environmental-economic tradeoffs and monopsony power

	(1)	(2)	(3)	(4)	(5)
Mixed	0.0818***		0.0821***	0.0935***	0.0934***
	(0.0190)		(0.0190)	(0.0203)	(0.0203)
Global South net import	-0.104***		-0.105***	-0.122***	-0.122***
	(0.0165)		(0.0165)	(0.0176)	(0.0176)
Product market size	-0.00720***		-0.00706***	-0.00558***	-0.00565***
	(0.00143)		(0.00143)	(0.00150)	(0.00150)
Import surplus share		-0.326**	-0.224	-0.0833	-0.0743
		(0.154)	(0.154)	(0.162)	(0.162)
HHI		-0.0226	-0.0288	-0.0546**	-0.0548**
		(0.0259)	(0.0259)	(0.0266)	(0.0266)
Import share × HHI		0.653**	0.535*	0.481	0.472
		(0.319)	(0.319)	(0.324)	(0.323)
Basel member					0.0750***
					(0.0256)
National-level NTB					0.0257***
					(0.00446)
GDP per capita				-3.205***	-3.078*** (0.548)
				(0.543)	
GDP per capita sq.				3.646*** (0.566)	3.562*** (0.572)
Unemployment				-0.0144***	-0.0146***
				(0.00213)	(0.00214)
Industrial output per GDP				-0.384***	-0.391***
				(0.0425)	(0.0425)
Nat. resource rents per GDP				0.0403***	0.0409***
				(0.0121)	(0.0122)
Trade per GDP				-0.128***	-0.128***
				(0.0259)	(0.0257)
Polyarchy				-0.376***	-0.380***
				(0.0555)	(0.0553)
WTO member				-0.109***	-0.112***
				(0.0228)	(0.0228)
Constant	3.180***	3.147***	3.186***	5.250***	5.282***
	(0.0871)	(0.0844)	(0.0873)	(0.227)	(0.227)
Waste Type	Yes	Yes	Yes	Yes	Yes
State	Yes	Yes	Yes	Yes	Yes
Year	Yes	Yes	Yes	Yes	Yes
Observations	133,449	133,449	133,449	117,802	117,802
Clusters	15,799	15,799	15,799	13,729	13,729
R-squared	0.423	0.423	0.424	0.421	0.421

Max sample: 170 states, 179 products, 25 years (1996–2020). All time-varying covariates lagged. SE clustered by product-state. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

The monopsony power coefficient of interest is on the interaction term between Import surplus share and *HHI*; it is positive across all models. To gauge support for H3, Figure 6 plots the marginal effects of *Import surplus share* on the tariff at all levels of *HHI* from 0 to 1 (using Model 5, in which the coefficient magnitude is smallest). As expected, the marginal effect is increasing with HHI, and it becomes statistically significant at the 95-percent level starting above an HHI of about 0.5. Figure 6 also displays the histogram of values of HHI in the estimation sample, which makes clear that values of HHI above 0.5 are rare, consistent with the intuition that extreme market concentration should be rare. Nonetheless, HHI exceeds 0.5 for 59 wastes products at some point in the sample period, which reinforces the practical usefulness of the theory. Additionally, as the theory makes no prediction about tariff levels in the absence of a sufficiently concentrated market, the null results at low HHI values are also consistent with H3.

Figure 6: Marginal effect of import share on the tariff, at all levels of HHI (Table 1, Model 5).



Notes: HHI exceeds 0.5 for 59 waste products at some point in the sample period.

In robustness tests, I focus on the sensitivity of the monopsony power (H3) results; results supporting the sin tariff conceptualization are consistently robust. First, I consider bound maximum product-level tariffs, which WTO member states can negotiate and include in their schedules of concessions to other WTO members. H3 can be recast to predict that a developing state government increases an import tariff closer to its bound maximum in the presence of monopsony power, holding all else equal. Of course, for a bound tariff to be set, a state needs to be selected into the WTO, into negotiating a binding for a specific waste product, and into the level of that binding, all of which are non-random (Pelc, 2013).[34] Thus, it is simply for robustness purposes that I re-estimate the same models from the distance to the bound maximum as the dependent variable and add the bound maximum as a control.[35] As reported in Appendix C.1, a higher bound maximum is a consistently important predictor of a smaller distance between the observed tariff and the binding, suggesting that states interested in setting higher tariffs had the forethought to negotiate higher bindings. Regarding H3, the monopsony power interaction term is as expected and achieves statistical significance, although with the reduced sample size confidence intervals on marginal effects cross 0 even at high HHIs. Overall, this exercise shows that even for the non-random subset of developing "Global South" WTO member states that have committed to a maximum tariff, the pattern of waste product monopsony power coinciding with higher tariffs is apparent.

In further robustness tests, I re-estimate Table 1 Model 5, dropping products of each waste type in turn (Appendix C.2). When metal waste is excluded, the point estimate of interest decreases substantially, implying that empirical evidence in support of H3 is strongly influenced by metal waste products—which are in fact 64 of 179 products. Next, I check robustness to binary indicators generated by binning HHIs above and below different thresholds (Appendix C.3). Overall, this exercise suggests that meaningful variation is lost when dichotomizing the continuous concept of HHI, although results continue to be significant at a threshold above 0.5. In Appendix C.4, I report placebo test results. Consistent with the argument that monopsony power acts through trends in physical negative externalities, the interaction term has the wrong sign if its constituent variables are generated from USD values and not tons. Consistent with the theory's scope conditions, results are not robust to an estimation sample comprised of Global North states. Last, given China's importance in the global waste trade, I exclude China from the sample and find that confidence intervals on marginal effects cross 0 even at high HHIs. While there is no theoretical reason to drop China from the sample, China's importance motivates the next section testing H4, where I leverage China's decision to drop itself from the sample for 26 waste products.

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[34] Descriptively, waste product tariffs average around 24% of their binding (Appendix D.5).

[35] For reference, 65 percent of tariff observations in the Table 1 Model 5 estimation sample are subject to a tariff binding, including 123 WTO member states and 160 waste products.

6. China's Garbage Ban

China's rise and its near-insatiable demand for raw materials over the last decades have been central in the development of the global waste trade (Minter, 2015).[36] So, when on July 18, 2017, the Chinese government promulgated "Operation National Sword"—known colloquially as "No More Foreign Garbage"—it shocked the waste trade.[37] The ban's precise timing was a product of issue linkage, serving as one of China's opening salvos in the U.S.-China trade war.[38] For its part, the global waste management industry had thought China's "Green Fence" policy that revamped regulatory enforcement four years earlier was successful enough to preclude the need for further action anytime soon and certainly not at such a scale.[39] The specific effect of what came to be called the China ban was their banning of imports of 26 HS 6-digit waste products, including several ash, residue, and slag products containing mixed metals; several yarn and textile waste products made of cotton, wool and animal hair, or artificial fibers; sorted and unsorted rags; unsorted paper; and all post-consumer plastics products (Appendix E.3). Import bans on unsorted waste paper and post-consumer plastics would be fully implemented in the five months before the end of 2017; the implementation timeline for other bans was delegated to regulators, although the goal of speed was implied. In the wake of the China ban, recycling and waste management systems buckled worldwide (Brooks, Wang, and Jambeck, 2018).

Another way to understand the China ban is that in 2017 China suddenly selected out of the markets for negative externalities for 26 waste products. The China ban led to trade diversion for banned waste products, as traced by a number of careful studies (e.g., Pacini et al., 2021; Liang et al., 2021; Tran, Goto, and Matsuda, 2021; Ma et al., 2021; Brooks, Wang, and Jambeck, 2018). This makes it an appropriate setting to operationalize and test H4. Given that trade diversion "treats" some developing state-banned product combinations with higher import surplus shares than they would have had absent the China ban, the theory predicts that Pigouvian motivations lead to higher sin tariffs for treated combinations, all else equal. For all else to be equal, it must be the case that banned waste product's market concentration (HHI) remains sufficiently high after China's exit for monopsony power to operate (H3). This is an empirical question; in

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[36] At some point in the study period (1995–2020), China accounted for over 50 percent of the import share for 45 different waste products.

[37] "General Office of the State Council on the issuance of a ban on the entry of foreign garbage to promote the reform of the solid waste import management system" State Office [2017] No. 70. July 18, 2017. In the text of the ban, China contextualizes how important the waste trade has been to it: "since the 1980s, in order to alleviate the shortage of raw materials, China began to import solid wastes from abroad." Translations from DeepL Translator.

[38] The United States had begun national security investigations of China on April 20. Bown, Chad P. and Melina Kolb. "Trump's Trade War Timeline: An Up-to-Date Guide." Peterson Institute for International Economics. June 2022.

[39] Flower, Will. "What Operation Green Fence has meant for Recycling." February 11, 2016. Waste 360.

fact, HHIs for banned waste products have steadily declined, making it more difficult to find support for H4.[40]

The research design most suited to this setting is differences-in-differences (DiD) estimation of the average treatment effect on the treated (ATET), or the effect on the tariff for treated developing state-banned product combinations, compared to the counterfactual in which those developing-state-banned product combinations were not treated. For DiD to be identified, we must be satisfied with the "parallel trends" assumption: The trends in tariffs for treated and untreated developing-state-banned product combinations were parallel before the China ban, and they would have remained parallel if not for the China ban. This is a high hurdle. Theoretically, developing states that "compete" in markets for negative externalities are surely motivated to account for expectations over the policy choices of their "competitors," and especially one as big as China.[41] That said, it is likely that the trade-war timing of China's ban was unpredictable enough to weaken the ability of China's "competitors" to have fully anticipated the 2017 action in their previous waste trade policy. I conceptualize the treatment in two ways, each of which differently address the theoretical plausibility of the parallel trends assumption.[42] While neither is dispositive methodologically, I offer that the results in combination provide judicious support for H4.

The first conceptualization of the treatment is geographical: In the commercial market, exporters were likely to divert banned waste products to importers in China's neighborhood—especially in an emergency situation when ships at sea suddenly needed new ports of entry. So, the treatment in the market for negative externalities applies to combinations of Asia-Pacific developing states and banned waste products. In terms of the parallel trends assumption, of all the developing states in the world, surely China's neighbors are motivated to anticipate a shock that would divert foreigners' garbage from China to their own shores. On the other hand, the Asia-Pacific geographic treatment has the advantage of exogeneity; it likely marks as treated many developing state-banned product combinations are not real "competitors" of China, making the treatment assignment less precise and effects more difficult to uncover.

40 Again, this article offers no theory as to why China selected out of these waste import markets in particular. As it happens, China had large import market shares for the 26 banned products, more than double those for other waste products. The volume of worldwide exports of banned products has trended downwards post-treatment, compared to an upward trend in exports of other waste products. Appendix D.6.

41 Empirically, HHIs for banned product import markets were already following a downward trend prior to the China ban (Appendix D.6).

42 On empirical plausibility, see Appendix D.7 for parallel trends plots.

The second conceptualization of the treatment is based on worldwide distributions of markets for negative externalities before the China ban. A developing state-banned product combination is treated if at any point in the pre-treatment period its import market share passed the 95th percentile threshold of the pre-ban distribution of import market shares (1995–2016). The *Pre-ban 95%* treatment reflects the intuition that exporters are more likely to divert trade to buyers in commercial markets with more preexisting import activity. On one hand, this conceptualization risks circular logic; the correlation between the *Pre-ban 95%* treatment and the same calculation using post-treatment data is somewhat high at 0.40. On the other hand, for the three years before the China ban, I cannot reject the null that the distributions were the same for banned and other waste products, while a significant difference does appear in each of the three years following the China ban.[43] Further, the correlations between the distribution-based *Pre-ban 95%* treatment and the *Asia-Pacific* treatment is very low, at 0.17, making it more difficult to find consistent support for H4 across both.

Table 2 reports results using each treatment, for both reduced form and full models.[44] Effects are positive and significant as expected for both treatment specifications, with an effect size ranging from an 11 percent to 14 percent increase in the product-level tariff attributable to the China ban. Effect sizes using the Asia-Pacific treatment and Pre-ban 95% treatment are of similar magnitudes, lending credence to the reliability of results despite different shortcomings in the conceptualizations. Overall, Table 2 provides judicious support for H4: in the wake of the China ban's shock to some commercial waste product markets, developing state-banned product combinations treated with higher import surpluses are more likely to exercise monopsony power in setting higher product-level tariffs.

[43] At the 90-percent level or higher. Using the distcomp package in Stata (Kaplan, 2019).

[44] Full models include covariates as in Table 1 Model 5.

Table 2: China garbage shock: Monopsony power and higher tariffs

	(1)	(2)	(3)	(4)
ATET	0.128***	0.129***		
Treated: Asia-Pacific				
	(0.0259)	(0.0347)		
Treated: Pre-ban 95%			0.101**	0.135**
			(0.0458)	(0.0527)
Full Model	No	Yes	No	Yes
Observations	156,949	116,176	156,949	116,176
Clusters	19,171	13,552	19,171	13,552
Treated Clusters	399	289	156	148

Sample: 169 states (China excluded). Full model as in Table 1 Model 5.
SE clustered by product-state. * p < 0.1, ** p < 0.05, *** p < 0.01.

Since the 2017 China ban, some other developing states have made forays into setting outright bans on imports of certain waste imports. The theory's scope condition implies that if a developing state were to ban imports of a waste product for which it faced a binding Pigouvian environmental-economic tradeoff, it should face politically consequential backlash from industry. Such backlash played out in Turkey when it attempted a ban on the import of ethylene polymer waste and scrap (HS 391510), a waste product banned by China that European exporters subsequently diverted in large quantities to Turkish importers (Gundougdu and Walker, 2021). The Turkish ban was announced in May 2021, went into effect for a week in July, and was then overturned. The domestic importing sector clearly played a role in the volte-face: In a press release, the Turkish plastics recycling association celebrated the success of its lobbying campaign and named government officials who were particularly helpful.[45] Just as in Turkey, India faced backlash when in June 2022 it enacted a ban on the full set of waste plastic products China had banned five years earlier. The Indian plastics industry was "up in arms," protesting that "thousands of jobs are at stake," and the ban's enforceability was immediately in question.[46] Even developing states like Turkey and India that find themselves with outsized monopsony power in the wake of the China ban have not broken out of the theory's scope condition. One implication is that Turkey, India, and similarly placed states in the developing "Global South" might remember sin tariffs as a means of trading off between environmental and economic priorities, despite being less headline-worthy.

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[45] It estimated that uncertainty around the ban cost the industry USD 547 million. "Polyethylene Waste Imports Ban is Lifted with Active Control!" PAGEV News Release, accessed January 2023. See also: Algedik, Onder. "Who opened the door to Europe's waste?" April 4, 2022. Duvar. Turkish President Erdogan's wife Emine has gotten the nickname "the Queen of Trash" amid rumors of personal influence around waste imports, as well as politically correlated inequities in the subnational distribution of EOL waste.

[46] Masih, Niha and Anat Gupta. "India imposes ban on single-use plastics. But will it be enforced?" July 1, 2022. *Washington Post.*

7. Garbage Conclusion

The global waste trade exists because importers in one national political jurisdiction demand waste products, and exporters in another national jurisdiction find it profitable to offer them for sale. What makes the waste trade different from other kinds of trade is that these voluntary transactions by definition relocate physical, even smelly negative externalities from one national jurisdiction to another. Because waste products contain recyclable and EOL waste content, one importer's "treasure" still contains trash. Foreigners' trash generates environmental, social, and political costs that accrue especially in developing states, on whose "backyards" Global North states rely in dealing with their own NIMBY problems. In this way, the waste trade can manifest a race to the bottom. Usefully, a product-line tariff—a standard protectionist trade policy tool—can operate as a Pigouvian "sin" tax allowing the developing state to negotiate the tradeoff between mitigating environmental harm and benefiting from economic openness. Tariffs can be repurposed for environmental protection.

The structure of international markets and the physicality of the waste trade's negative externalities generate power for developing "Global South" states with more, and more consequential, piles of foreign garbage. Alongside the commercial market is a market for negative externalities, or a "market for sin" brought along with the recyclable portion of a waste import. States "compete" in the market for negative externalities, with product-line tariffs as a means of adjusting the "price" at which they are willing to "buy" EOL waste from commercial market actors. As in any marketplace, if and when a player gains monopsony power, it gains price-setting power. Monopsony power in a waste product's market for negative externalities enables a developing state to set a higher import tariff, extracting more compensation while still accommodating domestic demand. Empirical support comes from both observational data and causal analysis around China's shocking 2017 "No More Foreign Garbage" policy banning imports of some (but not all) waste products.

The theory and evidence in this article demonstrate that economic globalization, sustainability, and the normative appeal of the "circular economy" approach come together in complex ways. Market mechanisms reallocate productive materials across national borders. But, when the traded product is waste, voluntary transactions simultaneously offshore materials that are harmful—even morally so. Still, the waste trade illustrates that developing states can leverage market power to their advantage in alleviating the consequences of low state capacity and protecting the environment within their territorial jurisdictions. I hope for the rubbish circumstances around the waste trade to provide a jumping off point for more scholars of international relations and political economy. For now, think again of my parents parsing the City of Mesa mailer explaining what is and is not recyclable as of January 2022.[47] In defending its new "When in Doubt, Keep it Out" tagline, Mesa includes in the mailer's fine print that its service providers are only accepting items with "strong market value." The theory and evidence in this article clear up the backstory: developing states have been demanding more compensation in exchange for serving as repositories for foreigners' garbage, which squeezes exporters' margins and undermines Mesa's ability to use international trade to solve its NIMBY problems. For the time being, Mesa needs my parents to take into account whether their (un)washed plastic yogurt container is sufficiently attractive as a source of recyclable inputs to importers, and the developing states in which they are located, to put it in the recycle bin or throw it in the trash.[48]

47 See again Appendix A.

48 At the time of writing, it goes in the trash.

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Appendix A: "When in Doubt, Throw it Out"

Figure 7: City of Mesa, Arizona, USA mailer to households, January 2022.

Appendix B: Developing "Global South" Sample

Table 3: Estimation sample: "Global South" developing states

Afghanistan	Fiji	Oman
Albania	French Polynesia	Pakistan
Algeria	Gabon	Palau
Angola	Gambia, The	Panama
Antigua and Barbuda	Georgia	Papua New Guinea
Argentina	Ghana	Paraguay
Armenia	Grenada	Peru
Aruba	Guatemala	Philippines
Azerbaijan	Guinea	Poland
Bahamas, The	Guinea-Bissau	Qatar
Bahrain	Guyana	Romania
Bangladesh	Haiti	Russian Federation
Barbados	Honduras	Rwanda
Belarus	Hong Kong SAR, China	Samoa
Belize	Hungary	Saudi Arabia
Benin	India	Senegal
Bermuda	Indonesia	Serbia
Bhutan	Iran, Islamic Rep.	Seychelles
Bolivia	Jamaica	Sierra Leone
Bosnia and Herzegovina	Jordan	Slovak Republic
Botswana	Kazakhstan	Slovenia
Brazil	Kenya	Solomon Islands
Brunei Darussalam	Korea, Rep.	South Africa
Bulgaria	Kuwait	Sri Lanka
Burkina Faso	Kyrgyz Republic	St. Kitts and Nevis
Burundi	Lao PDR	St. Lucia
Cabo Verde	Latvia	St. Vincent and the Grenadines
Cambodia	Lebanon	Sudan
Cameroon	Lesotho	Suriname

Cayman Islands	Liberia	Syrian Arab Republic
Central African Republic	Libya	Sao Tome and Prncipe
Chad	Lithuania	Taiwan
Chile	Macao SAR, China	Tajikistan
China	Madagascar	Tanzania
Colombia	Malawi	Thailand
Comoros	Malaysia	Timor-Leste
Congo, Dem. Rep.	Maldives	Togo
Congo, Rep.	Mali	Tonga
Costa Rica	Malta	Trinidad and Tobago
Croatia	Mauritania	Tunisia
Cuba	Mauritius	Turkmenistan
Cyprus	Mexico	Tuvalu
Czech Republic	Moldova	Turkey
Cote d'Ivoire	Mongolia	Uganda
Djibouti	Montenegro	Ukraine
Dominica	Morocco	United Arab Emirates
Dominican Republic	Mozambique	Uruguay
Ecuador	Myanmar	Uzbekistan
Egypt, Arab Rep.	Namibia	Vanuatu
El Salvador	Nauru	Venezuela, RB
Equatorial Guinea	Nepal	Vietnam
Eritrea	Nicaragua	Yemen, Rep.
Estonia	Niger	Zambia
Eswatini	Nigeria	Zimbabwe
Ethiopia	North Macedonia	

Notes: Developed "Global North" states are, as of the beginning of the study period (1995), (1) in the OECD and (2) in the World Bank's High Income classification group (Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Iceland, Ireland, Italy, Japan, Luxembourg, Netherlands, New Zealand, Norway, Portugal, Spain, Sweden, Switzerland, United Kingdom, United States). All other states are in the developing "Global South."

Appendix C: Additional Results

C.1 Robustness: Bound tariffs

Table 4: Robustness: Determinants of the closeness of the tariff and its bound maximum

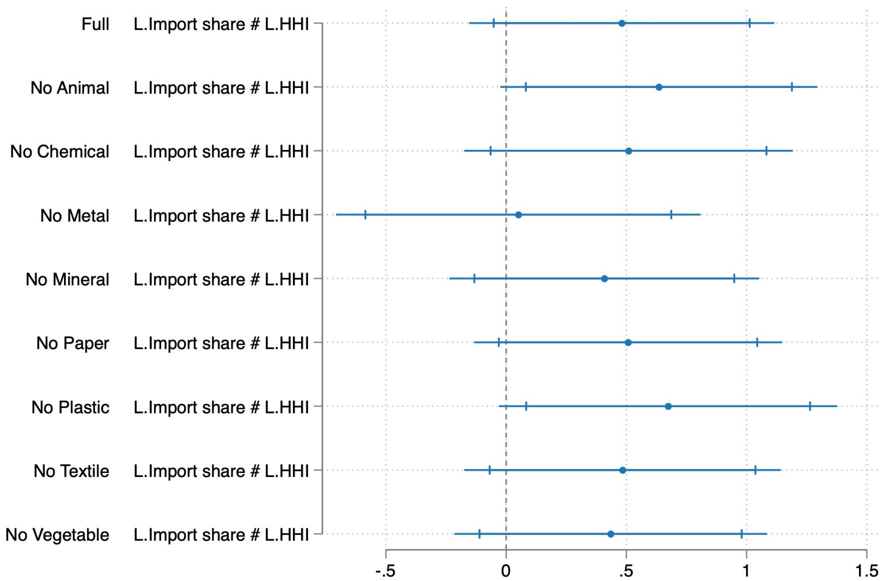
	(1)	(2)	(3)
Bound maximum (ln)	1.109***	1.130***	1.130***
	(0.0189)	(0.0197)	(0.0197)
Import share	-0.272	-0.263	-0.260
	(0.168)	(0.168)	(0.168)
HHI	0.0000156	-0.000949	-0.00119
	(0.0113)	(0.0121)	(0.0121)
Import share × HHI	0.493* (0.277)	0.495* (0.284)	0.491* (0.284)
Mixed/Not specified product	0.0887*** (0.0132)	0.0956*** (0.0145)	0.0954*** (0.0145)
Global South net import	-0.0157	-0.0173	-0.0171
	(0.0103)	(0.0111)	(0.0111)
Product market size	-0.00211*** (0.000681)	-0.00204*** (0.000739)	-0.00206*** (0.000739)
Basel member			0.0451*** (0.00972)
National-level NTB			0.0110*** (0.00260)
GDP per capita		-1.686*** (0.271)	-1.623*** (0.271)
GDP per capita sq.		1.564*** (0.269)	1.524*** (0.269)
Unemployment		-0.00636*** (0.00124)	-0.00655*** (0.00124)
Industrial output per GDP		-0.0771*** (0.0193)	-0.0766*** (0.0192)
Nat. resource rents per GDP		-0.0152** (0.00600)	-0.0157*** (0.00599)
Trade per GDP		-0.135*** (0.0130)	-0.133*** (0.0128)
Polyarchy		-0.00102	-0.00317
		(0.0252)	(0.0250)
Constant	0.736*** (0.101)	1.905*** (0.140)	1.894*** (0.139)
Waste Type	Yes	Yes	Yes
State	Yes	Yes	Yes
Year	Yes	Yes	Yes
Observations	75,099	67,500	67,500
Clusters	7,944	7,082	7,082
R-squared	0.865	0.861	0.861

Max sample: 123 developing state WTO members, 160 waste products (1996–2020). All time-varying variables lagged. SE clustered by product-state. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Notes: The dependent variable in Table 4 is the difference between the (non-time-varying) bound maximum and the observed tariff. I multiply the value by -1 so that predicted signs are consistent with those of the main results in the text. In the full dataset, 1.5 percent of observed tariffs violate their reported binding (1545 of 101139 observations). I drop these from robustness tests, given uncertainty over whether they are errors as well as the intuition that deliberate bound maximum violations have a different data generating process.

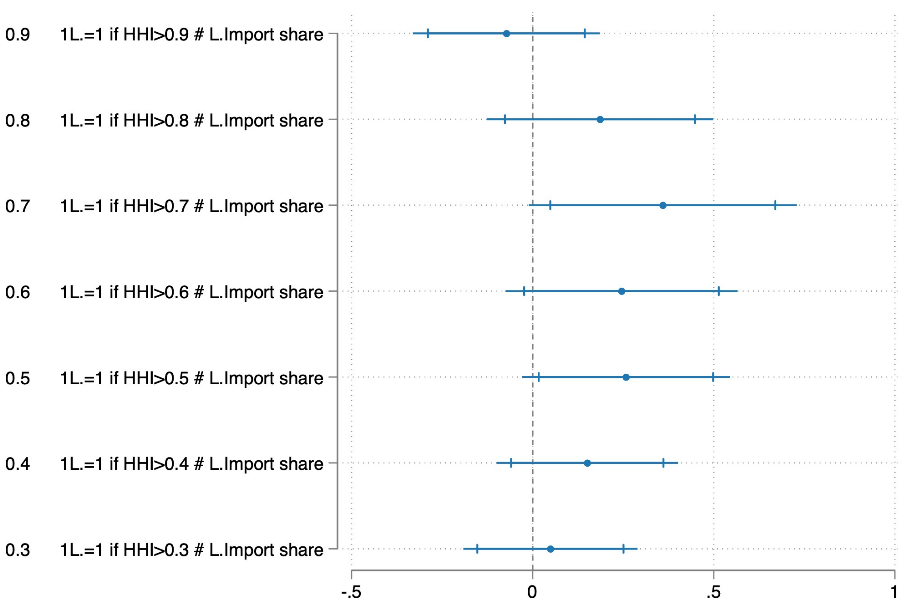
C.2 Robustness: Manipulating waste product sample

Figure 8: Monopsony power coefficients of interest, Table 1 Model 4, excluding types of waste products (full results in replication files)



C.3 Robustness: Binary operationalizations of market concentration

Figure 9: Monopsony power coefficients of interest, Table 1 Model 4, with HHI dichotomized as indicated (full results in replication files)



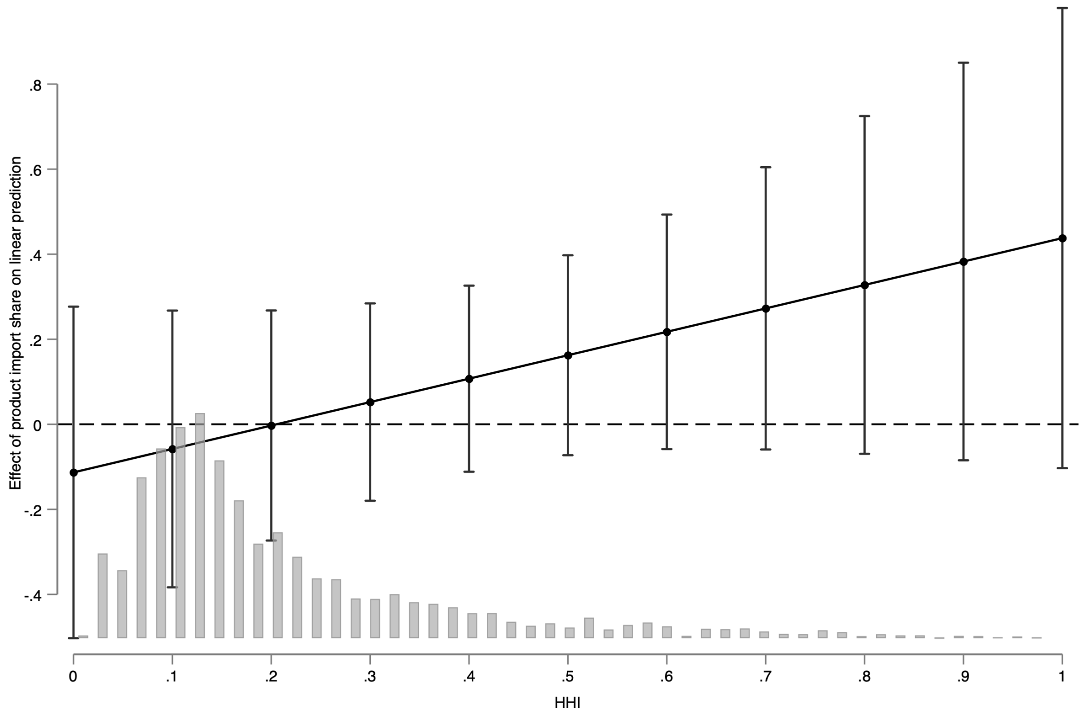
C.4 Robustness: Sensitivity and placebo tests

Table 5: Garbage tariff robustness and placebo tests

	(1) USD Shares	(2) highinc Only	(3) No China
L.Import share (USD)	0.0341 (0.173)		
L.HHI (USD)	-0.0662* (0.0367)		
L.Import share (USD) × L.HHI (USD)	-0.104 (0.357)		
Mixed product	0.0931*** (0.0203)	0.0189 (0.0723)	0.0926*** (0.0205)
Global South net import	-0.121*** (0.0175)	0.0672 (0.0530)	-0.122*** (0.0178)
L.Product market size	-0.00561*** (0.00151)	-0.0265*** (0.00866)	-0.00549*** (0.00151)
L.Basel member	0.0751*** (0.0256)		0.0741*** (0.0256)
L.National-level NTB	0.0257*** (0.00446)	0.0491*** (0.00968)	0.0228*** (0.00451)
L.GDP per capita	-3.059*** (0.548)	8.479*** (1.837)	-4.740*** (0.606)
L.GDP per capita sq.	3.542*** (0.572)	-8.433*** (1.490)	5.308*** (0.633)
L.Industrial output	-0.391*** (0.0425)	0.520*** (0.150)	-0.387*** (0.0425)
L.Unemployment	-0.0146*** (0.00214)	-0.0307*** (0.00739)	-0.0168*** (0.00216)
L.Trade per GDP	-0.127*** (0.0257)	0.227** (0.0914)	-0.133*** (0.0258)
L.Polyarchy	-0.380*** (0.0553)	-0.778*** (0.287)	-0.383*** (0.0552)
L.WTO member	-0.111*** (0.0228)		-0.135*** (0.0242)
L.Nat. resources per GDP	0.0408*** (0.0122)		0.0465*** (0.0122)
L.Import share		0.206* (0.124)	-0.125 (0.197)
L.HHI		-0.0163 (0.0422)	-0.0531** (0.0269)
L.Import share × L.HHI		-0.332* (0.192)	0.566 (0.414)
Constant	5.282*** (0.227)		5.301*** (0.228)
Waste Type	Yes	Yes	Yes
State	Yes	Yes	Yes
Year	Yes	Yes	Yes
Observations	117,802	18,034	116,176
Clusters	13,729	1,321	13,552
R-squared	0.421	0.150	0.421

SE clustered by product-state. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

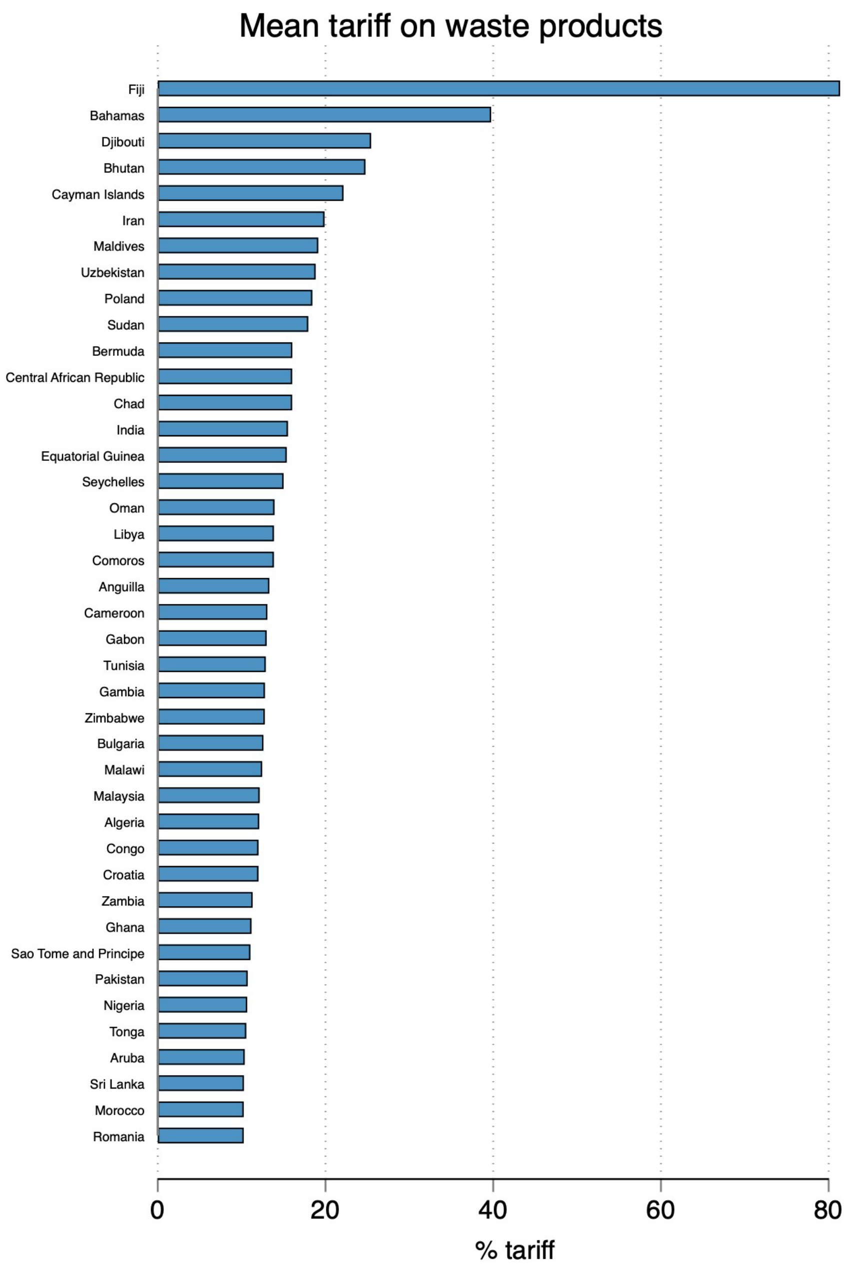
Figure 10: Margins when dropping China, Table 5 Model 3



Appendix D: Descriptive Information

D.1 Developing "Global South" states with very high average waste product tariffs

Figure 11: Summary of developing "Global South" states with high waste product tariffs (1995–2020).

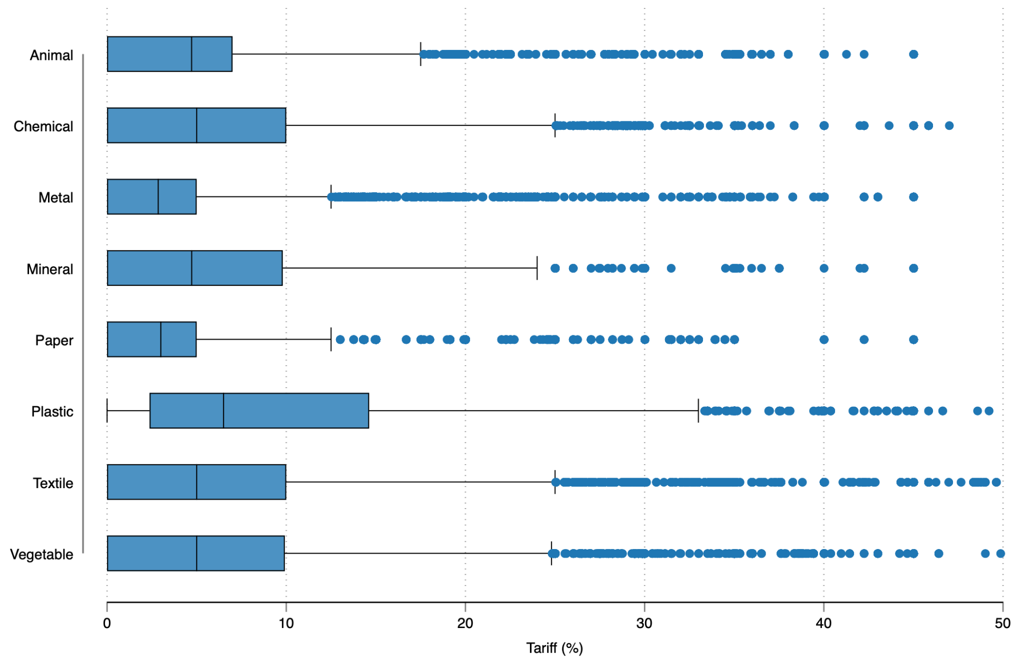


Notes: Observations are the mean import tariff across 179 waste products (1996-2020).
Global South states with values > 10% reported.

Notes: Fiji stands out in the number one position for exceptionally high average tariffs, of over 80 percent. Fiji is not a member of the primary multilateral organization in this space, the Basel Convention of Transboundary Movement of Hazardous Wastes and Their Disposal; it could be that Fiji's high tariffs are somehow compensating for its lack of access to Basel Convention regulatory resources.

D.2 Evidence of waste product tariff heterogeneity

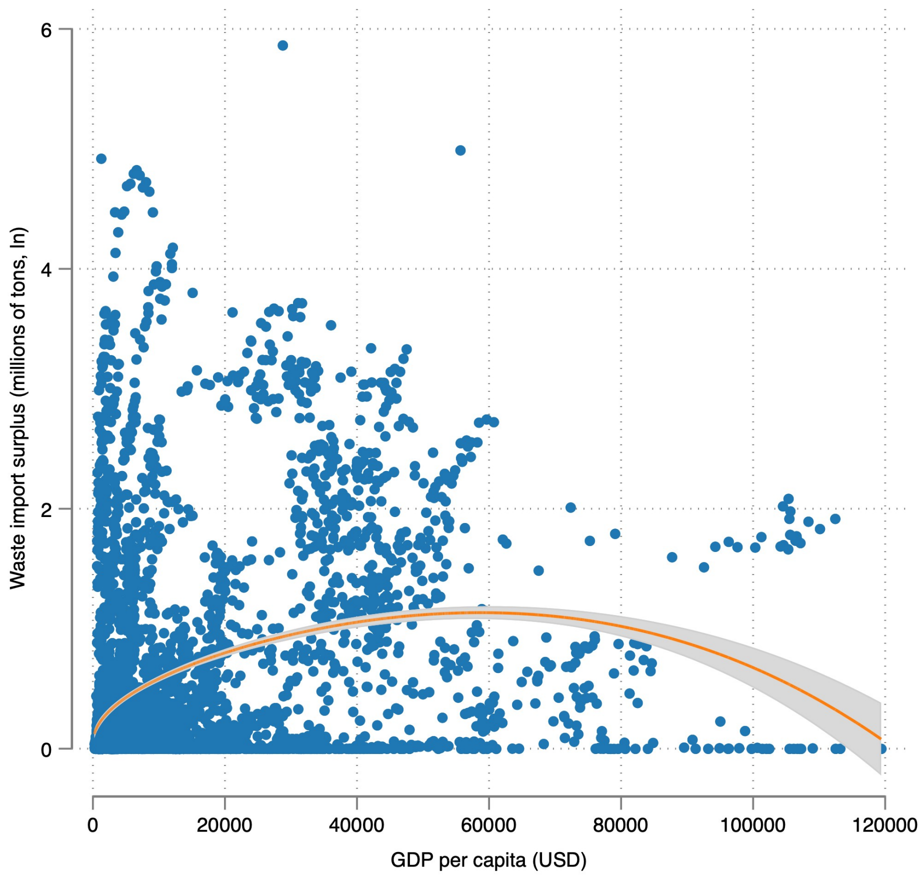
Figure 12: Summary of heterogeneity in import tariffs by waste product-country-year that constitute the dependent variable. Tariffs <50 percent for developing "Global South" states, 179 products, 1996–2020 reported.



Notes: Box plots summarize distributions and outliers for waste product-state-year tariffs. Observations greater than 50% are not reported.

D.3 Evidence of Environmental Kuznets Curve pattern

Figure 13: Evidence of inverse U-shape pattern as predicted by Environmental Kuznets Curve literature.

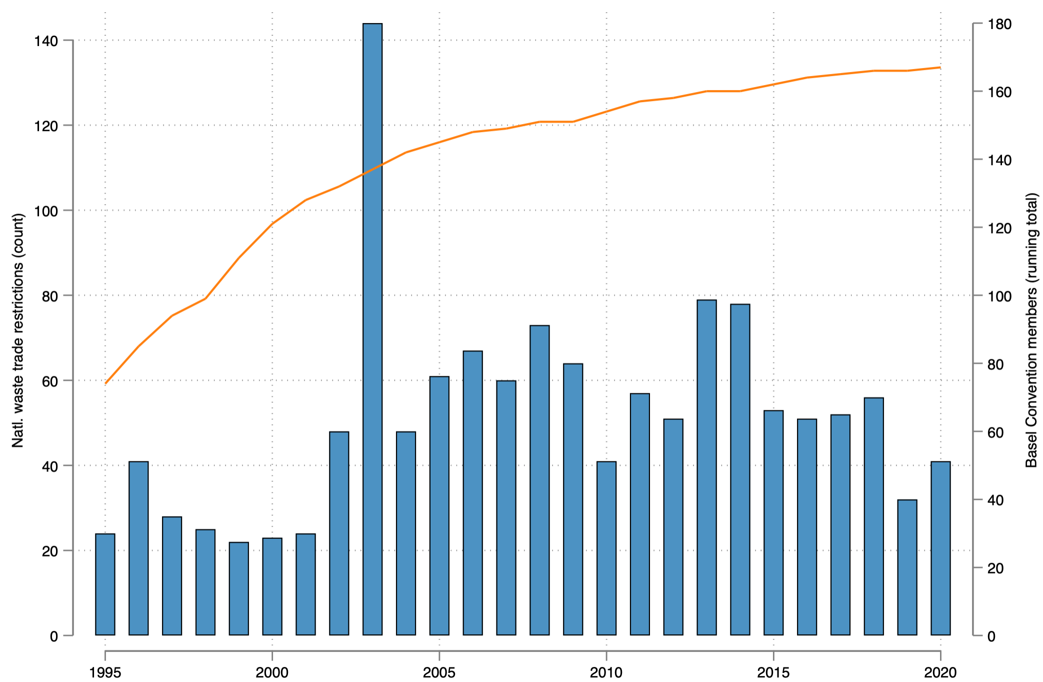


Notes: Observations by country-year (1995-2020). Fractional polynomial fit curve with 95% confidence.

D.4 Non-tariff barriers

The United Nations FAOLEX database categorizes 10,050 unique laws in the "waste and hazardous substances" domain from 1923–2020 (https://www.fao.org/faolex/en/ accessed January 2022). To be a non-tariff barrier on waste imports, the law must additionally fit at least one of four additional criteria: FAOLEX codes trade as its primary category; FAOLEX keywords include "international trade"; the law is multilateral (and thus relevant to cross-border issues); and/or the actual text of the law includes at least one of a set of keywords relating to international trade. (See replication files for detail and robustness to alternative coding rules.) There are 1430 unique developing "Global South" waste import restrictions in the full FAOLEX dataset, 1948–2020. Figure 14 illustrates the relatively steady rollout of new national-level NTBs across the sample period, against the count of Basel Convention members. The spike in 2003 results from several new EU regulations that apply at the national level for each of the developing "Global South" EU states.

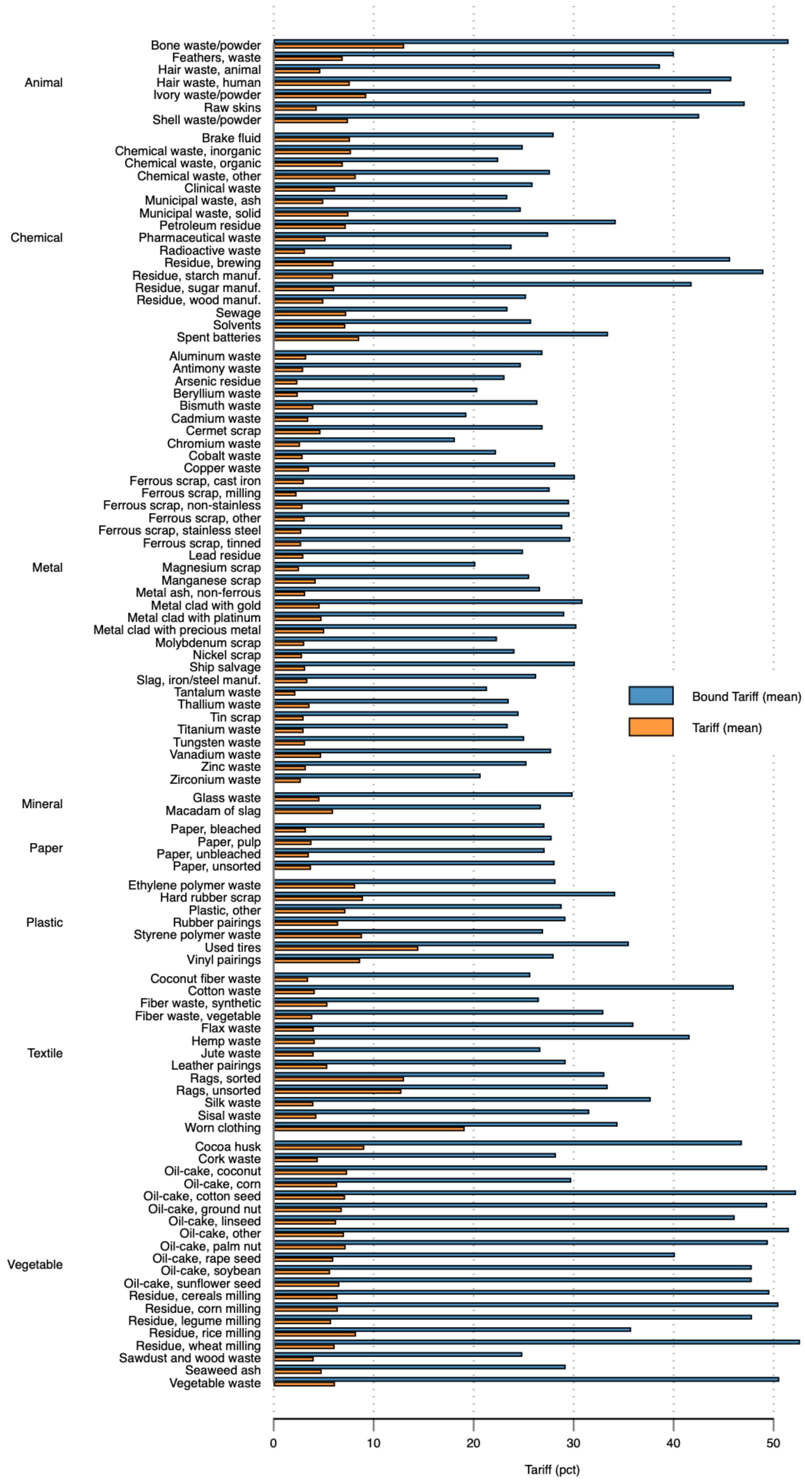
Figure 14: This figure summarizes national-level waste import restrictions rolled out by developing "Global South" states, overlaid on the count of Basel Convention members, for the study period (1995–2020).



Notes: Bars indicate the count of new national-level waste trade restrictions by Global South states. Line is count of Basel Convention members.

D.5 Bound tariffs

Figure 15: Mean bound and actual tariffs on waste products, developing "Global South" (avg. 1995–2020)



Notes: Similar 6-digit HS products combined for presentation. Using only country-product-years with both bound and actual tariffs reported.

D.6 China Ban: Descriptives

Figure 16: China's surplus import share for banned and other waste products, before and after 2017. (The ban's rollout over time explains why shares do not drop to zero in the period.)

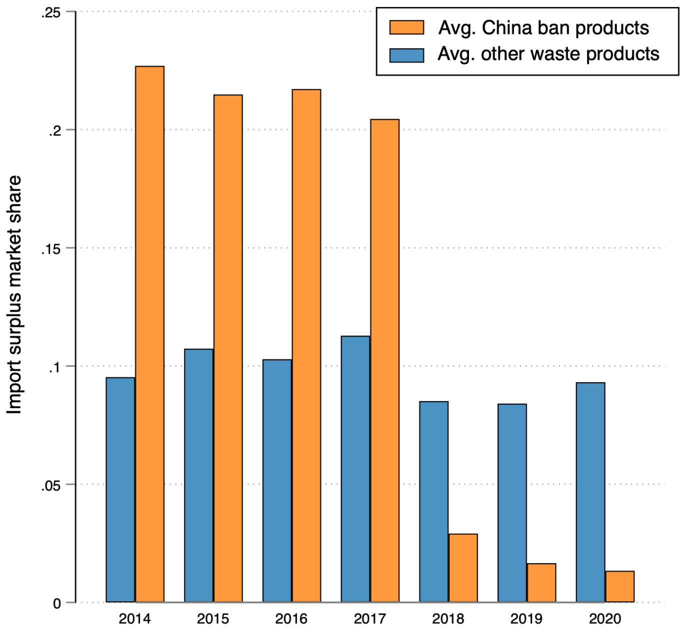


Figure 17: Trends in export volumes for banned and other waste products, before and after 2017.

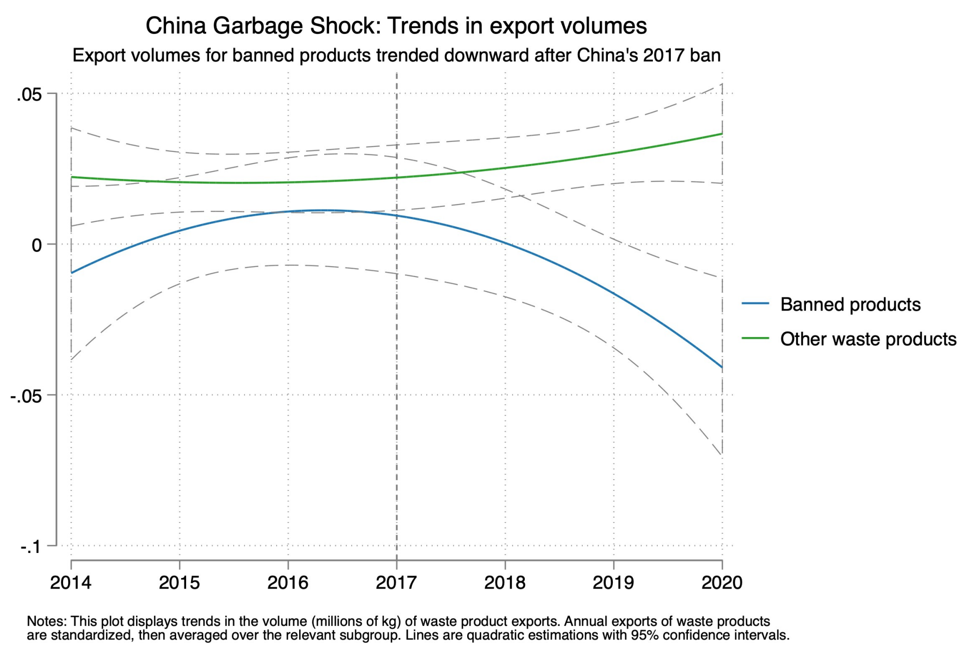
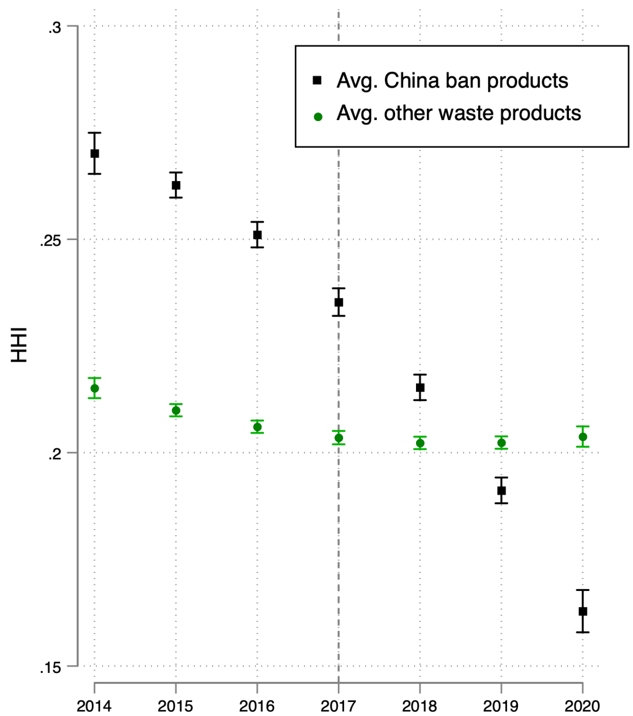


Figure 18: Average HHI for products banned by China and other waste products, before and after 2017.



D.7 Parallel trends plots, by treatment specification

Figure 19: Asia-Pacific treatment

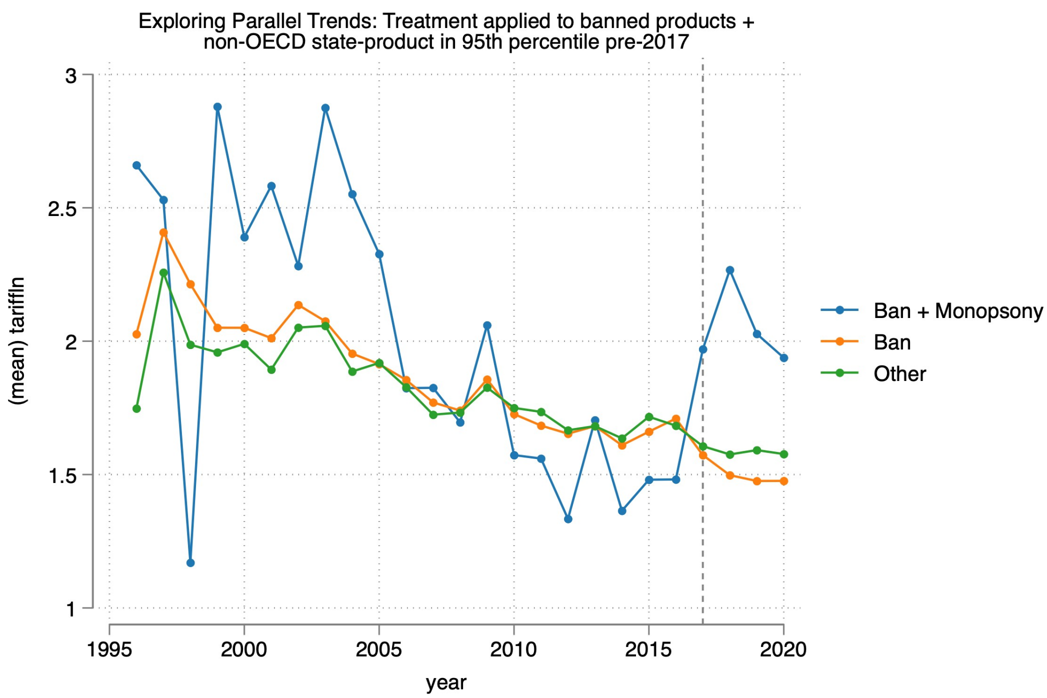
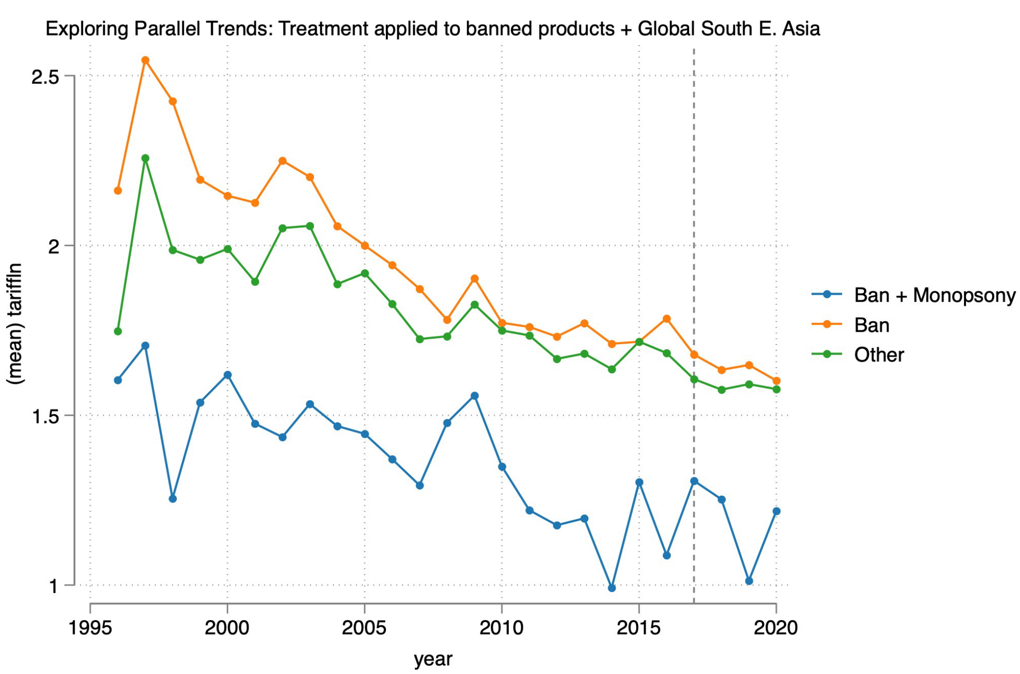


Figure 20: Pre-ban 95% treatment



Appendix E: Waste Product HS Codes

E.1 Full waste product list

This is a list of 179 6-digit HS codes for waste and scrap products per HS code revisions 1992, 1995, 2002, 2007, 2012, and/or 2017. The previously best-available OECD list is of 63 waste products, which for example misses 17 of the 26 waste products China banned in 2017 (Kellenberg, 2012). The count of codes by HS revision is as follows: 1992 HS revision – 129 waste products; 1996 – 131; 2002 – maximum of 144; 2007 – 134; 2012 – 134; 2017 – 135. To be classified as a waste product, the definition includes the term *waste* or *scrap*; it is a residual or byproduct from primary production processes; and/or the product is a one-time primary good intended to be processed into inputs for further use. Detailed decision rules available in replication files.

050100 050210 050290 050300 050510 050590 050690 050710 050790 050800 150200 180200 230210 230220 230230 230240 230250 230310 230320 230330 230400 230500 230610 230620 230630 230640 230641 230649 230650 230660 230670 230690 230800 230810 230890 240130 251720 252530 261900 262011 262019 262020 262021 262029 262030 262040 262050 262060 262090 262091 262099 262100 262110 262190 271390 284440 284450 300680 300692 380400 382510 382520 382530 382541 382549 382550 382561 382569 382590 391510 391520 391530 391590 400400 401220 401700 410110 410120 410121 410122 410129 410130 410140 410150 410210 410221 410229 410310 410330 410390 411000 411520 440130 440131 440139 440140 450190 470710 470720 470730 470790 500300 500310 500390 510310 510320 510330 510400 520210 520291 520299 530130 530290 530390 530490 530500 530519 530529 530590 530599 550510 550520 630900 631010 631090 700100 711210 711220 711230 711290 711291 711292 711299 720410 720421 720429 720430 720441 720449 740400 750300 760200 780200 790200 800200 810110 810191 810197 810210 810291 810297 810310 810330 810420 810510 810530 810600 810710 810730 810810 810830 810910 810930 811000 811020 811100 811211 811213 811220 811222 811230 811240 811252 811259 811291 811292 811300 854810 890800

E.2 Mixed waste products

Table 6: Waste products coded as mixed/definition-by-exclusion

HS-6 digit	Waste type	Short definition	(Relevant portion of) full definition
050690	Animal	Bone waste/powder	Animal products: bones and horn-cores and powder or waste of such...n.e.s. in heading no. 0506
230690	Vegetable	Oil-cake, other	Oil-cake and other solid residues: ...resulting from the extraction of oils, n.e.s. in heading no. 2306
230800	Vegetable	Vegetable waste	...vegetable waste, residues and by-products...not elsewhere specified or included
261900	Metal	Slag, iron/steel manuf.	Slag, dross: (other than granulated slag), scalings and other waste from the manuf. of iron or steel
262029	Metal	Lead residue	Ash and residues...containing mainly lead: excluding leaded gasoline sludges...
262091	Metal	Metal ash, non-ferrous	Ash and residues...other than those containing lead, arsenic, mercury, thallium or their mixtures...
262099	Metal	Metal ash, non-ferrous	Ash and residues...not containing mainly lead, or arsenic, mercury, thallium, antimony...
262110	Chemical	Municipal waste, ash	Slag and ash: ash and residues from the incineration of municipal waste
262190	Vegetable	Seaweed ash	Slag and ash n.e.c. in ch. 26: ...excluding ash and residues from the incineration of municipal waste
284440	Chemical	Radioactive waste	Radioactive elements, isotopes, compounds, n.e.s. in heading no. 2844...
300692	Chemical	Pharmaceutical waste	Pharmaceutical goods: waste pharmaceuticals

HS-6 digit	Waste type	Short definition	(Relevant portion of) full definition
382510	Chemical	Municipal waste, solid	Residual products...not elsewhere specified or included: municipal waste
382520	Chemical	Sewage	Residual products...not elsewhere specified or included: sewage sludge
382530	Chemical	Clinical waste	Residual products...not elsewhere specified or included: clinical waste
382549	Metal	Bismuth waste	Residual products...not elsewhere specified or included: waste organic solvents, other than halogenated
382550	Chemical	Brake fluid	Residual products...not elsewhere specified or included: wastes of metal pickling liquors, brake fluids...
382561	Chemical	Solvents	Residual products...not elsewhere specified or included: ...other wastes n.e.c. in 3825...
382569	Chemical	Solvents	Residual products...not elsewhere specified or included: ...other wastes n.e.c. in 3825...
382590	Chemical	Chemical waste, other	Residual products...not elsewhere specified or included: n.e.c. in 3825...
391590	Plastic	Plastic, other	Plastics n.e.s. in heading no. 3915: waste, parings and scrap
470790	Paper	Paper, unsorted	...waste and scrap, of paper or paperboard n.e.s. in heading no. 4707 and of unsorted waste and scrap
520299	Textile	Cotton waste	Cotton: waste other than garnetted stock and yarn (including thread) waste
530500	Textile	Coconut fiber waste	Coconut, abaca... ramie and other vegetable textile fibres n.e.c....waste of these fibres...

HS-6 digit	Waste type	Short definition	(Relevant portion of) full definition
630900	Textile	Worn clothing	Clothing: worn, and other worn articles
631090	Textile	Rags, unsorted	Rags: ...worn out articles of twine, cordage, rope or cables, of textile materials: other than sorted
711230	Metal	Metal clad with precious metal	...ash containing precious metal or precious metal compounds
711299	Metal	Metal clad with precious metal	...including metal clad with precious metals, other than that of gold and platinum...
720441	Metal	Ferrous scrap, milling	Ferrous...turnings, shavings, chips, milling waste, sawdust, fillings...whether or not in bundles
720449	Metal	Ferrous scrap, other	Ferrous waste and scrap: n.e.s. in heading no. 7204
854810	Chemical	Spent batteries	Waste and scrap of primary cells, primary batteries and electric accumulators: spent...
890800	Metal	Ship salvage	Vessels and other floating structures: for breaking up

E.3 Waste products subject to China import ban

Table 7: Waste product imports banned in China's "Operation National Sword" (2017)

HS code	Short definition	Coded as mixed product?
261900	Slag, iron/steel manuf.	Yes
262011	Zinc waste	
262019	Zinc waste	
262021	Lead residue	
262029	Lead residue	Yes
262030	Copper waste	

HS code	Short definition	Coded as mixed product?
262040	Aluminum waste	
262060	Arsenic residue	
262091	Metal ash, non-ferrous	Yes
262099	Metal ash, non-ferrous	Yes
391510	Ethylene polymer waste	
391520	Styrene polymer waste	
391530	Vinyl pairings	
391590	Plastic, other	Yes
470790	Paper, unsorted	Yes
510310	Hair waste, animal	
510320	Hair waste, animal	
510330	Hair waste, animal	
510400	Hair waste, animal	
520210	Cotton waste	
520291	Cotton waste	
520299	Cotton waste	Yes
550510	Fiber waste, synthetic	
550520	Fiber waste, synthetic	
631010	Rags, sorted	
631090	Rags, unsorted	Yes

Notes: Source: Chinese notification to the WTO, July 18, 2017 (G/TBT/N/CHN/1211). Three additional codes fall into the parameters of the ban; however, they were no longer in use as of 2017. These codes are: 262020, 262050, and 262090, having to do with lead waste, vanadium waste, and non-ferrous metal ash. In the months after the original 18 July 2017 promulgation, China slightly loosened some related contamination standards. See, e.g., Cole Rosengren and Cody Boteler. November 16, 2017. "China proposes new 0.5% contamination standard with March 2018 enforcement." Waste Dive. www.wastedive.com/news/china-proposes-new-05-contamination-standard-with-march-2018-enforcement/511122/.