

China's Waste Import Ban and Pollution Relocation in the U.S.

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Department Seminar

2022

Recycling in the U.S.

U.S. Recycling Industry Is Struggling To Figure Out A Future Without China

August 20, 2019 - 3:27 PM ET
Heard on All Things Considered

Countries Tried to Curb Trade in Plastic Waste. The U.S. Is Shipping More.

Data shows that American exporters continue to ship plastic waste overseas, often to poorer countries, even though most of the world has agreed to not accept it.



Your Recycling Gets Recycled, Right? Maybe, or Maybe Not

Plastics and papers from dozens of American cities and towns are being dumped in landfills after China stopped recycling most "foreign garbage."

SUSTAINABILITY

Recycling in the U.S. Is Broken. How Do We Fix It?

BY RENEE CHO | MARCH 13, 2020

63 Comments

ENVIRONMENT | PLANET OR PLASTIC?

China's ban on trash imports shifts waste crisis to Southeast Asia

As plastic scrap piles up, Malaysia and others fight back.

Recycling in America Is a Mess. A New Bill Could Clean It Up.

As programs shutter and plastic use rises in the pandemic, a New York bill to get manufacturers to pick up the recycling tab could offer a solution.



By Michael Kimmelman Photo Illustrations by Bobby Doherty

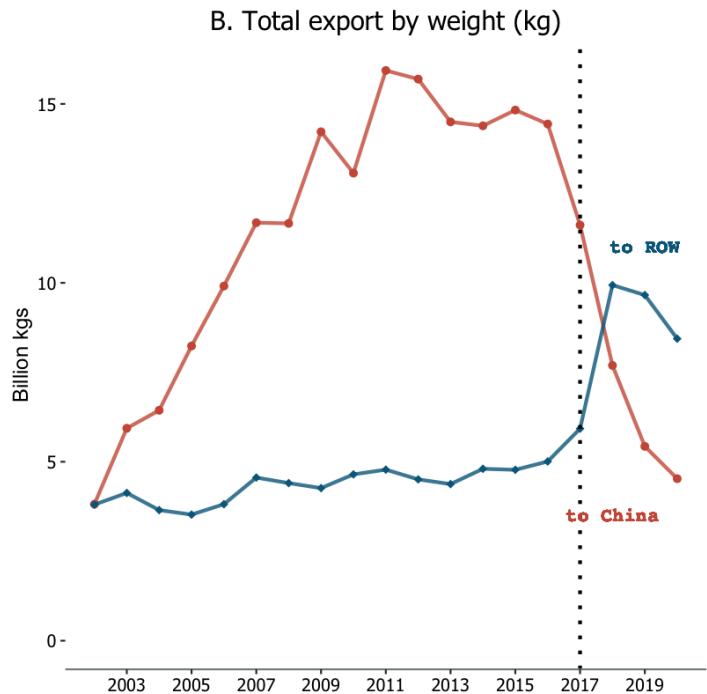
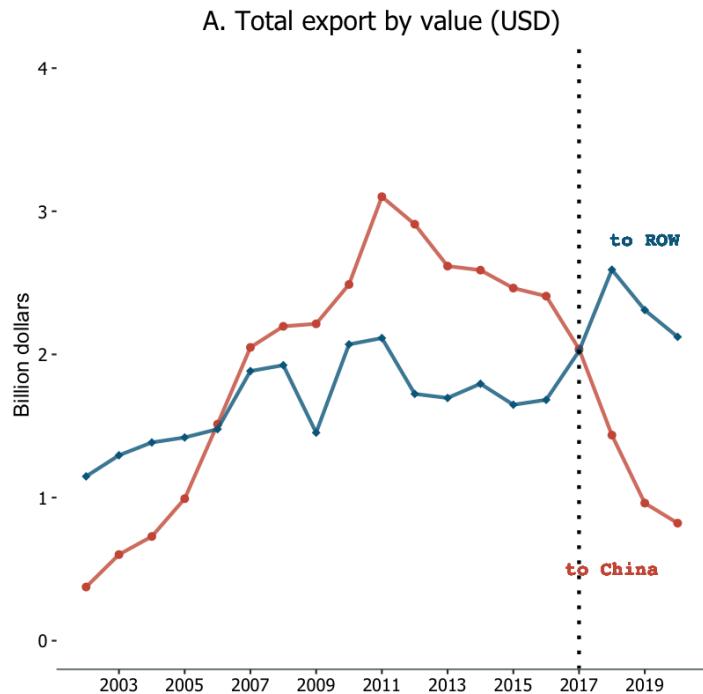
Published Jan. 27, 2021 Updated Jan. 28, 2021

News Articles about current recycling in the U.S.

Introduction

- Recyclable waste transfer is an important part of global pollution relocation
 - **1,000,000,000** metric tons from developed to developing countries
- China was the biggest importer of U.S. recyclables
- In 2017, China announced its **Green Sword (GS) Policy**, which banned almost all recyclable waste imports
- Wastes from recycling remain in the U.S.
- U.S. has no **economical or efficient** recycling infrastructure
 - Recyclables went to landfills.

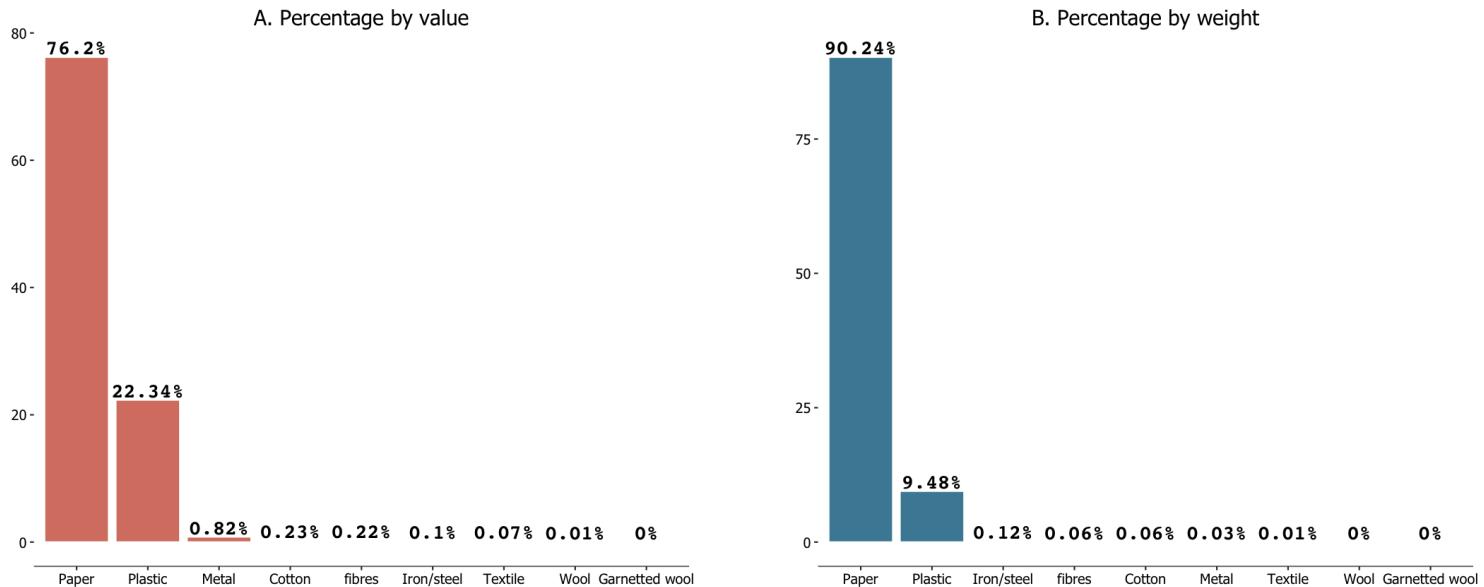
GS Policy and Trade



Data Source: USA Trade Online Data

Figure 2. U.S. Recyclable Waste Exports to China and ROW

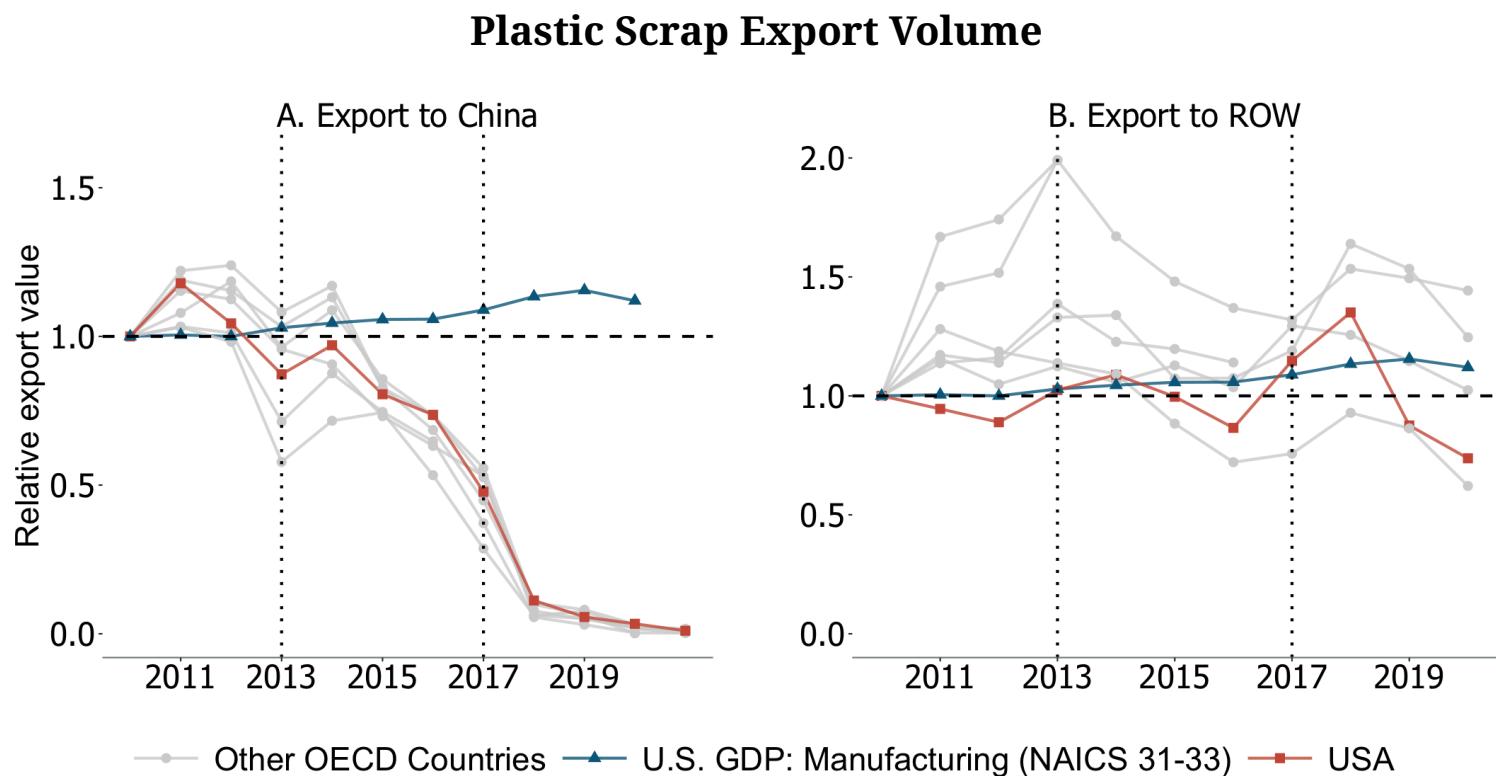
GS Policy and Trade



Data Source: USA Trade Online Data

Figure 3. Composition of Recyclable Waste Exports

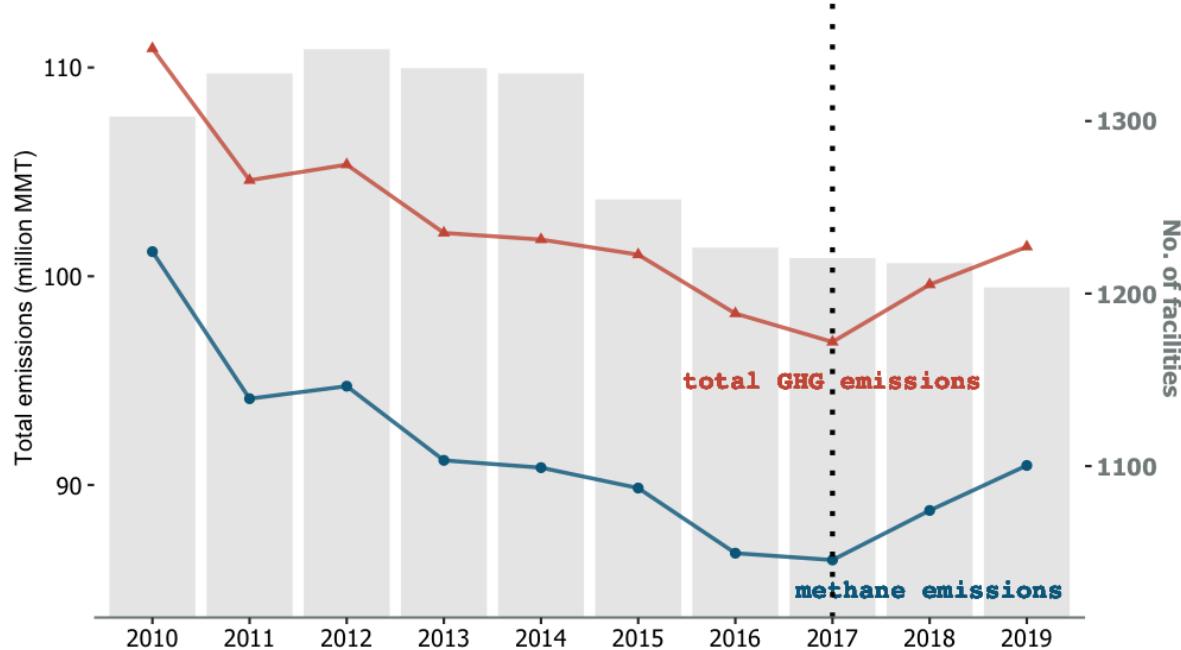
GS Policy and Trade



Data Source: UN Comtrade Data

Figure 4. Plastic Scrap Export to China and ROW

GS Policy and Emission



Data Source: US EPA Greenhouse Gas Reporting Program

Figure 5. U.S. Total Emissions by Waste Industry

Research Questions

- For the U.S.
 - What has been the effect of China's GS policy on **Domestic Emissions** from landfill facilities?
 - How do **Heterogeneous Changes** in emissions relate to **Trade Exposures** at state level?
- For the state of **California**
 - What are the **Distributional Effects** of the GS policy on pollution relocation for local communities at census-block levels?
 - What are the potential **Mechanisms** to explain the distributional effects in those communities?

Relevance

Recycling. Aadland and Caplan (2006), Bohm et al. (2010), Kinnaman (2014), Kinnaman et al. (2014)

→ First quantitative analysis of China's GS policy on the U.S. environment at the **national, state, and local community** levels

Trade and Environment. Shapiro (2016), Shapiro (2018), Shapiro (2021)

→ First study of the causal relationship between **trade volume and domestic emissions**

Pollution Displacement. Copeland et al. (1994), enderson (1996), Becker and Henderson (2000), Greenstone (2002), Cherniwchan (2017), Hernandez-Cortes and Meng (2020), Tanaka et al. (2021), Shapiro and Walker (2021), Ho (2021), Morehouse and Rubin (2021), Shapiro and Walker (2021)

→ First empirical evidence on **pollution displacement under exogenous policy shock**

Environmental Justice. Baden and Coursey (2002), Cameron and McConnaha (2006), Banzhaf and Walsh (2008), Depro et al. (2011), Banzhaf and Walsh (2013), Depro et al. (2015), Banzhaf et al. (2019), Ho (2020), Hernandes and Meng (2020), Shapiro and Walker (2021)

→ First analysis on the effect of an exogenous policy shock on **racial disparity** with regard to waste transfers

Policy Relevance. RECYCLE Act of 2021, Recycling Infrastructure and Accessibility Act of 2022, the Plastic Waste Reduction and Recycling Research Act, Infrastructure Bill 2021

→ The **international context** for domestic recycling policies can no longer be ignored.

Data

- **UN Comtrade**
 - Annual exports by commodities at country level
- **U.S.A Trade Online**
 - Annual exports by commodities at state level
- **U.S. EPA Inventory of Greenhouse Gas Emissions and Sinks**
 - Annual emissions by industry at state level
- **U.S. EPA Greenhouse Gas Reporting Program (GHGRP)**
 - Annual emissions by industry at facility level
- **California Department of Resources Recycling and Recovery (CalRecycle) Disposal Flow Data**
 - Quarterly disposal flow at facility level
- Other data
 - U.S. Census racial mix at census-block level
 - ACS 5-year median income at census block group level
 - Statewide Database (SWDB) presidential election data at precinct level

1. The Effect of China's Waste Ban on Domestic Methane Emissions

Results:

- The cumulative emissions increased by more than **10 million** metric tons of CO₂ eq.
 - **11** states have seen a statistically significant increase in methane emissions
 - The more waste a state **exported**, the **greater impact** the GS policy had on the state



Why study methane emissions?

- **Anaerobic decomposition of recyclable wastes**
 - papers and paperboard (80%) and plastics (15%)

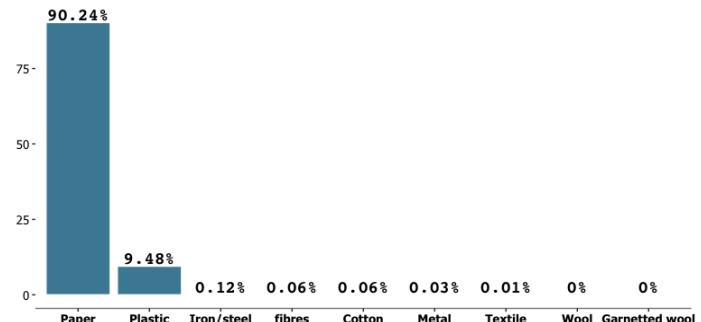


Figure A.1 U.S. Recyclable Waste Composition

Why study methane emissions?

- Anaerobic decomposition of recyclable wastes
 - papers and paperboard (80%) and plastics (15%)
- **Precursor gas of air pollutant**
 - organic hazardous air pollutants (HAP), volatile organic compounds (VOC), hydrogen sulfide, tropospheric ozone, etc.

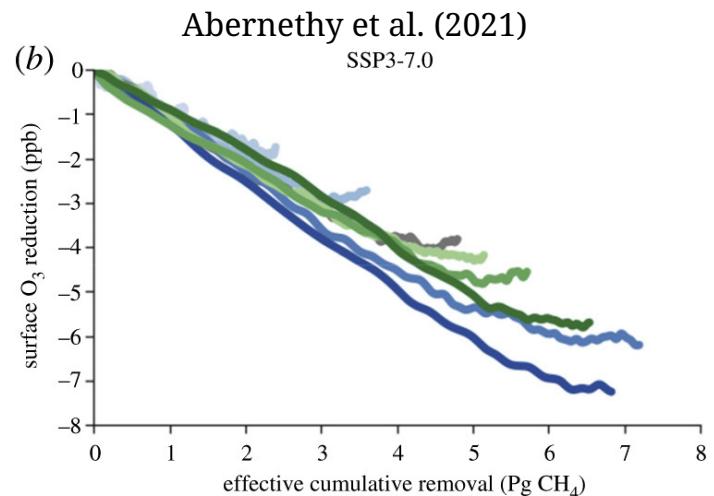


Figure A.2 Methane removal and reductions in ozone

Why study methane emissions?

- Anaerobic decomposition of recyclable wastes
 - papers and paperboard (80%) and plastics (15%)
- Precursor gas of air pollutant
 - organic hazardous air pollutants (HAP), volatile organic compounds (VOC), hydrogen sulfide, tropospheric ozone, etc.
- **Water and soil pollution**
 - micro-plastic



Figure A.3 Microplastic in water and soil

Why study methane emissions?

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- Precursor gas of air pollutant
 - organic hazardous air pollutants (HAP), volatile organic compounds (VOC), hydrogen sulfide, tropospheric ozone, etc.
- Water and soil pollution
 - micro-plastic
- **Extreme weather events and higher fire risk**
 - 86 times stronger than CO₂

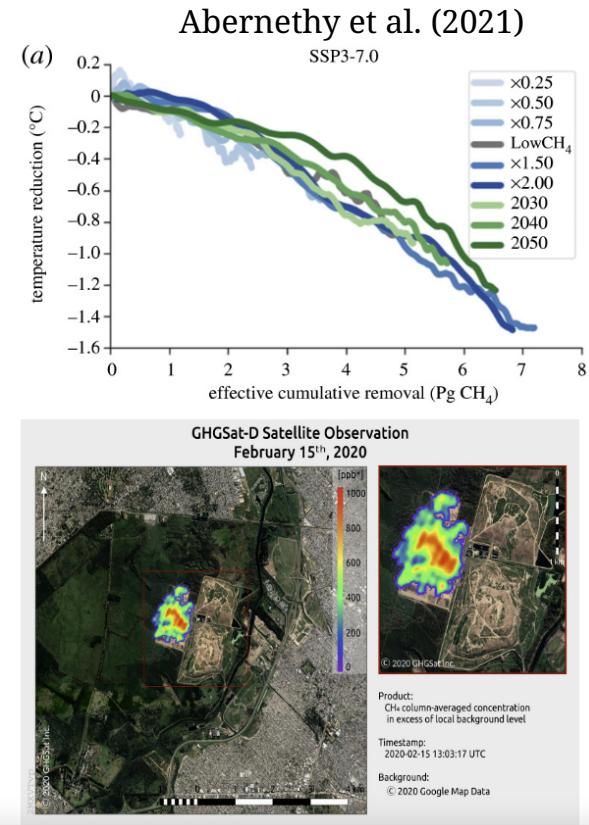


Figure A.4 Methane removal and reductions in temperature

Why study methane emissions?

- Anaerobic decomposition of recyclable wastes
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- Precursor gas of air pollutant
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- Water and soil pollution
 - micro-plastic
- Extreme weather events and higher fire risk
 - 86 times stronger than CO₂
- **Consistently measured data from 2010 to 2020**

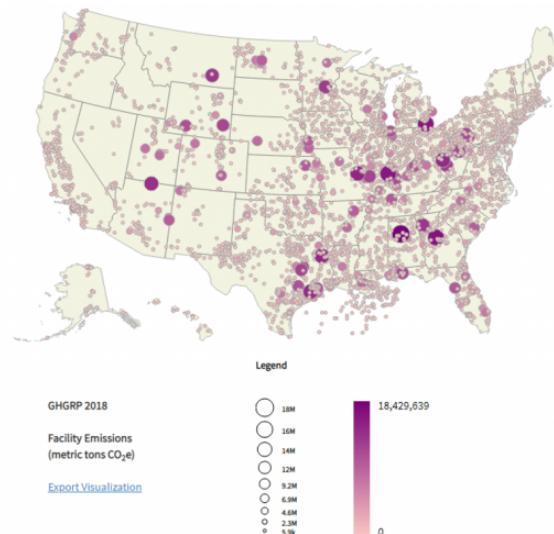


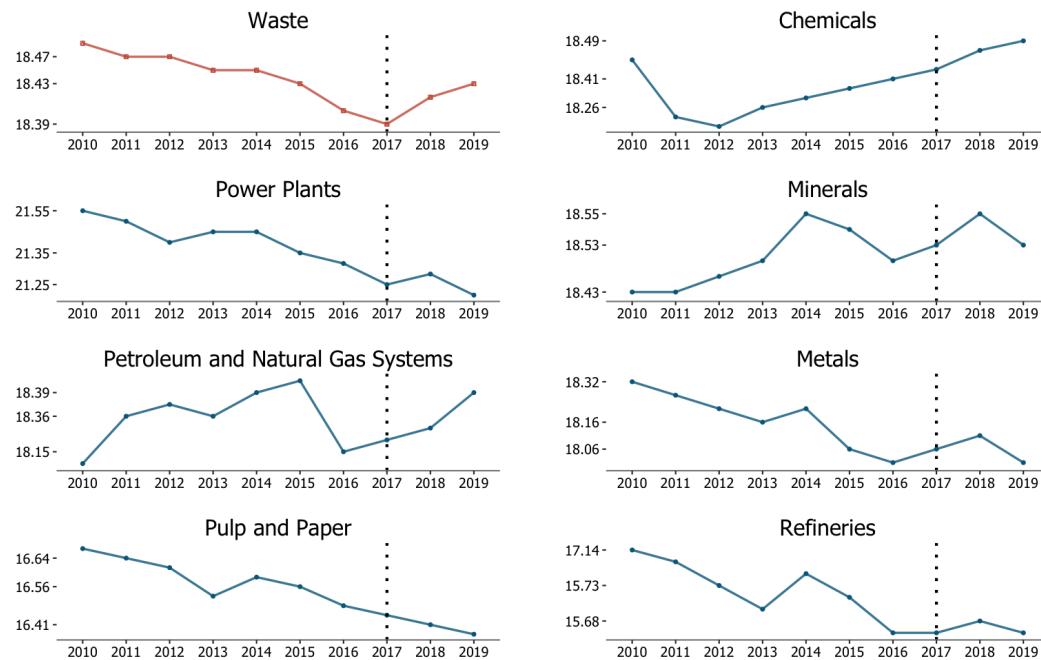
Figure A.5 EPA GHGRP data

Data

- **U.S. EPA Greenhouse Gas Reporting Program (GHGRP)**
 - Methane emissions from landfill facilities
 - 2010 to 2020 annually
- Approximately 8,000 facilities required to report emissions annually
- High compliance rates
 - no financial penalty but high reputational cost
- Covered industries include power plants, petroleum and natural gas systems, minerals, chemicals, pulp and paper, refineries, waste, etc.
- Data generation process for waste industry:
 - Facilities report annual **amounts of waste accepted**
 - Methane emissions are calculated by the U.S. EPA using a complicated model

The Effect of China Ban on State Pollution: Synthetic Control

- Rely on exogenous variation in methane emissions across **all other industries** in the EPA GHGRP



Data Source: EPA GHGRP

Figure 6. U.S. Total Emissions by Industry

State-level Pollution: Synthetic Control Method

- Take advantage of the fact that other industries which also emit GHGs were **not** affected by China's GS policy
- Use other industries (all states) as donor pool for synthetic control group
- Train the model using the pre-policy period (**2010-2017**)
 - Calculate state-industry pair weights to minimize prediction error

$$\hat{Y}_{11t}^N = \sum_{j=2}^J \sum_{s=2}^{50} w_{js} Y_{jst}$$

- Predict counterfactual methane emissions in the absence of GS policy using post-policy period (**2018-2020**)

Results

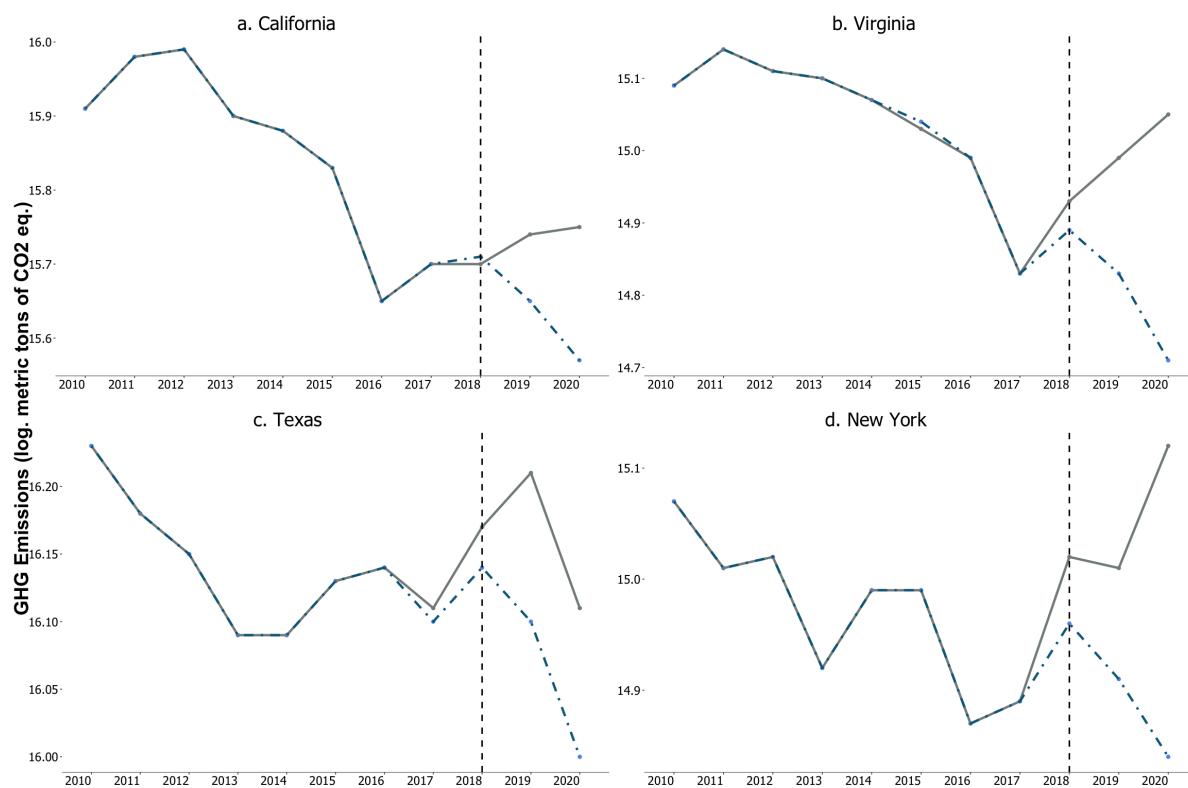


Figure 7. Synthetic Control Outcomes: four example states

Results

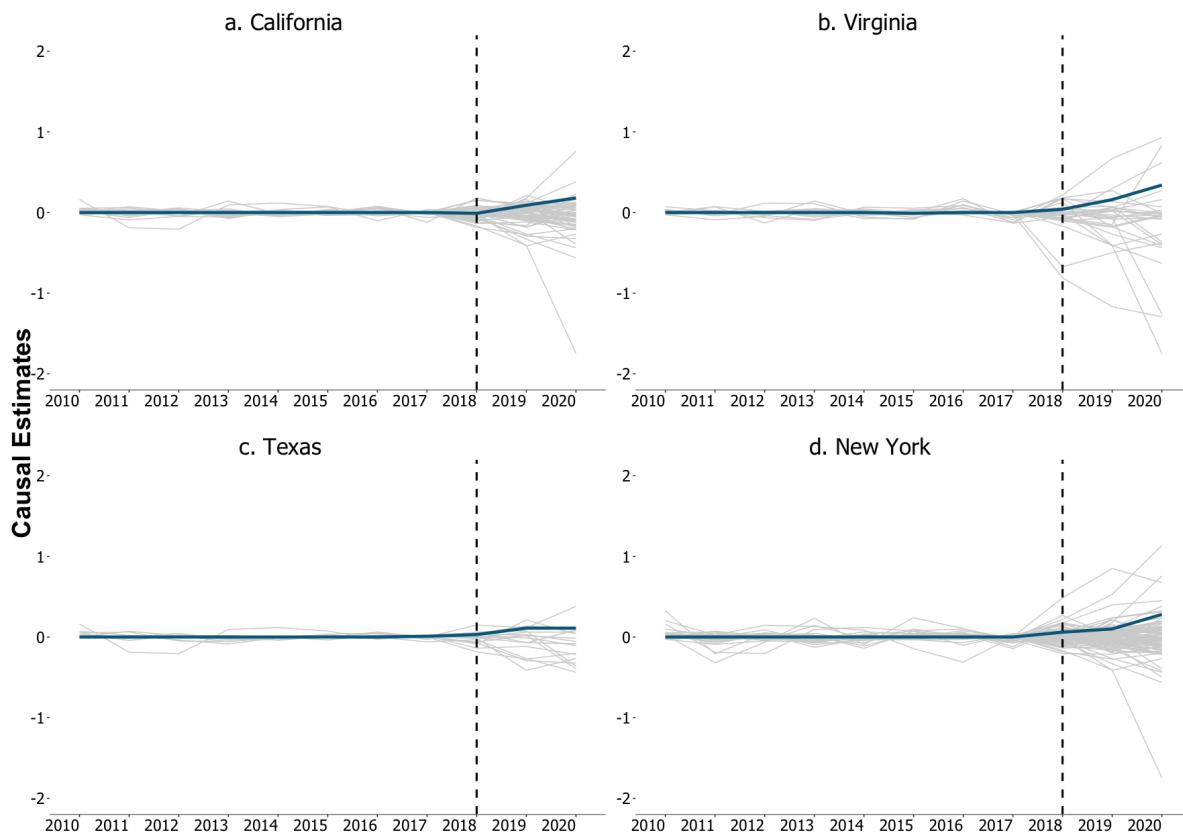


Figure 8. Synthetic Control Outcomes: placebo tests

Results

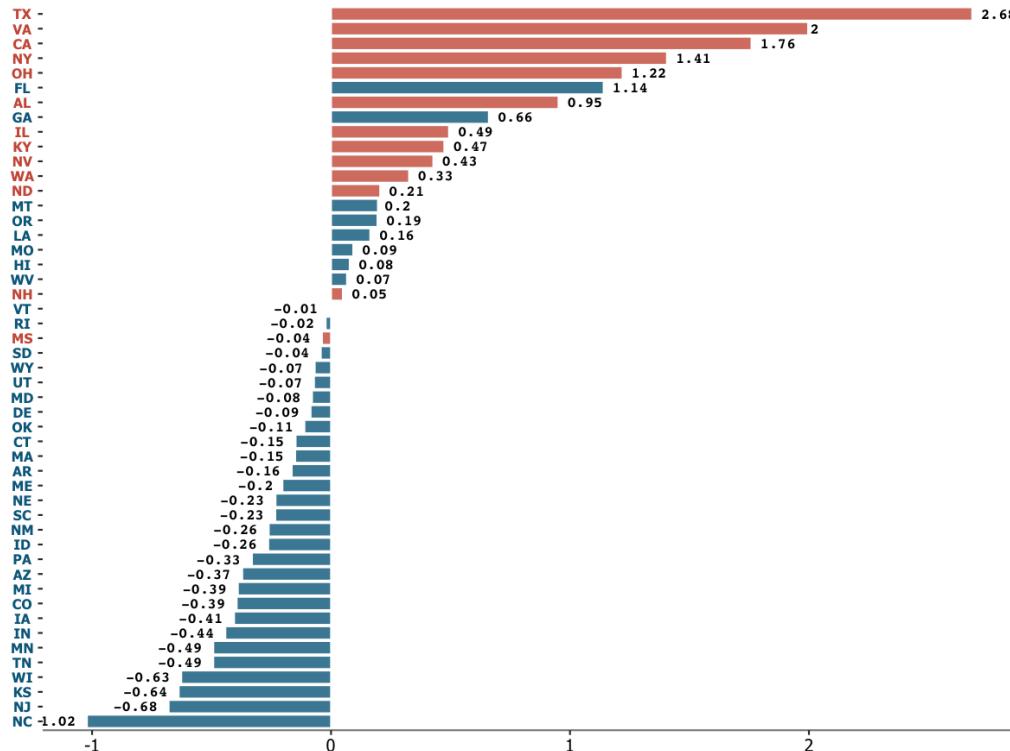


Figure 9. Net Changes of Emissions after the GS Policy (Red-significant, blue-insignificant)

State-level Causal Estimates and Trade Exposures

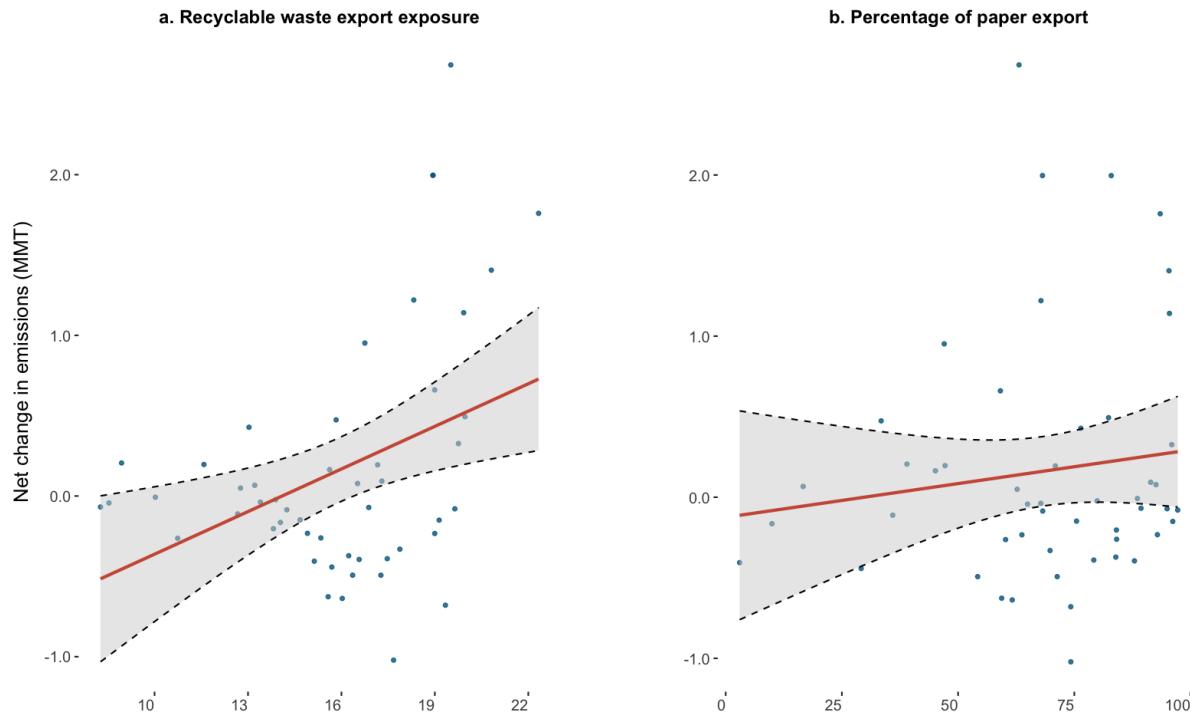


Figure 10. Correlations of State-level Emission Net Change

- \uparrow Recyclable wastes a state exported \rightarrow \uparrow increase in methane emissions.

2. State-level Pollution and Waste Trade Exposure



Result:

- For every **1** additional metric ton of recyclable waste exported, the U.S. domestic emissions were reduced by **0.83** metric tons of CO₂ eq.
- **12 million** metric tons of export reduction increased emissions by **11 million** metric tons of CO₂ eq.

Data

- **U.S.A Trade Online**
 - State-level exports from 2003 to 2019 annually
 - HS4 commodity code : 9 different types of recyclable wastes that are affected by the policy e.g., 3915 (plastic), 2619 (iron/steel slag), 2620 (metal slag), 4707 (paper & paperboard), etc.
- **U.S. EPA Greenhouse Gas Inventory**
 - State-level methane emissions by industry
 - 2003 to 2019 annually
- **UN Comtrade Data**
 - Country-level exports from 2003 to 2019 annually
 - HS4 commodity code : 9 different types of recyclable wastes that are affected by the policy e.g., 3915, 2619, 2620, 4707 etc.
- **U.S. Bureau of Economic Analysis (BEA)**
 - Annual Employment, Personal income and Consumer Expenditure at state level

Trade and Domestic Emissions

Naive OLS:

$$\Delta \text{Methane}_{it} = \alpha + \beta_1 \Delta \text{Export}_{it} + s_i + u_t + e_{it}$$

- $\Delta \text{Methane}_{it}$ = change of metric tons (in millions) of methane emissions from the waste industry of state i in year t , compared to last year
- $\Delta \text{Export}_{it}$ = change of export values (in billions \$) of recyclable wastes from state i in year t compared to last year
- s_i = state fixed effect
- u_t = year fixed effect

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- s_i = state fixed effect
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- **Identification Threat**
 - Omitted variables: economics activities, etc (endogeneity)
 - Reverse causality: emission permits → waste exports
 - Supply instead of demand shock: technological improvement

Bartik Shift-Share Instrument

- Endogeneity, reverse causality
 - **Bartik shift-share instrument:** Bartik 1991, Autor et.al 2013 (AER), Wong 2020 (AEJ)

Bartik Shift-Share Instrument

- Endogeneity, reverse causality

$$\textcolor{teal}{IV}_{it}^{\text{Bartik}} = \sum_j \frac{E_{ijt_0}}{E_{jt_0}} \Delta Export_{ucjt}$$

- Instrument: $\textcolor{teal}{IV}_{it}^{\text{Bartik}}$

Bartik Shift-Share Instrument

- Endogeneity, reverse causality

$$IV_{it}^{Bartik} = \sum_j \frac{E_{ijt_0}}{E_{jt_0}} \Delta Export_{ucjt}$$

- Instrument: IV_{it}^{Bartik}
- i = state, j = recycling waste commodity

Bartik Shift-Share Instrument

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- t_0 initial year (2004)
- $\frac{E_{ijt_0}}{E_{jt_0}}$ is the initial share (2004) of U.S. state i 's export to China
- $\Delta Export_{ucjt}$ Change of export from the U.S. to China for recyclable waste j

Bartik Shift-Share Instrument

- Endogeneity, reverse causality

$$IV_{it}^{Bartik} = \sum_j \frac{E_{ijt_0}}{E_{jt_0}} \Delta Export_{ucjt}$$

- Supply-side shock

$$IV_{it,others}^{Bartik} = \sum_j \frac{E_{ijt_0}}{E_{jt_0}} \Delta Export_{ocjt}$$

- Use values of export values from **11 other countries** to **China** by
 - Australia, Austria, Canada, France, Germany, Portugal, New Zealand, United Kingdom, Japan, Spain, and Finland

Bartik Shift-Share Instrument

- Endogeneity, reverse causality

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- 2SLS

$$\widehat{\Delta Export}_{it} = \alpha + \beta_1 \Delta IV_{it}^{Bartik} + s_i + u_t + e_{it}$$

$$\Delta Methane_{it} = \alpha + \beta_1 \widehat{\Delta Export}_{it} + s_i + u_t + e_{it}$$

Results

Table 1: Models to explain change in methane emissions as a function of change in recyclable waste exports

	Naive OLS	Bartik shift-share IV	Bartik shift-share IV others
Dependent Variable	Change of Methane Emissions		
2002-2019 first differences			
Δ Export	-0.492 ***	-0.722 ***	-0.893 ***
	(0.122)	(0.114)	(0.124)
2SLS first stage estimates: Change in Exports regressed on IV			
IV_{Bartik}		1.11 ***	9.55 ***
		(0.038)	(0.465)
State fixed effect	Y	Y	Y
Year fixed effect	Y	Y	Y
First stage F		50.25	34.36

Note: Each column reports a separate regression. * $p<0.1$; ** $p<0.05$; *** $p<0.01$. The first-differenced model is like fixed effect model but with a less restrictive assumption. The intercept in this first-differenced model captures all unobserved factors that may affect the emissions but are constant over time. It also captures the linear time trend. The year fixed effects capture every time pattern other than the linear time trend.

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Cumulative emission increase

$$\beta = -0.893$$

$$\Delta \widehat{Methane}_{total} = \sum_{t=2016}^{2019} \beta \left[\sum_{state=i}^I \Delta Export_t^i \right]$$

- From 2016 to 2019, U.S. total recyclable waste export reduced by **12 million** metric tons.
 - Methane emission increased by about **11 million** metric tons of CO_2 eq.

3. Pollution Relocation in California and Distributional Effects



Results:

- Closer, lower-income, White communities are affected more
- Distributional effects can be explained by land costs, transportation costs, and political costs

Data

- **California Department of Resources Recycling and Recovery (CalRecycle) Disposal Flow Data**
 - Captures the amount of disposal transported (by origin jurisdiction and destination facility)
 - 2002 to 2021 (quarterly)
 - Contains 464 origin jurisdictions and 263 disposal facilities
- **Other Data Sources**
 - U.S. Census racial composition, median income at census-block level
 - Statewide Database (SWDB) election data at precinct level
 - Waste Business Journal (WBJ) waste allocation data at facility level

Pollution Relocation

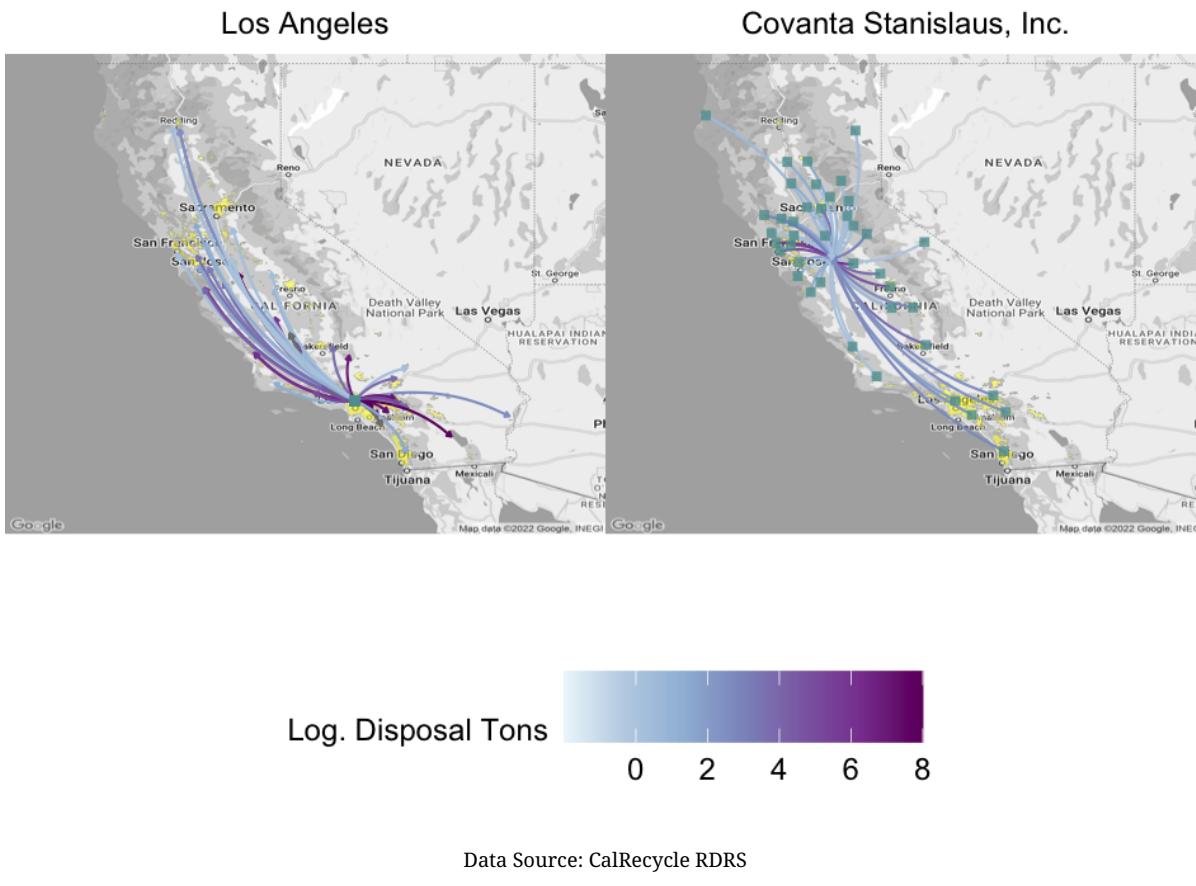
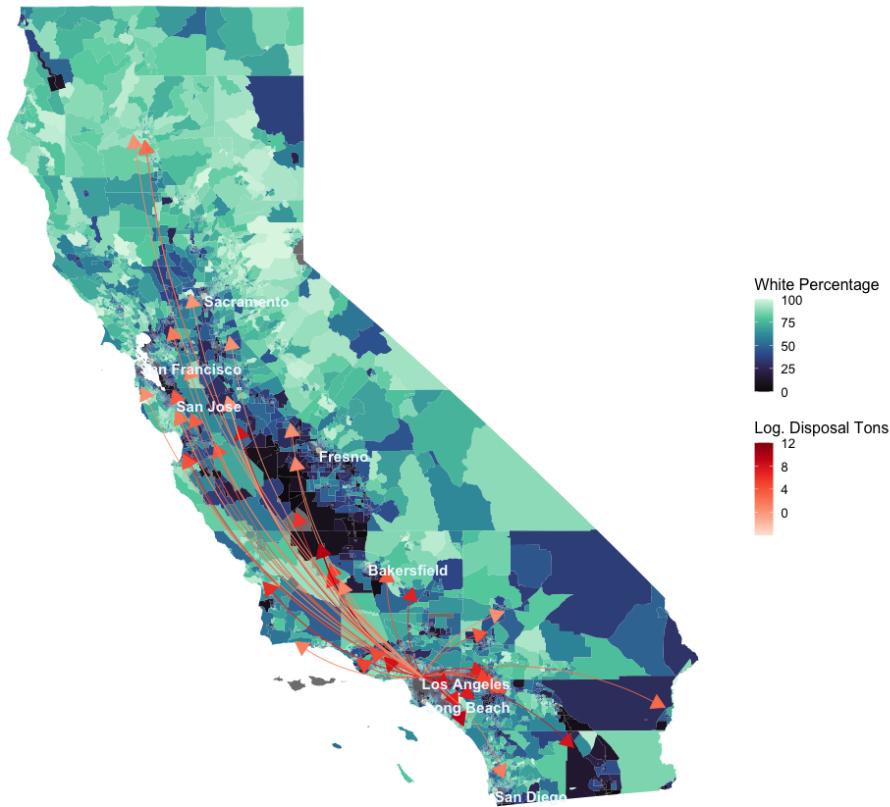


Figure 11. Average net increase in waste flows across regions after the GS policy

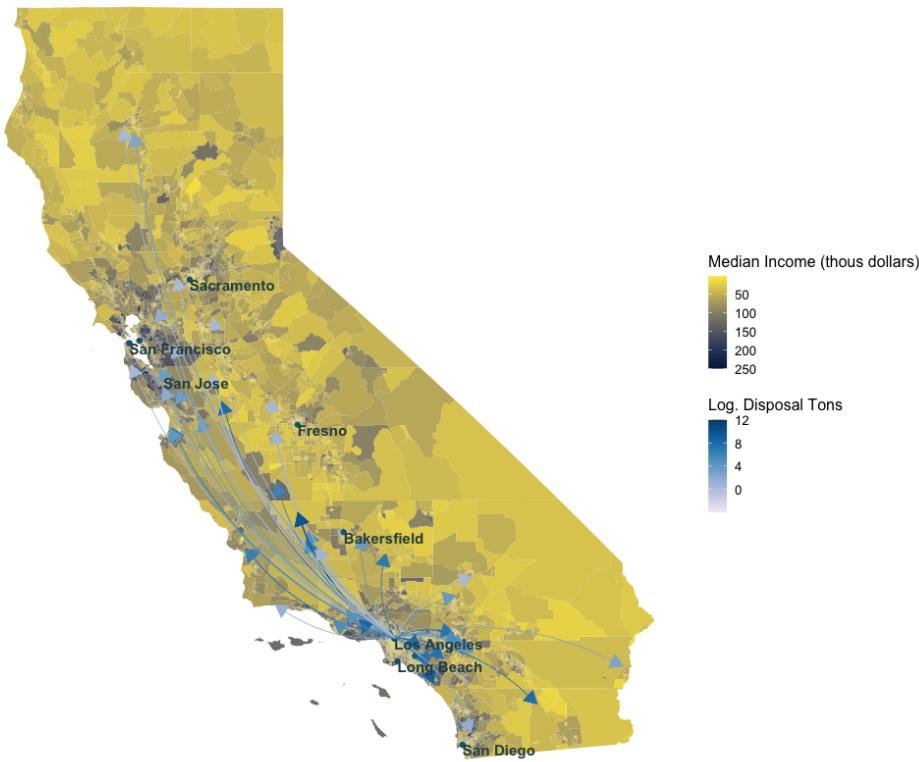
Pollution Relocation by Racial Composition



Data Source: CalRecycle RDRS and U.S. Census

Figure 12. Waste Pollution Relocation by Race

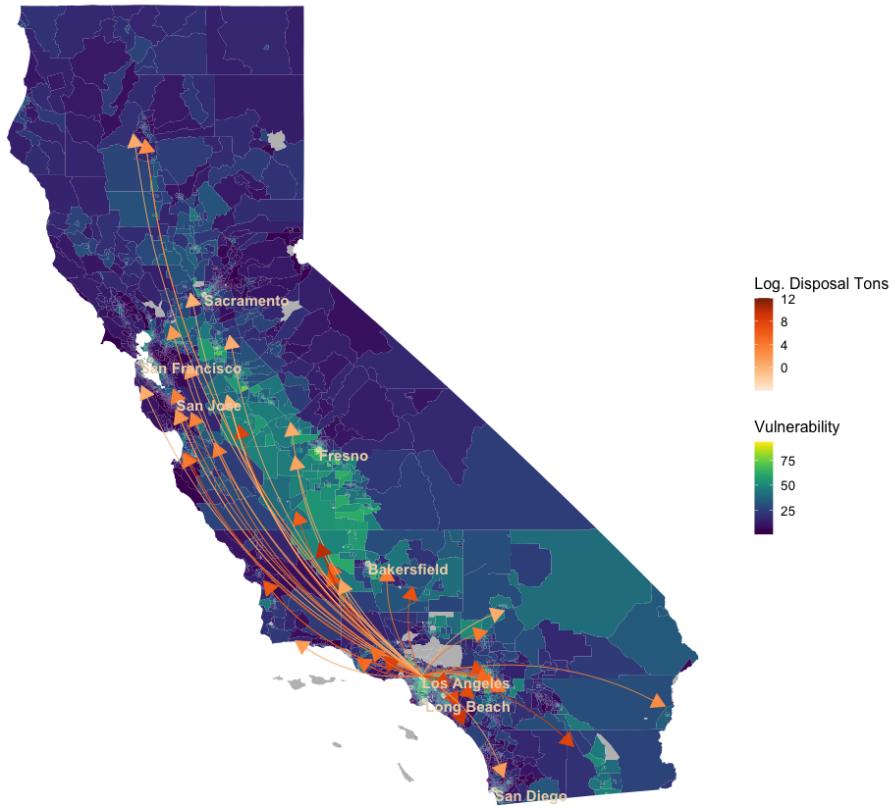
Pollution Relocation by Median Income



Data Source: CalRecycle RDRS and ACS

Figure 13. Waste Pollution Relocation by Median Income

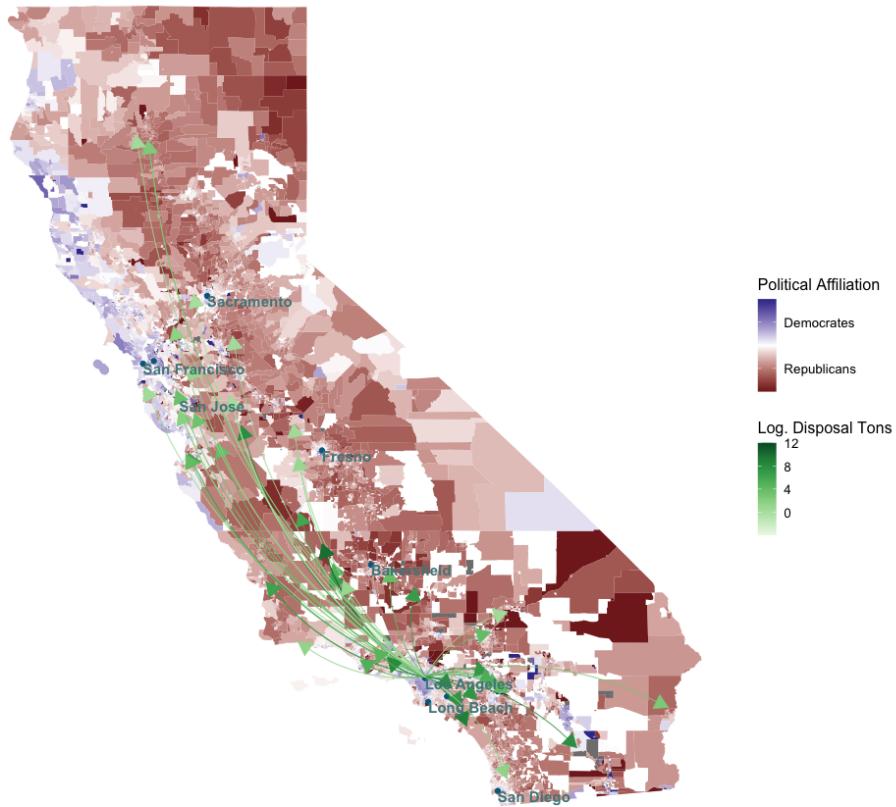
Pollution Relocation by Environmental Vulnerability



Data Source: CalRecycle RDRS and Calenvironscreen 4.0

Figure 14. Waste Pollution Relocation by Environmental Vulnerability

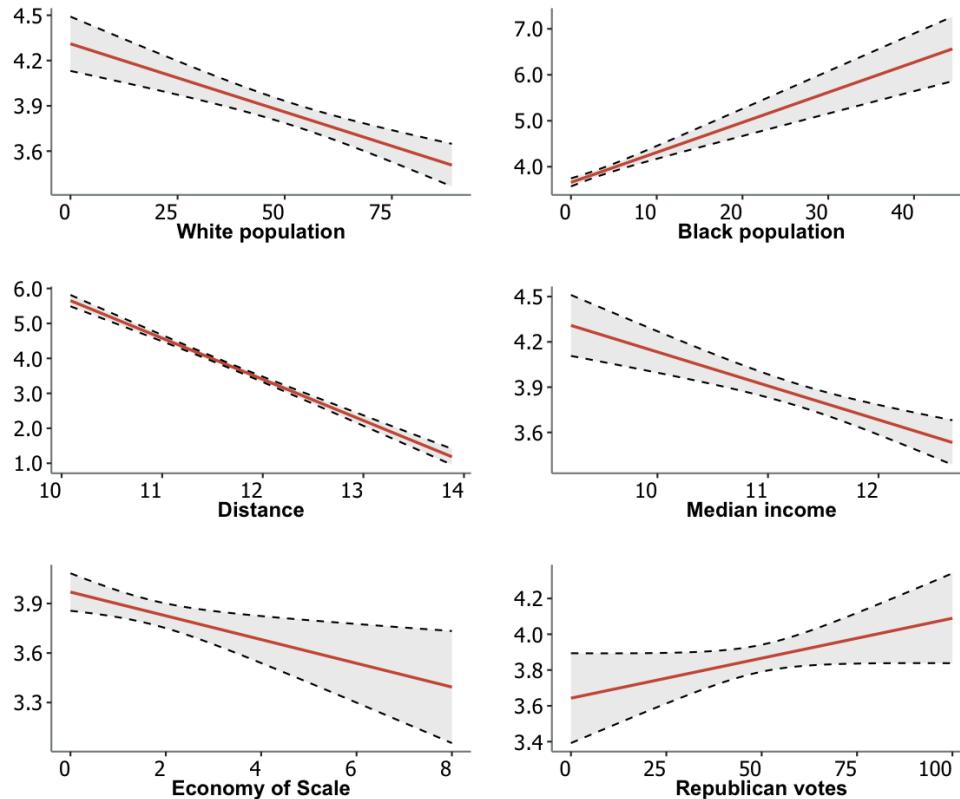
Pollution Relocation by Political Affiliation



Data Source: CalRecycle RDRS and SWDB

Figure 15. Waste Pollution Relocation by Political Affiliation

Correlations



Data Source: CalRecycle RDRS

Figure 16. Correlations of Disposal Flow and Destination Community Characteristics

Gravity-type Model

$$\begin{aligned} \textbf{\textit{Disposal}}_{ijt} = & \alpha + \beta_1 \log(\textit{Dist}_{ij}) + \beta_2 \log(R_j) + \beta_3 \log(X_{jt}) \\ & + \beta_5 GS_{post} \times \log(\textit{Dist}_{ij}) + \beta_6 GS_{post} \times \log(R_j) + \beta_7 GS_{post} \times \log(X_{jt}) \\ & \epsilon_o + \theta_d + \mu_{od} + \eta_t + \lambda_{odt} \end{aligned}$$

$\textbf{\textit{Disposal}}_{ijt}$ = tons of the disposal transported from origin jurisdiction i to destination community j in year quarter t

Community **j** = area that is a 3km buffer within the destination facility

\textit{Dist}_{ij} = distance between origin i and destination j

R_{jt} = racial compositions of destination j

X_{jt} = median income and economies of scale of waste industry of destination j

GS_{post} = dummy variable for the GS policy in effect

Fixed-effects: $\epsilon_o, \theta_d, \mu_{od}, \eta_t, \lambda_{odt}$ o origin county d destination county

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Fixed-effects: $\epsilon_o, \theta_d, \mu_{od}, \eta_t, \lambda_{odt}$ o origin county d destination county

Gravity-type Model

$$\begin{aligned} Disposal_{ijt} = & \alpha + \beta_1 \log(Dist_{ij}) + \beta_2 \textcolor{red}{\log(R_j)} + \beta_3 \log(X_{jt}) \\ & + \beta_5 GS_{post} \times \log(Dist_{ij}) + \beta_6 GS_{post} \times \log(R_j) + \beta_7 GS_{post} \times \log(X_{jt}) \\ & + \epsilon_o + \theta_d + \mu_{od} + \eta_t + \lambda_{odt} \end{aligned}$$

$Disposal_{ijt}$ = tons of the disposal transported from origin jurisdiction i to destination community j in year quarter t

Community j = area that is a 3km buffer within the destination facility;

$Dist_{ij}$ = distance between origin i and destination j

R_{jt} = **racial compositions of destination j**

X_{jt} = median income, economies of scale, and presidential vote share of destination j

GS_{post} = dummy variable for the GS policy in effect

Fixed-effects: $\epsilon_o, \theta_d, \mu_{od}, \eta_t, \lambda_{odt}$ \circ origin county d destination county

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Fixed-effects: $\epsilon_o, \theta_d, \mu_{od}, \eta_t, \lambda_{odt}$, o origin county, d destination county.

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Results prior to the GS Policy (point and interval)

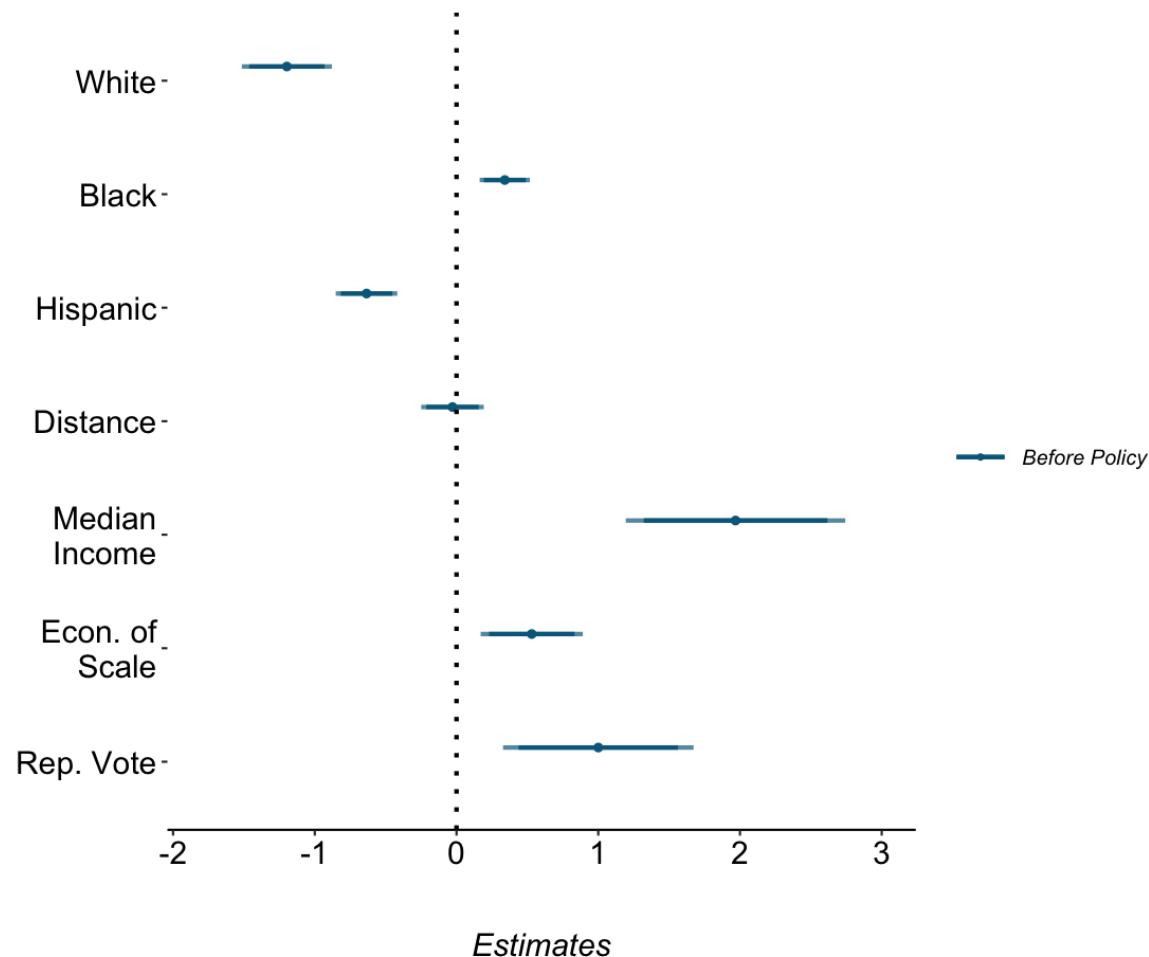


Figure 17: Gravity Model Key coefficient estimates at census-block level

Results after the GS Policy (in red)

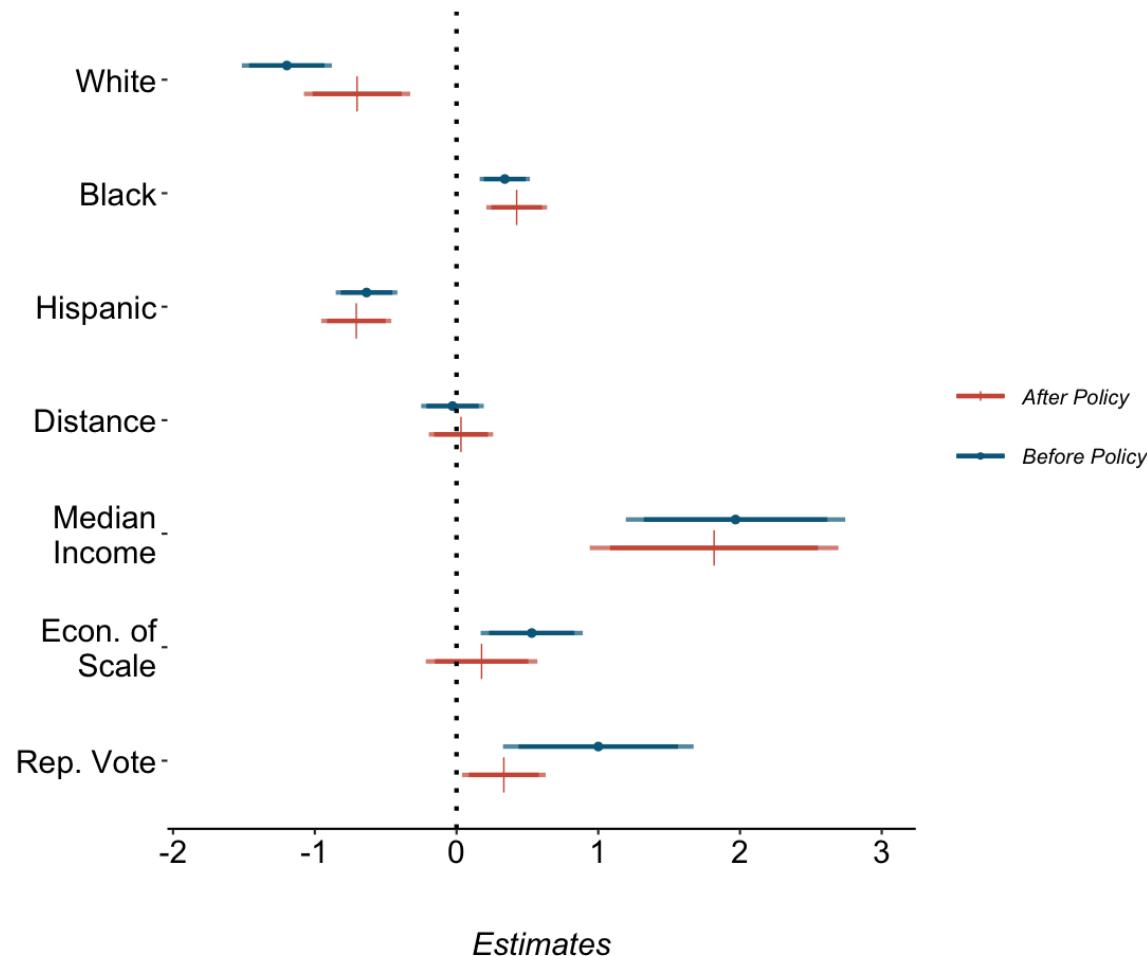


Figure 17: Gravity Model Key coefficient estimates at census-block level

Mechanism: Simple model

- Pollution relocation depends
 - Directly on total disposal generated
 - Inversely on monetary and non-monetary costs

$$\textcolor{red}{TranspWaste}_{ijt} = f(\textit{TotalWaste}_{it}, \textit{Cost}_{ijt})$$

+ -

- **$\textit{TranspWaste}_{ij}$ = the waste pollution relocated from jurisdiction i to facility j**
- $\textit{TotalWaste}_i$ = the waste pollution generated by jurisdiction i
- C_{ij} = costs of shipping wastes from jurisdiction i to destination community j

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Mechanism: Simple model

- Pollution relocation depends
 - Directly on total disposal generated
 - Inversely on monetary and non-monetary costs

$$TranspWaste_{ijt} = f(TotalWaste_{it}, \underset{+}{Cost}_{ijt})$$

- Three cost metrics

$$Cost_{ijt} = f(\underset{+}{L}_{jt}, \underset{+}{T}_{ijt}, \underset{+}{P}_{ijt})$$

- $L_{ij}(Pop_j)$ = land cost approximated by population density of destination j
- $T_{ijt}(d_{ij})$ = transportation cost approximated by the distance origin i and destination j located**
- $P_{ij}(V_{jc})$ = a political cost function w.r.t. votes in district where facility j located

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$$TranspWaste_{ijt} = f(TotalWaste_{it}, \underbrace{Cost_{ijt}}_{+ -})$$

- Three cost metrics

$$Cost_{ijt} = f(L_{jt}, T_{ijt}, \underbrace{P_{ijt}}_{+ + +})$$

- Political Cost

$$P_{jt} = f(\underbrace{Votes_{jt} - Votes_{ct}}_{-})$$

- **$Votes_{jt}$ = presidential vote share of destination community j**
- $$Votes_{ct}$ = presidential vote share of county c where destination community j located$
- P_{jt} = absolute difference between community and county vote shares

Mechanism: Simple model

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Mechanism: Political Cost

$$P_{jt} = f(\underbrace{Votes_{jt} - Votes_{ct}}_{-})$$

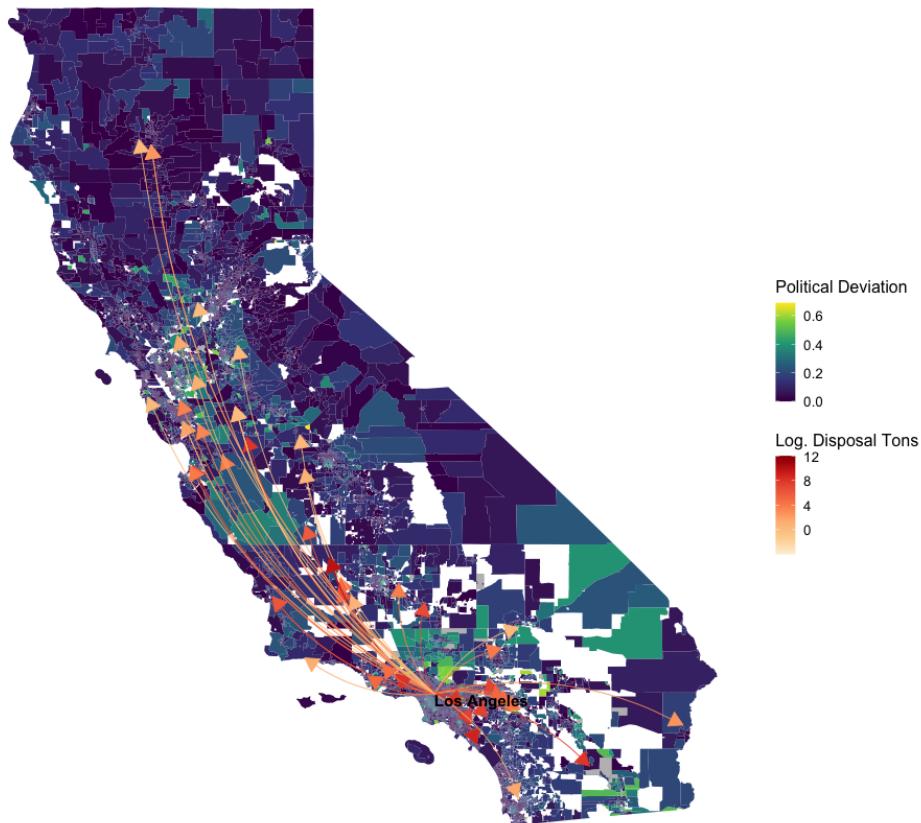
- $Votes_{jt}$ = presidential vote share of destination community j
- $Votes_{ct}$ = presidential vote share of county c where destination community j located
- P_{jt} = **absolute difference between community and county vote shares**

For example, **community A's** Republican vote share of 2016 presidential election was **80%** . However the **county's** Republican vote share was **40%** .

The absolutely vote discrepancy is $|40\% - 80\%| = 40\%$

- Low political cost
 - high difference in vote share to surrounding communities
 - political minorities
 - less resistance to waste inflows

California Political Cost by Precinct



Mechanisms: prior to the GS policy

Dependent Variable	Disposal Shipment			
Transportation costs	-0.326***			-0.476 ***
	(0.113)			(0.112)
Transportation costs x 1(post)	0.031			0.0196
	(0.049)			(0.063)
Land costs	0.019			-0.063
		(0.052)		(0.060)
Land costs x 1(post)	-0.017			-0.057 **
	0.020)			(0.024)
Political costs	-0.028			-0.011
		(0.041)		(0.032)
Political costs x 1(post)	0.107 *			0.101 *
	(0.062)			(0.057)
County fixed effects	Y	Y	Y	Y
Year fixed effects	Y	Y	Y	Y
Quarter fixed effects	Y	Y	Y	Y
<i>R</i> ₂	0.642	0.638	0.654	0.664

Note: Each column reports a separate regression. * $p<0.1$; ** $p<0.05$; *** $p<0.01$.

Mechanisms: after the GS policy

Dependent Variable	Disposal Shipment			
Transportation costs	-0.326***		-0.476 ***	
	(0.113)			(0.112)
Transportation costs x 1(post)	0.031		0.0196	
	(0.049)			(0.063)
Land costs		0.019		-0.063
		(0.052)		(0.060)
Land costs x 1(post)		-0.017		-0.057 **
		0.020)		(0.024)
Political costs			-0.028	-0.011
			(0.041)	(0.032)
Political costs x 1(post)			0.107 *	0.101 *
			(0.062)	(0.057)
County fixed effects	Y	Y	Y	Y
Year fixed effects	Y	Y	Y	Y
Quarter fixed effects	Y	Y	Y	Y
<i>R</i> ₂	0.642	0.638	0.654	0.664

Note: Each column reports a separate regression. * $p<0.1$; ** $p<0.05$; *** $p<0.01$.

Conclusion

- **U.S. Domestic Emissions**

- Decrease in exports with recyclable wastes causes an increase in emissions from the waste industry
- Many states have seen **statistically significant increases** in methane emissions after the GS policy

- **California Pollution Relocation**

- Before China's GS policy

Waste tend to relocate to **minority communities**

- After China's GS policy

Inflows increased more for **nearby lower-income white communities**

- Potential mechanism

After GS policy shock, pollution relocated more to lower land cost but higher political costs communities

Thank you

Questions?

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Should We Recycle?

- So, Should We Recycle? July 12, 2019
- Waste Land September 11, 2020
Won duPont-Columbia Award
- Is Recycling Worth It Anymore? People On The Front Lines Say Maybe Not. April 21, 2021
"The Litter Myth"



Accepted Recyclables

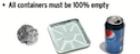
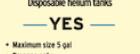
Glenwood Recycling Poster

All Materials Are Collected Separately - Follow The YES/NO Instructions
 Fall 2015 • For questions about recycling call: 541-682-4339 or 541-682-4120

Office Paper YES  NO <ul style="list-style-type: none">Plastic or plastic coated paperRecycle items below in "Mixed Paper" binFluorescent or bright colored paperCatalogs & Magazines	Cans & Foil Tin/Steel Cans/Aluminum YES  NO <ul style="list-style-type: none">Rinse lids on or off. Labels okayPressurized container must be 100% emptyDirty containersAluminized plastic bags	Aseptic Beverage & Soup Boxes Paper Milk Cartons YES  NO <ul style="list-style-type: none">Frozen food cartonsBeverage pouchesAluminized plastic bags	Milk Jugs "Natural" HDPE bottles / jugs ("NATURAL" = SEE-THROUGH) YES  NO <ul style="list-style-type: none">Containers smaller than a tennis ballSolid white jugs(Place these in "Mixed plastic")
Mixed Paper YES  NO <ul style="list-style-type: none">FOOD PAPERS of any kind:<ul style="list-style-type: none">Plates, cups, napkins, to-go or frozen food boxesTissue, diapers, or paper towels	Newspaper YES  NO <ul style="list-style-type: none">Plastic containers or bagsNon-recyclable samples or promotionsBrown paper bags	Corrugated Cardboard & Brown Paper Bags YES  NO <ul style="list-style-type: none">Other paper boards & packing materialWaxed cardboardDirty pizza boxes	Plastic Bottles, Tubs & Jugs YES  NO <ul style="list-style-type: none">StyrofoamContainers smaller than a tennis ballCompostable (87 PLA)Lids (place in separate container provided)Other shapes
Glass Jars & Bottles YES  NO <ul style="list-style-type: none">Window glassDrinking glassLight bulbsPyrex	Household Batteries YES  NO <ul style="list-style-type: none">Alkaline batteries made after 1996 (sizes AAA-D-O to toss in garbage)Commercial or Industrial batteries	Auto Batteries All types & sizes of auto & other lead-acid batteries YES  NO <ul style="list-style-type: none">Alkaline batteries made after 1996 (sizes AAA-D-O to toss in garbage)Commercial or Industrial batteries	Plastic Bags & Sheeting YES  NO <ul style="list-style-type: none">Trash bags, black bagsBubble wrap, air bubble packs (unless ALL air is removed)

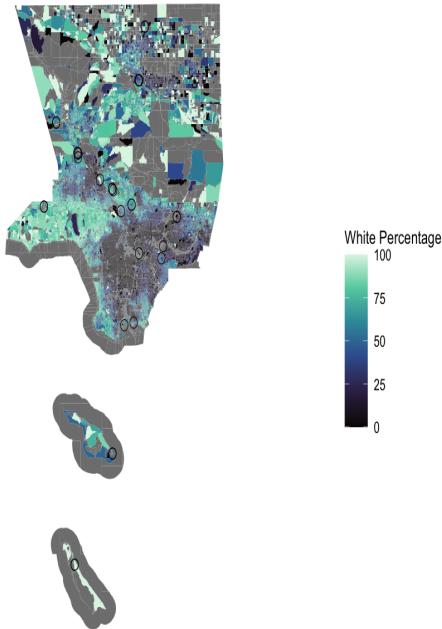
Glenwood Recycling Instructions — Fall 2021

All materials are collected separately. Follow these instructions.

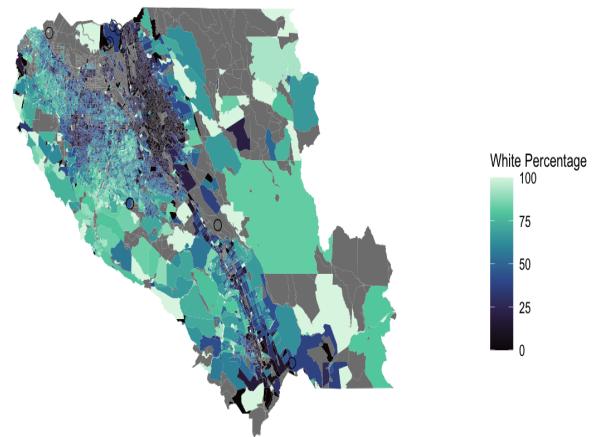
Aluminum YES  NO <ul style="list-style-type: none">Dirty materialsShiny or flexible plastic pouches	Antifreeze Place on cart YES  NO <ul style="list-style-type: none">Household onlyStore in unbreakable containers with secure lidMaximum 15 gallons per dayOriginal containers are NOT recyclableCommercial or farm	Auto Batteries All types & sizes of auto & other lead-acid batteries YES  NO <ul style="list-style-type: none">Household OnlyMaximum 10 bulbs	Corrugated Cardboard & Brown Paper Bags YES  NO <ul style="list-style-type: none">Mixed cardboardPackaging materialPizza boxes
Appliances Freon containing YES  NO <ul style="list-style-type: none">Commercial units	Electronic Waste YES  NO <ul style="list-style-type: none">Household OnlyMaximum 7 items per visitTVs, computer monitors & CPUsPrinters, keyboards, printers, miceStereos, VCRs, DVDs, cell phones	Fluorescent Lamps YES  NO <ul style="list-style-type: none">Incandescent bulbsBroken bulbsLamps taped together	Glass Jars & Bottles YES  NO <ul style="list-style-type: none">Drinking glassPyrexWindow glassLightbulbsBroken glass
Propane Tanks & Disposable Helium tanks YES  NO <ul style="list-style-type: none">Maximum size 5 galPropane only1lb camping-freeOther compressed gas cylinders	Household Batteries YES  NO <ul style="list-style-type: none">All button, rechargeable & air-cadAll Lithium, silver oxide & mercury batteriesAlkaline batteries made after 1996 (sizes AAA-D-O to toss in garbage)Commercial or Industrial batteries	Milk Jugs & other HDPE # 2 bottles / jugs (no color) YES  NO <ul style="list-style-type: none">Other HDPE # 2 bottles / jugs (no color)Solid white jugs	Mixed Paper YES  NO <ul style="list-style-type: none">Plates, cups, napkinsFrozen food boxes or to-go or boxesTissue, diapers, or paper towels

Appendix: Racial variation

Los Angeles County



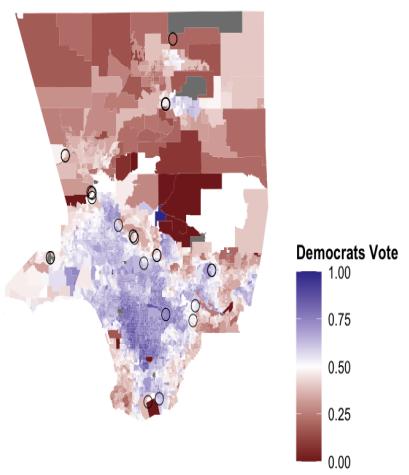
Santa Clara County



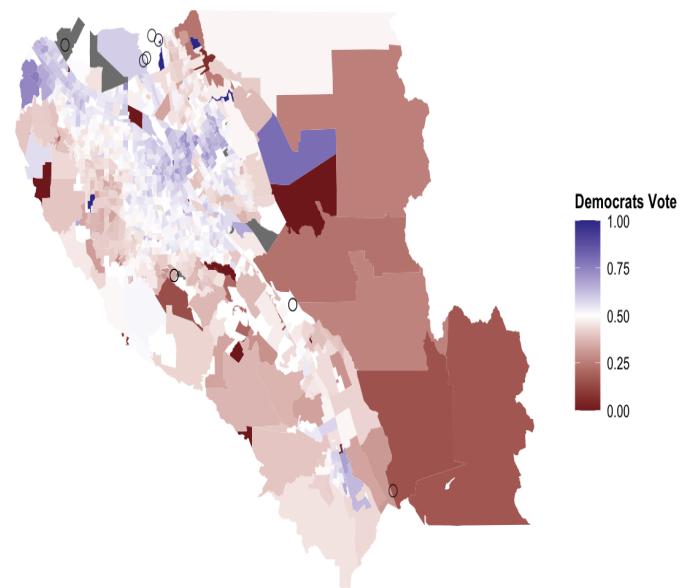
Racial variation within the county

Appendix: Voting variation

Los Angeles County



Santa Clara County



Voting variation within the county