Living near Trash: Testing Residential Mobility in the Context of Solid Waste Disposal*

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PRELIMINARY AND INCOMPLETE

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Abstract

Forming sound environmental justice policy involves understanding whether the correlation between race and environmental bads results from the disproportionate siting of locally unwanted land uses or nuisance-driven residential mobility. This paper presents evidence of residential sorting in the context of municipal solid waste disposal facilities, using a difference-in-difference strategy. Specifically, I compare changes in population after an opening (and closing) of a trash site between blocks within one mile to faraway blocks. Results show a 11 percent decrease in white population and a 44 percent increase in Hispanic population in a block after a trash site opened within one mile. Closing the site does not change white population immediately while inducing a 11 percent fall in Hispanic population, relative to the period during which the site was operating.

Keywords: Environmental justice; Residential mobility; Solid waste

JEL Classification: Q53; Q56; R23

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1 Introduction

Environmental justice (EJ) has long been considered important in the agenda of the U.S. Environmental Protection Agency since the 1994 Executive Order of President Bill Clinton.[1] Evidences of environmental injustice are first formally shown by the U.S. General Accounting Office (1983) and United Church of Christ's Commission on Racial Justice (1987) (UCC). They report the disproportionate distribution of facilities for treatment, storage, and disposal of hazardous waste (TSDFs) among demographic groups by race/ethnicity, and income.[2] Two decades later, the revised report by UCC (Bullard et al., 2007) showed that the disparity is still an issue: African American and Hispanic residents occupied 43.7% of residents within one kilometer (0.6 mile) of a hazardous waste facility, while just 19% outside of a 5-km buffer. Given the persistence of the disparity, researchers have continued to unravel the explanations for the correlations between race, ethnicity, and hazards. Some studies argue that environmental inequality emerges because environmental hazards are disproportionately sited in minority neighborhoods. Others show that environmental injustice may develop and persist, since minority residents are more likely to move into areas containing hazards. Such evidence of residential mobility is important, because it suggests that some EJ policies (e.g. Superfund remediation) may not help the households that were originally exposed to the environmental hazards, but instead benefit the richer households that migrate into the area (Sieg et al., 2004).

This paper tests the residential sorting hypothesis using a panel data of block-level demographics. Using a difference-in-difference model, I identify the impact of entry and exit of municipal solid waste (MSW) facilities on population of each demographic groups in affected communities. Specifically, I compare the population change after an opening/closing of the site between affected blocks that contain a facility within one mile and faraway blocks, after controlling for time-invariant characteristics of blocks and year fixed effects. The identification assumption is that the demographic trends between blocks within a block group are likely to be similar apart from their proximity to an entry (or exit).

I find evidence of migration correlated with openings and closings of MSW facilities at a block. Opening leads to white exit of about 11 percent and Hispanic move-ins of 44 percent. Closing the site would not induce white mobility but a significant fall of 11 percent in Hispanic population, relative to the operating period. In fact, relative to the period before the site were opened, closing induces white exit of about 13 percent and Hispanic move-ins of 32 percent.

There are several factors that contribute to the migration resulted from openings and closings of waste facilities. The first is green preference or willingness to avoid pollution of residents in the neighborhoods of facilities. The second is job preference. Economic activities of MSW facilities may create job opportunities. With a weak green preference, one may prefer to move in the MSW neighborhood because of a job offer. The third is credit constraints. Closing an MSW facility may

[1]See the details of the EPA's "Plan EJ 2020" at www.epa.gov/environmentaljustice/about-ej-2020

[2]UCC reported the percentage minority population in zip code areas with an operating hazardous waste facility, on average, was twice as great as in areas that did not contain a site.

gentrify its neighborhood, resulting an increase in housing values. This will induce out-migration of people who have credit constraints and cannot afford high costs of living.

While this paper does not disentangle the effects of those above channels, it presents evidence of their effects. Specifically, I show that closing an MSW facility does not gentrify its neighborhood toward white taste but destroy job opportunities for Hispanic residents. I exploit the closing events that resulted from the 1992 Resource Conservation and Recovery Act (RCRA) to decompose the effect of closings into the effect of closings started in 1992–1996 and the effect of closings that began after 1996. The results show that closures of MSW facilities under the 1992 RCRA resulted in much higher white exit than post-1997 closures. The reason is because the closed sites during 1992–1996 were heavily polluted. Closures of MSW facilities under 1992 RCRA did not receive any special treatment, contrasting to sites under the Superfund program that received special cleanup. MSW facilities were forced to close because they did not meet new environmental regulations, such as requirements to install methane and water monitoring. On the other hand, post-1997 closures, which resulted from the downturns in the operation of a facility, led to a larger job loss, resulting in significant move-outs of Hispanic residents, relative to the move-ins during the operating period of trash sites.

Evidence of non-gentrification and job loss effects of MSW site closures is also implied by the results that show decreases in median household income and median housing values in the site neighborhoods. Specifically, closing an MSW site led to 6.7 percent fall in median household income and 3.6 percent fall in median housing values in 1-mile nearby blocks, relative to the period during which the site was operating.

The paper builds upon studies of residential sorting in response to changes in an environmental amenity, by Banzhaf and Walsh (2008), and Gamper-Rabindran and Timmins (2011). Banzhaf and Walsh (2008) predict increased population density in neighborhoods that experience exogenous improvements in air quality, suggesting that households vote with their feet for environmental quality. Gamper-Rabindran and Timmins (2011) present evidence of residential sorting after Superfund remediation programs. Their method is less prone to the endogeneity problems than Banzhaf and Walsh (2008)'s method because they exploit the risk assessment under the Superfund program to compare neighborhoods of similar-risk toxic sites that received cleanup treatment to those that did not. My paper exploits the spatial and temporal variations in the openings and closings of MSW facilities to compare the change in population after these events between nearby blocks within 1 mile of the sites and faraway blocks beyond 1 mile.

In addition to studies on residential sorting, the literature discusses the evidence of neighborhood gentrification and the effects of environmental bads on human health. Currie et al. (2015) also exploit the spatial variation and temporal variation in openings and closings of industrial plants to study their effects on housing values and infant's health. Davis (2011) study the effects of operating power plants on local housing values and rents. Greenstone and Gallagher (2008), and Gamper-Rabindran and

Timmins (2013) document the effects of Superfund cleanups on housing values.

Those papers and the literature on environmental justice have studied the distribution of industrial plants in the toxic release inventory database and the distribution of treatment, storage, and disposal facilities for hazardous waste. I, on the other hand, focus on the impacts of municipal solid waste facilities. This is important because closure of an MSW facility does not necessarily lead to in-migration. A closed MSW facility stops receiving trash, but it does not receive any special treatment. Hence, the closed facility must have both accumulated pollution over its operating period and the loss of jobs opportunities, thereby inducing move-outs in local communities.

2 Data

2.1 Facility Data

MSW facility data come from surveys by an industry survey company. The data survey quarterly volume and price by facility from 1992 to 2016. I focus on the list from January 1992 to December 2010 that contain a facility that ever operated in this period. The status of operating versus closing are based on annual price value rather than volume value. Specifically, a facility is considered "operating" if it has a positive price value. Yet, a few facilities continued receiving a small amount of trash for a few years after its price was zero. There are three facilities that re-opened after closing for some years. Since those closing periods were less than five years, I assume these facilities were active. I do not observe the facilities that closed before 1992.

Figure (1) shows the number of sites by type during the period 1992–2010. Most opening sites are transfer stations and composting sites; only four opening sites are landfills. By contrast, most closing sites are landfills and demolition landfills. While most openings happened in 1995–1996, most closings appear to continuously happen during 1990s. Figure (2) shows the map of closings and openings in California between 1992 and 2000.

2.2 Demographic Data

Residency data come from aggregate data at the block level from the decennial census (accessed via IPUMS NHGIS) for three years, 1990, 2000, and 2010. These data are available publicly and at the smallest geographic unit the Census Bureau uses. Information at the block level includes total population, race, ethnicity, gender, age, number of house units, occupied houses, occupied-by-owner houses, number of householders by race and ethnicity. Some economic variables are available only at the block group level, such as education, median household income, median housing value, median gross rent, housing occupancy, housing tenure, population below poverty, household receiving public assistance income, household receiving social security income. For these block-group variables, I assign count variables to block values based on population shares.

Because US Census Bureau redesign census units from 1990 to 2010, I construct the panel of block by year for years 1990, 2000, and 2010 by fixing the 2010 blocks and calculating the 1990 and 2000 information for these blocks using NHGIS crosswalks. NHGIS crosswalks are similar to the US Census Bureau relationship files, but NHGIS crosswalks provide interpolation weights to support the allocation of summary data from 2000 blocks to a 2010 block. Each interpolation weight identifies approximately what portion of the 2000 block's population and housing units were located in its intersection with a 2010 block. So, for each 2000 block, a share of each demographic count is assigned to a 2010 block based on the interpolation weight.

I drop blocks that do not have any land areas. Due to missing values of demographic characteristics for 1990 blocks, the final sample of block by year include $565,468$ block observations in 1990 and $691,487$ observations in each of 2000 and 2010. Table (1) reports summary statistics of the characteristics of these blocks by year.

To examine the change in residency due to exposure to a nearby MSW facility, I define the exposure status of a block based on the distance from the block's geographic centroid to the nearest facility. The literature has suggested radii from one to three miles for TSDFs and toxic plants to capture the local effects of environmental hazards. In this paper, I use one mile as the base line, and conduct sensitivity checks for larger distances such as two miles and three miles. Using the status of MSW facilities, I can define the exposure status of blocks *at a point in time*. For example, an "active" block is the block that is near to an active facility; a "closed" block is the block that is near to a closed facility. Because the one-mile buffer of a block may include several facilities, a "mixed" block is the block that is near to an active facility and also to a closed facility. To ensure the mutual exclusivity of these categories, an "active" block is, hence, the block that is near to *only* active facilities. Similarly, a "closed" block is the block that is near to only closed facilities.

To estimate effects of openings and closings of MSW facilities, comparing a block that contains a facility to a block that does not requires that these blocks must be similar in unobserved characteristics that could determine residential mobility. Rather than relying on similarity of levels, my approach uses difference-in-difference strategy. This strategy relies on the assumption that trends in the unobserved determinants of residential mobility are evolving similarly.

3 Evidence of Residential Sorting Using Panel Data

Given the panel data of blocks in three time periods, 1990, 2000, and 2010, and different timing of openings and closings of MSW facilities, my difference-in-difference strategy exploits the variation in geographical and temporal exposure to a facility. Specifically, I compare the change in block outcome after an opening/closing of a facility in exposed blocks, relative to unexposed blocks. Formally, the regression model is:

$$Y_{bt} = \alpha_1 \mathbf{1}[\text{Active}]_{bt} + \alpha_2 \mathbf{1}[\text{Closed}]_{bt} + \alpha_3 \mathbf{1}[\text{Mixed}]_{bt} + \eta_b + \tilde{\eta}_t + \epsilon_{bt} \tag{1}$$

where Y_{bt} is the resident level (by race and ethnicity) of block b in year t. Indicator $\mathbf{1}[\text{Active}]_b$ equals 1 if block b contains only active facilities within its one mile buffer of its centroid in year t. Indicator $\mathbf{1}[\text{Closed}]_{bt}$ equals 1 if block b contains only closed facilities within its one mile buffer of its centroid in year t. Indicator $\mathbf{1}[\text{Mixed}]_{bt}$ equals 1 if block b contains an active facility and another closed facility within its one mile buffer of its centroid in year t. The left-out category is blocks with no facility at all, within one mile.

The regression includes block fixed effects η_b to control for all time-invariant determinants of residency in a block, and year fixed effects $\tilde{\eta}_t$ to control for factors that are common across blocks in the same year. The inclusion of these fixed effects ensures that identification comes from facility openings and closings. The year fixed effects are also important since they provide model flexibility to capture the fact that different blocks may be exposed to an operating facility at different times. The standard errors are clustered by tract to allow each tract to have different economic and demographic structure, and blocks within the tract to share similar activities. An alternative is to cluster by block group. However, even block groups may be small units and share similar economic conditions within a tract. Additionally, facilities may locate on block and block group borders, which makes clustering by tract more appropriate. Of course, one can also cluster by adjacent group of block groups and/or adjacent group of tracts to fully account for spatial correlation resulted from near-border facility siting.

The parameters of interest are α_1 and α_2, which measure the effects of openings and closings of MSW facilities, relative to the period before opening, respectively. Specifically, parameter α_1 measures the effect on population level in nearby blocks, relative to faraway blocks, during the period that the facility is operating, relative to the period before it opened. Parameter α_2 measures the effect on population level in nearby blocks, relative to faraway blocks, during the period that the facility is closing, relative to the period before it opened. Variable $\mathbf{1}[\text{Mixed}]_{bt}$ is mainly to control for blocks that have multiple facilities and that have an active facility and a closing facility. Parameter α_3 is not the main interest, although it captures the effect of having both an active facility and a closing facility relative to the period before operating.

To test the effect of closing relative to the operating period, I use the following regression:

$$Y_{bt} = \beta_1 \mathbf{1}[\text{Near}]_{bt} + \beta_2 \mathbf{1}[\text{Closed}]_{bt} + \eta_b + \tilde{\eta}_t + \epsilon_{bt} \tag{2}$$

where $\mathbf{1}[\text{Near}]_{bt}$ equals 1 if block b contains any facility, either closing or opening, within its one mile buffer of its centroid in year t. The parameter of interest is β_2, which measure the effect of closing relative to operating period. Parameter β_1 measures the effect of openings, which is in fact equal to

α_1.

There are several channels for the effects of closing an MSW facility. To relate the effects of closings to causes by pollution versus job loss, I decompose the effect of closings into the effect of closings due to environmental regulation and the effect of closings due to economic condition and the operation of a facility itself. Specifically, I decompose the effect of closings into the effect of closings that began in 1992–1996 and the effect of closings that began afterward. Due to the 1992 RCRA regulation, the closings happening during 1992–1996 should have resulted from the strict regulation, while the closures started from 1997 should be accounted by the operation process of facilities. This pattern can be supported in figure (1), which shows a sharp increase in closures from 1992 to 1996 and a jump in openings of transfer stations (which were not subject to RCRA regulation).

I hypothesize that closings resulting from environmental regulation would affect population by pollution channels. Sites that are forced to close by regulation are more heavily polluted than other sites, and hence induce more out-migration. Although one may argue that sites that are forced to close by regulation would receive environmental remediation and hence attract new move-ins, this is not likely the case for MSW facilities. Closures of MSW facilities under 1992 RCRA did not receive any special treatment from the Superfund program for hazardous waste sites. MSW facilities were forced to close under 1992 RCRA because these sites did not meet new environmental regulations such as installing methane and water monitoring. Hence, closed sites under 1992 RCRA are likely to irritate their neighborhoods more than other sites. This would result in greater out-migration at these sites for those who have high preferences to avoid living near a trash site. On the other hand, closures resulted from the downturn operation of a facility are highly associated with large job loss. As a result, there would be exits for those who had preferences to move into neighborhoods of trash sites for employment.

The control group I have used so far is the group of blocks beyond one mile from the facility location. If there is any impact on neighborhoods within two miles, for example, this would result in bias against my findings using one-mile neighborhoods. To explore the effects of openings and closings by distance to the environmental bads, I use the following regression:

$$\begin{aligned} Y_{bt} = &\sum_{d=1}^{6} \delta_d \mathbf{1}[\text{Active from } (d-1) \text{ to } d \text{ miles}]_{bt} \\ &+ \sum_{d=1}^{6} \gamma_d \mathbf{1}[\text{Closed from } (d-1) \text{ to } d \text{ miles}]_{bt} \\ &+ \sum_{d=1}^{6} \omega_d \mathbf{1}[\text{Mixed from } (d-1) \text{ to } d \text{ miles}]_{bt} + \eta_b + \tilde{\eta}_t + \epsilon_{bt} \end{aligned} \tag{3}$$

where $\mathbf{1}[\text{Active from } (d-1) \text{ to } d \text{ miles}]_{bt}$ equals 1 if the distance from the centroid of block b to the nearest active facility is between $(d-1)$ miles to d miles and there is no closed facility in that range.

Indicator $\mathbf{1}[\text{Closed from } (d-1) \text{ to } d \text{ miles}]_{bt}$ equals 1 if the distance from the centroid of block b to the nearest closed facility is between $(d-1)$ miles to d miles and there is no active facility in that range. Indicator $\mathbf{1}[\text{Mixed from } (d-1) \text{ to } d \text{ miles}]_{bt}$ equals 1 if the distances from the centroid of block b to the nearest active facility and the nearest closed facility are between $(d-1)$ miles to d miles. Parameters of interest are δs and γs, which measure the effects of opening and closing of a trash facility by distance, relative to the areas beyond 6 miles, respectively.

Before turning to the results, I consider some of potential limitations associated with the data and the empirical design. First, I do not have information on closings that happened before 1992. The control group in my analysis potentially include blocks that have closed facilities that I did not observe. This information missing, however, is not a problem because it would create bias against my findings. Second, I do not have more frequent data on population by year to distinguish the short-run and long-run effects of openings and closings and do event analysis. Missing yearly data also prevents me from conducting a parallel trend test (to test the identification assumption of difference-in-difference model) and Granger causality test (to test whether causes happen before consequences and not vice versa). Third, I do not have additional regressors to control for time variant characteristics. Conventional methods would use block characteristics before 1990, interacted with a time trend, to control for block-by-time specific characteristics. However, the Census Bureau completely redesigned census geography with the 1990 Census, and nothing comparable between 1980 blocks and 1990 blocks. Our results, however, show that block fixed effects and year fixed effects already do a good job in explaining the block population, evident by high values of R squared.

4 Results

Table (2) reports estimates for the effects of openings and closings on residency by race and ethnicity. Panel A shows the effects on population. Panel B shows the effects on number of households by race and ethnicity of householder. The estimates are the coefficients of regression model (1), columns (1)–(4), and model (2), columns (5)–(8). I estimate these models on a unbalanced panel of block-by-year observations for years 1990, 2000, and 2010. The panel is unbalanced due to missing values of some blocks in 1990.

The estimates in panel A show that an operating MSW facility within one mile is associated with significant decreases in white population and black population, but a significant increase in Hispanic residents. Using the block mean population in 1990, this implies a decrease of 11 percent in the white population, a decrease of 32 percent in black population, and an increase of 44 percent in Hispanic population in a block. Closures of MSW facility result in a further significant decrease of 14 percent in black population, and a significant fall of 11 percent in Hispanic population, relative to operating period.

Results in panel B show effects of openings and closings on the number of households that are consistent with results in panel A. Specifically, using the block mean household in 1990, an opening of an MSW facility within one mile is associated with a 13 percent decrease in white-head households, a 26 percent decrease in black-head households, and a 39 percent in Hispanic-head households. Relative to the operating period, closings result in a further 3 percent decrease in white-head households, a 10 percent in black-head household, but a 24 percent increase in Asian-head households, and negligible effect on Hispanic households.

These estimates suggest a significant pattern of white and black exits and Hispanic move-ins in neighborhoods of operating MSW facilities. The white exit can be explained by two reasons. First, white residents may have higher willingness to avoid unpleasant surroundings of trash sites. Second, white residents may have more resources to move away from the sites than Hispanic residents. Meanwhile, Hispanic residents may find job opportunities in neighborhoods of operating MSW facilities to move in. Alternatively, Hispanic people may find affordable housing and living options in these affected areas due to income constraints.

The negative effects of closing, relative to operating period, on all three racial groups suggest that closing sites may be more heavily polluted than operating sites or destroy job opportunities. Although time-variant characteristics are not controlled in the regressions, several important determinants of block residency have been controlled by block fixed effects and year fixed effects. High values of adjusted R squared helps increase our confidence in the validity of the estimates.

To relate the effects of closings to reasons of pollution and job loss, I decompose the effect of closings into the effect of closings due to environmental regulation and the effect of closings as an organization and operation process of a facility. Specifically, table (3) decomposes the effect of closings into the effect of closings happening since 1992–1996 (due to RCRA regulation) and the effect of closings from 1997 (due to volunteer operation process of facilities). The estimates show that regulation-forced closures result in much bigger exit by white residents and bigger move-ins by Hispanic people. This verifies the conjecture that sites that are forced to close by regulation are more heavily polluted than operating sites, resulting bigger exit by white residents. On the other hand, closures resulted from the downturn operation of a facility lead to larger job loss, resulting in significant move-outs of those Hispanic residents that had moved in during the operating period of trash sites.

I also examine the effects of openings and closings on other outcomes. Since these variables are interpolated from block group levels, the estimates are much less robust than the effects on residency level. Table (4) in the appendix reports the effects on median household income, median housing values, and median gross rent. Four interesting facts emerge. First, neighborhoods of MSW facilities earn less than faraway areas. Second, neighborhoods of closed facilities earn much less. This suggests that closures of MSW facilities result in job loss for their neighborhoods. Third, neighborhoods of closed facilities have much lower value after closure than during the operating period before the facility closed. This verifies the above conjecture that a closed facility is associated with high pollution level, and that closing does not remedy the environmental hazards, at least for the 10-year period.

Additionally, the low housing values after closures suggest that facilities do not close because of high land costs, if closing decisions reflect expected future costs. Fourth, post-1997 closures are associated with higher decrease in income and house values, which again suggests these closures are highly likely to destroy jobs.

In all regressions the comparison group is blocks that do not contain any facilities within one mile from the blocks' centroids. To examine the sensitivity of the results on the definition of affected communities, I explore the spatial effects of openings and closings by distance to hazards. Examining the effects of facility operation in distance is helpful because channels of unwanted elements from MSW facilities such as smells, toxic emissions, water pollution have geographical affects, and dwindle in distance. Figure (3) plots the coefficients δ's, γs and their 95th percentile confidence intervals. It shows the marginal effect of an operating facility on resident level with respect to distance to the nearest MSW facility. Overall, the marginal effect of an opening of a trash site fades with distance. Point estimates for the effects of white exit and Hispanic move-ins are significant for blocks within 4 miles of an opening of a trash site and fade away beyond 4 miles. Closing a trash site does not result in a significant improvement of amenities to recover to the period before opening. Since trash is cumulated into a site over time, closure reflects an end after many years of operations. Hence, we can see residential mobility due to an opening of a trash site has spread into larger areas surrounding the site. The Hispanic move-ins and the white exit patterns are still highest in the nearest neighborhoods of the sites.

Tables (**??**) and (**??**) in the appendix reestimate the effects of opening and closing in 2-mile neighborhoods and 3-mile neighborhoods, respectively. Results confirm smaller effects in extended neighborhoods than the 1-mile neighborhoods.

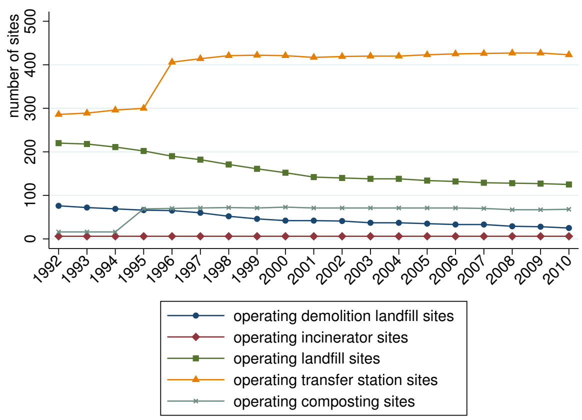
5 Conclusion

This paper presents evidence of residential mobility in the surroundings of MSW facilities. Opening a trash site induces a significant decrease in white residents, but an increase in Hispanic residents in 1-mile nearby blocks. While the literature has documented sizable in-migration after Superfund cleanup (18 percent increase in population density, Gamper-Rabindran and Timmins (2011)) or reduced exposure to TRI pollution (5–7 percent increase in population, Banzhaf and Walsh (2008)), this paper shows that there is no significant in-migration after closing an MSW facility. Closure, however, results in out-migration. A reason is that waste has been accumulated over time into a site. A closed MSW facility only stops receiving trash, but it does not receive any special treatment. The closed facility must have accumulated pollution over its operating periods, and hence induce a higher white exit and a larger area of affection by distance. Closure also reduces Hispanic move-ins considerably due to job destructions.

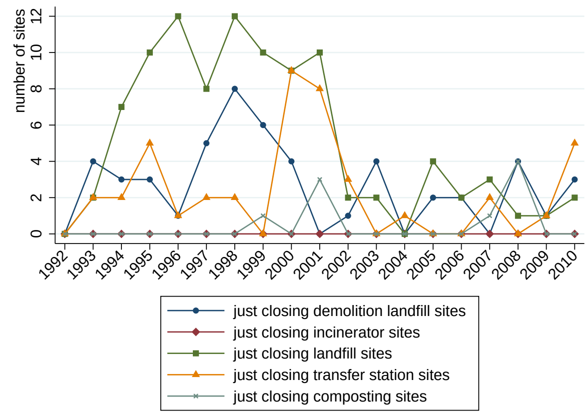
Figures and Tables

FIGURE 1: Overview of municipal solid waste facilities in CA from Jan 1992 to Dec 2010

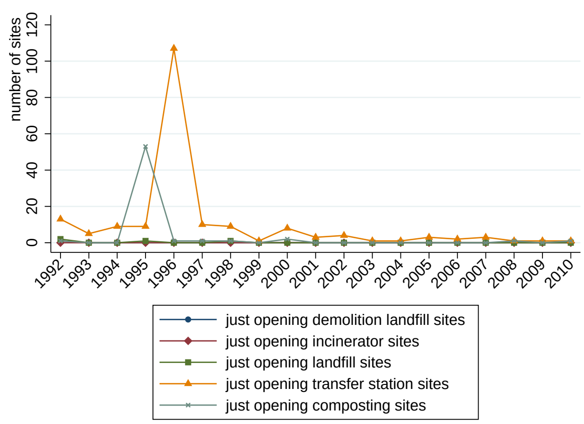
(A) Number of operating sites



(B) Number of new closings



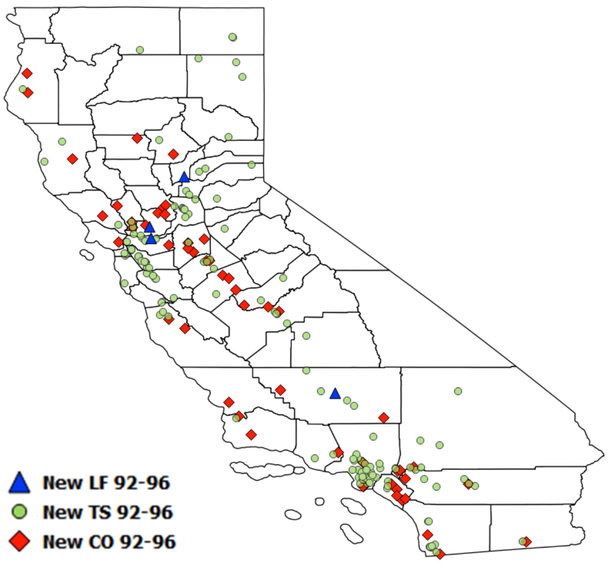
(C) Number of new openings



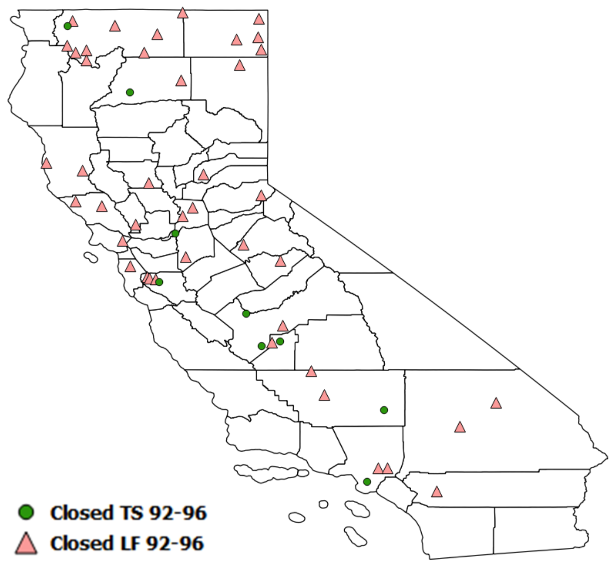
Note: The graph shows the number of MSW sites by type and year. Operating sites are active sites that have positive price values. New closings refer to sites that have just closed in that year. New openings refer to sites that have just opened in that year. Demolition landfills are basically landfills that accept construction and demolition waste.

FIGURE 2: Map of new openings and closings of MSW facilities in CA from Jan 1992 to Dec 2010

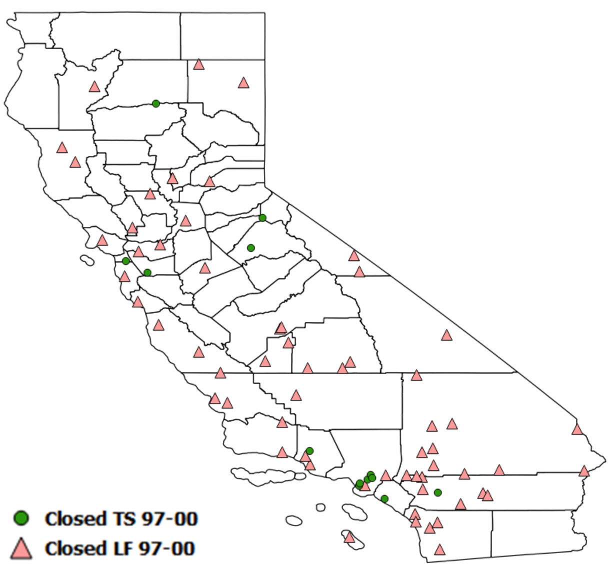
(A) New openings during 1992–1996



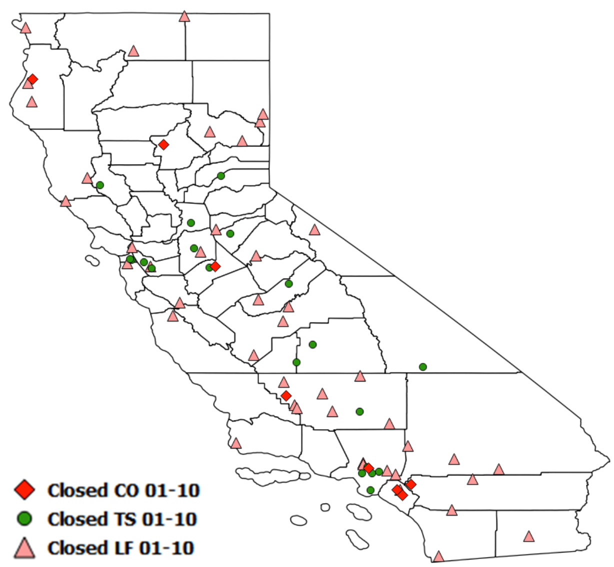
(B) New closings during 1992–1996



(C) New closings during 1997–2000



(D) New closings during 2001–2010

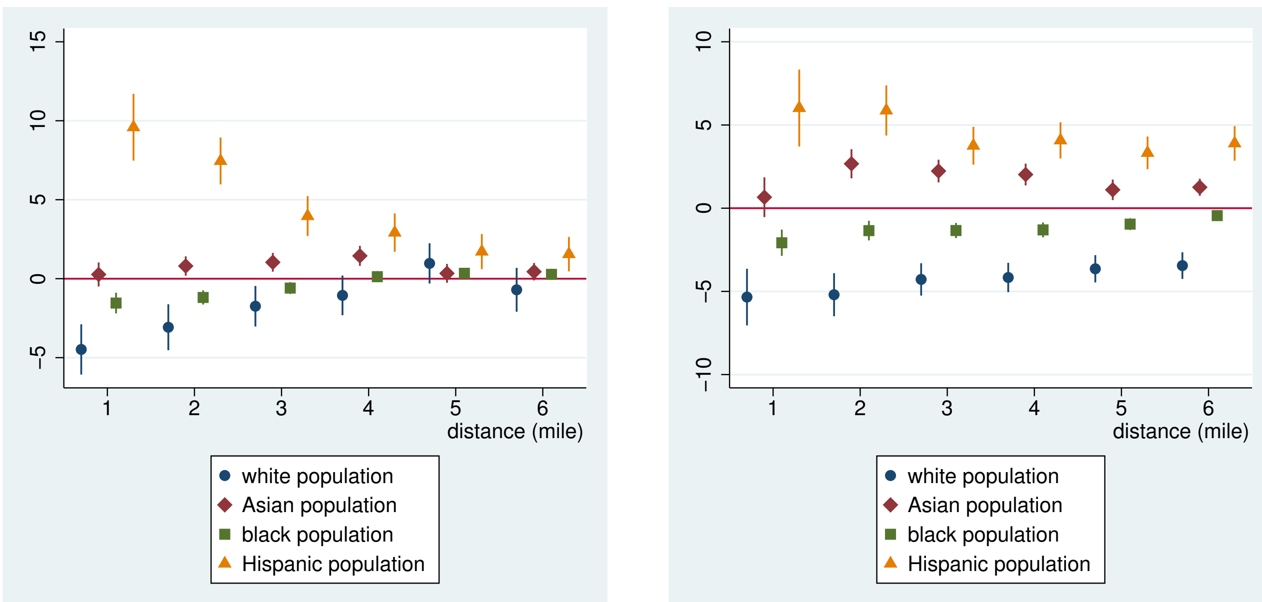


Note: The graph shows the locations of new openings and new closings of MSW facilities in California from January 1992 to December 2010. MSW facilities are divided into three categories: LF, TS, and CO. LF denotes a landfill that includes an MSW landfill, an incinerator, or a demolition site. TS implies a transfer station that includes a transfer station or a material recovery site. CO implies a composting site.

FIGURE 3: The effects of openings and closings on population by distance

(A) The effects of being near to an active facility

(B) The effects of being near to a closed facility



Note: The graph shows the effects of living near an opening and closing of an MSW facility by distance. The figures were constructed by regressing population level on indicators for the distances to the nearest opening/closing MSW site, and block and year fixed effects. Standard errors are clustered by tract. Reported are the coefficients and their 95% confidence intervals for the opening/closing events happening between $d-1$ miles and d miles to the block's centroid. These are the marginal effects on population level in the blocks that are near to an opening/closing site, relative to blocks that are beyond 6 miles away.

TABLE 1: Characteristics of blocks by year

	1990		2000		2010	
	count	percentage	count	percentage	mean	percentage
total blocks	565,468		691,487		691,487	
active blocks	42,805	7.57%	60,667	8.77%	52,432	7.58%
closed blocks	0	0%	10,148	1.47%	16,942	2.45%
mixed blocks	0	0%	3,686	0.01%	5,859	0.01%
	mean	sd	mean	sd	mean	sd
population	52.63	108.51	48.98	113.84	53.88	121.89
white	30.11	64.13	22.87	55.27	21.63	52.96
Asian	4.79	19.46	5.28	23.46	6.91	28.81
black	3.70	20.42	3.16	18.94	3.13	18.43
Hispanic	13.60	46.31	15.86	55.00	20.27	61.60
household	18.36	38.46	16.63	38.66	18.19	41.37
white household	12.37	28.08	9.69	24.58	9.41	23.80
Asian household	1.32	5.52	1.59	7.51	2.18	9.75
black household	1.28	6.74	1.12	6.07	1.17	5.93
Hispanic household	3.25	10.16	3.71	12.21	4.90	14.39
median household income	39425.17	30255.36	45437.47	29269.67	50424.88	26446.30
median housing value	52866.52	40570.41	46979.29	30262.88	39814.08	20881.26
median gross rent	642.63	443.18	715.51	436.88	850.18	421.48

Note: This table reports characteristics of blocks by year, after reassigning 1990 values and 2000 values to 2010 blocks, using NHGIS crosswalk links and weights. Year 1990 has a smaller number of blocks due to missing values.

TABLE 2: Effects of openings and closings of MSW facilities on 1-mile neighborhoods

	(1) white	(2) Asian	(3) black	(4) Hispanic	(5) white	(6) Asian	(7) black	(8) Hispanic
Panel A: Effects on resident population								
active	-3.328***	-0.352	-1.205***	5.959***				
	(0.610)	(0.347)	(0.324)	(0.888)				
closed	-3.977***	0.068	-1.737***	4.416***	-0.630	0.443	-0.531**	-1.518**
	(0.857)	(0.610)	(0.401)	(1.138)	(0.563)	(0.496)	(0.260)	(0.758)
mixed	-4.232***	-1.466**	-1.247***	4.800***				
	(1.118)	(0.637)	(0.438)	(1.334)				
near					-3.342***	-0.369	-1.206***	5.941***
					(0.612)	(0.347)	(0.324)	(0.888)
adj. R^2	0.841	0.745	0.743	0.823	0.841	0.745	0.743	0.823
Panel B: Effects on resident households								
active	-1.584***	-0.051	-0.329***	1.268***				
	(0.245)	(0.108)	(0.106)	(0.190)				
closed	-2.022***	0.256	-0.451***	0.994***	-0.428*	0.315*	-0.123*	-0.267
	(0.366)	(0.217)	(0.123)	(0.252)	(0.257)	(0.187)	(0.073)	(0.175)
mixed	-2.052***	-0.451**	-0.306**	0.963***				
	(0.419)	(0.184)	(0.140)	(0.290)				
near					-1.592***	-0.057	-0.328***	1.263***
					(0.246)	(0.108)	(0.106)	(0.190)
adj. R^2	0.883	0.742	0.864	0.852	0.883	0.742	0.864	0.852
N	1948442	1948442	1948442	1948442	1948442	1948442	1948442	1948442

Note: This table reports estimates for the effects of openings and closings on residency by race and ethnicity. Panel A shows the effects on population. Panel B shows the effects on number of households by race and ethnicity of householder. The estimates are the coefficients of regression models (1) and (2). I estimate these models on a unbalanced panel of block-by-year observations for years 1990, 2000, and 2010. The panel is unbalanced due to missing values of some blocks in 1990. All models include block and year fixed effects. Standard errors are clustered by tract.

TABLE 3: Effects of pre-1997 and post-1997 closings of MSW facilities on 1-mile neighborhoods

	(1) white	(2) Asian	(3) black	(4) Hispanic	(5) white	(6) Asian	(7) black	(8) Hispanic
active	-3.409***	-0.376	-1.194***	5.913***	-3.382***	-0.282	-1.201***	5.966***
	(0.610)	(0.349)	(0.322)	(0.885)	(0.610)	(0.345)	(0.324)	(0.889)
pre-1997 closed	-6.066***	1.952	-1.623***	4.530***	-6.036***	2.052	-1.630***	4.587***
	(1.175)	(1.370)	(0.522)	(1.559)	(1.176)	(1.379)	(0.523)	(1.568)
post-1997 closed	-3.479***	-0.731	-1.771***	4.289***	-3.454***	-0.645	-1.777***	4.338***
	(0.916)	(0.589)	(0.435)	(1.215)	(0.917)	(0.592)	(0.437)	(1.219)
multi-closed					3.584	12.207**	-0.933*	6.964
					(11.043)	(5.487)	(0.546)	(9.963)
mixed	-4.284***	-1.492**	-1.224***	4.723***	-4.231***	-1.312**	-1.238***	4.825***
	(1.106)	(0.627)	(0.435)	(1.318)	(1.127)	(0.654)	(0.440)	(1.345)
adj. R^2	0.841	0.745	0.743	0.823	0.841	0.745	0.743	0.823

Note: This table decompose the effect of closings into the effect of closings happening since 1992–1996 and the effect of closings from 1997. "Multi-closed" indicates multi-site blocks that contain a site that closed in pre-1997 period and a site that closed in post-1997 period. I estimate these models on a unbalanced panel of block-by-year observations for years 1990, 2000, and 2010. The panel is unbalanced due to missing values of some blocks in 1990. All models include block and year fixed effects. Standard errors are clustered by tract.

TABLE 4: Effects of openings and closings economic conditions of 1-mile neighborhoods

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	median household income			median housing value			median gross rent		
active	-4505.3***		-4403.5***	-2045.4***		-1935.2**	-69.5***		-68.5***
	(612.5)		(609.1)	(765.9)		(763.8)	(10.0)		(10.0)
closed	-7215.6***	-2646.6***		-3965.5***	-1925.1*		-84.6***	-13.4	
	(1112.4)	(886.4)		(1349.4)	(1067.5)		(17.6)	(13.7)	
mixed	-7507.0***		-7354.4***	-1811.8		-1674.1	-147.0***		-145.4***
	(1961.6)		(1950.4)	(1835.5)		(1821.6)	(24.6)		(24.5)
near		-4552.3***			-2041.7***			-70.7***	
		(619.2)			(772.1)			(10.1)	
pre-97 closed			-5750.3***			-1550.6			-87.7***
			(1744.0)			(1733.9)			(23.4)
post-97 closed			-7560.9***			-4606.1***			-81.4***
			(1236.1)			(1523.1)			(19.9)
adj. R^2	0.649	0.649	0.649	0.605	0.605	0.605	0.471	0.471	0.471

Note: This table reports estimates for the effects of openings and closings on median household income and housing values in blocks that contain an exposed facility within 1 miles from the blocks' centroids. I estimate these models on a unbalanced panel of block-by-year observations for years 1990, 2000, and 2010. The panel is unbalanced due to missing values of some blocks in 1990. All models include block and year fixed effects. Standard errors are clustered by tract.

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