

Can the Sharing Economy Reduce Waste?

Metropolitan Washington Council of Governments
Recycling Committee
June 1, 2017

Anders Fremstad
Assistant Professor
Economics Department
Colorado State University
anders.fremstad@colostate.edu

Material plenitude in the U.S.



“You wouldn’t believe what Americans throw away.”



The average drill in the US is supposedly used for 15 minutes in its entire lifetime.



Owning and operating a vehicle costs over \$8,000 a year, but the average car is used less than 4 percent of the time.



New homes have 1,050 sq. ft. per person, compared to 550 sq. ft. 40 years ago.

Stuff around the world



Source: Peter Menzel, 1995, *Material World*. Households and their possession from Mali, Mongolia, Samoa, Cuba, Japan, and the United States.

Variety of institutions for sharing goods



Carpools



Private clubs



Libraries



Rental companies

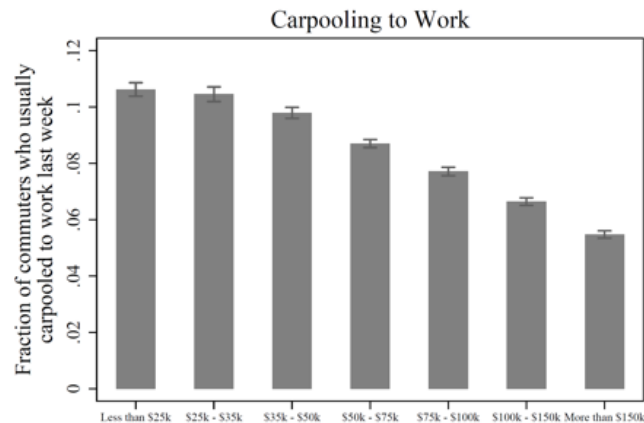


Thrift stores

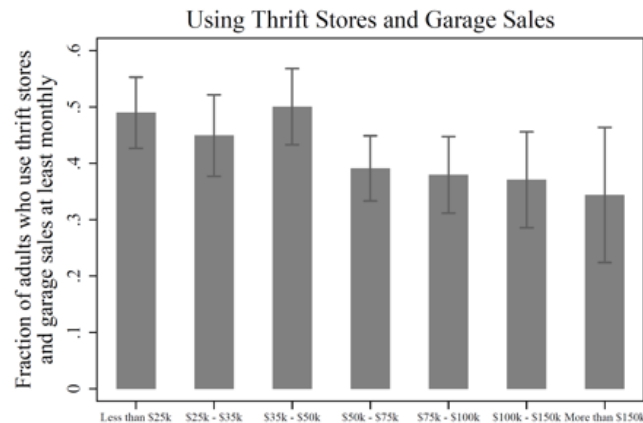


Garage sales

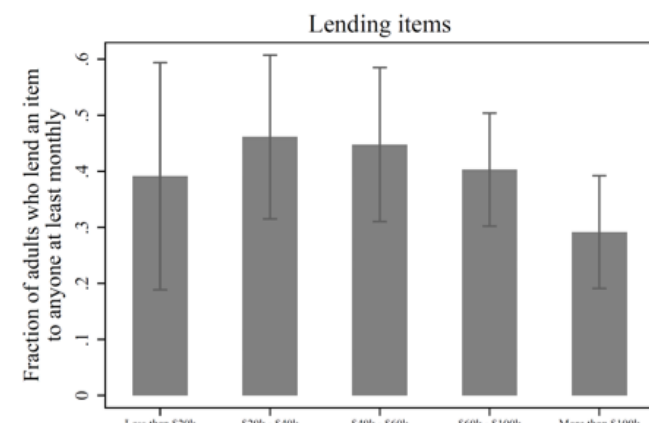
Traditional forms of sharing decline with income



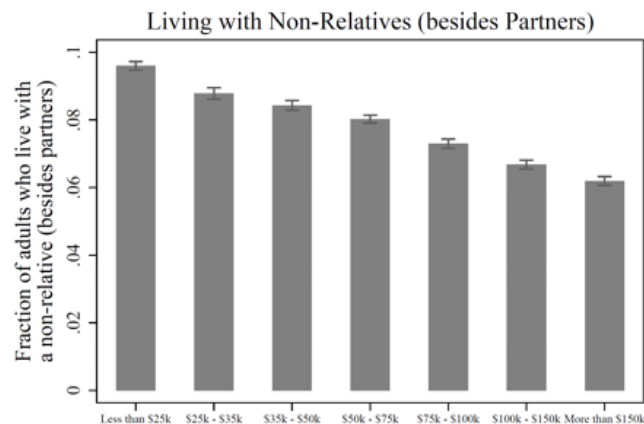
Source: American Community Survey, 2014



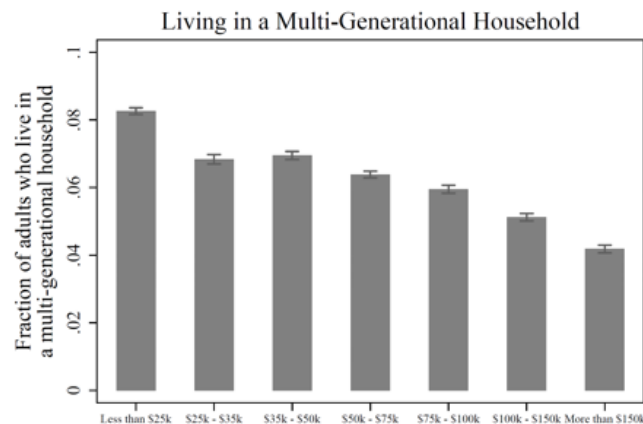
Source: Center for a New American Dream Poll, 2014.



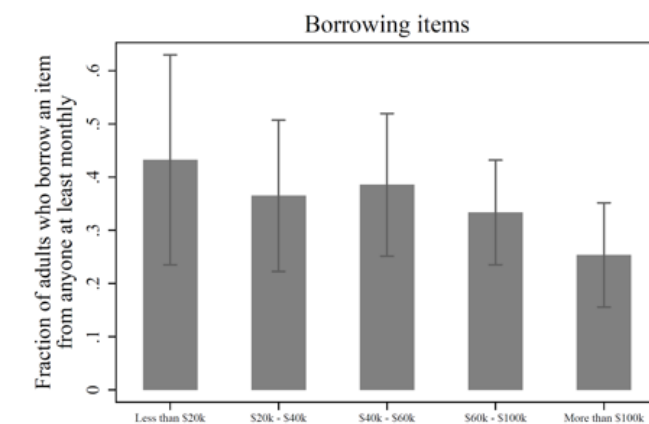
Source: Author's survey of NeighborGoods users, 2013



Source: American Community Survey, 2014



Source: American Community Survey, 2014



Source: Author's survey of NeighborGoods users, 2013

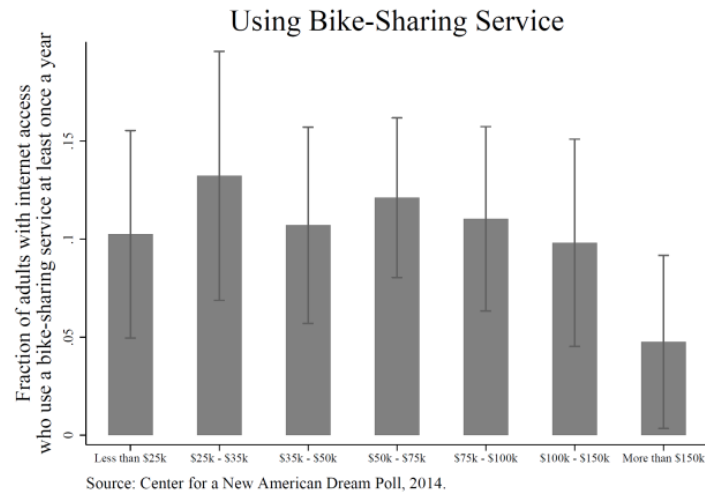
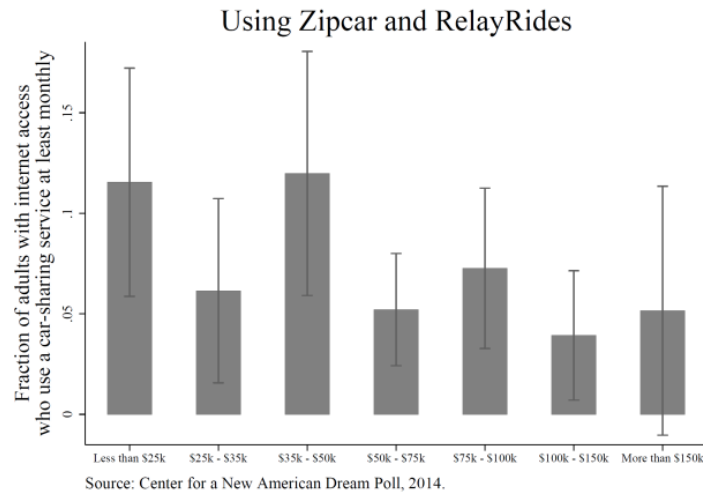
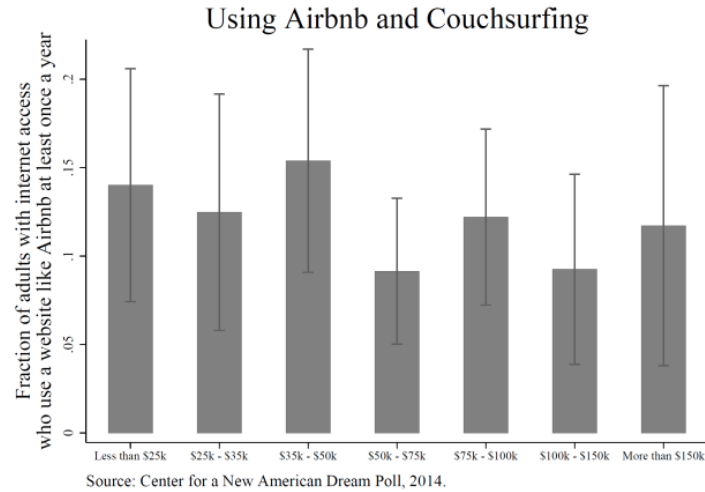
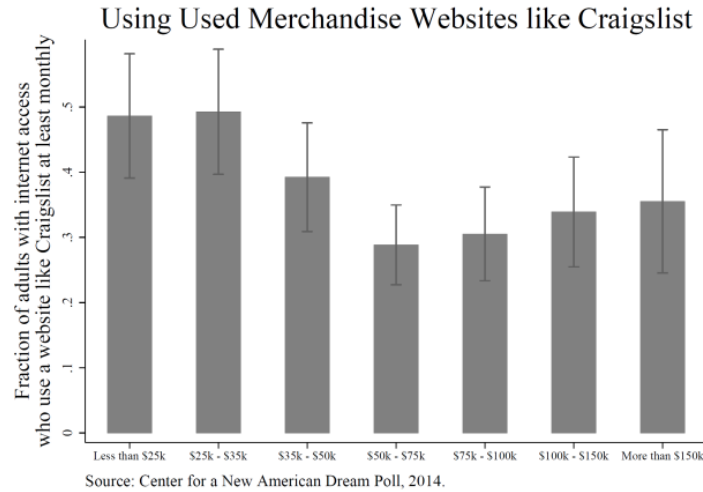
Fremstad, 2016, Figure 1: Household income and the use of traditional institutions for sharing goods

Rise of the sharing economy?

- Digital networks lower the transaction cost of matching people to idle resources (Botsman and Rogers 2010, Schor 2014, Sundararajan 2016)
- Peer-to-peer sharing is a “fluid” form of cooperation which may appeal to many people (Benkler 2004)
- Many platforms institute rating and feedback systems to facilitate trust among strangers (Botsman and Rogers 2010, Schor 2014, Sundararajan 2016)



Sharing economy platforms may have broad appeal



Peer-to-peer platforms



Exchanging used goods



Sharing goods



Micro labor markets



Sharing lodging



Car-sharing



U B E R



Ride-sharing

Does Craigslist reduce waste?

- Craigslist increased utilization of rental housing (Kroft and Pope 2014)
- More efficient secondhand markets can extend the lifetime of goods (Gavazza *et al.* 2014)
- Used good markets may reduce waste and other environmental burdens (Thomas 2003, Geyer *et al.* 2015, Zink *et al.* 2015)
- Reuse may account for part of decline in per capita waste generation (EPA 2011)

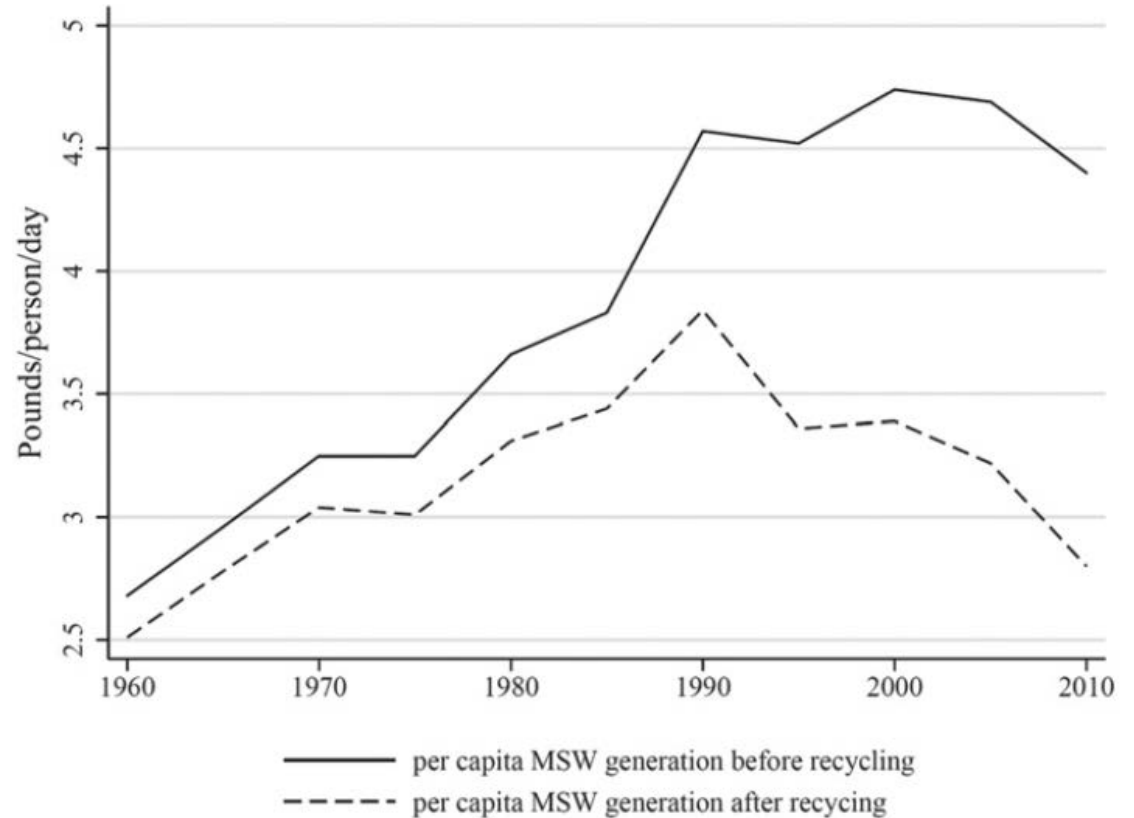
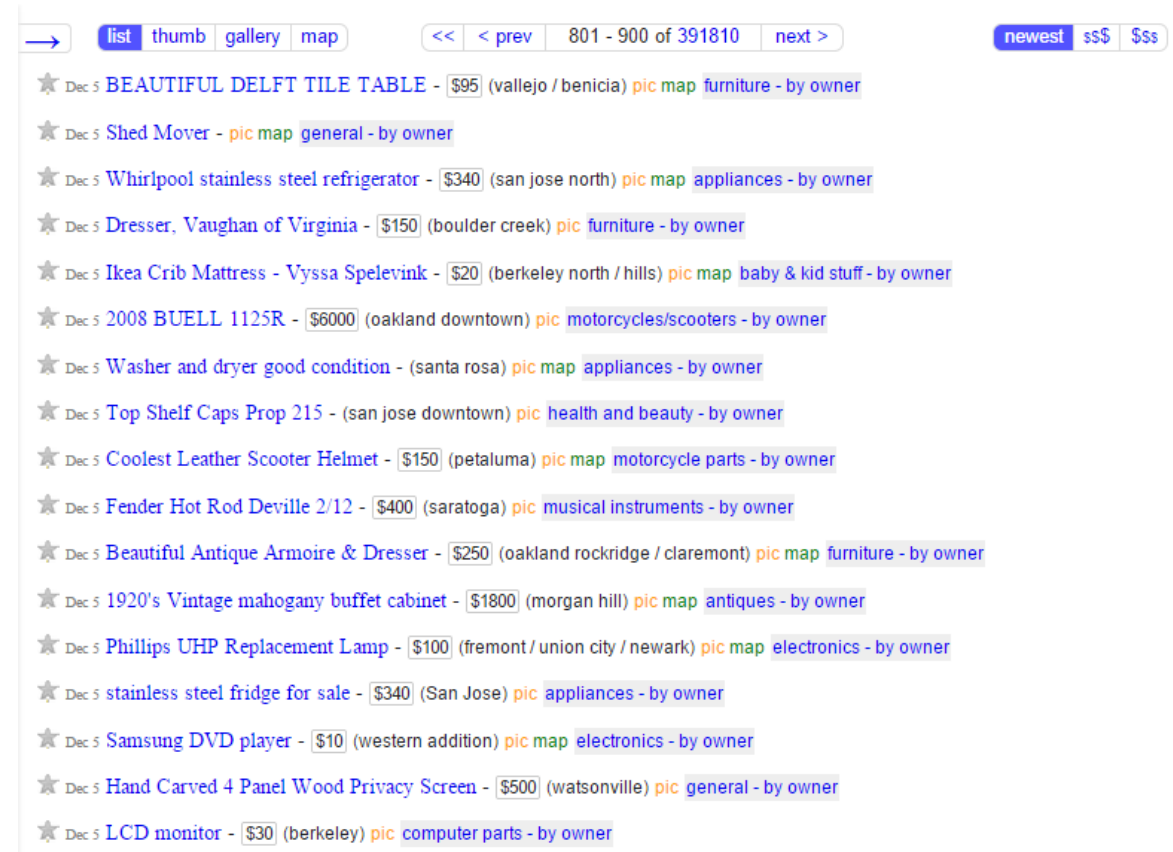


Fig. 1. Trends in per capita solid waste generation in the United States.

Craigslist's market for secondhand goods

- Craigslist was launched in San Francisco in 1995
- For-sale posts are generally free
- Platform quickly crowded out the California Materials Exchange (CalMAX)
- 54 percent of Americans use websites like Craigslist, and 11 percent every week (CNADS)
- Americans create about 1 billion for-sale posts a year.
- There are thousands of furniture items posted on DC's list each day.



Data and Methodology

- I combine panel data for 124 counties in California and Florida from 1996 to 2013
 - Daily per capita waste (post-recycling)
 - Control variables
 - Date Craigslist launched 46 lists
- I estimate the following fixed-effects model:

$$W_{c,t} = \alpha CL_{c,t} + \beta X_{c,t} + \eta_c + \lambda_t + \varepsilon_{c,t}$$

Table 2

Descriptive statistics for key variables.

Waste data is from California's eDRS and Florida's Annual Waste Reports, employment and wage data are from the QCEW, and internet data is from the CPS.

Variable		Mean	Std. Dev.	Min	Max	Observations
Daily waste, post recycling in pounds/person/day	Overall	5.69	2.77	0.20	65.89	N = 2275
	Between		2.54	1.94	25.12	n = 124
	Within		1.75	-4.82	46.46	T-bar = 18.3
Daily waste, pre recycling in pounds/person/day (Florida only)	Overall	7.65	4.01	1.12	72.58	N = 1097
	Between		3.77	2.25	29.10	n = 67
	Within		2.41	-3.49	51.13	T-bar = 16.4
Total wages per capita	Overall	11300	6579	2798	63190	N = 2275
	Between		6146	3948	45371	n = 124
	Within		2332	-5689	29533	T-bar = 18.3
Con. wages per capita	Overall	664	433	31	3243	N = 2275
	Between		361	85	1694	n = 124
	Within		239	-234	2212	T-bar = 18.3
Total jobs per 1000 pop.	Overall	337	103	105	785	N = 2275
	Between		103	117	715	n = 124
	Within		22	195	499	T-bar = 18.3
Con. jobs per 1000 pop.	Overall	18.64	9.53	1.82	75.01	N = 2275
	Between		7.93	4.22	45.37	n = 124
	Within		5.30	-5.39	59.30	T-bar = 18.3
Log population density	Overall	4.78	1.64	0.40	9.78	N = 2275
	Between		1.69	0.48	9.72	n = 124
	Within		0.10	4.19	5.24	T-bar = 18.3
Internet penetration (raw)	Overall	0.64	0.21	0.00	0.99	N = 459
	Between		0.09	0.38	0.82	n = 60
	Within		0.19	0.03	0.97	T = 7.65
Int. pen. (imputed, 1995-2013)	Overall	0.56	0.23	0.00	0.99	N = 2275
	Between		0.06	0.35	0.77	n = 124
	Within		0.23	0.00	0.99	T-bar = 18.3

Notes: This table lists unweighted means and standard deviations for key variables. Some data are available for limited county-quarters.

Results

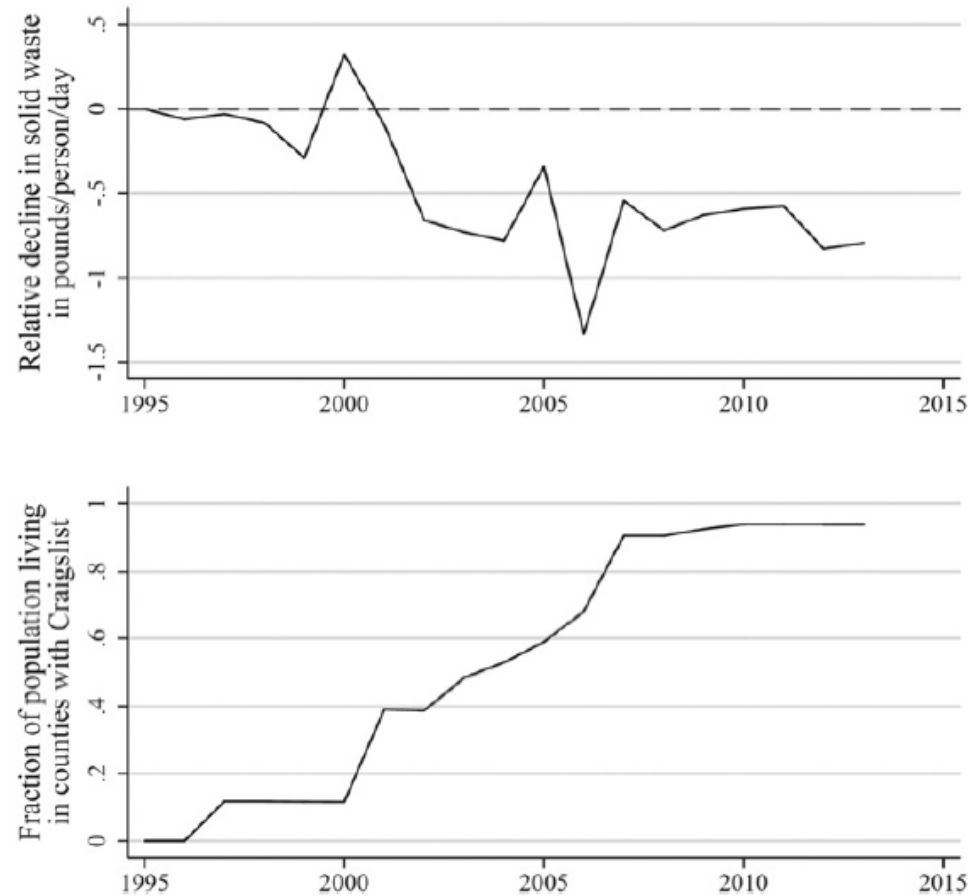


Fig. 3. Relative decline in waste generation in counties that get Craigslist. *Notes:* The top panel shows the relative decline in waste in counties that get Craigslist from Fig. 2. The bottom panel shows the percentage of Californians and Floridians living in counties with Craigslist over time.

Table 3

Effect of Craigslist on daily per capita waste.

	(1)	(2)	(3)	(4)
Craigslist	-0.365** (0.183)	-0.352* (0.186)	-0.266 (0.163)	-0.557 (0.341)
Total wages per capita (in \$1000s)		-0.121*** (0.0241)	-0.0956*** (0.0172)	-0.123 (0.107)
Con. wages per capita (in \$1000s)		1.009 (0.659)	-0.230 (0.717)	2.539** (1.239)
Total jobs per capita		6.900** (3.034)	5.565 (4.031)	10.31*** (3.840)
Con. jobs per capita		5.362 (24.57)	79.70*** (29.45)	-70.26* (39.86)
Log population density		-0.234 (0.694)	-0.433 (1.166)	-0.761 (0.881)
Internet penetration		-0.0927 (0.360)	0.366 (0.314)	-0.321 (0.623)
Year fixed effects	Y	Y	Y	Y
County fixed effects	Y	Y	Y	Y
Data used	All	All	California	Florida
Observations	2275	2275	1054	1221
R-squared	0.670	0.678	0.821	0.638

Notes: OLS regressions of daily per capita waste on Craigslist and control variables. Columns (3) and (4) report estimates for California and Florida separately. County-cluster-robust standard errors are in parentheses.

Timing of Waste Reductions

Table 4
Timing Craigslist's effect on waste.

	(1)	(2)
Craigslist, $k = -1$	-0.0782 (0.236)	-0.0374 (0.203)
Craigslist, $k = 0$	-0.337 (0.231)	-0.407 (0.254)
Craigslist, $k = 1$	-0.519** (0.257)	-0.515* (0.291)
Total wages per capita (in \$1000s)	-0.119** (0.0581)	-0.119** (0.0583)
Con. wages per capita (in \$1000s)	1.406* (0.761)	1.402* (0.759)
Total jobs per capita	0.00505 (0.00309)	0.00503 (0.00310)
Con. jobs per capita	-0.00997 (0.0261)	-0.00969 (0.0261)
Log population density	-0.558 (0.712)	-0.575 (0.717)
Internet penetration	-0.0947 (0.380)	-0.0935 (0.380)
Year fixed effects	Y	Y
County fixed effects	Y	Y
Data used	No SF Bay	No SF Bay
Observations	2142	2142
R-squared	0.679	0.679

Notes: Column (1) estimates changes in waste 2 years before CL's entry, the first 2 years with CL, and years 3 and on with CL. Column (2) estimates changes in waste 4 years before CL's entry, the first 4 years with CL, and years 5 and on with CL. Both regressions exclude counties that are not observed at least 5 years prior to Craigslist's entry (i.e. counties served by the list for the San Francisco Bay Area), but including those counties does not qualitatively change the results. County-cluster-robust standard errors are in parentheses.

Alternative Explanations for Waste Reduction

Table 5
Robustness of Craigslist's effect on daily per capita waste.

	Recycled waste (1)	Pre-recycling waste (2)	Post-recycling waste (3)	Post-recycling waste (4)	Post-recycling waste (5)
Craigslist	−0.0832 (0.145)	−0.594 (0.402)	−0.389* (0.232)	−0.0897 (0.230)	−0.386** (0.182)
Total wages per capita (in \$1000s)	0.0210 (0.0649)	−0.123 (0.147)	0.00329 (0.0482)	0.0575 (0.0448)	
Con. wages per capita (in \$1000s)	0.160 (0.467)	2.604* (1.365)	1.511 (0.923)	0.204 (0.826)	
Total jobs per capita	−3.106 (2.574)	7.423 (5.684)	0.00208 (4.113)	2.306 (4.566)	
Con. jobs per capita	−0.295 (19.33)	−63.33 (46.01)	−13.01 (37.11)	20.15 (40.68)	
Log population density	−0.234 (0.396)	−1.020 (1.117)	3.940 (3.797)	−1.352 (3.953)	
Internet penetration	−0.379 (0.246)	−0.843 (0.689)	−0.147 (0.304)	−0.517* (0.295)	
Year fixed effects	Y	Y	Y	Y	Y
County fixed effects	Y	Y	Y	Y	Y
County linear trends	N	N	Y	Y	5 selected
County quadratic trends	N	N	N	Y	0 selected
Data used	Florida	Florida	All	All	All
Observations	1097	1097	2275	2275	2275
R-squared	0.757	0.695	0.714	0.780	0.673

Notes: Column (5) reports double-selection post-LASSO estimates. This procedure chose a set of control variables from my standard controls, 124 county-specific linear trends, 124 county-specific quadratic trends, and 2275 observation dummies. County-cluster-robust standard errors are in parentheses.

Plausibility of estimates

Table 6: Analysis of for-sale posts on Craigslist

Category	Fraction of for-sale posts	Average weight of items posted	Assumed fraction of posts that generate an exchange	Assumed fraction of exchanges that would have occurred elsewhere without CL	Assumed fraction of disposed goods that would have been recycled	Implied weight diverted from waste stream per post
Secondhand goods	0.788	-	-	-	-	25.06
Cars & trucks	0.111	3737	0.69	0.99	0.75	6.45
Furniture	0.097	155	0.69	0.5	0.05	50.89
Auto parts	0.075	103	0.69	0.5	0.05	33.71
Electronics	0.058	45	0.69	0.5	0.05	14.75
Baby & kid stuff	0.038	71	0.69	0.5	0.05	23.32
Appliances	0.036	173	0.69	0.5	0.05	56.63
Sporting goods	0.029	77	0.69	0.5	0.05	25.35
General	0.028	297	0.69	0.5	0.05	97.19
Clothing & access.	0.026	8	0.69	0.5	0.05	2.61
Tools	0.025	57	0.69	0.5	0.05	18.71
Household items	0.024	33	0.69	0.5	0.05	10.95
Not secondhand goods	0.212	-	-	-	-	0.00
Weighted average	-	-	-	-	-	19.7

Note: The fraction of posts and average weight of posts in each category are based on the author's proportionate stratified random sample of 1,000 for-sale posts on Craigslist across 28 lists in California. Section 6 explains my assumptions about the fraction of posts that generate an exchange, the fraction of exchanges that would have occurred with Craigslist, and the fraction of disposed goods that would have been recycled.

Future research on sharing economy and waste

- **Quantify source reduction via the sharing economy**
 - **Improve Craigslist research:** Track posts and survey users on whether the item sold, at what price the item sold, what they would have otherwise done with the item, and why they use Craigslist.
 - **Investigate other sharing platforms:** Compile data on posts, transactions, and feedback mechanisms, preferably with cooperation from platform.



Thank you!

Questions and comments are welcome.

References

- Botsman, Rachel, and Roo Rogers. 2010. *What's Mine Is Yours: The Rise of Collaborative Consumption*. New York: HarperCollins.
- Center for a New American Dream. (2014). New American Dream Poll [cited 9/1/2014]. Available from <http://www.newdream.org/resources/poll-2014>.
- Fremstad, A. (2016). "Sticky Norms, Endogenous Preferences, and Shareable Goods." *Review of Social Economy* 74, 2: 194-214.
- Fremstad, A. (2017). Does Craigslist Reduce Waste? Evidence from California and Florida. *Ecological Economics* 132: 135-143.
- Gavazza, Alessandro, Alessandro Lizzeri, and Nikita Roketskiy. (2014). "A Quantitative Analysis of the Used-Car Market." *The American Economic Review*. 104 (11): 3668-3700.
- Geyer, Roland, Brandon Kuczenski, Trevor Zink, and Ashley Henderson. (2015). "Common misconceptions about recycling." *Journal of Industrial Ecology*.
- Kroft, Kory, and Devin G. Pope. (2014). "Does Online Search Crowd Out Traditional Search and Improve Matching Efficiency? Evidence from Craigslist." *Journal of Labor Economics*. 32 (2): 259-303.
- Schor, J. (2010). *Plenitude: The New Economics of True Wealth*. London: Penguin Press.
- Schor, J. (2014). "Debating the Sharing Economy," The Great Transition Initiative, Tellus Institute.
- Sundararajan, A. (2016). *The Sharing Economy: The End of Employment and the Rise of Crowd-Based Capitalism*. MIT Press.
- Zink, Trevor, Roland Geyer, and Richard Startz. (2015). "A Market-Based Framework for Quantifying Displaced Production from Recycling or Reuse." *Journal of Industrial Ecology*.