

## A Additional Tables

Table 7: List of 221 Categories with Weak Log-Linear First Stage ( $F < 10$ )

Category	Partial $F$	Partial $R^2$	Scaled Coef	Size Rank	Spot Share	GRP/OCC
Cosmetics, Misc. Beauty Aids & Supp	10.0	0.002	-0.096	244	0.08	3.2
Radio Stations	9.6	0.002	-0.223	193	0.91	1.9
City, State & Foreign Governments	9.0	0.001	-0.100	141	0.86	2.1
TV Program-Multi-News	8.9	0.001	-0.054	48	0.96	2.5
TV Program-Cable-Talk Show	8.9	0.000	-0.018	273	0.01	1.5
Non-Carbonated	8.8	0.001	-0.012	239	0.03	1.6
Food Wraps, Foils & Bags	8.8	0.001	-0.008	125	0.03	1.7
Garden Machinery, Implements & Fixtures	8.6	0.001	-0.068	158	0.25	2.8
Accting, Auditing & Bookkeeping Services	8.5	0.002	-0.024	100	0.10	1.6
Pasta Products & Pasta Product Dinners	8.3	0.000	-0.046	218	0.06	2.8
Pre-Recorded Video	7.9	0.001	0.003	40	0.01	1.7
Telecommunication Systems & Services	7.6	0.001	-0.050	151	0.22	2.2
Car Batteries	7.5	0.001	-0.023	258	0.01	2.8
Fitness & Diet Programs & Spas	7.5	0.001	-0.024	60	0.18	2.3
TV Program-Evening-Ent	7.2	0.001	-0.136	187	0.32	1.5
All Other Prepared Dinners & Entrees & Pizzas	6.9	0.001	-0.007	32	0.06	1.9
Motion Pictures	6.9	0.001	0.004	5	0.02	2.0
Computers, Components & Accessories	6.7	0.001	0.008	59	0.01	2.4
Home Insurance	6.3	0.001	-0.023	111	0.09	2.0
Telephone Companies, Public & Private	6.3	0.001	-0.010	14	0.13	2.2
TV Program-Prime-Sports	6.3	0.001	-0.056	223	0.35	1.7
Garden Pest Controls	6.1	0.001	-0.081	169	0.22	3.1
Regular Carbonated	6.1	0.001	-0.011	93	0.04	2.2
Security Systems & Fire Safety Systems	6.1	0.001	-0.051	171	0.19	2.3
Sport & Protective Footwear	6.1	0.001	-0.011	118	0.01	1.5
Soups	5.9	0.000	-0.021	67	0.05	1.9
Motorcycles & Vhcls Misc-Factory:new	5.9	0.000	-0.012	164	0.03	2.2
Pre-Fabricated Homes & Buildings	5.8	0.001	-0.192	271	0.81	2.7
Books & Music	5.7	0.001	-0.015	219	0.05	1.5
TV Program-Synd-Ent	5.5	0.001	-0.025	38	0.88	1.3
Combination Copy & Misc Dairy Products	5.5	0.001	-0.009	44	0.06	1.9
Petroleum Companies, General Promotion	5.5	0.000	-0.035	201	0.05	3.2
Cookies & Crackers	5.4	0.002	0.008	74	0.01	1.6
Jellies, Jams, Preserves, Peanut Butter	5.4	0.001	-0.010	134	0.05	2.2
Mattresses	5.3	0.000	-0.048	135	0.07	2.3
Blouses & Shirts	5.2	0.000	-0.016	255	0.00	2.9
Paint, Varnishes & Misc Coatings	5.2	0.001	0.032	115	0.03	2.4
Miscellaneous Medication & Proprietary Remedies	5.2	0.001	-0.007	82	0.04	1.6
TV Program-Multi-Ent	5.1	0.001	-0.044	160	0.49	1.6
Refrigerators & Freezers	5.0	0.000	-0.018	198	0.01	2.0
TV Program-Synd-Talk Show	5.0	0.001	-0.039	96	0.91	1.7
Car Cleaners, Waxes & Polishes	5.0	0.001	-0.013	231	0.03	1.2
Pet Food (not Elsewhere Classified)	4.8	0.001	-0.045	265	0.06	2.8
TV Program-Morning-News	4.8	0.001	-0.101	170	0.99	2.1
Stationery & Miscellaneous Paper Goods	4.7	0.001	-0.018	192	0.02	1.7
Sauces, Gravies, Dips	4.6	0.000	-0.010	127	0.02	1.9
General Household Small Appliances(not Else Class)	4.2	0.000	0.007	130	0.01	1.8
Farm Machinery & Equipment	4.2	0.001	-0.054	245	0.43	2.7
Shampoos, Conditioners & Cream Rinses	4.0	0.000	-0.005	52	0.02	1.3
TV Program-Daytime-Sports	4.0	0.000	-0.036	213	0.33	1.6

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Category	Partial $F$	Partial $R^2$	Scaled Coef	Size Rank	Spot Share	GRP/OCC
Women's Scents & Fragrances	3.9	0.000	0.011	143	0.03	2.9
Mobile Homes,campers,rvs:dealerships	3.8	0.000	-0.124	204	0.96	2.7
Mutual Funds & Money Funds	3.8	0.000	0.007	194	0.01	2.9
TV Program-Prime-Ent	3.8	0.001	0.010	4	0.19	2.2
Toys	3.7	0.001	0.001	24	0.00	1.9
Home Audio Equipment & Accessories	3.7	0.000	0.023	209	0.01	2.8
Pre-Recorded Audio	3.7	0.000	0.008	185	0.04	1.2
TV Program-Daytime-Ent	3.6	0.001	-0.018	109	0.24	1.5
Shoes & Boots, Regular & Casual	3.5	0.000	-0.012	157	0.01	1.8
Disinfectants	3.5	0.001	-0.007	144	0.04	1.4
Electronics Stores (Incl Rental)	3.2	0.000	-0.018	110	0.10	2.2
Resort Promotion (Area)	3.1	0.001	-0.028	92	0.40	2.5
Horticultural Services & Misc	3.1	0.001	-0.116	199	0.28	2.3
Baking Mixes, Crusts & Baking Ingred	3.1	0.001	-0.025	189	0.06	1.5
Hair Dressings, Sprays & Restoration Prod	3.0	0.000	-0.006	147	0.01	1.3
Car & Truck Rental Svcs	2.9	0.000	0.018	161	0.01	1.3
TV Program-Cable-News	2.8	0.000	-0.001	112	0.00	1.6
Credit Cards	2.8	0.000	-0.004	30	0.03	1.8
Investments & Collectns (not Else Class)	2.7	0.000	-0.043	257	0.30	2.0
Diapers(Incl Infant & Adult)	2.7	0.000	-0.005	81	0.02	1.6
Small Kitchen Appliances & Equipment	2.7	0.000	-0.007	133	0.03	1.9
Home Phone Equipment	2.6	0.000	0.014	128	0.04	2.5
Bedding & Linens	2.6	0.000	-0.019	232	0.12	1.2
Gasoline Dealrs Services & Promotions	2.4	0.000	-0.038	208	0.39	3.0
Misc Toilet Goods	2.4	0.000	0.005	62	0.02	2.0
Personal Care/Grooming Appliances	2.3	0.000	0.007	207	0.02	1.2
Laxatives	2.3	0.000	-0.005	114	0.02	2.4
Miscellaneous Sporting Equipment	2.3	0.000	-0.009	261	0.04	1.0
Toilet Soaps	2.3	0.000	-0.005	99	0.02	1.5
TV Program-Daytime-Talk Show	2.2	0.000	0.056	196	0.08	3.0
Misc Corporate Advertising (not Else Class)	2.2	0.000	-0.012	119	0.10	2.4
US Government	2.2	0.000	-0.008	63	0.15	1.0
Gelatins & Puddings (Mixes & Prepared)	2.2	0.000	-0.012	227	0.01	2.0
Department Stores	2.1	0.000	-0.005	9	0.11	2.9
Boats, Motors & Accessories	2.1	0.000	-0.051	267	0.70	2.6
Jewelry	2.0	0.000	-0.056	241	0.26	3.0
TV Program-Overnite-News	2.0	0.000	-0.119	174	1.00	2.8
Cable Tv Network	2.0	0.000	-0.001	17	0.01	1.3
Misc Equipment, Fixtures & Systems	2.0	0.000	-0.038	243	0.29	2.2
Sunglasses, Frames & Corrective Lenses	2.0	0.000	-0.005	122	0.02	2.1
Laundry Detergents & Cleaning Preparations	2.0	0.000	-0.004	39	0.02	1.6
Gasoline & Oil	1.9	0.000	0.009	149	0.05	2.0
Other Fruits	1.7	0.000	-0.015	225	0.09	2.0
Misc Men's Toiletries & Hygienic Goods	1.7	0.000	0.002	217	0.00	0.8
Motorcycle & Vehicle Misc-Dealerships	1.7	0.000	-0.098	252	0.93	2.5
Dairy Product Substitutes	1.7	0.000	-0.009	168	0.04	2.3
Sponges	1.7	0.000	-0.003	75	0.02	1.8
Misc Building Materials	1.7	0.000	-0.029	270	0.30	2.0
Non-Computerized Games	1.7	0.000	0.002	86	0.00	1.9
Infants Foods	1.6	0.000	-0.007	190	0.02	1.5
Combination Copy Food/Food Products/Gp	1.6	0.000	-0.017	154	0.07	2.3
Computer & Data Processing Services	1.6	0.000	-0.025	264	0.20	1.8
Pharmaceutical Houses, Gp	1.6	0.000	-0.003	10	0.03	2.5
Steamship, Truck & Other Facilities	1.6	0.000	-0.008	120	0.10	2.4
Television Stations	1.5	0.000	0.022	237	0.13	2.3

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Table 7 – Continued from previous page

Category	Partial $F$	Partial $R^2$	Scaled Coef	Size Rank	Spot Share	GRP/OCC
Liquor	1.5	0.000	0.001	64	0.01	1.4
Car & Truck Tires & Tubes	1.4	0.000	-0.004	136	0.02	2.3
Hardware & Lumber Stores	1.4	0.000	-0.023	152	0.12	2.6
Feminine Hygiene Products	1.3	0.000	-0.003	84	0.02	1.1
Shaving Equipment & Supplies	1.3	0.000	0.003	91	0.01	1.7
TV Program-Multi-Sports	1.3	0.000	-0.012	102	0.29	2.1
Doors & Windows	1.2	0.000	-0.072	266	0.73	2.5
Candy & Gum	1.2	0.000	0.002	12	0.01	1.5
Deodorizers, Air Fresheners & Purifiers	1.2	0.000	-0.002	68	0.02	1.4
Floor & Furniture Polish & Wax	1.2	0.000	-0.009	205	0.02	1.7
Dental Supplies & Mouthwashes	1.2	0.000	-0.003	23	0.03	1.7
Insecticides	1.2	0.000	-0.019	226	0.08	2.3
Stoves & Ranges (Including Microwave)	1.2	0.000	-0.019	256	0.03	2.7
Railroad Travel	1.1	0.000	-0.028	249	0.16	2.7
Salad Dressings & Mayonnaise	1.1	0.000	0.006	129	0.08	2.0
Facial Cleansers & Make-Up Removers	1.1	0.000	-0.005	139	0.02	1.4
Shortening, Oil, Margar & No-Stick Prod	1.1	0.000	0.006	165	0.03	1.9
Vegetable Juices	1.0	0.000	0.004	177	0.01	2.6
Patio & Barbecue Equip & Accessor	1.0	0.000	-0.011	229	0.03	1.5
Hosiery	0.9	0.000	-0.009	259	0.01	2.6
Gas, Power, Lighting & Water Companies	0.9	0.000	-0.062	167	0.81	3.1
Online Tv Program-Promo	0.9	0.000	0.006	268	0.02	1.3
Video Equipment & Accessories	0.8	0.000	0.009	180	0.02	3.0
TV Program-Cable-Sports	0.7	0.000	0.001	41	0.01	2.3
Misc Household Furnishings	0.7	0.000	0.012	230	0.02	1.6
Employment Recruitment	0.7	0.000	-0.039	221	0.41	1.9
TV Program-Evening-Sports	0.7	0.000	-0.027	224	0.54	1.8
Beans & Grains	0.7	0.000	0.027	179	0.05	2.2
Furniture	0.7	0.000	-0.035	220	0.20	2.8
Computer Software	0.7	0.000	0.002	50	0.01	2.1
Beer	0.7	0.000	0.002	43	0.02	1.8
Heating & Cooling Equip, Fixtrs & Systems	0.7	0.000	0.023	210	0.36	2.8
Combination Copy & Misc Prepared Food	0.6	0.000	0.004	236	0.02	2.5
Reducing Aids	0.6	0.000	-0.003	131	0.02	1.2
Condiments, Pickles, Relishes	0.6	0.000	-0.034	212	0.08	1.9
Telex, Telemail & Telegram Systems	0.6	0.000	0.010	238	0.04	1.0
Cameras and Photographic Supplies	0.5	0.000	0.006	183	0.02	2.3
Meats, Poultry & Fish	0.5	0.000	-0.004	80	0.12	2.8
Pets & Pet Supplies	0.5	0.000	-0.004	103	0.08	2.0
TV Program-Morning-Ent	0.5	0.000	-0.005	94	0.25	2.2
Vacuum Cleaners & Dishwashers	0.5	0.000	-0.002	126	0.02	1.8
Misc Medical & First-Aid Supplies	0.5	0.000	0.005	188	0.02	1.3
Comb Copy & Misc Commun & Public Utilit	0.5	0.000	-0.021	247	0.18	3.2
Depilatories, Face & Body Hair Bleaches	0.5	0.000	-0.004	234	0.02	1.2
Watches	0.4	0.000	-0.008	211	0.07	2.8
Comb Copy & Misc Elec Entertnmnt Equip	0.4	0.000	0.005	121	0.01	2.0
Men's Scents & Fragrances	0.4	0.000	-0.007	181	0.02	2.5
Bottled Waters	0.4	0.000	-0.014	178	0.07	1.8
Sugars, Syrups & Artificial Sweeteners	0.4	0.000	-0.005	191	0.02	2.0
Medicated Skin Products & Liniments	0.4	0.000	-0.003	90	0.05	1.5
In-Home Tests (Including Computerized)	0.4	0.000	-0.004	182	0.07	1.3
Vegetables	0.4	0.000	-0.005	140	0.10	2.0
Shoe Care Products	0.4	0.000	-0.002	145	0.02	2.6
Sunscreens & Tanning Products	0.4	0.000	-0.005	172	0.02	1.7
Apparel Fabrics & Finishes	0.4	0.000	-0.003	248	0.00	1.8

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Table 7 – Continued from previous page

Category	Partial $F$	Partial $R^2$	Scaled Coef	Size Rank	Spot Share	GRP/OCC
Other Soaps & Detergents	0.4	0.000	0.001	98	0.02	1.4
Laundry Equipment	0.4	0.000	0.004	186	0.02	2.6
Window Coverings & Trtmnts & Hh Fabrics	0.4	0.000	-0.015	272	0.09	2.2
Misc Clnrs, Waxes & Polishes (Spec Uses)	0.3	0.000	-0.002	89	0.04	1.2
Skin Care Creams, Lotions & Oils	0.3	0.000	0.001	29	0.03	1.6
Anti-Freeze & Additives	0.3	0.000	0.005	253	0.05	1.7
Facial Make-Up Products	0.3	0.000	0.002	88	0.02	2.0
Hispanic Tv Network	0.3	0.000	-0.012	242	0.21	1.1
Home Workshop Hand & Power Tools	0.3	0.000	-0.003	163	0.02	1.7
Miscellaneous Laundry Supplies	0.3	0.000	0.008	206	0.02	1.5
Auto & Truck Parts,accessories & Kits	0.2	0.000	0.005	173	0.09	2.6
Underclothing	0.2	0.000	-0.004	184	0.00	1.9
Vinyl Flrng & Misc Hard Surf Flr Covrgs	0.2	0.000	-0.006	262	0.05	1.4
Fruit Juices & Fruit Flavored Drinks(Incl Powdrd)	0.2	0.000	0.001	37	0.02	2.0
Exercise Equipment	0.2	0.000	0.001	215	0.01	1.4
Airline Travel	0.2	0.000	0.010	153	0.23	3.2
Hair Coloring & Curling Formulae	0.2	0.000	0.001	73	0.02	1.8
Airline Freight	0.2	0.000	0.003	214	0.04	3.0
Seasonings, Spices & Extracts & Marinades	0.2	0.000	-0.007	166	0.03	2.0
Cat Food	0.2	0.000	-0.001	106	0.01	1.8
TV Program-Daytime-News	0.2	0.000	-0.024	235	0.92	2.2
Cruise Ship Travel	0.2	0.000	0.004	148	0.07	2.4
Dog Food	0.2	0.000	-0.001	53	0.01	1.7
Auto & Light Trucks-Factory:corp Advrtsng	0.2	0.000	-0.009	260	0.10	1.9
Brokerage Svcs	0.1	0.000	-0.001	36	0.03	2.5
Manicure Preparations & Implements	0.1	0.000	0.004	197	0.02	1.4
Combination Copy Ready-to-Wear	0.1	0.000	-0.001	132	0.01	1.8
Dietary Carbonated	0.1	0.000	-0.002	150	0.04	2.5
Vitamin Preparations & Tonics	0.1	0.000	-0.001	22	0.02	1.7
TV Program-Prime-News	0.1	0.000	-0.006	156	0.52	1.8
Pain Relievers, Sedatives & Sleeping Preps	0.1	0.000	0.001	34	0.02	1.4
Digestive Aids & Antacids	0.1	0.000	-0.001	54	0.02	1.6
Lip Make-Up	0.1	0.000	0.001	138	0.01	1.3
Cleaners & Cleansers (Genl Hshold Use)	0.0	0.000	-0.001	87	0.03	1.2
Craft, Hobby & Sporting Goods & Toy Stores	0.0	0.000	0.002	66	0.17	2.6
Citrus Fruits	0.0	0.000	-0.001	240	0.01	3.5
TV Program-Evening-News	0.0	0.000	-0.003	108	0.65	2.4
Typewriters & Misc Office Equipment	0.0	0.000	-0.005	250	0.01	2.4
Miscellaneous Passenger Travel	0.0	0.000	-0.015	254	0.64	2.3
Fertilizers & Seed Treatments	0.0	0.000	0.007	222	0.17	2.4
Household Paper Products	0.0	0.000	-0.000	105	0.02	1.9
Combination Copy & Misc Hygienic Goods	0.0	0.000	-0.002	274	0.04	2.6
TV Program-Latenite-Sports	0.0	0.000	-0.012	251	0.81	2.1
Wine	0.0	0.000	-0.001	200	0.02	2.2
Sportswear	0.0	0.000	-0.001	202	0.01	2.2
Eye Make-Up	0.0	0.000	0.000	79	0.01	1.4
TV Program-Cable-Ent	0.0	0.000	0.000	1	0.00	1.4
Ice Cream, Frozen Novelties & Sherbet	0.0	0.000	-0.002	137	0.11	2.6
Travel Services & Tours	0.0	0.000	-0.000	47	0.03	2.3
Deodorants & Anti-Perspirants	0.0	0.000	0.000	104	0.01	1.0
Miscellaneous Pdts/Svcs	0.0	0.000	-0.001	124	0.46	1.8
Hobbycraft	0.0	0.000	0.000	228	0.02	2.5
Pens, Pencils, Markers & Miscellaneous	0.0	0.000	0.001	195	0.01	2.2
Otr Manuf Materials & Supplies	0.0	0.000	0.001	176	0.11	2.5
Cookware & Cutlery	0.0	0.000	-0.001	263	0.00	1.3

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Table 7 – Continued from previous page

Category	Partial $F$	Partial $R^2$	Scaled Coef	Size Rank	Spot Share	GRP/OCC
Broadcast Tv Network	0.0	0.000	-0.001	146	0.25	1.8
TV Program-Latenite-Ent	0.0	0.000	-0.000	117	0.23	3.0
Lawn & Garden Seeds, Bulbs & Nursery Stock	0.0	0.000	-0.002	246	0.57	2.9
Agricultural Services & Miscellaneous	0.0	0.000	-0.002	269	0.28	2.8
Business Propositions	0.0	0.000	-0.001	233	0.05	1.0
Milk, Butter, Eggs (Including Powdered)	0.0	0.000	-0.000	83	0.05	2.5

Table 8: List of 87 Categories with Non-Empty LASSO Selection

Category	Partial $F$		Partial $R^2$		# Terms Selected
	LASSO	Log-Linear	LASSO	Log-Linear	
Hospitals, Physicians & Misc. Physical Culture	197.2	197.2	0.031	0.031	1
Household Furnishings & Appliance Stores	162.9	327.5	0.059	0.058	2
Passenger Cars-Factory:New & CPO	143.0	143.0	0.026	0.026	1
Construction, Engineering & Archit Srvcs	122.2	122.2	0.018	0.018	1
Autos & Light Truck - Dealerships	109.0	280.2	0.036	0.035	2
Light Trucks & Vans-Factory:New & CPO	105.9	105.9	0.024	0.024	1
Miscellaneous Professional Services	100.5	141.2	0.029	0.028	2
Dance, Theater, Concerts, Opera	91.3	91.3	0.014	0.014	1
Misc Entertainment & Combination Copy	80.1	144.6	0.020	0.020	2
Automotive	72.2	72.2	0.011	0.011	1
Miscellaneous Organization Advertising	68.9	96.5	0.028	0.028	2
Optical Goods and Services	64.6	184.6	0.021	0.018	3
Data Communications Networks	53.5	53.5	0.010	0.010	1
Misc Financial Inst. Services & Products	52.4	52.4	0.009	0.009	1
Miscellaneous Retail	51.1	114.4	0.025	0.023	3
Restaurants, Hotel Dining & Nightclubs	50.8	135.4	0.029	0.026	5
Passenger Cars-Dealer Assn:New & CPO	49.4	106.8	0.019	0.018	3
Cakes, Pies, Pastries & Donuts	43.1	43.1	0.005	0.005	1
Direct Response Products	40.3	40.3	0.011	0.011	1
Apparel, Footwear & Accessory Stores	36.8	36.8	0.004	0.004	1
Schools & Camps, Seminars	35.8	71.9	0.015	0.014	2
Light Trucks & Vans-Dealer Assn:New & CPO	34.8	63.0	0.011	0.011	2
Tv Station	29.5	35.4	0.006	0.006	2
Real Estate, R.e. Brokers & Developers	27.2	27.2	0.004	0.004	1
Banks	25.3	45.0	0.006	0.006	2
Fix-it Supplies	24.4	31.3	0.002	0.002	2
Medical Appliances & Equipment	22.1	14.3	0.002	0.001	1
Medicated Skin Products & Liniments	19.5	0.4	0.002	0.000	1
Cereals	19.4	30.1	0.009	0.007	3
Laxatives	19.3	2.3	0.003	0.000	1
Non-Computerized Games	19.2	1.7	0.002	0.000	1
Cable Television Stations	18.8	42.9	0.008	0.007	3
TV Program-Synd-Talk Show	18.8	5.0	0.003	0.001	1
Religious, Charitable & Humanitarian	18.2	16.1	0.005	0.003	2
all Other Prepared Dinners & Entrees & Pizzas	17.4	6.9	0.002	0.001	1
Hotels & Resorts	17.2	17.2	0.003	0.003	1
Computers, Components & Accessories	16.5	6.7	0.002	0.001	1
Jewelry, Gift Stores & Galleries	16.4	11.2	0.002	0.001	1
Home Audio Equipment & Accessories	16.4	3.7	0.000	0.000	1
Cookies & Crackers	16.1	5.4	0.004	0.002	2
Lotteries	15.9	15.9	0.002	0.002	1

Continued on next page

Table 8 – Continued from previous page

Category	Partial $F$		Partial $R^2$		# Terms Selected
	LASSO	Log-Linear	LASSO	Log-Linear	
Plumbing & Sanit Equip, Fixtrs & Systems	15.9	23.6	0.003	0.003	2
Vitamin Preparations & Tonics	15.5	0.1	0.002	0.000	1
Automobile Insurance	15.4	20.0	0.004	0.004	2
Combination Copy & Misc Dairy Products	14.9	5.5	0.001	0.001	1
Life Insurance	14.8	18.3	0.004	0.004	2
City,state & Foreign Governments	14.6	9.0	0.001	0.001	1
TV Program-Prime-Sports	14.6	6.3	0.002	0.001	1
Sport & Protective Footwear	14.4	6.1	0.002	0.001	1
Other Insurance & Combination Copy	14.4	14.4	0.003	0.003	1
Regular Carbonated	14.2	6.1	0.004	0.001	3
Golf Equipment	13.9	17.9	0.004	0.004	2
Magazines, Newspapers, Misc Media	13.8	15.1	0.002	0.002	2
Cheese Products	13.3	10.2	0.002	0.002	1
Pasta Products & Pasta Product Dinners	13.2	8.3	0.000	0.000	1
Women's Scents & Fragrances	13.1	3.9	0.001	0.000	1
Beer	13.1	0.7	0.005	0.000	3
Disinfectants	12.9	3.5	0.002	0.001	1
Pet Food (not Elsewhere Classified)	12.8	4.8	0.003	0.001	2
TV Program-Multi-News	12.8	8.9	0.002	0.001	1
Misc Accessories, Supplies & Hardware	12.6	12.6	0.001	0.001	1
Stationery & Miscellaneous Paper Goods	12.4	4.7	0.001	0.001	1
Cold, Cough & Sinus Remedies	12.4	12.7	0.002	0.001	2
Home Insurance	12.3	6.3	0.001	0.001	1
Sauces, Gravies, Dips	12.1	4.6	0.001	0.000	1
Appetizers, Snacks & Nuts	11.9	21.4	0.005	0.003	4
Cat Food	11.6	0.2	0.002	0.000	1
Vacuum Cleaners & Dishwashers	11.6	0.5	0.002	0.000	1
Shaving Equipment & Supplies	11.3	1.3	0.001	0.000	1
TV Program-Latenite-News	11.0	11.0	0.002	0.002	1
Fitness & Diet Programs & Spas	10.4	7.5	0.001	0.001	2
Coffee, Tea, Cocoa & Derivatives	10.2	12.2	0.002	0.002	2
Computerized Games & Accessories Includ Software	10.2	10.2	0.001	0.001	1
Comb Copy & Misc Commun & Public Utilit	10.1	0.5	0.001	0.000	1
Cosmtcs Comb Cpy,misc Beauty Aids & Supp	10.0	10.0	0.002	0.002	1
Toilet Soaps	10.0	2.3	0.001	0.000	1
Medical & Dental Insurance	9.7	18.9	0.002	0.002	3
Liquor	9.7	1.5	0.001	0.000	1
Breads, Rolls, Waffles & Pancakes	9.3	17.6	0.001	0.001	2
Accting, Auditing & Bookkeeping Services	8.7	8.5	0.002	0.002	2
Food & Liquor Stores	8.7	16.8	0.004	0.003	3
Amusement Parks & Sporting Events	8.1	23.0	0.002	0.002	3
Apparel Fabrics & Finishes	7.9	0.4	0.001	0.000	1
Drugs, Toiletries & Salons	7.9	10.2	0.002	0.001	2
Pre-Fabricated Homes & Buildings	7.9	5.8	0.002	0.001	1
Cellular Radio Systems & Accessories	7.8	11.8	0.003	0.003	2
Radio Stations	7.3	9.6	0.003	0.002	3

## B Selecting the Optimal Instruments

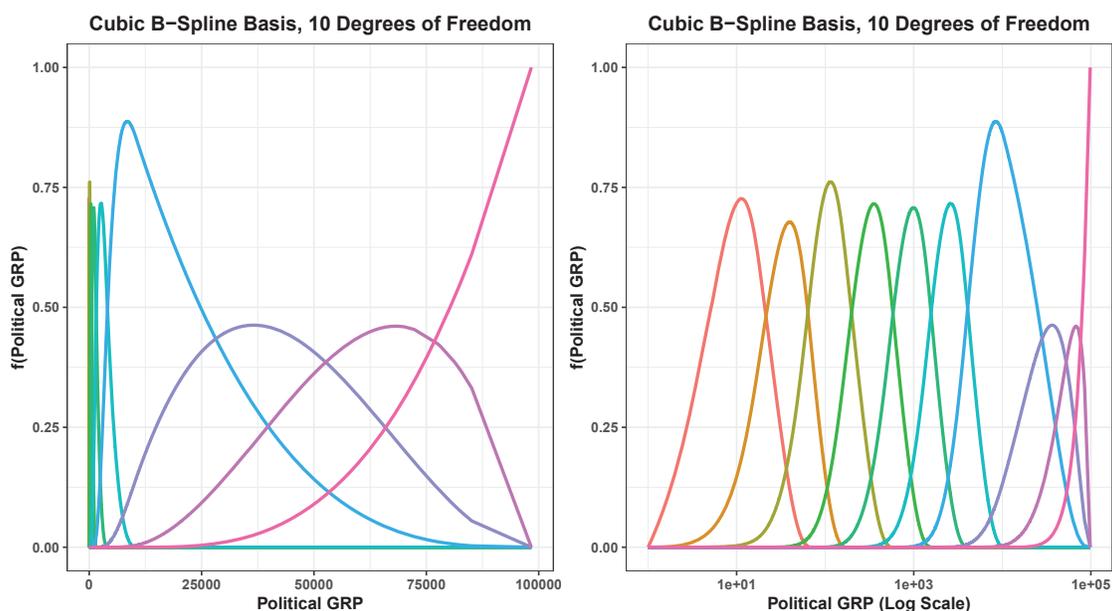
### B.1 Candidates of Optimal Instruments Selection

We use the following four sets of non-linear transformations for political GRP as candidates for optimal instruments:

- A 5th degree orthogonal polynomial. [5 Terms]
- A 5th degree orthogonal polynomial of  $\log(1+\text{political GRP})$ . [5 Terms]
- A cubic B-spline basis with 10 degrees of freedom. The knots are placed on equally spaced quantiles of political GRP. [10 Terms]
- A cubic B-spline basis with 20 degrees of freedom. [20 Terms]

While each set of candidates could capture any non-linearity in the data fairly well on its own, we use all of them together to account for the fact that we have no *a priori* knowledge about which set fits the data best. In addition, our broad set of candidates allows the optimal instrument to be some combination of polynomial and spline terms. Finally, we include the polynomial of  $\log(1+\text{political GRP})$  to improve the fit for a potential constant-elasticity relationship. Figure 14 illustrates the cubic spline basis with 10 terms by plotting them against both political GRP and  $\log(1+\text{political GRP})$ .

Figure 14: Illustration: Cubic B-Spline Basis for Political GRP



## B.2 The LASSO Method from Belloni et al (2012)

Given a first-stage regression equation  $d_i = D(x_i) + v_i$  where  $d_i$  is the endogenous variable,  $x_i \in \mathbb{R}^p$  are a vector of instruments, and  $D(\cdot)$  is an unknown function, Belloni, Chen, Chernozhukov, and Hansen [2012] approximate the optimal instrument by  $\hat{D}(x_i) = x_i' \hat{\beta}$ , where  $\hat{\beta}$  is the solution of a LASSO optimization problem:

$$\hat{\beta} \in \operatorname{argmin}_{b \in \mathbb{R}^p} \frac{1}{n} \sum_{i=1}^n (d_i - x_i' b)^2 + \frac{\lambda}{n} \sum_{k=1}^p |\hat{\gamma}_k \beta_k| \quad (7)$$

In the program above,  $\lambda$  is a tuning parameter that controls regularization, and  $\hat{\gamma}_k$  is an estimate of the optimal penalty loading  $\gamma_k := \sqrt{\sum_{i=1}^n x_{ik}^2 v_i^2}$ . Following the recommendation of Belloni et al. [2012] (Appendix A), we set the tuning parameter to  $\lambda = 2.2\sqrt{n}\Phi^{-1}\left(1 - \frac{0.1}{2p \log(n)}\right)$  and estimate the optimal penalty loadings using the following iteration procedure:

1. Set the initial penalty loadings to  $\hat{\gamma}_k = \sqrt{\sum_{i=1}^n x_{ik}^2 (d_i - \bar{d})^2}$  and solve the LASSO program above to obtain  $\tilde{\beta}$ . Then estimate the first-stage residual as  $\tilde{v}_i = d_i - x_i' \tilde{\beta}$ .
2. Set the penalty loadings to  $\hat{\gamma}_k = \sqrt{\sum_{i=1}^n x_{ik}^2 \tilde{v}_i^2}$  and repeat.
3. Iterate step (2) 15 times.

Since the DMA and month fixed effects should always be included in the regression, we partial out these fixed effects from both the endogenous variable (category ads) and the 40 potential instruments before running the LASSO procedure.

## B.3 Further LASSO Results

To further compare the LASSO optimal instruments with our benchmark log-linear specification, we plot the partial- $F$  and partial- $R^2$  in scatter plots in Figures 15 and 16. We observe three main patterns from this comparison. First, among the 221 categories with log-linear partial-F below

10, LASSO selects nothing for 186 categories, but produces a higher partial-F for 33 categories. This pattern can be clearly seen from the left tail in Figure 15 above the 45-degree line, and it suggests that the LASSO optimal instruments pick up a non-linear relationship between political and category ads that is neglected in the log-linear specification. Second, for each of the 28 categories with log-linear partial-F above 25, LASSO produces a smaller or equal partial-F and a slightly larger partial- $R^2$ , as shown in the right tail in Figure 15 below the 45-degree line, and in Figure 16 above the 45-degree line. This pattern suggests the LASSO procedure trades off instrument strength (which relates to bias of the IV estimator) for a better first-stage fit (which relates to variance of the IV estimator).

To further understand what the optimal instruments capture, we calculate the predicted effect function  $g_j(P) := \beta_j' f_j(P)$  for each category  $j$  from the LASSO selection  $f_j(\cdot)$  and the first-stage coefficients  $\beta_j$ . We then plot  $g_j(P)$  against  $P$  for the 25 categories with LASSO  $F > 25$  in Figure 17, for the 21 categories with both log-linear and LASSO  $F \in [10, 25]$  in Figure 18, and for the 28 “upgraded” categories with log-linear  $F < 10$  and LASSO  $F \in [10, 25]$  in Figure 19. These curves are helpful for considering monotonicity. In Figure 17, the curves all look reasonably flat until very high levels of political advertising, when the crowd out becomes more severe. While some early ranges show some positive effects of  $P$  on  $A$ , it does not appear significant and is drastically outweighed by the negative impact at the high levels of  $P$ . Figure 18 shows similar results. Figure 19 looks somewhat different. There are a few brands with considerable amounts of positive effect of  $P$  on  $A$  which may be a warning sign of monotonicity violations. However, most categories in this figure show a very different crowd-out curve than those categories that have a strong first-stage in the log-linear case. This illustrates that the LASSO strengthens the first stage, particularly for brands that show patterns of crowd out that do not appear log-linear. However, this improvement in relevance comes at the cost of monotonicity concerns.

Figure 15: Partial  $F$ : LASSO v.s. Linear

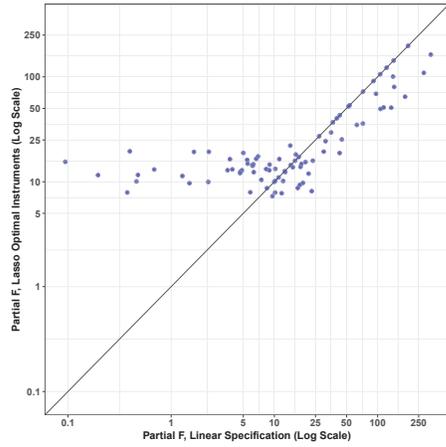


Figure 16: Partial  $R^2$ : LASSO v.s. Linear

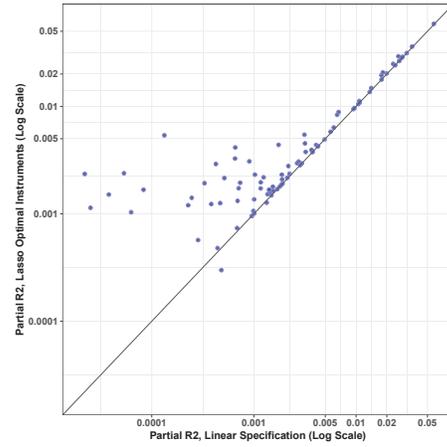
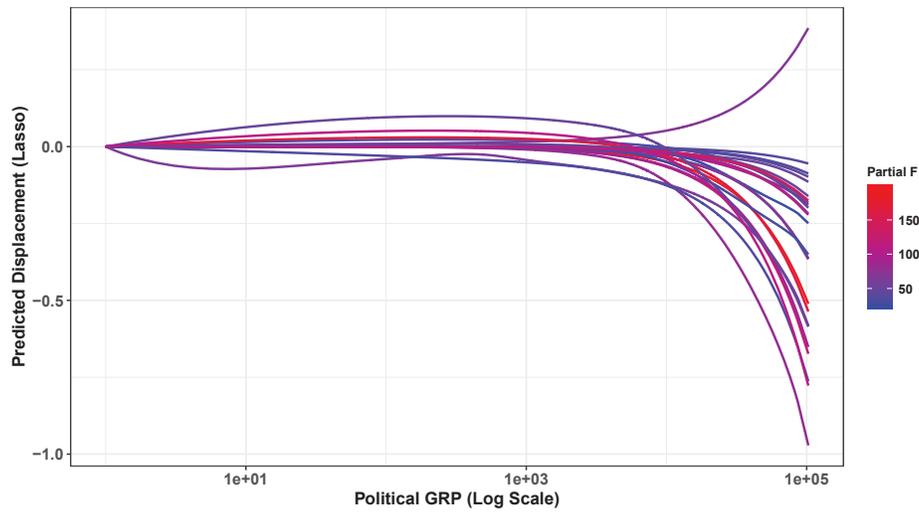


Figure 17: LASSO Predicted Displacement Effect, 25 Categories with LASSO  $F > 25$



Notes: For each category, we compute and plot the predicted displacement effect  $g_j(P) := \beta'_j f_j(P)$  at each level of political GRP  $P$ . Each line represents one category, and is colored by the Lasso partial- $F$ .

Figure 18: LASSO Pred. Effect, 21 Categories with LASSO  $F \in [10, 25]$  and Log-Linear  $F \in [10, 25]$

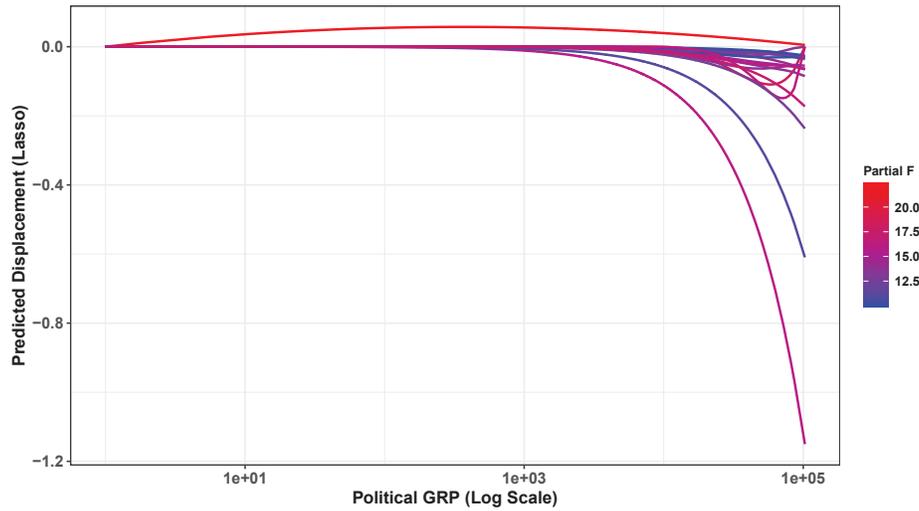
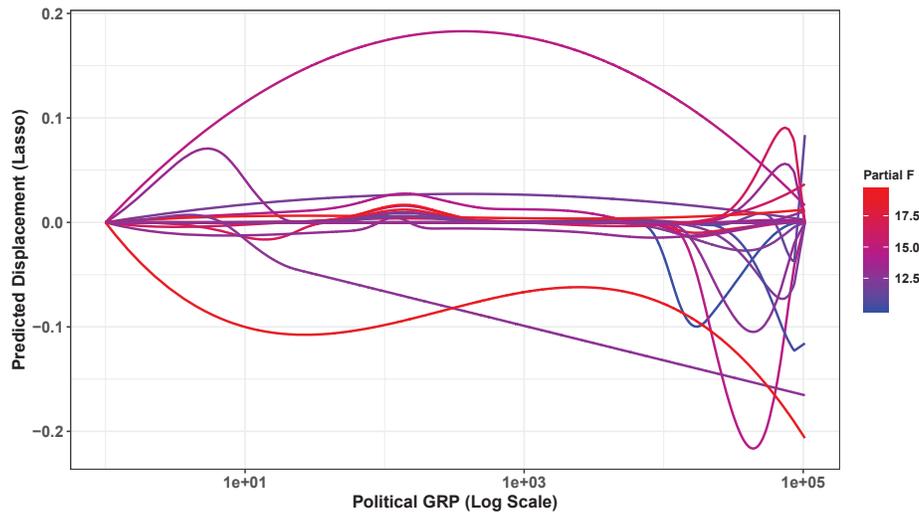


Figure 19: LASSO Predicted Effect, 28 Categories with LASSO  $F \in [10, 25]$  and Log-Linear  $F < 10$



## C Alternative Method For Imputing Local Impressions

In this appendix, we explore a more flexible method for imputing local impressions data for non-sweep months. Let  $I_{ijkt}$  be Nielsen's impression estimate for station  $i$ , month  $t$ , day-of-week  $j$ , and 5-15 minute time interval  $k$ . Let  $t_1$  be the last sweep month before  $t$ , and let  $t_2$  be the first

sweep month after  $t$ . When  $I_{ijkt}$  is not observed, we want to impute it by taking a weighted sum of  $I_{ijkt_1}$  and  $I_{ijkt_2}$ :  $I_{ijkt} \approx \beta_1 I_{ijkt_1} + \beta_2 I_{ijkt_2}$ .

Our simple imputation method in the main text uses time distance as weights:  $\beta_1 = (t - t_1)/(t_2 - t_1)$  and  $\beta_2 = (t_2 - t)/(t_2 - t_1)$ . The accuracy of this method on observed data in non-sweep months in LPM markets is summarized by the blue line in Figure 20, which shows that the method tends to overestimate the impressions.

Our alternative, more flexible method allows  $\beta_1$  and  $\beta_2$  to vary across days of week and 3-hour time intervals. Specifically, for each day of week  $j$  and each 3-hour time interval  $K$ , we take the observed impressions across all stations in LPM markets and run the following regression:

$$I_{ijkt} = \beta_{1jK} I_{ijkt_1} + \beta_{2jK} I_{ijkt_2} + \varepsilon_{ijkt} \quad k \in K, j \text{ Fixed}$$

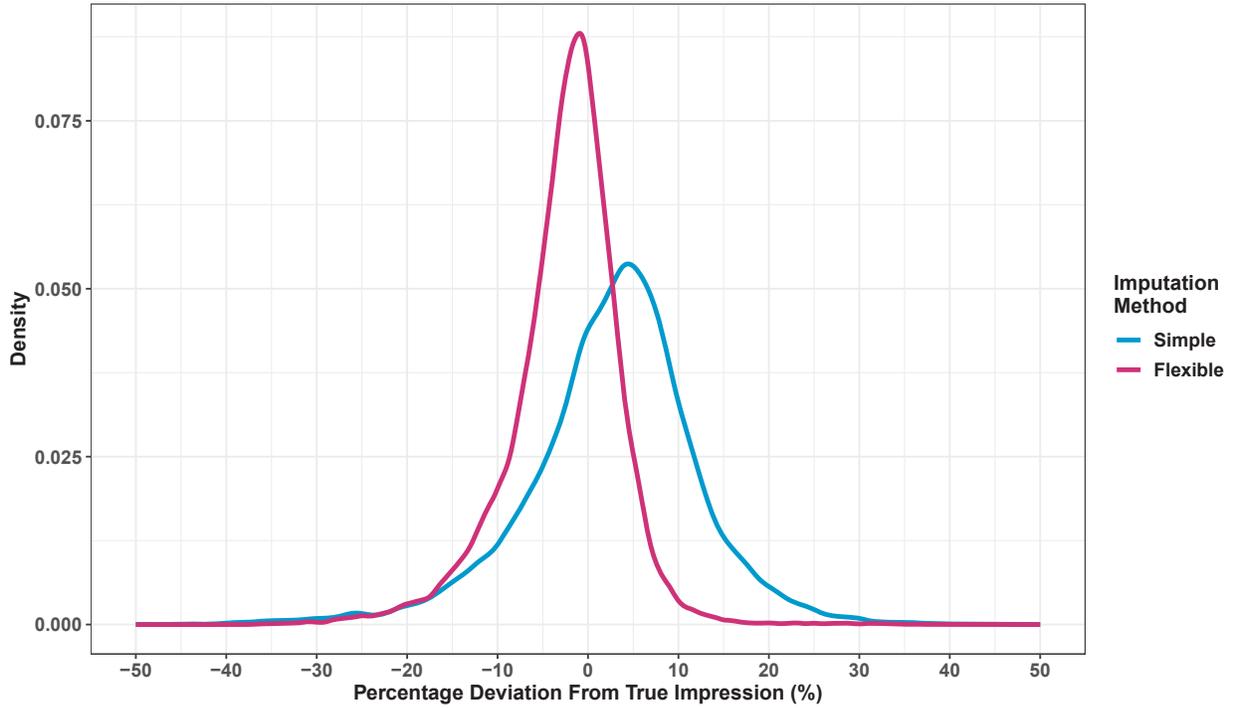
and then we use the estimated parameters to impute the unobserved impressions for all stations in non-LPM markets:  $I_{ijkt} \approx \hat{\beta}_{1jK} I_{ijkt_1} + \hat{\beta}_{2jK} I_{ijkt_2}$ . The accuracy of our flexible method on observed data in non-sweep months is summarized by the red line in Figure 20. The flexible method is able to correct a large fraction of overestimates.

Finally, we use the flexible imputation method to re-compute GRPs and re-run the log-linear first stage estimations as in Section 4.1. The scatterplot in Figure 21 compares the first stage partial- $F$  based on the two imputation methods, and it shows that the results are virtually unchanged for most categories. While the partial- $F$  from the flexibly-imputed data is slightly higher for most categories with strong or semi-strong first stage, the differences only change our classification of two categories, resulting in 29 categories with  $F > 25$  and 25 categories with  $10 < F < 25$ .<sup>42</sup>

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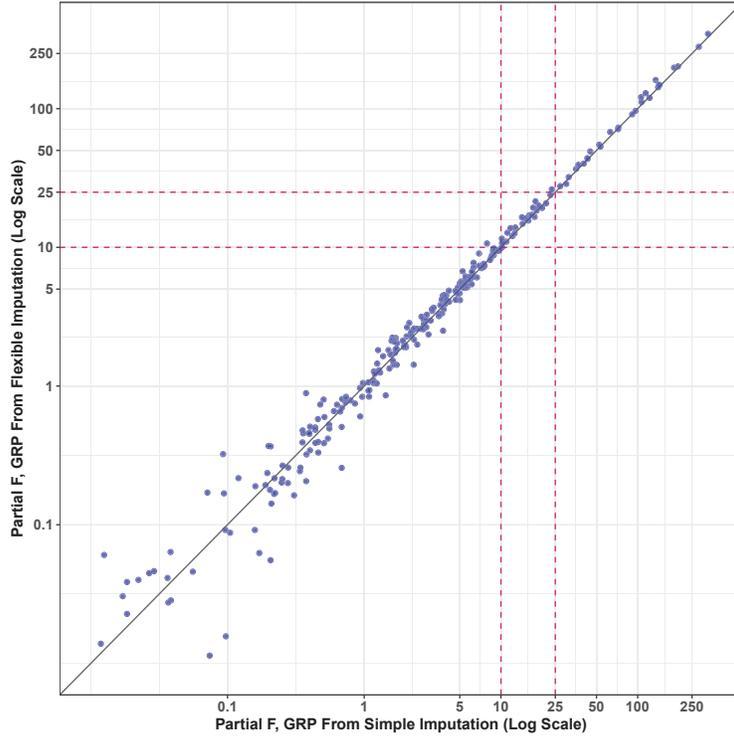
<sup>42</sup>Category “Plumbing & Sanitary Equipment, Fixtures, and Systems” has a partial- $F$  of 23.6 under the original imputation and 26.2 under the flexible imputation. Category “Pre-Recorded Video” has a partial- $F$  of 7.9 under the original imputation and 10.7 under the flexible imputation.

Figure 20: Accuracy of Simple and Flexible Impressions Imputation Methods



Note: The figure plots the distributions (kernel density estimates) of imputation errors for two imputation methods. Imputation error is calculated as the percentage deviation of the estimated impression from observed impression in sweep months. We aggregate observed and imputed impressions to [Market-Year-Month-Day of Week] level (i.e. summing the impressions across stations and time intervals) before calculating imputation errors. The densities are estimated across 12586 such observations for each imputation method.

Figure 21: First Stage Partial- $F$  Statistics: Simple v.s. Flexible Imputation



Note: First stage partial- $F$  statistics for 274 categories using GRPs calculated from flexibly-imputed impressions are plotted along the vertical axis. Partial- $F$  statistics based on our simple imputation method are plotted along the horizontal axis.

## D Exclusion Restriction Robustness Test

In this appendix, we conduct a robustness check under an assumption about the range of potential advertising effect sizes. In particular, we assume that the category-level advertising effect is positive ( $\beta \geq 0$ ). Further, we posit that political advertising  $P$  crowds out commercial advertising  $A$ . Under these assumptions, the effect of  $P$  on commercial sales  $\log(1 + Q)$  should be strictly negative. As a result, any positive and statistically significant reduced-form estimate of  $P$  on  $\log(1 + Q)$  constitutes a violation of the exclusion restriction.

We implement this test on 36 CPG categories in our data that could be matched to one or more product modules in the Nielsen RMS database.<sup>43</sup> For each category  $j$ , we calculate the total revenue  $Q_{jmt}$  of market  $m$  in month  $t$  by summing up the revenue of all products in the category

<sup>43</sup>The RMS data contains the weekly quantity sold at the UPC-retail outlet level for several anonymous retail chains that partner with Nielsen.

across all stores in the market. We then estimate the reduced form regression as in equation (8), where the right hand side is the same as the first-stage equation (2), and the standard errors are clustered at market level. The RMS data is only available through 2014, so we have 60 months of data. For each category, we estimate the reduced-form equation:

$$\log(1 + Q_{mt}) = \Pi P_{mt} + \alpha_m + \alpha_t + \varepsilon_{mt}, \quad (8)$$

and report the reduced-form coefficient  $\Pi$  for each of the 36 categories in Table 9. We find that 5 of the 36 (14%) categories show positive and significant reduced-form coefficients, indicating a violation of the exclusion restriction; this is more than we should expect to occur simply due to chance. None of the 36 categories show negative and significant reduced-form coefficients. That said, only one of the 36 categories has a first stage  $F > 25$  and only three more have  $F \in [10, 25]$ .

Overall, we think the results of this robustness test indicate that the exclusion restriction requires careful thought on a case-by-case basis. It is neither a weak nor obvious assumption. If we think that demand shocks  $U$  might be correlated across categories, as might be the case for an income shock, then the results here may themselves raise concerns for other categories.

Table 9: Exclusion Restriction Robustness Check for 36 CPG Categories

Category	RF Coef.	RF Std. Err.	RF $p$ -value	Scaled RF Coef.	FS Partial F
Candy & Gum	$9.89 \times 10^{-7}$	$2.15 \times 10^{-7}$	0.000	0.023	1.2
Soups	$1.04 \times 10^{-6}$	$3.05 \times 10^{-7}$	0.001	0.024	5.9
Sponges	$6.72 \times 10^{-7}$	$2.55 \times 10^{-7}$	0.009	0.016	1.7
Deodorizers, Air Fresheners & Purifiers	$5.91 \times 10^{-7}$	$2.35 \times 10^{-7}$	0.013	0.014	1.2
all Other Prepared Dinners & Entrees & Pizzas	$6.12 \times 10^{-7}$	$2.71 \times 10^{-7}$	0.025	0.014	6.9
Jellies, Jams, Preserves, Peanut Butter	$4.58 \times 10^{-7}$	$2.56 \times 10^{-7}$	0.076	0.011	5.4
Cold, Cough & Sinus Remedies	$5.48 \times 10^{-7}$	$3.07 \times 10^{-7}$	0.076	0.013	12.7
Cheese Products	$4.76 \times 10^{-7}$	$2.84 \times 10^{-7}$	0.096	0.011	10.2
Cereals	$3.31 \times 10^{-7}$	$2.24 \times 10^{-7}$	0.142	0.008	30.1
Skin Care Creams, Lotions & Oils	$-2.72 \times 10^{-7}$	$1.97 \times 10^{-7}$	0.168	-0.006	0.3
Deodorants & Anti-Perspirants	$-2.46 \times 10^{-7}$	$1.83 \times 10^{-7}$	0.181	-0.006	0.0
Dietary Carbonated	$-2.39 \times 10^{-7}$	$2.04 \times 10^{-7}$	0.244	-0.006	0.1
Feminine Hygiene Products	$1.84 \times 10^{-7}$	$1.64 \times 10^{-7}$	0.263	0.004	1.3
Vitamin Preparations & Tonics	$1.84 \times 10^{-7}$	$1.65 \times 10^{-7}$	0.267	0.004	0.1
Cookies & Crackers	$2.33 \times 10^{-7}$	$2.11 \times 10^{-7}$	0.272	0.005	5.4
Coffee, Tea, Cocoa & Derivatives	$2.09 \times 10^{-7}$	$1.96 \times 10^{-7}$	0.290	0.005	12.2
Dog Food	$1.89 \times 10^{-7}$	$1.83 \times 10^{-7}$	0.305	0.004	0.2
Milk, Butter, Eggs (Including Powdered)	$2.52 \times 10^{-7}$	$2.48 \times 10^{-7}$	0.311	0.006	0.0
Food Wraps, Foils & Bags	$2.14 \times 10^{-7}$	$2.43 \times 10^{-7}$	0.381	0.005	8.8
Diapers(Incl Infant & Adult)	$1.27 \times 10^{-7}$	$1.53 \times 10^{-7}$	0.410	0.003	2.7
Regular Carbonated	$-1.5 \times 10^{-7}$	$1.82 \times 10^{-7}$	0.413	-0.004	6.1
Pain Relievers, Sedatives & Sleeping Preps	$1.22 \times 10^{-7}$	$1.63 \times 10^{-7}$	0.456	0.003	0.1
Salad Dressings & Mayonnaise	$-1.94 \times 10^{-7}$	$2.69 \times 10^{-7}$	0.473	-0.005	1.1
Shampoos, Conditioners & Cream Rinses	$1.17 \times 10^{-7}$	$1.83 \times 10^{-7}$	0.524	0.003	4.0
Beer	$-4.03 \times 10^{-7}$	$7.43 \times 10^{-7}$	0.588	-0.009	0.7
Fruit Juices & Fruit Flavored Drinks(Incl Powdrd)	$9.39 \times 10^{-8}$	$2.14 \times 10^{-7}$	0.661	0.002	0.2
Dental Supplies & Mouthwashes	$6.62 \times 10^{-8}$	$1.71 \times 10^{-7}$	0.700	0.002	1.2
Ice Cream, Frozen Novelties & Sherbet	$-8.41 \times 10^{-8}$	$2.27 \times 10^{-7}$	0.712	-0.002	0.0
Cat Food	$6.17 \times 10^{-8}$	$1.83 \times 10^{-7}$	0.737	0.001	0.2
Laxatives	$4.92 \times 10^{-8}$	$1.63 \times 10^{-7}$	0.764	0.001	2.3
Laundry Detergents & Cleaning Preparations	$-5.26 \times 10^{-8}$	$2.14 \times 10^{-7}$	0.806	-0.001	2.0
Liquor	$-1.93 \times 10^{-7}$	$9.07 \times 10^{-7}$	0.832	-0.005	1.5
Shaving Equipment & Supplies	$4.03 \times 10^{-8}$	$2.04 \times 10^{-7}$	0.843	0.001	1.3
Digestive Aids & Antacids	$3.05 \times 10^{-8}$	$1.81 \times 10^{-7}$	0.866	0.001	0.1
Hair Dressings, Sprays & Restoration Prod	$-1.93 \times 10^{-8}$	$1.8 \times 10^{-7}$	0.915	-0.000	3.0
Cleaners & Cleansers (Genl Hshold Use)	$-1.42 \times 10^{-8}$	$2.05 \times 10^{-7}$	0.945	-0.000	0.0

## E Log-Linear First Stage with Advertising Stock

In this appendix, we report the log-linear first-stage results when the endogenous variable is the “ad stock” over the past 12 months, rather than the “ad flow” of the current month. Specifically, we estimate the following first-stage equation:

$$\log(1 + S_{jmt}) = \beta_j Z_{mt} + \alpha_{jm} + \alpha_{jt} + \varepsilon_{jmt}, \quad (9)$$

where the ad stock  $S_{jmt}$  is the weighted sum of category GRPs  $A_{jmt}$  over the past 12 months:

$$S_{jmt} = \sum_{k=0}^{12} \delta^k A_{jm,t-k}. \quad (10)$$

The ad stock measure captures the cumulative effect of past advertising and is frequently used in the estimation of advertising elasticities. We use the monthly decay parameter  $\delta = \sqrt[12]{0.9^{52}} \approx 0.6335$ , which is consistent with the weekly decay parameter of 0.9 used by Shapiro, Hitsch, and Tuchman [2019]. We conduct this exercise for two versions of the instrument: the flow of political advertising ( $Z_{mt} = P_{mt}$  as before) and the stock of political advertising, which we assume decays at the same rate as commercial advertising. ( $Z_{mt} = \sum_{k=0}^{12} \delta^k P_{m,t-k}$ ) Because political advertising flow should not be able to affect the component of commercial advertising stock that comes from past commercial advertising, the political stock instrument might be a stronger instrument. However, the stock instrument requires additional assumptions.<sup>44</sup>

The number of categories with partial- $F$  statistics above 25 is 28 for the ad-flow specification and 17 for the ad-stock specification with political ad flow as an instrument (the “stock-flow” specification). For the ad-stock specification with political ad-stock as the instrument (the “stock-stock” specification), there are only 14 categories with partial- $F$  above 25. The distribution of partial- $F$  for the three specifications are compared in Table 10, Table 11, and Figures 22--23 below. Figure 22 plots the partial- $F$  for the “stock-flow” specification against the partial- $F$  for the ad-flow specification, while Figure 23 plots the partial- $F$  for the “stock-stock” specification against the partial- $F$  for the ad-flow specification. The comparisons show that the ad-stock first stage is generally weaker than the ad-flow first stage. The weak first stages of the two ad-stock specifications are more pronounced for categories with strong ad-flow first stages, as shown by the right tails below the 45-degree line in Figures 22–23.

We also compare the scaled first-stage coefficients for the three specifications in Table 11 and Figures 24--25.<sup>45</sup> The negative effect of political advertising on ad stock is generally smaller than the negative effect on ad flow, which is expected because the ad stock is driven in a large part

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<sup>44</sup>Using the stock of political advertising as an instrument requires an additional exclusion. That is, we must assume that the only structural state dependence operates through advertising carry-over. Otherwise, it is possible that increased political advertising in time  $t - 1$  leads to lower sales in time  $t - 1$ , which then leads to lower sales in time  $t$  through structural state dependence. This violates the exclusion restriction that the instrument must only affect the outcome through its correlation with the endogenous variable.

<sup>45</sup>As before, the scaling factor is the median of instrument  $Z_{mt}$  across markets in October 2016. The value is 23438 for the political ad flow and 32597 for the political ad stock.

by past advertising that is not affected by current political advertising. The scaled coefficients are qualitatively similar in the specification with political ad stock as the instrument.

Table 10: Classification of Categories by Range of Partial- $F$  in 3 Specifications

		Stock-Flow			Stock-Stock			Total (Ad-Flow)
		$F > 25$	$10 < F \leq 25$	$F \leq 10$	$F > 25$	$10 < F \leq 25$	$F \leq 10$	
Ad-Flow	$F > 25$	16	10	2	14	11	3	28
	$10 < F \leq 25$	1	9	15	0	10	15	25
	$F \leq 10$	0	6	215	0	3	218	221
Total (Stock-Flow / Stock-Stock)		17	25	232	14	24	236	

Table 11: Quantiles of Log-Linear First Stage Partial- $F$  and Scaled Coefficients: 3 Specifications

Quantiles:		Min	0.05	0.10	0.25	0.50	0.75	0.90	0.95	Max
Partial- $F$	Ad-Flow	0.0	0.0	0.0	0.4	2.1	6.9	26.1	78.9	327.5
Partial- $F$	Stock-Flow	0.0	0.0	0.0	0.3	1.6	4.8	14.5	32.9	98.2
Partial- $F$	Stock-Stock	0.0	0.0	0.1	0.3	1.3	4.1	14.2	26.8	88.3
Scaled Coef.	Ad-Flow	-0.264	-0.121	-0.072	-0.029	-0.008	0.000	0.006	0.010	0.088
Scaled Coef.	Stock-Flow	-0.162	-0.066	-0.039	-0.016	-0.003	0.001	0.007	0.016	0.130
Scaled Coef.	Stock-Stock	-0.157	-0.063	-0.039	-0.014	-0.003	0.002	0.008	0.020	0.103

Figure 22: Partial  $F$ : “Stock-Flow” v.s. Benchmark

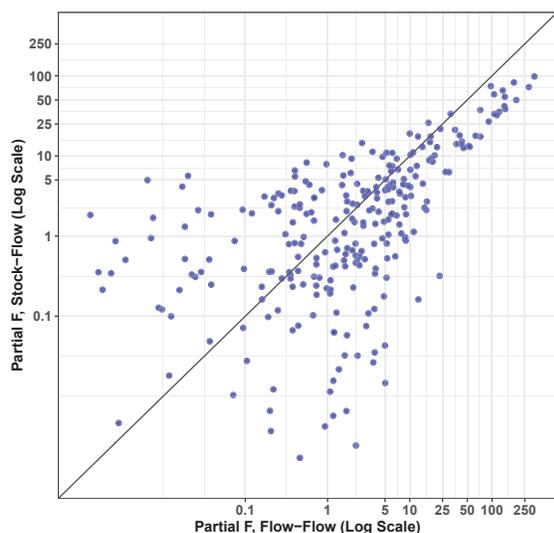


Figure 23: Partial  $F$ : “Stock-Stock” v.s. Benchmark

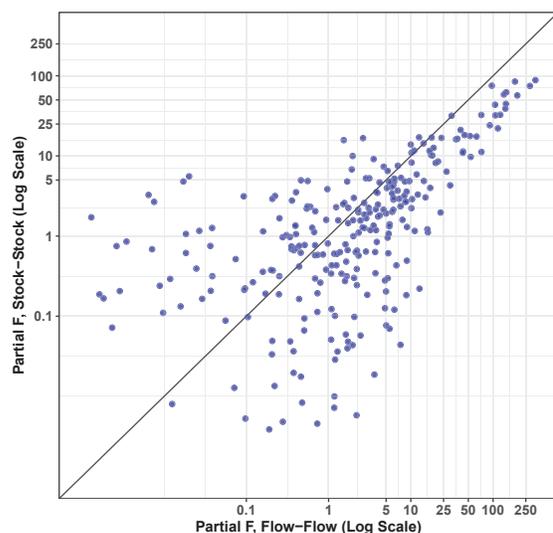


Figure 24: Scaled Coefficients: “Stock-Flow” v.s. Benchmark

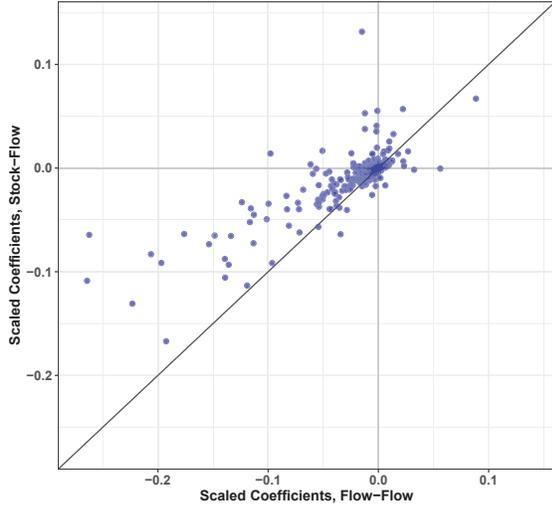
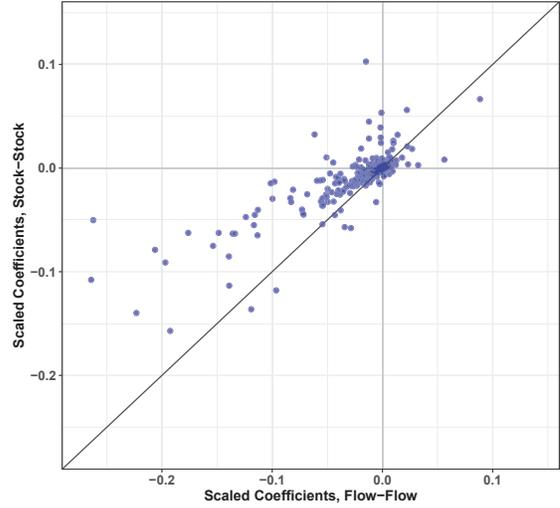


Figure 25: Scaled Coefficients: “Stock-Stock” v.s. Benchmark



## F Distributions of First-Stage Coefficients With Alternative Fixed Effects

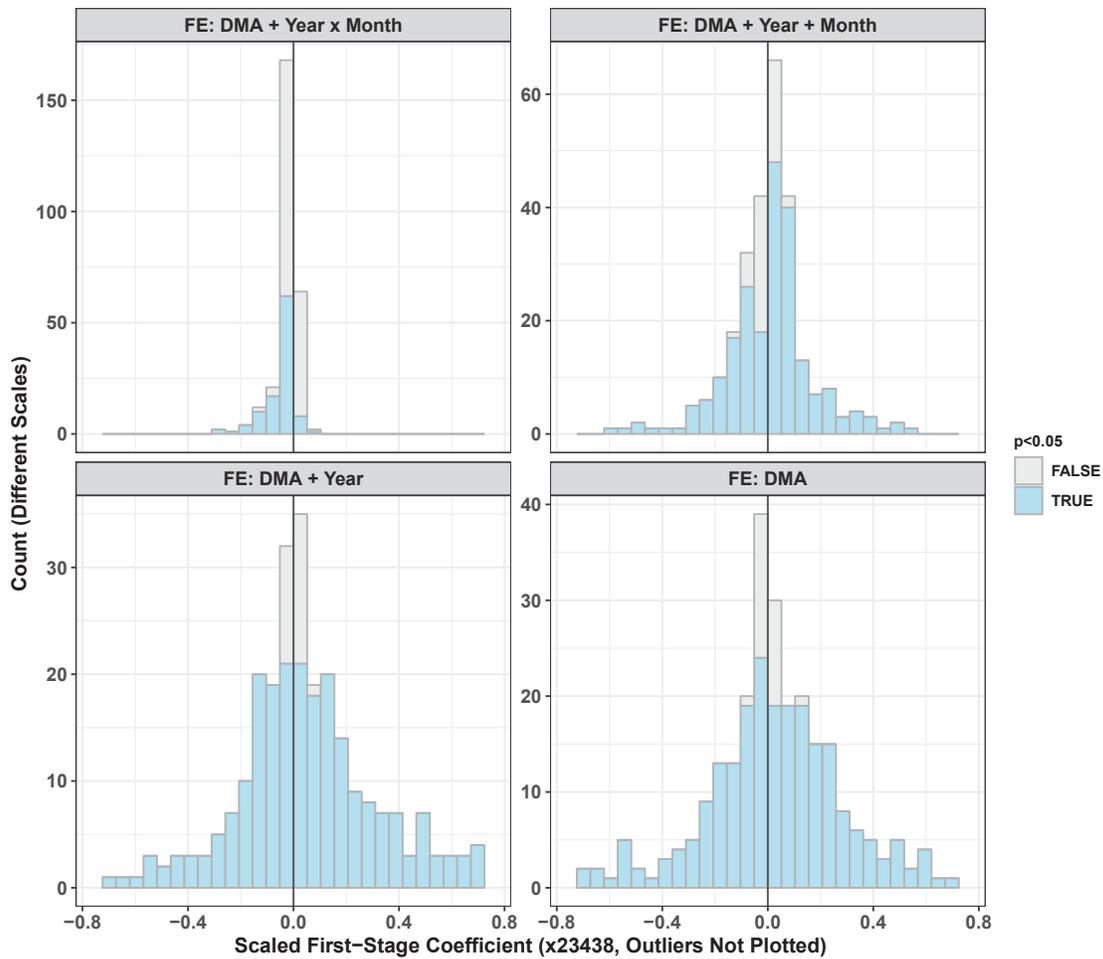
In this appendix, we provide suggestive evidence that DMA and year-month fixed effects are necessary for satisfying the monotonicity condition (as discussed in Section 2.3). Specifically, we estimate Equation (2) with three alternative sets of fixed effects: DMA + Year + Month, DMA + Year, and DMA only.

The number of categories with positive and negative first-stage coefficients under these specifications are reported in Table 12, and the distributions of coefficients are reported in Figure 26. Only 9 out of 274 categories (3.3%) have positive significant coefficients under the DMA and year-month fixed effects, which is roughly what would be predicted just due to chance. In contrast, more than 130 categories, or almost half of all categories, have positive and significant first-stage coefficients under each of the three alternative specifications. This shows that without the year-month fixed effects, the theory does not work as prescribed. This is consistent with failures of the monotonicity condition described in Section 2.3.

Table 12: Fraction of Positive / Negative First-Stage Coefficients Under Alternative Fixed Effects

Fixed Effects	Negative		Positive	
	$p < 0.05$	$p \geq 0.05$	$p < 0.05$	$p \geq 0.05$
DMA + Year $\times$ Month	96	112	9	57
DMA + Year + Month	92	31	131	20
DMA + Year	109	11	139	15
DMA	110	16	136	12

Figure 26: Distribution of First-Stage Coefficients Under Alternative Fixed Effects



## G Implementation with FCC Data

In this appendix, we provide a roadmap for implementing the political advertising instrument with publicly available data from the Federal Communications Commission. The chief advantage of the FCC dataset is that it is available in real-time to all audiences; our hope is that it will broaden the applicability of this IV approach. Since August 2012, the FCC mandates that television stations in the fifty largest DMAs post data about their sales of airtime to political groups, including campaigns and Political Action Committees, to an online database, available at <https://publicfiles.fcc.gov>. The posts must be in real-time, and as of July 2014, the mandate was expanded to include all stations.<sup>46</sup> In September 2018, we collected data on the total number of files uploaded to the database by stations in each market in each month since August 2012. This dataset presents two challenges: first, files comprise invoices, order forms, contracts, and occasionally other forms such as a federal candidate certificates.<sup>47</sup> Each file therefore represents an unknown number of GRPs. The second challenge is that files must only be retained for two years, so that our data from August 2012-August 2016 may contain only a selected sample of stations which have chosen to retain their files for longer than required. This limitation is somewhat temporary, however, as we plan to update our file counts in real-time going forward. To explore whether file counts capture political advertising volumes, Figure 27 compares counts to GRPs measured by Ad Intel. We find a robust, positive relationship between the two measures. Note also that neither challenge in the FCC data threatens our identification strategy so long as file counts correlate with commercial airtime and also satisfy the exclusion restriction from section 2. The use of file counts merely requires that compliance must not be driven by a third factor that affects product markets directly.

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<sup>46</sup>FCC, About Public Inspection Files, Accessed December 3, 2018.

<sup>47</sup>These must be ratified in order for an official campaign to receive lowest unit rates.

Figure 27: FCC File Counts vs Political GRPs

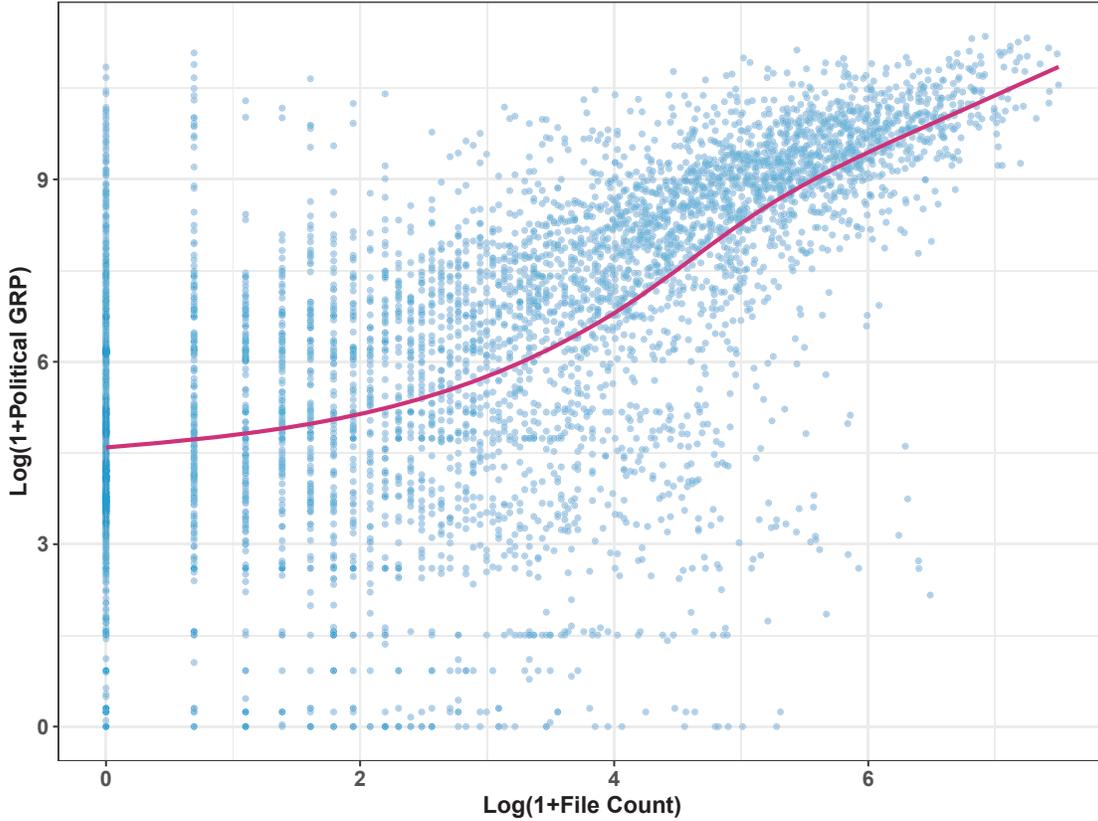


Table 13: FCC File Counts and Spots

	Mean	SD	Min	Percentile			Obs
				10	50	90	
Spots in an FCC File	57.71	74.66	1	7	37	124	3,869

**Notes:** Based on invoices, contracts, and order forms uploaded to the FCC online database during the 2012 Presidential Election. See Moshary [Forthcoming] for a detailed description of the data.

We compare the “free” FCC political file count instrument with the “paid” political GRP instrument under the log-linear specification. Table 14 tabulates the numbers of categories by first-stage strength for the two instruments: the FCC instrument achieves  $F > 25$  in 15 categories and  $10 < F < 25$  in 17 categories, compared to 28 and 25 for the political GRP instrument. Meanwhile, the number of categories with partial  $R^2 > 0.01$  is 14, compared to 21 for the benchmark. In general, we find that the FCC instrument is weaker than the political GRP instrument at all levels.

The 15 categories in which the FCC instrument achieves  $F > 25$  are listed in Table 15 along with their partial  $F$  and partial  $R^2$  for both instruments. The comparison shows that the noise of the FCC instrument has a large impact on both the first-stage strength and explanatory power. However, the list also shows that the FCC instrument is mostly consistent with the political GRP instrument in terms of the categories where they are strong. In fact, most of the strong categories for the FCC instrument are the strongest ones for political GRP: all 15 categories in the list have  $F > 50$  and  $R^2 > 0.01$  in the benchmark specification. Therefore, the free FCC instrument may be an attractive option for researchers interested in one of these categories.

Table 14: Classification of Categories by First Stage Strength: FCC v.s. Political GRP Instrument

Instrument	FCC			Total (Political GRP)	
	$F > 25$	$10 < F < 25$	$F < 10$		
Political GRP	$F > 25$	15	7	6	28
	$10 < F < 25$	0	7	18	25
	$F < 10$	0	3	218	221
Total (FCC)		15	17	242	

Table 15: List of 15 Categories With  $F > 25$ : FCC Instrument

Category	Partial $F$		Partial $R^2$		Disp. Effect	
	FCC	Pol. GRP	FCC	Pol. GRP	FCC	Pol. GRP
Household Furnishings & Appliance Stores	82	330	0.054	0.058	-0.07	-0.14
Miscellaneous Organization Advertising	74.3	154	0.054	0.05	0.08	0.13
Miscellaneous Professional Services	73.3	141.2	0.042	0.028	-0.04	-0.05
Autos & Light Truck - Dealerships	72.5	280.2	0.032	0.035	-0.1	-0.2
Light Trucks & Vans-Factory:new & Cpo	49	106.1	0.02	0.024	-0.03	-0.05
Hospitals,physicians & Misc.physical Culture	48.4	192.9	0.024	0.03	-0.06	-0.12
Optical Goods and Services	45.9	183.2	0.021	0.018	-0.08	-0.14
Restaurants, Hotel Dining & Nightclubs	35.4	134.6	0.022	0.026	-0.02	-0.03
Misc Entertainment & Combination Copy	34	146.7	0.008	0.02	-0.1	-0.27
Dance, Theater, Concerts, Opera	33.2	90.2	0.01	0.014	-0.09	-0.15
Passenger Cars-Factory:new & Cpo	31	143.4	0.017	0.026	-0.02	-0.04
Schools & Camps, Seminars	28.8	72.6	0.014	0.014	-0.03	-0.06
Construction, Engineering & Archit Srvcs	28	120.9	0.013	0.017	-0.07	-0.15
Miscellaneous Retail	27.5	112.7	0.018	0.023	-0.02	-0.04
Passenger Cars-Dealer Assn:new & Cpo	25.2	110	0.01	0.018	-0.1	-0.21