Data appendix: Using urban migration flows for non-market amenity valuation

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To infer household willingness-to-pay for urban amenities, our model jointly relies on (1) aggregate-level data on migration flows between metropolitan statistical areas (MSAs) and (2) micro-level data that provides household-level location choices, income, and housing expenditures, as well as demographic information we can leverage to understanding heterogeneity in preferences. In what follows, we describe these data and explain the decisions we took during their preparation and cleaning.

The aggregate MSA-to-MSA migration flow data come directly from the Census Bureau. We use the 2012-2016 vintage, which was constructed from 1-year American Community Survey (ACS) samples over that time period. Our flow measure is the Bureau's point estimate of the annual count of individuals who moved between given MSAs during the past year; thus, the measure is effectively a 5-year average of the origin-destination pair's gross annual migration flow. While this is an estimate based on a 5% population sample, we prefer this data to the IRS's tax-filing-generated migration data for three main reasons. First, because our model is cross-sectional in nature, we have little interest in constructing a year-over-year panel of migration flows, which is the main advantage of the IRS data. Second, the IRS data has well-noted sample selection issues: household that don't file taxes (read: poor or elderly) or file complicated taxes after the standard filing deadline (read: wealthy) are not counted. Third, the IRS data is heavily censored from the left; migration flows of fewer than 10 households are suppressed, painting an less complete picture of migration patterns. As zero flows between MSAs cannot be identified by our model, we find this systematic censoring especially unattractive.

Our household microdata is a 5-year (2012-2016) public-use ACS sample curated by the much-heralded IPUMS USA (Ruggles et al, 2020). While this ACS product is also the original source of our aggregate MSA-MSA flows, in its public-use micro-data form, confidentiality measures have been taken in terms of geographic information. For the unfamiliar, we discuss the ramifications of these confidentiality measures below in some detail, but the key implication is that one cannot recreate or replicate the Census Bureau's point estimates of MSA-to-MSA migration flows directly from the publicly-available microdata. Hence our reliance on the separate data product for aggregate migration flow counts. In the microdata, households' current residential geography is assigned by Public Use Microdata Area (PUMA), while their previous residential geography is assigned by Migration PUMA

(MIGPUMA). PUMA geographies are nested in MIGPUMAs. PUMAs are built from counties and census tracts, comprising of populations roughly on the order of 100,000. MIGPUMAs correspond to exactly one or more PUMAs, often resulting in aggregated geographies that contain larger populations.

MSAs are constructed from counties. As a result, for households we observe residing in a PUMA that crosses an MSA boundary, it is not possible to assign the correct geography with certainty. Resulting misassignment errors are typically small, and in our experience, almost universally ignored in similar empirical social science applications. However, these assignment errors may compound when incorporating MIGPUMAs, since their geographic footprint may be substantially larger. As we are unaware of any previous work using this MIGPUMA variable in the locational sorting literature, we proceed by the following data construction procedure. This undertaking, of course, has our modelling application in mind and may be more or less appropriate in other settings.

Our objective in constructing the microdata sample is to maintain as many potential origin/destination MSAs as possible for our second-stage estimation, while balancing a desire to obtain unbiased first-stage estimation parameters. To determine which households are included in our estimation sample, the following rules/practices are adopted in our MIGPUMA assignment procedure.

1. We assign MIGPUMAs to MSAs by broadly attempting to minimize total error rate (sum of commission and omission rates, see below for fuller definition) that results from inclusion. When possible, we prefer assignment errors of omission to assignment errors of commission. In several cases, this results in a higher total error rate, but zero commission error rate.

2. Total error rates greater than the arbitrary value of 50% result in an MSA being dropped from our sample. This results in the loss of 14 MSAs, representing the roughly 2.46% of the urban-based population in the continental US. These MSAs are displayed in Table A2.1.

3. When possible, we create "hybrid-MSAs" in order to avoid dropping high-error-rate MSAs from our sample. These are spatial joins of neighboring MSAs where MIGPUMA boundaries make it impossible to differentiate a household's true origin MSA. For our intended purpose of valuing air quality and climate, these MSAs are likely to be similar in key characteristics, though we do lose a little bit of usable variation. In total, we map 35 MSAs into 16 "hybrid-MSAs".

4. For all cases of commission error, we make sure that the MIGPUMA in question only contains rural counties or micropolitan statistical areas. If an offending MIGPUMA spans two MSAs, we either create a "hybrid-MSA" or drop the MIGPUMA's households from the sample. Thus, we never misclassify a household's origin in the sense of assigning them to one MSA when they truly resided in a different MSA.

Our resulting MIGPUMA-to-MSA assignment results in each MSA falling into one of four descriptive classes:

1. Perfect match: MIGPUMA and MSA geographies align perfectly, resulting in a 100% match of an MSA's households to their true origin MSA. (Geography count: 150 / 344)

2. Some omission occurring: All households assigned to an origin MSA by our procedure did previously reside in the true geographic boundaries of that MSA. However, some percentage of true residents are omitted because MIGPUMA boundaries cross the MSA borders. (Geography count: 117 / 344)

3. Some commission occurring: 100% of households who did previously reside in an origin MSA are assigned the correct geography, but additional households are also assigned to that origin. These additional households did not truly reside in the MSA's boundaries, but their MIGPUMA's borders surpass those of the MSA. (Geography count: 60 / 344)

4. Both omission and commission occurring: some percentage of the origin MSA's true residents are omitted from our resulting sample, and some additional, non-origin-MSA resident households are committed. (Geography count: 17 / 344)

A summary of destination and origin assignment error rates for included MSAs is found below in table A2.2.

MSA Title	Population
Brunswick, GA	112370
Carson City, NV	55274
Danville, IL	81625
Elmira, NY	88830
Florence-Muscle Shoals, AL	147137
Grand Forks, ND-MN	98461
Grants Pass, OR	82713
Jonesboro, AR	121026
Lewiston, ID-WA	60888
Morristown, TN	113951
Pine Bluff, AR	100258
Pocatello, ID	82839
Pueblo, CO	159063
Sebring, FL	98786

Table A2.1: MSAs omitted from our study due to PUMA/MIGPUMA-MSA boundary issues in the microdata.

Table A2.2: Summary list of MSAs included in analysis

		Destination error (%)			Origin error (%)		
MSA Name (* denotes merge of >1 MSAs)	Population	Omission	Commission	Total	Omission	Commission	Total
Abilene, TX	165252	20.42	0	20.42	20.42	0	20.42
Akron, OH	703200	0	0	0	0	0	0
Albany, GA	157308	21.9	0	21.9	21.9	0	21.9
Albany-Corvallis, OR*	202251	0	0	0	0	0	0
Albany-Schenectady-Troy, NY	870716	3.76	0	3.76	3.76	0	3.76
Albuquerque, NM	887077	1.85	0	1.85	1.85	0	1.85
Alexandria, LA	153922	14.49	28.45	42.94	14.49	28.45	42.94
Allentown-Bethlehem-Easton, PA-NJ	821173	0	0	0	0	0	0
Altoona, PA	127089	0	26.54	26.54	0	26.54	26.54
Amarillo, TX	251933	4.02	0	4.02	4.02	0	4.02
Ames, IA	89542	0	22.71	22.71	0	22.71	22.71
Ann Arbor, MI	344791	0	0	0	0	0	0
Anniston-Oxford-Jacksonville, AL	118572	0	0	0	0	0	0
Appleton-Fond du Lac, WI*	327299	0	0	0	0	0	0
Asheville, NC	424858	43.91	0	43.91	43.91	0	43.91
Athens-Clarke County, GA	192541	39.38	0	39.38	39.38	0	39.38
Atlanta-Sandy Springs-Roswell, GA	5286728	5.82	0	5.82	5.82	0	5.82
Atlantic City-Hammonton-Ocean City, NJ*	371814	0	0	0	0	0	0
Auburn-Opelika, AL	140247	0	0	0	0	0	0
Augusta-Richmond County, GA-SC	564873	9.42	0	9.42	9.42	0	9.42
Austin-Round Rock, TX	1716289	6.54	0	6.54	6.54	0	6.54
Bakersfield, CA	839631	0	0	0	0	0	0
Baltimore-Columbia-Towson, MD	2710489	1.76	0	1.76	1.76	0	1.76
Bangor, ME	153923	0	0	0	0	0	0
Barnstable Town, MA	215888	39.25	0	39.25	0	11.01	11.01
Baton Rouge, LA	802484	0	0	0	0	0	0
Battle Creek, MI	136146	0	30.3	30.3	0	30.3	30.3
Bay City-Midland, MI*	191400	0	0	0	0	0	0
Beaumont-Port Arthur, TX	403190	3.58	0	3.58	3.58	0	3.58
Beckley, WV	124898	0	33.27	33.27	0	33.27	33.27
Bellingham, WA	201140	0	0	0	0	0	0
Bend-Redmond, OR	157733	0	0	0	0	0	0
Billings, MT	158934	34.9	0	34.9	6.34	39.18	45.52
Binghamton, NY	251725	5.53	0	5.53	0	28.12	28.12
Birmingham-Hoover, AL	1128047	11.84	0	11.84	11.84	0	11.84
Bismarck, ND	114778	5.23	9.02	14.25	5.23	9.02	14.25
Blacksburg-Christiansburg-Radford, VA	178237	0	0	0	0	0	0

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		Destination error (%)			Origin error (%)		
MSA Name (* denotes merge of >1 MSAs)	Population	Omission	Commission	Total	Omission	Commission	Total
Bloomington, IL	186133	8.9	0	8.9	8.9	0	8.9
Bloomington, IN	159549	13.52	0	13.52	13.52	0	13.52
Bloomsburg-...-Hazleton, PA*	649193	2.81	0	2.81	0	12.71	12.71
Boise City, ID	616561	12.99	0	12.99	1.14	5.11	6.25
Boston-...-Nashua, MA-CT-NH*	5870103	2.41	0.33	2.74	0	12.03	12.03
Bowling Green, KY	158599	28.25	0	28.25	28.25	0	28.25
Bremerton-Silverdale, WA	251133	0	0	0	0	0	0
Bridgeport-Stamford-Norwalk, CT	916829	0	0	0	0	0	0
Brownsville-Harlingen, TX	406220	0	0	0	0	0	0
Buffalo-Cheektowaga-Niagara Falls, NY	1135509	0	0	0	0	0	0
Burlington, NC	151131	0	0	0	0	0	0
Burlington-South Burlington, VT	211261	0	0	0	0	0	0
California-Lexington Park, MD	105151	0	45.77	45.77	0	45.77	45.77
Canton-Massillon, OH	404422	0	0	0	0	0	0
Cape Coral-Fort Myers, FL	618754	0	0	0	0	0	0
Cape Girardeau, MO-IL	96275	8.56	30.8	39.36	8.56	30.8	39.36
Carbondale-Marion, IL	126575	0	32.85	32.85	0	32.85	32.85
Casper, WY	75450	0	28.26	28.26	0	28.26	28.26
Cedar Rapids, IA	257940	18.11	0	18.11	18.11	0	18.11
Chambersburg-Waynesboro-Gettysburg, PA*	251025	0	0	0	0	0	0
Champaign-Urbana, IL	231891	13.29	0	13.29	13.29	0	13.29
Charleston, WV	227078	10.85	0	10.85	10.85	0	10.85
Charleston-North Charleston, SC	664607	0	0	0	0	0	0
Charlotte-Concord-Gastonia, NC-SC	2217012	15.68	0	15.68	23.7	0	23.7
Charlottesville, VA	218705	7.84	14.12	21.96	7.84	14.12	21.96
Chattanooga, TN-GA	528143	8.02	5.08	13.1	8.02	5.08	13.1
Cheyenne, WY	91738	0	28.35	28.35	0	28.35	28.35
Chicago-Naperville-Elgin, IL-IN-WI	9461105	0.5	0	0.5	0.5	0	0.5
Chico, CA	220000	0	0	0	0	0	0
Cincinnati, OH-KY-IN	2114580	9.96	0	9.96	9.96	0	9.96
Clarksville, TN-KY	260625	0	11.57	11.57	0	11.57	11.57
Cleveland, TN	115788	0	31.1	31.1	0	31.1	31.1
Cleveland-Elyria, OH	2077240	0	0	0	0	0	0
Coeur d'Alene, ID	138494	3.5	0	3.5	0	44.52	44.52
College Station-Bryan, TX	228660	14.79	0	14.79	14.79	0	14.79
Colorado Springs, CO	645613	0	0	0	0	0	0
Columbia, MO	162642	0	0	0	0	0	0
Columbia, SC	767598	0	0	0	0	0	0
Columbus, GA-AL	294865	31.78	0	31.78	31.78	0	31.78

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MSA Name (* denotes merge of >1 MSAs)	Population	Destination error (%)			Origin error (%)		
		Omission	Commission	Total	Omission	Commission	Total
Columbus, IN	76794	0	35.56	35.56	0	35.56	35.56
Columbus, OH	1901974	5.27	0	5.27	5.27	0	5.27
Corpus Christi, TX	428185	20.54	0	20.54	20.54	0	20.54
Crestview-...-Panama City, FL*	420580	3.77	9.63	13.4	3.77	9.63	13.4
Cumberland-...-Winchester, MD-WV-VA*	483370	0	19.24	19.24	0	19.24	19.24
Dallas-Fort Worth-Arlington, TX	6426214	1.85	0	1.85	1.85	0	1.85
Dalton, GA	142227	27.86	0	27.86	27.86	0	27.86
Daphne-Fairhope-Foley, AL	182265	0	0	0	0	0	0
Davenport-Moline-Rock Island, IA-IL	379690	17.62	0	17.62	17.62	0	17.62
Dayton, OH	799232	0	0	0	0	0	0
Decatur, AL	153829	0	0	0	0	0	0
Decatur, IL	110768	0	0	0	0	0	0
Deltona-Daytona Beach-Ormond Beach, FL	590289	0	0	0	0	0	0
Denver-Aurora-Lakewood-Boulder-Greeley, CO*	3090874	0.8	0	0.8	0.52	3.19	3.71
Des Moines-West Des Moines, IA	569633	16.44	0	16.44	1.92	11.16	13.08
Detroit-Warren-Dearborn, MI	4296250	2.06	0	2.06	2.06	0	2.06
Dothan, AL	145639	0	25.65	25.65	0	25.65	25.65
Dover, DE	162310	0	0	0	0	0	0
Dubuque, IA	93653	0	38.48	38.48	0	38.48	38.48
Duluth, MN-WI	279771	15.78	33.59	49.37	15.78	33.59	49.37
Durham-Chapel Hill, NC	504357	20.42	0	20.42	20.42	0	20.42
East Stroudsburg, PA	169842	0	0	0	0	0	0
Eau Claire, WI	161151	5.52	0	5.52	0	43.64	43.64
El Centro, CA	174528	0	0	0	0	0	0
El Paso, TX	804123	0.43	0	0.43	0.43	0	0.43
Elizabethtown-Fort Knox, KY	148338	21.53	28.24	49.77	0	44.88	44.88
Elkhart-Goshen, IN	197559	0	0	0	0	0	0
Erie, PA	280566	0	0	0	0	0	0
Eugene, OR	351715	0	0	0	0	0	0
Evansville, IN-KY	311552	42.32	0	42.32	42.32	0	42.32
Fargo, ND-MN	208777	28.26	0	28.26	28.26	0	28.26
Farmington, NM	130044	22.38	0	22.38	0	43.15	43.15
Fayetteville, NC	366383	12.82	0	12.82	12.82	0	12.82
Fayetteville-Springdale-Rogers, AR-MO	463204	8.38	0	8.38	8.38	0	8.38
Flagstaff, AZ	134421	0	0	0	0	0	0
Flint, MI	425790	0	27.19	27.19	0	27.19	27.19
Florence, SC	205566	0	0	0	0	0	0
Fort Collins, CO	299630	0	0	0	0	0	0
Fort Smith, AR-OK	280467	33.08	0	33.08	33.08	0	33.08

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MSA Name (* denotes merge of >1 MSAs)	Population	Destination error (%)			Origin error (%)		
		Omission	Commission	Total	Omission	Commission	Total
Fort Wayne, IN	416257	14.64	0	14.64	14.64	0	14.64
Fresno, CA	930450	0	0	0	0	0	0
Gadsden, AL	104430	0	0	0	0	0	0
Gainesville, FL	264275	6.41	0	6.41	6.41	0	6.41
Gainesville, GA	179684	0	0	0	0	0	0
Glens Falls, NY	128923	0	0	0	0	0	0
Goldsboro, NC	122623	0	0	0	0	0	0
Grand Island, NE	81850	0	23.3	23.3	0	23.3	23.3
Grand Junction, CO	146723	12.15	0	12.15	0	36.41	36.41
Grand Rapids-Wyoming, MI	988938	12.39	0	12.39	12.39	0	12.39
Great Falls, MT	81327	0	44.99	44.99	0	44.99	44.99
Green Bay, WI	306241	19.02	0	19.02	19.02	0	19.02
Greensboro-High Point, NC	723801	12.94	0	12.94	12.94	0	12.94
Greenville, NC	168148	0	0	0	0	0	0
Greenville-Anderson-Mauldin, SC	824112	14.47	0	14.47	14.47	0	14.47
Gulfport-Biloxi-Pascagoula, MS	370702	11.85	0	11.85	11.85	0	11.85
Hammond, LA	121097	0	28.03	28.03	0	28.03	28.03
Hanford-Corcoran, CA	152982	0	0	0	0	0	0
Harrisburg-Carlisle, PA	549475	0	0	0	0	0	0
Harrisonburg, VA	125228	0	0	0	0	0	0
Hartford-West Hartford-East Hartford, CT	1212381	0	0	0	0	0	0
Hattiesburg, MS	142842	0	15.94	15.94	0	15.94	15.94
Hickory-Lenoir-Morganton, NC	365497	24.87	0	24.87	24.87	0	24.87
Hilton Head Island-Bluffton-Beaufort, SC	187010	0	0	0	0	0	0
Hinesville-Savannah, GA*	425528	12.28	0	12.28	12.28	0	12.28
Homosassa Springs, FL	141236	0	0	0	0	0	0
Hot Springs, AR	96024	0	40.52	40.52	0	40.52	40.52
Houma-Thibodaux, LA	208178	0	10.11	10.11	0	10.11	10.11
Houston-The Woodlands-Sugar Land, TX	5920416	1.21	0	1.21	1.21	0	1.21
Huntington-Ashland, WV-KY-OH	364908	17.11	25.47	42.58	17.11	25.47	42.58
Huntsville, AL	417593	6.06	0	6.06	0	18.22	18.22
Idaho Falls, ID	133265	21.78	0	21.78	21.78	0	21.78
Indianapolis-Carmel-Anderson, IN	1887877	0	0	0	0	0	0
Iowa City, IA	152586	14.22	0	14.22	14.22	0	14.22
Ithaca, NY	101564	0	0	0	0	0	0
Jackson, MI	160248	0	0	0	0	0	0
Jackson, MS	567122	9.96	0	9.96	0	7.92	7.92
Jackson, TN	130011	11.22	0	11.22	11.22	0	11.22
Jacksonville, FL	1345596	1.96	0	1.96	14.12	0	14.12

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MSA Name (* denotes merge of >1 MSAs)	Population	Destination error (%)			Origin error (%)		
		Omission	Commission	Total	Omission	Commission	Total
Jacksonville-New Bern, NC*	304574	4.32	16.34	20.66	4.32	16.34	20.66
Janesville-Beloit, WI	160331	0	0	0	0	0	0
Jefferson City, MO	149807	0	0	0	0	0	0
Johnson City, TN	198716	38.11	0	38.11	38.11	0	38.11
Johnstown, PA	143679	0	0	0	0	0	0
Joplin, MO	175518	0	0	0	0	0	0
Kalamazoo-Portage, MI	326589	23.35	0	23.35	23.35	0	23.35
Kankakee, IL	113449	0	0	0	0	0	0
Kansas City, MO-KS	2009342	10.24	0	10.24	10.24	0	10.24
Killeen-Temple, TX	405300	23.46	0	23.46	23.46	0	23.46
Kingsport-Bristol-Bristol, TN-VA	309544	30.98	0	30.98	30.98	0	30.98
Kingston, NY	182493	18.99	0	18.99	0	29.82	29.82
Knoxville, TN	837571	22.46	0	22.46	22.46	0	22.46
Kokomo, IN	82752	0	39.88	39.88	0	39.88	39.88
La Crosse-Onalaska, WI-MN	133665	14.23	0	14.23	14.23	0	14.23
Lafayette, LA	466750	26.87	0	26.87	26.87	0	26.87
Lafayette-West Lafayette, IN	201789	14.38	0	14.38	14.38	0	14.38
Lake Charles, LA	199607	0	31.79	31.79	0	31.79	31.79
Lake Havasu City-Kingman, AZ	200186	0	9.28	9.28	0	9.28	9.28
Lakeland-Winter Haven, FL	602095	0	0	0	0	0	0
Lancaster, PA	519445	0	0	0	0	0	0
Lansing-East Lansing, MI	464036	0	0	0	0	0	0
Laredo, TX	250304	0	0	0	0	0	0
Las Cruces, NM	209233	0	0	0	0	0	0
Las Vegas-Henderson-Paradise, NV	1951269	0	0	0	0	0	0
Lawrence, KS	110826	0	0	0	0	0	0
Lawton, OK	130291	18.42	0	18.42	0	40.62	40.62
Lebanon, PA	133568	0	0	0	0	0	0
Lewiston-Auburn, ME	107702	0	0	0	0	0	0
Lexington-Fayette, KY	472099	37.34	0	37.34	37.34	0	37.34
Lima, OH	106331	0	0	0	0	0	0
Lincoln, NE	302157	5.54	0	5.54	5.54	0	5.54
Little Rock-North Little Rock-Conway, AR	699757	4.04	0	4.04	4.04	0	4.04
Logan, UT-ID	125442	10.19	29.9	40.09	10.19	29.9	40.09
Longview, TX	214369	43.21	0	43.21	43.21	0	43.21
Longview, WA	102410	0	19.56	19.56	0	19.56	19.56
Los Angeles-Long Beach-Anaheim, CA	12828837	0	0	0	0	0	0
Louisville/Jefferson County, KY-IN	1235708	1.96	0	1.96	1.96	0	1.96
Lubbock, TX	290805	4.12	0	4.12	4.12	0	4.12

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MSA Name (* denotes merge of >1 MSAs)	Population	Destination error (%)			Origin error (%)		
		Omission	Commission	Total	Omission	Commission	Total
Lynchburg, VA	252634	0	0	0	0	0	0
Macon, GA	232293	33.04	0	33.04	33.04	0	33.04
Madera, CA	150865	0	0	0	0	0	0
Madison, WI	605435	19.38	0	19.38	19.38	0	19.38
Manhattan, KS	92719	0	27.04	27.04	0	27.04	27.04
Mankato-North Mankato, MN	96740	0	16.51	16.51	0	16.51	16.51
Mansfield, OH	124475	0	0	0	0	0	0
McAllen-Edinburg-Mission, TX	774769	0	0	0	0	0	0
Medford, OR	203206	0	0	0	0	0	0
Memphis, TN-MS-AR	1324829	17.81	0	17.81	17.81	0	17.81
Merced, CA	255793	0	0	0	0	0	0
Miami-Fort Lauderdale-West Palm Beach, FL	5564635	0.51	0	0.51	0	1.3	1.3
Michigan City-La Porte, IN	111467	0	0	0	0	0	0
Midland, TX	141671	3.39	0	3.39	3.39	0	3.39
Milwaukee-Waukesha-West Allis, WI	1555908	0	0	0	0	0	0
Minneapolis-St. Paul-Bloomington, MN-WI	3348859	11.19	0	11.19	11.19	0	11.19
Missoula, MT	109299	0	43.63	43.63	0	43.63	43.63
Mobile, AL	412992	0	0	0	0	0	0
Modesto, CA	514453	0	0	0	0	0	0
Monroe, LA	176441	12.88	0	12.88	12.88	0	12.88
Monroe, MI	152021	0	0	0	0	0	0
Montgomery, AL	374536	0	0	0	0	0	0
Morgantown, WV	129709	0	0	0	0	0	0
Mount Vernon-Anacortes, WA	116901	0	44.64	44.64	0	44.64	44.64
Muncie, IN	117671	0	0	0	0	0	0
Muskegon, MI	172188	0	0	0	0	0	0
Myrtle Beach-Conway-North Myrtle Beach, SC-NC	376722	0	0	0	0	0	0
Napa, CA	136484	0	0	0	0	0	0
Naples-Immokalee-Marco Island, FL	321520	0	0	0	0	0	0
Nashville-Davidson–Murfreesboro–Franklin, TN	1670890	8.62	0	8.62	8.62	0	8.62
New Haven-Milford, CT	862477	0	0	0	0	0	0
New Orleans-Metairie, LA	1189866	0	0	0	0	0	0
New York-Newark-Jersey City, NY-NJ-PA	19567410	0.29	0	0.29	0.29	0	0.29
Niles-Benton Harbor, MI	156813	0	0	0	0	0	0
North Port-Sarasota-Bradenton, FL	702281	0	0	0	0	0	0
Norwich-New London, CT	274055	0	0	0	0	0	0
Ocala, FL	331298	0	0	0	0	0	0
Odessa, TX	137130	0	0	0	0	0	0
Ogden-Clearfield, UT	597159	9.95	0	9.95	9.95	0	9.95

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		Destination error (%)			Origin error (%)		
MSA Name (* denotes merge of >1 MSAs)	Population	Omission	Commission	Total	Omission	Commission	Total
Oklahoma City, OK	1252987	13.01	0	13.01	13.01	0	13.01
Olympia-Tumwater, WA	252264	0	0	0	0	0	0
Omaha-Council Bluffs, NE-IA	865350	21.89	0	21.89	21.89	0	21.89
Orlando-Kissimmee-Sanford-The Villages, FL*	2227831	0	0	0	0	0	0
Oshkosh-Neenah, WI	166994	0	0	0	0	0	0
Owensboro, KY	114752	8.31	0	8.31	8.31	0	8.31
Oxnard-Thousand Oaks-Ventura, CA	823318	0	0	0	0	0	0
Palm Bay-Melbourne-Titusville, FL	543376	0	0	0	0	0	0
Parkersburg-Vienna, WV	92673	0	7.58	7.58	0	7.58	7.58
Pensacola-Ferry Pass-Brent, FL	448991	0	0	0	0	0	0
Peoria, IL	379186	15.11	0	15.11	15.11	0	15.11
Philadelphia-...-Vineland-Bridgeton, PA-NJ*	6122241	0	0	0	0	0	0
Phoenix-Mesa-Scottsdale, AZ	4192887	0.26	0	0.26	8.96	0	8.96
Pittsburgh, PA	2356285	6.39	0	6.39	18.98	0	18.98
Pittsfield, MA	131219	0	0	0	0	0	0
Port St. Lucie, FL	424107	0	0	0	0	0	0
Portland-South Portland, ME	514098	0	0	0	0	0	0
Portland-Vancouver-Hillsboro, OR-WA	2226009	7.17	0	7.17	7.17	0	7.17
Prescott, AZ	211033	0	0	0	0	0	0
Providence-Warwick, RI-MA	1600852	12.83	0	12.83	34.25	0	34.25
Provo-Orem, UT	526810	1.94	0	1.94	1.94	0	1.94
Punta Gorda, FL	159978	0	0	0	0	0	0
Racine, WI	195408	0	0	0	0	0	0
Raleigh, NC	1130490	5.36	0	5.36	5.36	0	5.36
Rapid City, SD	134598	0	22.22	22.22	0	22.22	22.22
Reading, PA	411442	0	0	0	0	0	0
Redding, CA	177223	0	0	0	0	0	0
Reno, NV	425417	0.94	0	0.94	0.94	0	0.94
Richmond, VA	1208101	15.68	0	15.68	15.68	0	15.68
Riverside-San Bernardino-Ontario, CA	4224851	0	0	0	0	0	0
Roanoke, VA	308707	0	6.71	6.71	0	6.71	6.71
Rochester, MN	206877	30.27	0	30.27	30.27	0	30.27
Rochester, NY	1079671	18.71	0	18.71	18.71	0	18.71
Rockford, IL	349431	0	0	0	0	0	0
Rocky Mount, NC	152392	0	0	0	0	0	0
Rome, GA	96317	0	42.18	42.18	0	42.18	42.18
Sacramento–Roseville–Arden-Arcade, CA	2149127	0	0	0	0	0	0
Saginaw, MI	200169	0	0	0	0	0	0
Salem, OR	390738	19.3	0	19.3	19.3	0	19.3

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MSA Name (* denotes merge of >1 MSAs)	Population	Destination error (%)			Origin error (%)		
		Omission	Commission	Total	Omission	Commission	Total
Salinas, CA	415057	18.52	0	18.52	0	11.75	11.75
Salisbury, MD-DE	373802	0	0	0	0	0	0
Salt Lake City, UT	1087873	5.35	0	5.35	5.35	0	5.35
San Angelo, TX	111823	1.43	0	1.43	1.43	0	1.43
San Antonio-New Braunfels, TX	2142508	8.76	0	8.76	8.76	0	8.76
San Diego-Carlsbad, CA	3095313	0	0	0	0	0	0
San Francisco-Oakland-Hayward, CA	4335391	0	0	0	0	0	0
San Jose-Sunnyvale-Santa Clara, CA	1836911	3.01	0	3.01	3.01	0	3.01
San Luis Obispo-Paso Robles-Arroyo Grande, CA	269637	0	0	0	0	0	0
Santa Cruz-Watsonville, CA	262382	0	0	0	0	0	0
Santa Fe, NM	144170	0	0	0	0	0	0
Santa Maria-Santa Barbara, CA	423895	0	0	0	0	0	0
Santa Rosa, CA	483878	0	0	0	0	0	0
Seattle-Tacoma-Bellevue, WA	3439809	0	0	0	0	0	0
Sebastian-Vero Beach, FL	138028	0	0	0	0	0	0
Sheboygan, WI	115507	0	0	0	0	0	0
Sherman-Denison, TX	120877	0	37.44	37.44	0	37.44	37.44
Shreveport-Bossier City, LA	439811	6.06	0	6.06	6.06	0	6.06
Sierra Vista-Douglas, AZ	131346	0	26.53	26.53	0	26.53	26.53
Sioux City, IA-NE-SD	168563	24.56	0	24.56	24.56	0	24.56
Sioux Falls, SD	228261	0	18.17	18.17	0	18.17	18.17
South Bend-Mishawaka, IN-MI	319224	16.38	0	16.38	16.38	0	16.38
Spartanburg, SC	313268	9.24	0	9.24	9.24	0	9.24
Spokane-Spokane Valley, WA	527753	10.71	0	10.71	10.71	0	10.71
Springfield, IL	210170	6.05	0	6.05	6.05	0	6.05
Springfield, MA	621570	8.1	0	8.1	0	10.3	10.3
Springfield, MO	436712	10.97	0	10.97	10.97	0	10.97
Springfield, OH	138333	0	0	0	0	0	0
St. Cloud, MN	189093	20.33	0	20.33	20.33	0	20.33
St. George, UT	138115	0	0	0	0	0	0
St. Joseph, MO-KS	127329	6.24	0	6.24	6.24	0	6.24
St. Louis, MO-IL	2787701	8.95	0	8.95	8.95	0	8.95
State College, PA	153990	0	0	0	0	0	0
Staunton-Waynesboro, VA	118502	0	26.65	26.65	0	26.65	26.65
Stockton-Lodi, CA	685306	0	0	0	0	0	0
Sumter, SC	107456	0	45.2	45.2	0	45.2	45.2
Syracuse, NY	662577	16.4	0	16.4	11.08	11.96	23.04
Tallahassee, FL	367413	25.02	0	25.02	25.02	0	25.02
Tampa-St. Petersburg-Clearwater, FL	2783243	0	0	0	0	0	0

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MSA Name (* denotes merge of >1 MSAs)	Population	Destination error (%)			Origin error (%)		
		Omission	Commission	Total	Omission	Commission	Total
Terre Haute, IN	172425	37.45	0	37.45	37.45	0	37.45
Texarkana, TX-AR	149198	0	35.19	35.19	0	35.19	35.19
Toledo, OH	610001	10.5	0	10.5	0	6.36	6.36
Topeka, KS	233870	8.18	4.44	12.62	8.18	4.44	12.62
Trenton, NJ	366513	0	0	0	0	0	0
Tucson, AZ	980263	0	0	0	0	0	0
Tulsa, OK	937478	16.75	0	16.75	21.34	19.62	40.96
Tuscaloosa, AL	230162	6.85	0	6.85	6.85	0	6.85
Tyler, TX	209714	0	0	0	0	0	0
Utica-Rome, NY	299397	6.34	0	6.34	0	24.09	24.09
Valdosta, GA	139588	21.75	0	21.75	21.75	0	21.75
Vallejo-Fairfield, CA	413344	0	0	0	0	0	0
Victoria, TX	94003	7.67	19.77	27.44	0	13.1	13.1
Virginia Beach-Norfolk-Newport News, VA-NC	1676822	12.01	0	12.01	12.01	0	12.01
Visalia-Porterville, CA	442179	0	0	0	0	0	0
Waco, TX	252772	7.07	0	7.07	7.07	0	7.07
Walla Walla-Kennewick-Richland, WA*	316199	1.29	0	1.29	1.29	0	1.29
Warner Robins, GA	179605	15.42	0	15.42	15.42	0	15.42
Washington-Arlington-Alexandria, DC-VA-MD-WV	5636232	7.73	0	7.73	7.73	0	7.73
Waterloo-Cedar Falls, IA	167819	21.89	0	21.89	21.89	0	21.89
Watertown-Fort Drum, NY	116229	0	18.9	18.9	0	18.9	18.9
Wausau, WI	134063	0	0	0	0	0	0
Weirton-Steubenville-Wheeling, WV-OH*	272404	0	0	0	0	0	0
Wenatchee, WA	110884	0	0	0	0	0	0
Wichita Falls, TX	151306	13.09	0	13.09	13.09	0	13.09
Wichita, KS	630919	5.07	0	5.07	5.07	0	5.07
Williamsport, PA	116111	0	25.26	25.26	0	25.26	25.26
Wilmington, NC	254884	0	0	0	0	0	0
Winston-Salem, NC	640595	19.83	0	19.83	19.83	0	19.83
Yakima, WA	243231	0	0	0	0	0	0
York-Hanover, PA	434972	0	0	0	0	0	0
Youngstown-Warren-Boardman, OH-PA	565773	0	0	0	0	0	0
Yuba City, CA	166892	0	0	0	0	0	0
Yuma, AZ	195751	0	0	0	0	0	0