Preliminary Research for Replacing or Supplementing the Acreage, Number of Rooms and Bedrooms, Tenure, Property Value, & Real Estate Taxes Questions on the American Community Survey with Administrative Records

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Introduction

- "Agility in Action: A Snapshot of Enhancements to the American Community Survey" (Census Bureau, 2015)
    - Census Bureau is investigating ways to reduce the difficulty and length of the American Community Survey (ACS) using administrative records.
    - Benefits of administrative records: sufficient coverage and quality; populate missing responses; enhance editing/imputation routines.

- CARRA investigates the use of administrative records to enhance data collection across several housing topics.
    - Measure coverage by linking commercial housing data to ACS records.
    - Assess the extent of agreement and limitations of the commercial data in relation to the ACS.
    - Present results summarizing performance of the external data across various household(er) characteristics.

Data & Methodology

- 2014 ACS unswapped and unweighted records.

- County and municipal property tax data compiled by a third-party commercial vendor from tax year 2014.

  - Data for over 112 million housing parcels in the United States.

Data & Methodology: Limitations

- Government property tax records often focus on aggregate measures of property structures rather than individual units within the structure.

- Local authorities collect information from the property owner, whereas the ACS surveys the occupant.

- The lack of standardization in the objectives and collection methods used by local authorities does not consistently reflect the same level of detail and context presented in the ACS questionnaire.

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Data & Methodology: MAF-match

Table 1: Vendor data MAFID-match rate across ACS households

	ACS		Vendor data
	Full sample	Subsample	
Total Observations	5,325,044 (persons)		112,620,085 (housing units)
# Households/Housing Units	2,273,701	1,320918	112,620,085
Households with MAFID	2,273,701	1,320918	92,482,246
# Unique MAFIDs	-		90,303,407
Households with MAFID Match	1,458,986	1,163,748	1,458,986 (1,163,748, subsample)
Match Rate Across ACS Households	*64.17%*	*88.1%*	

Note: Subsample column refers to single family, owner-occupied housing units.

Source: 2014 American Community Survey and government property tax data from commercial vendor.

- We link each external data source record and ACS response by Master Address File Identification Number (MAFID) – a number associated with each record in the Master Address File (MAF).

  - The MAF is a database containing the address or location description of every building (residential or non-residential) known to the Census Bureau.

  - MAFID match rate across ACS households: **64.17% (88.1%, single family and owner-occupied subsample)**.

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Results:
Linkage to non-missing Information

- Among linked data, some topics match to non-missing vendor data at very high rates, 90+ percent.
  - Acreage, property value, property tax

- Total number of rooms and bedrooms have missing data issues.
  - Links to missing vendor data 56.09% and 38.85% of the time, respectively.

- Tenure links to missing vendor data 87.53% of the time.
  - Low-quality contextual agreement; not compatible with this particular administrative record source.

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Relative Relationship between Linked Vendor and ACS Data Values, missing values removed

Source: 2014 American Community Survey and government property tax data from commercial vendor.

Acreage

4 How many acres is this house or mobile home on?

☐ Less than 1 acre → *SKIP to question 6*
☐ 1 to 9.9 acres
☐ 10 or more acres

Source: 2014 American Community Survey.

Table 4: ACS Acreage (2014, unedited) by Vendor Data

ACS Acreage	Matched ACS Count	Vendor Acreage			
		Less than 1 acre	1 to 9.99 acres	10 or more acres	Vendor data on acreage not available
Less than 1 acre	1,030,397	92.79	2.4	0.34	4.47
1 to 9.99 acres	259,438	20.41	74.82	2.02	2.75
10 or more acres	56,717	3.32	16.91	77.3	2.47
ACS data on acreage not available	112,434	64.19	11.36	2.63	21.82
Column total	1,458,986	1,083,088	241,241	55,573	79,084

Source: 2014 American Community Survey and government property tax data from commercial vendor.

- ACS matches to non-missing vendor data 94.58 percent of the time.

- Overall agreement rate is 83.52%.
  - Across responses, most frequent agreement occurs with acreage values less than one.

Number of Rooms

a. How many separate rooms are in this house, apartment, or mobile home?
Rooms must be separated by built-in archways or walls that extend out at least 6 inches and go from floor to ceiling.

- INCLUDE bedrooms, kitchens, etc.
- EXCLUDE bathrooms, porches, balconies, foyers, halls, or unfinished basements.

Number of rooms

Source: 2014 American Community Survey.

- ACS matches to non-missing vendor data 43.91 percent of the time.

- Overall agreement rate is 15.34%.
  - Across responses, most frequent agreement occurs with total room values equal to five, 18.73%; six rooms with a one room difference, 36.93%.

Table 6: ACS Number of Rooms (2014, unedited) by Vendor Data

ACS Number of Rooms	Matched ACS Count	Vendor Number of Rooms										Vendor data missing
		1	2	3	4	5	6	7	8	9	10+	
1	2,996	1.57	7.24	7.11	5.97	5.14	3.6	1.84	1.67	0.77	1.67	**63.42**
2	8,458	0.3	2.55	10.07	11.07	7.64	2.98	1.21	0.83	0.34	0.72	**62.3**
3	37,496	0.2	0.63	6.52	10.7	9.67	6.02	2.5	1.34	0.4	0.6	**61.42**
4	125,495	0.1	0.23	1.44	13.41	12.76	6.41	2.57	1.61	0.53	0.74	**60.2**
5	276,555	0.07	0.11	0.48	4.53	18.73	11.43	4.02	1.67	0.62	0.77	**57.57**
6	312,159	0.06	0.08	0.3	2.2	11.19	17.99	7.76	3.06	1.01	0.9	**55.47**
7	241,629	0.05	0.06	0.2	1.36	7.17	13.24	12.94	6.53	2.21	1.6	**54.63**
8	178,092	0.06	0.06	0.16	0.92	4.96	9.56	10.36	11.82	4.44	3.18	**54.48**
9	103,376	0.05	0.05	0.15	0.71	3.88	7.85	8.85	10.88	7.59	5.69	**54.29**
10+	141,085	0.06	0.04	0.13	0.52	2.83	5.62	7.1	9.8	7.45	12.32	**54.13**
ACS data missing	31,645	0.14	0.25	0.5	3.06	9.15	10.14	6.74	4.98	2.33	3.34	**59.37**
Column total	1,458,986	1,039	1,924	8,832	48,722	144,209	166,684	110,699	80,302	38,081	40,080	818,414

Source: 2014 American Community Survey and government property tax data from commercial vendor.

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Number of Rooms

7. a. How many separate rooms are in this house, apartment, or mobile home?
Rooms must be separated by built-in archways or walls that extend out at least 6 inches and go from floor to ceiling.

- INCLUDE bedrooms, kitchens, etc.
- EXCLUDE bathrooms, porches, balconies, foyers, halls, or unfinished basements.

Number of rooms

Source: 2014 American Community Survey.

- ACS matches to non-missing vendor data 43.91 percent of the time.

- Overall agreement rate is 15.34%.
  - Across responses, most frequent agreement occurs with total room values equal to five; six rooms with a one room difference, 36.93%.

Table 6: ACS Number of Rooms (2014, unedited) by Vendor Data

ACS Number of Rooms	Matched ACS Count	Vendor Number of Rooms										Vendor data missing
		1	2	3	4	5	6	7	8	9	10+	
1	2,996	1.57	7.24	7.11	5.97	5.14	3.6	1.84	1.67	0.77	1.67	63.42
2	8,458	0.3	2.55	10.07	11.07	7.64	2.98	1.21	0.83	0.34	0.72	62.3
3	37,496	0.2	0.63	6.52	10.7	9.67	6.02	2.5	1.34	0.4	0.6	61.42
4	125,495	0.1	0.23	1.44	13.41	12.76	6.41	2.57	1.61	0.53	0.74	60.2
5	276,555	0.07	0.11	0.48	4.53	18.73	11.43	4.02	1.67	0.62	0.77	57.57
6	312,159	0.06	0.08	0.3	2.2	11.19	17.99	7.76	3.06	1.01	0.9	55.47
7	241,629	0.05	0.06	0.2	1.36	7.17	13.24	12.94	6.53	2.21	1.6	54.63
8	178,092	0.06	0.06	0.16	0.92	4.96	9.56	10.36	11.82	4.44	3.18	54.48
9	103,376	0.05	0.05	0.15	0.71	3.88	7.85	8.85	10.88	7.59	5.69	54.29
10+	141,085	0.06	0.04	0.13	0.52	2.83	5.62	7.1	9.8	7.45	12.32	54.13
ACS data missing	31,645	0.14	0.25	0.5	3.06	9.15	10.14	6.74	4.98	2.33	3.34	59.37
Column total	1,458,986	1,039	1,924	8,832	48,722	144,209	166,684	110,699	80,302	38,081	40,080	818,414

Source: 2014 American Community Survey and government property tax data from commercial vendor.

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Number of Bedrooms

b. How many of these rooms are bedrooms?
Count as bedrooms those rooms you would list if this house, apartment, or mobile home were for sale or rent. If this is an efficiency/studio apartment, print "0".

Number of bedrooms

Source: 2014 American Community Survey.

- Instances of missing vendor data still significant, but not as prevalent as with total rooms.

- ACS matches to non-missing vendor data 61.15 percent of the time.

- Overall agreement rate is 43.67%.
  - Across responses, most frequent agreement occurs with total bedroom values equal to three, 49.1%; four bedrooms with a one room difference, 61.35%.
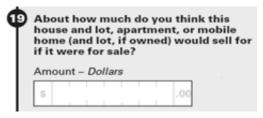
Table 9: ACS Number of Bedrooms (2014, unedited) by Vendor Data

ACS Number of Bedrooms	Matched ACS Count	Vendor Number of Bedrooms					Vendor data missing
		1	2	3	4	5+	
0	5,276	7.24	10.96	24.81	8.83	2.16	46
1	35,050	31.52	15.29	8.44	2.43	0.79	41.53
2	267,398	1.54	41.19	13.77	2.51	0.57	40.42
3	712,281	0.25	5.44	49.1	4.86	0.69	39.66
4	323,525	0.14	2.18	18.81	39.76	3.17	35.94
5+	86,166	0.16	1.47	12.15	21.8	29.06	35.36
ACS data missing	29,290	1.09	9.32	28.08	12.69	6.01	42.81
Column total	1,458,986	18,244	165,856	470,362	193,759	43,926	566,839

Source: 2014 American Community Survey and government property tax data from commercial vendor.

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Property Value

19 About how much do you think this house and lot, apartment, or mobile home (and lot, if owned) would sell for if it were for sale?

Amount – *Dollars*

$ _____ .00

Source: 2014 American Community Survey.

- ACS matches to non-missing vendor data 99.61 percent of the time.

- Overall agreement rate *in decile range* is 28.72%.

- With up to 5% difference in values, most frequent agreement occurs with property values between $85,000 to $118,000, 16.61%.
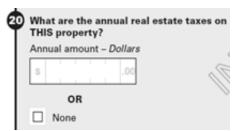
Table 13: ACS Property Value (2014, unedited) by Vendor Data

ACS Property Value	Matched ACS Count	Vendor Property Value										
		[0-50K)	[50K-85K)	[85K-118K)	[118K-149,999)	[149,999-175K)	[175K-211K)	[211K-270K)	[270K-350K)	[350K-500K)	[500K+]	Vendor data missing
[0-50K)	117,710	59.76	14.6	6.35	4.87	2.92	2.98	3.16	2.22	1.57	0.97	0.61
[50K-85K)	116,743	38.43	48.02	10.3	1.62	0.45	0.26	0.15	0.11	0.14	0.19	0.33
[85K-118K)	107,617	20.5	29.9	38.83	7.36	1.42	0.77	0.4	0.2	0.11	0.19	0.31
[118K-149,999)	112,415	13.47	15.97	32.14	31.29	4.6	1.41	0.49	0.16	0.07	0.09	0.31
[149,999-175K)	117,195	10.62	11.69	17.37	30.21	20.79	6.68	1.72	0.33	0.15	0.14	0.29
[175K-211K)	111,886	8.22	7.98	10.24	17.16	21.55	25.39	7.41	1.23	0.31	0.2	0.31
[211K-270K)	114,727	6.81	5.33	5.96	9.12	11.58	25.11	30.66	4.41	0.57	0.17	0.28
[270K-350K)	126,441	7.73	3.45	4.22	4.7	5.53	11.52	29.37	28.13	4.7	0.37	0.28
[350K-500K)	107,783	8.7	2.81	2.49	2.87	2.44	4.61	11.6	26.3	34.32	3.61	0.25
[500K+]	106,697	6.64	3.41	2.5	2.03	1.49	2.03	3.69	6.9	21.12	49.92	0.27
ACS data missing	319,772	30.02	18.41	12.89	9.49	5.46	5.7	5.9	4.39	3.7	3.45	0.6
Column total	1,458,986	304,093	222,031	187,969	157,357	101,081	111,187	122,793	95,284	80,679	70,892	5,620

Source: 2014 American Community Survey and government property tax data from commercial vendor.

Real Estate Tax

20 What are the annual real estate taxes on THIS property?

Annual amount – *Dollars*

$ _____ .00

OR

☐ None

Source: 2014 American Community Survey.

- ACS matches to non-missing vendor data 96.97 percent of the time.

- Overall agreement rate *in decile range* is 43.45%.

- With up to 5% difference in values, most frequent agreement occurs with tax values greater than or equal to $6,800, 39.33%.

Table 17: ACS Real Estate Tax (2014, unedited) by Vendor Data

ACS Real Estate Tax	Matched ACS Count	Vendor Property Tax										
		[0-450)	[450-850)	[850-1,200)	[1,200-1,600)	[1,600-2,000)	[2,000-2,600)	[2,600-3,500)	[3,500-4,500)	[4,500-6,800)	[6,800+]	Vendor data missing
[0-450)	112,627	54.47	14.28	5.8	4.11	2.65	2.47	2.14	1.22	0.98	0.56	11.31
[450-850)	112,835	14.97	57.89	12	5.16	2.55	1.77	1.35	0.55	0.42	0.13	3.2
[850-1,200)	123,930	4.77	15.2	44.25	16.96	6.58	4.78	2.48	1.1	0.62	0.35	2.91
[1,200-1,600)	107,881	2.36	5.81	12.23	46.7	15.82	7.09	4.62	1.55	0.9	0.33	2.58
[1,600-2,000)	103,674	1.58	3.45	5.72	12.65	42.53	19.17	7.57	2.89	1.44	0.43	2.57
[2,000-2,600)	109,557	0.96	1.61	2.58	4.57	8.8	52.38	20.34	4.15	2.07	0.47	2.07
[2,600-3,500)	126,820	0.74	0.96	1.54	2.73	3.73	11.36	55.07	16.7	4.58	0.88	1.71
[3,500-4,500)	95,699	0.49	0.52	0.77	1.15	1.7	3.94	14.43	54.46	19.68	1.63	1.25
[4,500-6,800)	109,238	0.4	0.38	0.42	0.71	0.8	1.79	4.05	10.22	70.23	10.06	0.93
[6,800+]	111,527	0.65	0.72	0.81	1	0.84	1.03	1.7	2.01	9.46	81.1	0.67
ACS data missing	345,198	12.38	14.7	12.01	11.31	8.99	9.85	9.93	6.53	6.51	4.48	3.3
Column total	1,458,986	134,690	165,526	142,391	145,477	124,033	150,929	166,374	121,816	141,459	122,107	44,184

Source: 2014 American Community Survey and government property tax data from commercial vendor.

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Conclusion

- MAFID-match rate is 64.17 percent of all 2014 ACS households.
  - 88.1% in single family, owner-occupied subsample.

- Property tax data performs best for ACS topics directly related to the calculation of property owner tax obligations such as acreage, property value and real estate tax.
  - High availability of non-missing vendor data values.

- Regarding number of rooms and bedrooms, the linked data is not ideal but might still be valuable for imputation.

- Vendor data on tenure does not provide enough information for a quality match to ACS records.

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Appendix

Linkage to non-missing Information

Table 2: Match rate by non-missing and missing vendor data among MAFID-matched observations

ACS topic	Count, ACS records matched to non-missing vendor data	% of ACS households matched to non-missing vendor data	Count, ACS records matched to missing vendor data	% of ACS households matched to missing vendor data
Acreage	1,379,902	94.58%	79,084	5.42%
Number of Rooms	640,572	43.91%	818,414	56.09%
Number of Bedrooms	892,147	61.15%	566,839	38.85%
Tenure	181,927	12.47%	1,277,059	87.53%
Total Property Value	1,453,366	99.61%	5,620	0.39%
Real Estate Tax	1,414,802	96.97%	44,184	3.03%

Note: Rows sum to total MAFID-matched obs. (Number of ACS households) = 1,458,986

Source: 2014 American Community Survey and government property tax data from commercial vendor.

Table 1A: Match rate by non-missing and missing vendor data among MAFID-matched observations; single family, owner-occupied subsample
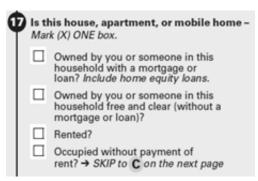
ACS topic	Count, ACS records matched to non-missing vendor data	% of ACS households matched to non-missing vendor data	Count, ACS records matched to missing vendor data	% of ACS households matched to missing vendor data
Acreage	1,125,501	96.71%	38,247	3.29%
Number of Rooms	524,235	45.05%	639,513	54.95%
Number of Bedrooms	720,014	61.87%	443,734	38.13%
Tenure	50,928	4.38%	1,112,820	95.62%
Total Property Value	1,160,534	99.72%	3,214	0.28%
Real Estate Tax	1,130,851	97.17%	32,897	2.83%

Note: Rows sum to total single family, detached MAFID-matched obs. (#ACS households) = 1,163,748

Source: 2014 American Community Survey and government property tax data from commercial vendor.

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Tenure

Source: 2014 American Community Survey.

Table 3: ACS Tenure (2014, unedited) by Vendor Data

	Matched ACS Count	Vendor Tenure	
ACS Tenure		Absentee (situs ≠ mail)	Vendor data on tenure not available
Owned with a mortgage	807,382	34,077	773,305
Owned without a mortgage	415,038	22,737	392,301
Rented	177,229	110,226	67,003
Occupied without payment of rent	23,648	8,256	15,392
Other	1,375	92	1,283
ACS data on tenure not available	34,314	6,539	27,775

Source: 2014 American Community Survey and government property tax data from commercial vendor.

- Focus on identifying owners/renters in vendor data.
  - Absentee owner indicator, 12.47%.
  - Corporate ownership, 3.48%.
  - Vacancy status, 0.33%.

- Missing data

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